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William Berg's
Tropical Fish
A Beginners Guide



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William Berg's

Tropical Fish

A Beginners Guide

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Tropical fish - a beginner's guide

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All aquarists are welcomed to download their own free version of Tropical fish - a beginner's guide from our website. And we would like to ask you to help us to spread the word about this guide to all prospective beginner aquarists out there.

We are planning for this e-book to be the first in a series of free e-books written to help aquarists give their fish a good home and allow them to get the most out of their hobby. The work on a second book in the series about Betta fish (Siamese fighting fish) has already begun. The future of the series is however partly dependent on the success of the first two books since their will be little meaning for us to devoted the considerable time required to write and edit an e-book like this if no one are interested in reading it. We would therefore like to ask for your help to spread the word of this e-book by linking to it from your blog or homepage and by telling your aquarist friends on forums and your offline friends about the e-book and the fact that it can be downloaded from AC Tropical Fish (aquaticcommunity.com).

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Chapter 1	7
How to set up an aquarium	7
Choosing a spot for your aquarium.....	8
Choosing an aquarium	9
Acrylic or Glass Aquarium	9
Putting the aquarium in place	10
Choosing equipment	10
Lighting.....	10
Heating.....	11
Filtration.....	11
- Mechanical filtration.....	11
- Chemical filtration.....	12
- Biological filtration.....	12
- Other types of filtration	12
Air Pumps	13
Decorations	13
Plants.....	15
Water test kit.....	16
Setting up the aquarium	17
Water chemistry	19
Conditioning water.....	21
Cycling.....	22
Adding Fish.....	23
Stress in your aquarium	26
Water problems and their solutions	27
Tropical fish aquarium problems	28
Vacation care for your fish	29
Safety	30
Chapter 2 – Plants	33
Choosing plants for your aquarium.....	33
Factors that affect plant growth	35
Water.....	35
Lighting.....	36
Substrate.....	36
Nutrients.....	37
Filtration.....	38
Suitable plants for beginners.....	38
Caring for plants	39
Propagating plants.....	41
Algae	42
Chapter 3 - Fish.....	44
Choosing Fish	44
Biomes	45
The Root biotope of South America	46
The Asian Lowland Still water Biotope.....	46
The Community Aquarium	46

Chapter 4 - Aquarium Maintenance.....	50
Daily routine	50
Checking the fish	50
Checking the water	51
Checking the Filter.....	51
Feeding the fish.....	52
Weekly Routine	52
Monthly Routine	54
The “Old Aquarium” Syndrome	54
Filtration.....	55
Chapter 5 - Food	58
Feeding Fish.....	58
Flavor and taste	59
Sound	59
Smell	59
Color and Buoyancy of food.....	59
Understanding feeding and digestion in fish	59
Protein	61
Fatty acids	61
Fat-soluble carotenoid.....	61
Carbohydrates	61
Vitamins and minerals	61
Types of food	62
Live foods	63
Cultivation of some common live food	64
Feeding Fry	65
Feeding Habits	66
Chapter 6 - Breeding Fish.....	69
Spawning Methods.....	69
Egg Scatterers	69
Egg Depositors.....	69
Mouth Brooders	70
Nest Builders.....	70
Livebearers.....	70
Equipment management while breeding fish.....	71
Choosing the parents.....	72
Conditioning the parents.....	73
Tips for effective breeding.....	74
Raising Fry.....	75
Failure in Reproduction	76
Chapter 7 – Diseases	78
Buying healthy fish	78
Prevent diseases	79
Quarantine Aquarium.....	80
Columnaris.....	81
Gill Disease	81

Ick	81
Dropsy	82
Fin-rot	82
Fungal Infections	82
Hole in the Head	82
Pop-Eye.....	83
Cloudy Eye.....	83
Swim Bladder Disease	83
Fish Lice.....	83
Nematode Worms	83
Water Quality Induced Diseases.....	83
Treating Fish	84

Chapter 1

Have you been thinking of adding a freshwater aquarium to your home? It's a lovely way to enjoy a miniature riverbed from the comforts of your own room. A beautiful aquarium with healthy, energetic fish swimming in clear waters and surrounded by green vegetation is a stunning sight. But before you begin, you need to be armed with all the relevant facts.

As a person who has spent more than 20 years in this hobby, I have tried and tested many of the tips, secrets and methods you will find in these pages. Setting up an aquarium is not really a science but needs to be done correctly to give your fish the best possible home. It needs a little bit of common sense and foresight. There are many dos and don'ts that are learnt over a long period of trial and error.

This book is written mainly for beginners and I have therefore tried to keep things on a very basic level and use a language that is easy to understand. By following these basic instructions you will be able to successfully set up and maintain a freshwater aquarium with easy or moderately difficult fish species. It is important to keep in mind that different fish has different demands and this book does only give you basic knowledge about aquarium keeping. It is advisable to start out with comparatively easy fish species before you advance to more delicate ones. A lot of fish species have intricate demands and in order to successfully keep such species you will need to research them more thoroughly. There is however a lot of beautiful and interesting fish species to choose among even for the novice aquarist, and by following the instructions in this book you will be capable of successfully keeping a beautiful aquarium filled with thriving vegetation and healthy and colorful fish.

How to set up an aquarium

An aquarium, to put it simply, is a container that can sustain fish and other aquatic life for a longer period of time. Acquiring a good aquarium for your fish is not a very difficult job as long as you give it some thought before you actually get it. There are some obvious considerations to be taken into account. Setting up and fully stocking a good aquarium will take anywhere between a couple of weeks and a month. The time that you spend with these basic steps will save you a lot of time and trouble at a later stage.

There are several things to consider before you purchase an aquarium. How much time you are willing to spend on the aquarium? What kind of aquarium do you want to buy? What is the ideal spot for your aquarium? What kind of fish should you put in your aquarium? How do you keep your fish and their environment healthy in the easiest and quickest way? How much time would it all take to maintain? What should you feed your fish and how much? What should you do when diseases strike? These are just some of the many questions that you need to think about.

A good and well stocked aquarium needs quite a bit of equipment. Here is a simple list of the items that you will need for a basic freshwater aquarium:

- An aquarium tank
- An aquarium stand
- A hood
- Lighting equipment
- Air pump
- Heater
- Thermometer
- Filters (internal or external)
- Gravel
- Decorations (optional, but interesting if you have these)
- Maintenance items like scrubber, siphon tube etc.

Choosing a spot for your aquarium

First, you will need to think about how much free space you have for your aquarium, whether that free space is open to sunlight, and which shape that is best suited for that free space. Never place an aquarium in direct sunlight and keep the aquarium away from any heating or cooling surfaces. Sunlight and heating or cooling surfaces will cause sudden and drastic changes in the temperature within the aquarium, and sunlight will also promote the growth of algae in the water.

Keep your aquarium away from machines that give out a lot of sound or cause vibration, like the washing machine, since this will stress the fish. Water accessibility and easy disposal of dirty water and waste are some other important factors to consider while selecting a good spot for your aquarium as you don't want to run around with buckets of water in your entire house. You will need to clean and change water at least monthly and better once a week. So, choose a place where you can work easily and without any interference. In a family with children, special care has to be taken to keep the aquarium away from areas of frequent activity. You do not want your children to push or fall on the aquarium while they play and injure themselves or break the aquarium glass.

Any good home has a certain décor. While choosing a spot for your aquarium, you must consider whether the general décor and lighting in the room will make it an attractive place for the new aquarium. Take the type of biotope you plan to have in your aquarium into consideration when you decide if an aquarium will work with the décor of the chosen spot. Different types of biotopes works with different decors. A saltwater reef aquarium will for instance have a very different look than a well planted South American biotope.

You should also consider that an aquarium is very heavy so the chosen spot has to be able to support the weight of the aquarium. Any aquarium over 10 gallons/ 40 L will weigh at least a hundred and fifty pounds / 70 Kg when filled and decorated. The weight comes chiefly from the glass and the water, and decoration such as gravel will further add to this

weight. Heavy aquariums will need to be kept on a sturdy stand rather than a shelf or a desk.

Choosing an aquarium

How big should your aquarium be? Aquariums come in many shapes and sizes. It is advisable to choose an aquarium that is at least 10 gallons/ 40 L, since small aquariums are much more difficult to maintain. The waste build up in small aquariums is quick and quite large in comparison with a larger aquarium. A small aquarium will therefore require very frequent water changes. Changes in temperature or water chemistry will also take place more quickly in small aquariums. Rapid changes in the temperature or water chemistry are harmful for fish.

I would recommend a 30-gallon/120 L aquarium to novice aquarists, since this will provide enough room for more fish and is easier to maintain as it has enough water volume to dilute fish waste. A larger aquarium will naturally be even easier to maintain, but the benefits of an aquarium that is larger than 30-gallon/120 L is not as significant as the difference between a 30-gallon/120 L aquarium and a smaller one. A 30-gallon/120 L aquarium is large enough to buffer against rapid changes in water values. 30-gallon/120 L is therefore an ideal beginner size.

Fish aquariums come in many shapes ranging from rectangular to hexagonal or even cylindrical. While making your purchase, it is not only the beauty of the piece that counts. Mundane matters like how easy it will be to clean out the aquarium regularly, and how to keep all the nooks and crannies hygienic are important considerations.

The height of the aquarium is also a very important aspect. An aquarium that is very deep is complicated to keep for the beginner aquarist. Increased height means greater difficulty when cleaning and your aquarium might therefore always carry some amounts of waste even after a thorough clean up. Poor light penetration is another problem with a deep aquarium. Plants will not thrive in water that has poor light penetration and special lighting is therefore needed in deep planted aquariums.

Acrylic or Glass Aquarium

Glass aquariums usually cost less and do not get scratches as easily as acrylic aquariums. Glass aquariums are also stronger, as they are bonded together by a silicone sealant. They need support only on the edges, unlike acrylic aquariums. Glass aquariums are very durable, and can last for many years without any problems. Proper lighting will make glass aquariums look almost as clear as acrylic ones. On a negative note can be said that glass aquariums are always much heavier than acrylic.

However, if you are looking for irregular shapes, than these are easier to obtain as acrylic aquariums. Acrylic aquariums are much clearer than glass, and have better insulation. This means that you can use a smaller heater in your aquarium to maintain the proper temperature. Acrylic aquariums do however scratch easily and can therefore only be

cleaned with specially made soft pads. Removing scratches from acrylic aquariums can be quite a troublesome procedure.

The price can also be an important factor when it comes to buying your first aquarium. Glass aquariums are usually the cheaper alternative and there is also a wider selection of second hand glass aquariums than there is of second hand acrylic aquarium since glass aquariums are more durable.

Putting the aquarium in place

When you have selected the best aquarium for your needs, it is time to take it home. Here is a checklist that you need to consider:

- Look for any scratches on the aquarium before you make the purchase.
- Test to see if there are any leaks in the aquarium.
- Take care not to load any heavy items inside the aquarium while you carry it home. This may lead to scratching or even breakage.

Get a tight fitting hood for the aquarium when you buy it. An open aquarium is never a healthy option. More water will evaporate from an aquarium where the water is open to sunlight, heat etc. Evaporation will lead to the water becoming concentrated with waste and animal- and plant debris, and can also cause water damages and mildew in the room around the aquarium. Contamination from falling waste is another problem. With an open aquarium you will also risk casualties since fish often jump out of an open aquarium, and ending up on the floor is more often than not fatal for the fish unless you immediately spot it and put it back in the aquarium. Thus an aquarium needs a good and sturdy hood. These hoods come in various decorative shapes and colors.

There are various accessories that go with your aquarium, other than the hood. An aquarium is a complete set of a number of equipment that works together.

Choosing equipment

Lighting

The first equipment that you will come across is probably the lighting for the aquarium. Most hoods come with fluorescent or incandescent lighting. Fluorescent bulbs are a better choice despite the fact that they are a bit more expensive since they have long-term benefits. They burn cooler, thereby not affecting the water temperature at all. Fluorescent bulbs have another benefit as they use less electricity. Fluorescent bulbs can be purchased in sizes that cover the entire aquarium. This will provide even lighting in all areas of the aquarium. There are a wide variety of fluorescent bulbs that emit different spectrums of light. Some of these will even assist plant growth. Some will lead to an increase in algae growth. Optimal plant growth requires a particular wattage, which can be decided by the size of the aquarium. Usually, 1 gallon of water will require 1.5 watts.

An average aquarium requires 8 to 10 hours of light a day. If you use incandescent lighting it is however better to turn on the lighting for a few fixed hours a day. Especially in the case of smaller aquariums, the water will become considerably hotter during the day. And at night, once the light is switched off, the temperature of the water will drop fast.

Heating

A thermostatically controlled water heater will help to maintain a regular water temperature in the aquarium. This is especially good in areas that get very hot during the day and cool off during the nights. The more wattage your heater has, the more heat it will generate. Larger aquariums need more heat than smaller ones as there is more water to heat. An immersible heater hangs into the water while the thermostat remains above water. This makes it easier to take readings. Fully submersible heaters are fixed to the back wall of the aquarium. In this case, one has to be very careful while taking the readings. Carelessness can cause the glass of the heater to crack or even explode.

Even in places where the temperature is relatively stable, the use of a heater is still recommended, and required if you keep tropical fish. Only fish that do well in cold water like goldfish should be kept in aquariums without heaters. The heater will help you to control the temperature in which the fish live. Even the hardiest of fishes cannot tolerate steep fluctuations in water temperature and will eventually die if they are submitted to such changes. It is therefore essential to have a thermometer that will read the temperature in the aquarium at all times and a heater that will heat the water when necessary. The crystal type thermometers that can be glued to the glass are very easy to read and inexpensive.

Filtration

Basically, there are 3 types of water filtration: mechanical filtration, chemical filtration and biological filtration.

- Mechanical filtration

In mechanical filtration, water is passed through a thin sponge or a screen, which removes the debris. The size of the debris that can be trapped and the time required to filter out the water depends on the quality and the density of the material used, as well as on the power of the pump head. In the course of time, these filters will get clogged and will need to be cleaned. Thus, mechanical filters help to clear out larger particulate matter from the aquarium. Under gravel filters are a type of mechanical filters that uses the aquarium gravel as filter material and trap the debris among the gravel.

- Chemical filtration

In chemical filtration, water is passed through Activated Carbon or a natural mineral called Zeolite. Activated Carbons are used primarily to make water clear and remove potentially harmful chemical substances. It will remove color and odor producing substances. Chemical filtration is most useful for removing particles that have got dissolved in the water and substances that are too small to be removed through mechanical filters. Usually, it helps to clear the yellow color that develops in aquarium water over a period of time. Chemical filtration is also very good to remove medicine lingering in the water after successfully curing a disease in your aquarium.

- Biological filtration

Biological filtration uses bacteria that live on gravel, glass surfaces etc to brake down harmful substances in the water. This is the most effective kind of filtration for reducing toxic wastes. Fish normally give out ammonia from their gills and in their feces. This ammonia is toxic for fish. In a natural environment, Ammonia is turned into Nitrite by one type of bacteria, and the Nitrite is then subsequently turned into Nitrate by another type of bacteria. Both Nitrate and Nitrate can harm your fish, but Nitrite is much more damaging than Nitrate. Fish waste products can propagate plant growth in your aquarium, but it will also propagate undesired algae growth.

Biological filtration will take place in a healthy aquarium without you having to worry about it, as long as you don't kill the bacteria by vigorous cleaning or the use of chemicals. One place where such biological filtration takes places is in the filter of your mechanical filter and it is therefore very important not to clean this filter in hot water or using any type of detergent. Clean it cautiously with room temperature water to allow at least some bacteria to survive in the filter material and start the biological filtration again as soon as you put the filter back in the aquarium.

- Other types of filtration

There are also some additional kinds of filters. Foam fractionators pass a large stream of bubbles through a column of water. Many substances will stick to the foam that collects at the top, and can thus be removed. Passing ozone and ultraviolet light through aquarium water are also effective to kill bacteria, algae and parasites. But, these are methods that have got different levels of endorsements from aquarists. While some swear by these methods, others say that ozone and ultraviolet rays do nothing for the aquaria. None of these methods can be recommended to the beginner aquarist as they are expensive and there usefulness unverified.

For effective filtration, you must take the size of your aquarium into account and use a combination of the filtration methods described above.

Air Pumps

Air bubbles that rise to the surface of the aquarium not only help to detoxify and aerate your aquarium, but also add to the beauty of the aquarium. These thousands of bubbles move toxins and waste from the substrate to the surface where they dissipate. They aerate the water, and add to the oxygen levels in the water which prevent low oxygen levels which can be harmful to your fish. If you use under gravel filtration, air pumps will aid these filters to work normally.

Decorations

When setting up your aquarium, it is definitely recommended to add decorations. Your fish will give you hours of viewing pleasure, and the more natural their environment look, the greater your pleasure will be since they will display a much wider range of natural behaviors. There are various kinds of suitable and aquarium safe decorations available. Your choice is limited only by the amount of money you are willing to spend and the fish species that you keep.

The primary focus when you decorate your aquarium, besides your fish well being, is to keep all unsightly equipment well hidden. It is therefore nice to have some sort of scenery at the back of the aquarium. The décor should be used to hide the equipment that you are using within the aquarium, so that your aquarium takes on a more natural look. You do not want wires and tubes peeking from all corners. There are several commercial backdrops that simulate water, plants etc. They are an excellent buys if you are happy with the look of these. This makes the fish feel more secure and makes your aquarium look better. Many of the shy fish feel 'exposed' from all sides, if there is nothing covering them from behind. Another inexpensive and easy solution is to use colored cardboards as your backdrop. They are not very hard to make, and can be changed as often as you wish. There are also more expensive backgrounds that you put inside the aquarium and that simulate real biotopes in a more realistic way. These are stunning but can unfortunately be rather expensive.

Painting the glass with your favorite shade is a widely used option, but this has to be done carefully. Make sure that no paint is spilled into the inside of the aquarium since any traces of paint in the water after the fish come in can be deadly to them. Also, if you do not spread the paint evenly, light coming in from the back will show up the bad patches. Changing the paint once you get tired of it is typically more cumbersome than simply changing a poster backdrop.

Substrate refers to the material that you use at the bottom of your aquarium, like sand, pebbles etc. This is not only a form of beautiful aquarium decoration; it will also serve several purposes in your aquarium. There are some aquarists who advocate putting in little or no substrate at all, while other can't imagine an aquarium without it. The substrate has complex physical, chemical and biological significance and helps keep your aquarium balanced. Some types of substrates will for instance help to buffer your water and maintain the right pH in your aquarium. Substrates help in anchoring plants and decorations to the bottom, aid in the filtration process, and act as catalysts for organic

processes within the aquarium. There are however a lot of aquatic plants that can grow even without a substrate.

It is best to use non-coated natural color gravel as substrate in your first aquarium. Care should be taken while selecting the size of the gravel or pebbles. When under gravel filtration is used, the gravel size should provide for free flow of water. Sand is therefore not a recommended aquarium decoration, especially not for beginners. Sand particles being small, reduces water flow and aeration. Take the kind of aquarium and fish you want to keep into consideration when you choose the gravel for your aquarium. Some gravel effect the water values and may make it impossible to keep the water conditions your intended fish want. An example of this is that gravel containing chalk will raise the pH level, which can be a problem if you want to keep South American fish from acidic waters.

As mentioned earlier, using sand at the bottom of your aquarium is generally not recommended. Sand is very tightly packed and can make cleaning up rather tiresome. Sand can also clog the filters, and pack away large amounts of waste and debris. But, if you simply love to see sand in your aquarium, you can of course choose sand and spend a little more time cleaning your aquarium.

Silver sand is the most commonly available type of sand. Though it is cheap, it packs more and can therefore be difficult to clean. Aquarium sand is slightly larger than silver sand, but is also about 5 times costlier. Marine sand comes from corals or seashells that have been crushed. These look good, but may alter the pH balance of your aquarium. Beach sand is not a safe option for your tropical aquarium. Beach sand has large deposits of salt that cannot be totally washed off. Beach sand may also have lots of pollutants that cannot be treated properly.

Certain substances like seashells, limestone and marbles should not be used in a tropical aquarium if you are a beginner aquarist striving to keep the water chemistry stable. These substances may dissolve slowly into the water thus gradually altering its pH balance.

How much substrate should you put in? The amount of substrate you will need depends upon the size of your aquarium and the set up. Planted aquariums will typically need more substrate than ones without plants. Aquariums without vegetation of one kind or another are not as common as planted aquariums, but can function very well and are kept by many aquarist all over the world. A 2-4 inches / 5-10 centimeter thick layer of substrate is recommended for plants, since this will help them to establish their root system. Once you calculate the area of your aquarium, it is easy to calculate the volume of substrate that needs to go in. Simply multiply the area of your aquarium with the desired height for your substrate.

Decorating your aquarium beautifully is an essential part of setting it up. Firstly, a decorated aquarium LOOKS great. Secondly, it also helps the fish in various ways. Many species need small nooks and crannies to hide from larger fish and to breed. Some fish

are also very territorial. Familiar rock formations, plants etc provide these with boundaries and landmarks which they can use territorial borders.

Plants

A lot of aquarists love the sight of lush vegetation swaying gently in a clear aquarium full of healthy fish. "Natural Aquarium" often refers to an aquarium that has a well-maintained balance between lush plants and healthy fish, each supplying what the other needs in a good environment. Plants and fish are the two main inhabitants of most aquariums. They coexist so well because each complements the other. Plants give out oxygen during photosynthesis. The oxygen released gets dissolved in the water and is used up by the fish. In turn, plants use up the nitrogenous waste released by the fish for their own growth.

In addition to their visual appeal and their capacity to produce oxygen, plants also provide shade, a home, breeding ground and food for some of the fish. Plants are also a nesting place for many microorganisms that are vital for the proper and balanced functioning of an aquarium. As the fish in your aquarium increases, the nitrogenous compounds also increase. Rich vegetation is a safety barrier that will keep toxicity lower.

Aquatic plants can be both floating and fixed. It is better to have a fair share of the fixed type in your first aquarium rather than going for the floating variety. While they look very pretty, floating plants can collect debris in and around them, and are more difficult to clean out. If you keep fish species that continuously uproot and disturb the plants, floating vegetation can however be the only feasible option if you want to keep real plants.

For decorative purposes alone, many aquarists go in for fake plants. Of course, these plants have numerous advantages. They are easy to clean, do not need any trimming, and will never decay or die. They have a base that will make them stick easily to the bottom of the aquarium and they will look perfect and healthy at all times. Artificial plants can however look very fake, especially if you choose some of the cheaper alternatives. Real plants will also help reduce the growth rate in algae something that plastic plants don't. Algae can therefore be a large problem in aquariums using plastic plants. In some aquariums it is however impossible to keep real plants, e.g. aquariums with plant eating fish species.

Some aquarists use a method where they put in plants – a lot of plants – in the aquarium before they introduce the fish. By using this method, they eliminate the need for normal cycling of the aquarium (cycling is explained a little later in this book). Using this method does however require extensive knowledge about the relevant biology and chemistry and other methods are easier for most beginner aquarists. If you wish to use this method, you must for instance closely monitor the carbon dioxide levels in the aquarium. The level of carbon dioxide in the water should be just right when you put in the fish. It is a good idea to put in algae eaters first, and then gradually add the rest of the fish over a longer period of time.

Water test kit

A water test kit is a MUST for any serious aquarist. This will help to keep the pH-value under control. It is also important to test the water for ammonia, nitrites, nitrates and hardness. There are numerous test kits available; some more basic than others. Test kits capable of measuring the levels of ammonia, nitrate and nitrite and the pH-value will often be enough for the beginner aquarist.

A simple ammonia test kit is usually the first kit purchased by aquarists. This type of test kit will allow you to observe the progress of the nitrogen cycle even though it is only measuring ammonia, not nitrate and nitrite. The break in period, when the fish have been just introduced into the aquarium, is the most dangerous period. At this time, the beneficial bacteria that help in detoxifying natural wastes have not yet fully developed. Biological filters can also stop working later due to many reasons and this will typically cause a peak in the ammonia levels. A peak in the ammonia levels can for instance be caused by a dirty filter filled with debris, having too small a filter for the load of fish in your aquarium, or adding medicines that kills the beneficial bacteria.

The nitrite test kit is used for the same purpose as the ammonia test kit in its initial phase - testing the nitrogen cycle. This kit is not as essential to the beginner aquarist as the ammonia test kit. It will however make it easier for you to know what's going on in your aquarium, and investing in a nitrite test kit can actually save you a lot of money since you will be able to rescue your fish before they all die from nitrite poisoning.

The nitrate kit is more important than the nitrite test kit, and should ideally be purchased together with the ammonia before you set up your aquarium. At the end of the nitrogen cycle, nitrate levels peak since nitrate is the end product. Increased levels of nitrate are dangerous for the fish and even established aquariums can have high levels of nitrates. Common indicators of too high nitrate levels are an oily shimmer at the surface of the aquarium and fish chipping for air on the surface. If the nitrate levels are too high, you should immediately do one or several water changes. Increasing the aeration of the water is also beneficial. If the problem persists, you must naturally try to determine the cause behind the high levels of nitrate.

The next important kit is the pH test kit. Before you buy fish, you will need to check out the pH of your water. The kind of fish you buy will depend on the pH of the water. Before they reach you, the fish may have been living in water that has a different pH than the pH in your aquarium and you will have to let such fish get time to adapt to the new values. Awareness of this will be helpful when you bring the fish home. Many fish species have special requirements when it comes to pH-values and may not be able to thrive in your tap water even if you give them time to adjust to the new pH-value. You must either change the pH-value in the aquarium to suit the fish or choose fish species that will appreciate the natural pH-value of your tap water.

Most kits are very easy to use. They base their results on color changes in the sample of water being tested. Certain additives help to counter specific problems. Frequently, a water change is the most effective way to change the undesirable results in a water test.

Setting up the aquarium

Before you can actually start filling up your aquarium, you will need to give it a thorough clean up. This will help to remove any traces of dirt, dust or contaminants. Using a very small amount of dish washing liquid along with warm water to clean your aquarium is ideal. But, follow this up IMMEDIATELY with a rinse in warm/hot water. This will remove all traces of the detergent from the glass surface. Remember to RINSE THOROUGHLY and then rinse again and again. Even a slight residue will harm your fish.

The next step is to wash ALL the things that will go into your aquarium. Begin with the gravel or sand. Wash half a bucket of sand or gravel under running water. Do not use anything other than water and make sure that the bucket that you use has not been used to hold detergent solutions of any kind. Stir the gravel around and keep changing water until it runs clear.

Then wash all the décor thoroughly and individually. If you intend to use under gravel filtration, you must wash the plates before adding them to the aquarium. If you are using bogwood to decorate your aquarium, you might have to soak it for a few weeks before you use it. Some bogwoods immediately sink while other has to be water drenched before sinking.

Any natural materials found in ponds, like rocks or driftwood, should first be treated before they are used. Soak them first in a mixture of chlorine bleach and water. Rinse in fresh water. Soak them again in fresh water and dry thoroughly. This can prevent undesirable elements like snails, parasites and other malevolent organisms from getting into your aquarium. It is however recommendable that you buy all your decoration at a reputable aquarium shop if this is your first aquarium as it can be hard to know what is suitable for use in your aquarium and what's not. Some items will emit unsuitable compounds regardless of how many times you soak them in bleach.

When you set up the aquarium, make sure that the spot that you have chosen has a completely flat floor, and that there is no shaking. Keeping a layer of specialist matting between the aquarium and what it stands on is a good idea. This will help to reduce any unevenness. Before you start filling the aquarium, make sure that you have a water conditioner that removes chlorine. In many countries chlorine is added to tap water in order to kill off micro organisms.

The first step while setting up your aquarium is to test for leaks. This may seem to be a waste of time if you feel that you have already checked your aquarium thoroughly. Leaks will however be very annoying and much more difficult to plug after your aquarium is

fully functional. So, fill up your aquarium with tap water, and wait for half a day. If there are no stains or indications of leaks, pump the water out, and rinse the aquarium.

Then, add the gravel into the aquarium. Underwater gravel filter along with its plates need to be put in before the gravel if you intend to use an under gravel filter. Gravel should be put in slowly to a height of 1-3 inches, depending upon the under gravel filtration, if you are using one. While putting the gravel in, see that you slope the gravel from back to front. The higher area should be towards the back. This will give the front part a better view.

Fill half the aquarium with water by pouring the water on to a plate that you put on the bottom of the aquarium to prevent disturbing the gravel. It is also a good idea to direct the water flow to the sides of the aquarium. If this is done slowly and carefully, your aquarium will be clear from the very beginning. In case your aquarium looks a bit cloudy and the particles have moved, allow the water to 'rest' for a day or two until most of the debris has gently subsided to the bottom again.

It is now time to install the thermometer, heater and filter. You should however wait until later before you plug them in. At this stage, you should only safely attach the equipment at suitable spots in the aquarium. The heater should be placed in an area where water circulation is the maximum. This will maintain an equal temperature in all parts of your aquarium.

You should also put in any decorative material at this stage. Rock formations, plastic plants etc can be put in and arranged more easily now than when the aquarium is completely filled. Remember to fix these materials in the substrate material so that they do not topple or float away later. As mentioned earlier, it is very important to wash each of these items before you place them in the aquarium. Position the decorations in such a way that your tubes and other accessories are well hidden behind them and in such a way that you find it ecstatically pleasing. A lot of fish species will appreciate if you create caves, crevices or other forms of hiding spots where the fish can feel safe.

You may want to put in your live plants now too. Care should be taken to keep the plants in areas that get good oxygen supply. Plants should be gently stuck into the substrate. If time is not a factor, it is a good idea to let your water stabilize for a few days before you add natural plants since this will be healthier for the plants. While choosing plants, do not simply go for the prettiest and most exotic plants. Many aquatic plant species will not survive long even in controlled conditions and are only suitable for experts. One such beautiful but sensitive plant is the popular *Rotala macranda*. Colorful plants are nice to look at, but they will usually require very strong lighting to survive. Plants that are not healthy will add to the debris and waste in your aquarium. Good sturdy plants like Java Moss and Water Sprite are therefore best for a beginner. Both Water Sprite and Java Moss can be left loose on the top, stapled to decorations or plugged to the bottom. One trick that comes in handy is to leave the plants floating in the water for a few days. They will start developing roots in about 3-4 days. Once the roots have come out, it will be easier to attach the plants to the substrate. Place some heavier stones around plants that

otherwise tend to float away. Don't leave plants floating on the surface to long as they will grow very strangely. When plants are floating, the aquarium lights will light up the side of the plant, and when the plant is later turned vertical and planted it will look very uneven. Growing sideways is unattractive in most plants.

Once the plants are in place and you checked that you didn't forget to add anything else it's time to fill the aquarium full with water. Once you have filled your aquarium to its optimum capacity, you will need to start the heater. Allow the heater to stay in water for half an hour before you turn it on. Before you plug it on, make sure that the thermometer is placed where it is easy to read. Read all the instructions in your operator's manual since these can vary between different heaters. Once you turn the heater on, the water temperature and the heater needs to be closely monitored for a day.

Sufficient and proper aeration comes next. When using air tubing for decoration, the risk of water back siphoning into the tubes are high, especially if they are placed lower than the water in the aquarium. So, the air pump should preferably be placed higher than the water level. Anti-siphon valves are also easily available. If you are using more than one air stone, a gang valve that has multiple outlets is very handy. The air pump should have enough power to supply air to the multiple items.

Next, you can turn on the power filtration or mechanical filtration, if you are using such appliances. After reading the instructions properly, set up the filter so that the flow of water is concentrated to the center of the aquarium. After plugging it in, allow it to run for a day. Never shut it off except for shorter periods for maintenance. The motor should not run dry and will get damaged if it does. Turning on and turning off the filter constantly will cause unnecessary wear and tear to the filter and more importantly will cause toxins to build in the filter which are released into the water when the filter are started again. It will also damage the biological filtration in the aquarium. In short, you should never turn off the filter ones it's on, except when you clean it.

Water chemistry

Since fish spend their entire life in water, water is the most important thing about an aquarium. Understanding water and its constituents will greatly help to maintain a good aquarium. There are basically three very important aspects to the water in your aquarium: the temperature, the pH and the levels of constituents in the water.

Most tropical fish flourish and thrive in warmer waters. Though these fish are resilient enough to withstand a wide range of temperatures, it is seen that warmer temperatures are best for tropical fish. As discussed earlier, having thermostatically controlled heaters are a must if keeping tropical fish. An easy to use thermometer is also very handy. Together, these will help you to keep a constant check on the water temperature. The water temperature will also affect a wide range of biological and chemical processes in your aquarium.

The pH-value is a way of measuring the alkalinity or acidity of a solution. The pH ranges from 0-14, where 14 is the most alkaline, and 0 is the most acidic. Fresh water fish can

live in a wide range of pH but the optimum pH values are for many popular beginner species a slightly acidic to a neutral value, 6.5-7.5.

Water hardness is another factor of importance. Water hardness refers to the amount of dissolved minerals in your water, especially calcium and magnesium. In most cases, you should be able to get by without manipulating the hardness of the water. Excessively soft water can cause problems in your tropical aquarium. Adding crushed coral to extra soft water will increase its hardness. But beware as the pH of the water will change too.

Dissolved oxygen, Carbon dioxide, Ammonia, Nitrites and Nitrates are some of the important elements present in your water. They are decisive factors in the health of the aquatic life within your aquarium.

The life in the aquarium depends on dissolved oxygen in the water. Gaseous oxygen is absorbed by water. Turbulence at the surface of the water increases the absorption of oxygen. Plants within the aquarium give off oxygen during photosynthesis, but this oxygen is also used up quickly. Just like fish and other animals in the aquarium, plants need oxygen for respiration and will consume a part of the oxygen that they produce. Since all the organisms in the aquarium – including microorganisms, invertebrates and fish – use up the dissolved oxygen quickly it is necessary to keep your aquarium well aerated. Plants alone will not always provide enough oxygen especially, not in aquariums with large fish populations. Unhealthy and decaying plants will even increase the demand for oxygen in the aquarium. A simple and basic aeration or filtration system is usually more than enough to give plenty of oxygen to your aquarium. Regular water changes, vacuuming off fish wastes and removing any rotting plant material will also help to increase the oxygen levels.

Ammonia is produced by the fish metabolism and excreted via the gills in and the fish feces. Ammonia can also be produced in your aquarium when plant material is broken down. Ammonia is highly toxic and will kill fish if the levels get to high. Nitrites are formed in the aquarium when the Ammonia gets broken down by bacteria. Nitrites are also dangerous to fish and unhealthy in too large quantities. Exposure to too much Nitrite can for instance make the fish anemic and eventually kill it.

Nitrates are another nitrogen-compound and Nitrate is produced when Nitrite is broken down by another type of bacteria. High levels of Nitrates are also toxic for fish, but most fish species are more resilient towards Nitrate than towards Ammonia and Nitrite. You should strive to keep the levels of Ammonia and Nitrite at zero, but low levels of Nitrates will always be present in the aquarium and your task will be to keep Nitrate under control rather than to eliminate it completely. Taking some easy precautions can do this. Never overstock your aquarium. Never overfeed your fish. Never lay off changing water partially. Never allow debris and fish waste to collect in your aquarium.

Conditioning water

You should NEVER add the fish immediately after filling your aquarium. Allow the water time to stabilize. The water will have some amounts of toxins in it from chemical treatments etc and this can be very harmful for the fish. Thus the water needs to be neutralized first. Any dissolved gases in the water will escape in a few days, and the pH of the water will also stabilize.

Tap water is not the natural habitat of fish. Tap water usually contains high amounts of chlorine and other disinfectants. These will harm the fish, the plants and other microorganisms that need to grow in the aquarium. There are three basic methods to dechlorinate water. Aeration of water will diffuse chlorine into the air. This can be achieved by filtering the water for 24 hours. Using activated carbons is another way of getting rid of the chlorine. Lastly, adding sodium thiosulfate to water instantly inactivates chlorine. Sodium thiosulfate also helps in getting rid of traces of ammonia. When adding the water preparation chemical it is important that you follow the dosing instructions carefully.

Adding aquarium salt or kosher salt is also recommended if you are going to keep fish that tolerate salt as it reduces the risk for disease in your aquarium. Some tropical fish do not tolerate salt in the water and you should therefore research if the types of fish you intend to keep in your aquarium tolerate salt or not.

If your fish species tolerate salt, 1 tablespoon of salt for every 5 gallons/ 20 L of water is usually a good rule of thumb. Some species will however only tolerate lower concentrations of salt. The most important thing to keep in mind while adding salt is the concentration of salt in water. As evaporation takes place, the salt in the water remains the same. Salt does not evaporate. So, while changing water, only the salt that has been removed should be replaced.

One more reason to research the species you intend to buy is to help you decide on the pH value of your water. Neutral pH is 7.0. Usually, tropical fish can survive in a wide range of pH. A pH of 6.4 to 7.9 is an acceptable range for a wide variety of fish. Knowing the pH value of your tap water is a definite advantage. Your geographical location influences the pH value of the water.

Before attempting to change the pH, there are certain things to be considered. Even if you have researched the optimum pH for your favorite fish, you need to assess if you really have to change the existing pH for the fish to survive and thrive. Mostly, the fish you have are bought from an aquarium. So, they are used to a pH level that might be different from the pH levels that are natural for them. A STABLE pH is more important than reaching exact values. Changing the pH values will also change the toxicity of nitrite and ammonia.

Cycling

There is one more step that needs to be completed before you can add the fish and this step probably the most crucial of them all. The water in which the fish live is a whole new ecosystem in itself. There are other microorganisms living in this water beside the fish, algae and plants. All the living organisms in your aquarium will produce waste that can become toxic. Fortunately, there is also a class of organisms that work in tandem to decompose this waste and to make it beneficial for the habitat. Understanding this basic but sometimes overlooked fact and doing your best to aid this process will make your aquarium a definite success.

Why probe into the details when you know that the waste that will be produced will also be efficiently decomposed? Well, since the ecosystem in an aquarium is an artificial one that you have created it can sometimes require your assistance. An aquarium that is just a few weeks or days old is at its most fragile. The water is new; microorganisms in the water may be beneficial or toxic. The key here is to minimize the undesirable organisms while boosting the colony of desirable and helpful bacteria. This is where the NITROGEN CYCLE comes in.

Nitrogen based substances are the most frequent byproducts of decomposition. The Nitrogen cycle refers to the process in which this decomposition takes place. Nitrogenous waste products in your aquarium will first break down into ammonia. Ammonia can be very toxic for fish. If ammonia can be detected by your test-kit, then the levels are too high for your fish.

Nitrifying bacteria are the microscopic organisms that aid the nitrogen cycle and convert harmful ammonia to a more harmless form - nitrate. In nature, there are vast colonies of these bacteria, but when you first set up your aquarium this type of bacteria is only minimal in your water. In the first few weeks, you have to induce this bacterial colony to multiply and reach an optimum level. A good nitrifying bacterial colony goes a long way in ensuring the health of your aquarium. The initial period when this bacterium is being coaxed to multiply is known as cycling the aquarium.

Certain conditions are optimal for the growth of the nitrifying bacteria. They grow well in areas that have a rich supply of oxygen. Lesser sunlight means less heat and less light. These are ideal for the growth of bacteria. Portions of the aquarium that are not disturbed by currents, and are relatively unmoved are also good breeding grounds for the nitrifying bacteria. This is however only the first half of the nitrogen cycle.

Slowly, as nitrites get converted, nitrates start building up. The second half of the nitrogen cycle converts the nitrites into nitrates which are relatively harmless through a process called denitrifying. This is then converted into nitrogen gas, which escapes into the air. It is however impossible to get rid of all the fish waste by simply letting nitrogen gas evaporate. If you do not perform frequent water changes, the levels of nitrate will sooner or later become high enough to seriously harm your fish and eventually kill it. Your aquarium can never be a perfectly balanced ecosystem. You are for instance adding new organic compounds to the system every time you feed your fish.

The nitrogen cycle begins when the aquarium is provided with a little bit of ammonia. One great way to do this is to add natural plants. The leaves falling off from these plants supply the first doses of nitrogen. Other methods include adding a pinch of flake food, adding a sliver of fish or shrimp to the water. Using some gravel or water from another aquarium is also a good way to kick starting the cycle since gravel or water from an established aquarium will be filled with the two necessary types of bacteria. Care must be taken to ensure that there is no infection in the water. Commercial products containing nitrifying bacteria are available in many pet shops and can be used to speed up the process.

Another very popular means of starting off the cycling process is using 'cycling fish'. Adding no more than one or two hardy and inexpensive fish, e.g. Zebra Danios, to the aquarium will introduce the necessary nitrites into the water. Do not over-feed the fish, because this will lead to the production of more ammonia than the yet fragile balance can handle. Using feeder fish as cycling fish is generally not recommended, because feeder fish is sometimes unhealthy and may introduce diseases into your aquarium.

Use your test kit to follow the ups and downs of the nitrogen cycle. In the cycle, remember that the nitrite levels will first go up and then fall to zero. This process may take 2-6 weeks. The speed in which the cycle completes will depend upon the temperature in your aquarium. It is however usually ok to start adding fish after 1-2 weeks since the bacteria colonies then has grow to a large enough size to support fish as long as the fish are sparsely fed. You should never add fish if the ammonia or nitrates level still are high in the aquarium. The ammonia levels should be non-detectable before adding fish.

Adding Fish

Now, we come to the most exciting and much awaited part of the hobby. The type of fish you choose is a purely personal decision, but for a beginner a few hardy fish species is the best choice to start with. Fish that are beautiful and interesting, but still easy to care for and feed is an excellent choice for the beginner. DO NOT purchase too much fish at once and put them into the water. Introducing a lot of fish will strain the habitat and topple the balance of the environment within the aquarium. As you know, when you put in new fish, you are introducing a whole batch of ammonia and bacteria into the water. If this is not done slowly and in stages, the concentration of these undesirable elements will increase beyond the tolerance level of your fish and your fish might die.

You also have to be aware of the species of fish and their compatibility with other fish before you decide what types of fish you should include. Different species of fish will flourish in different conditions. Having a wide variety of colorful fish is visually very appealing, but some combinations are not to be recommended. Keeping a large number of fish with similar demands and behavior will lead to an aquarium where the fish thrive in their new home. Select fish that are used to the kind of water that you can provide.

There are many ways to add fish into your water. While bringing the fish home, care should be taken to only have a few fish in each bag. Too many fish in a bag will cause the ammonia level in the water to rise and the oxygen level to drop. Since you will be bringing the fish in a smaller bag, sharp temperature fluctuations in this water are quite possible and you should avoid exposing the bag to heat or cold. It is necessary to plan your trip to the pet shop in advance. This will reduce the stress and shock that your new fish will be subjected to. Try to bring the fish home as quickly as possible, and in a large bag.

As soon as you get home, float the bag in your aquarium for a minimum of 15 minutes. This will allow the temperature within the bag to equalize with the temperature in the aquarium. You should thereafter add about a cup of water from your aquarium into the bag and wait another 15 minutes. Repeat this last procedure 4-5 times before releasing the fish. NEVER put the water that you brought from the store in your aquarium. It may contain diseases, parasites or other unwanted passengers such as undesirable bacteria and snails.

There are certain things you have to avoid while transferring the fish into your aquarium. Avoid using your hands while transferring fish. Net them out gently into the aquarium. Avoid putting in all the fish at once. Transfer the fish one by one, and leave a gap of 15 to 20 minutes before adding each fish. If you already have some fish in the aquarium, feed these well before you start the transfer. This will keep your new batch safe from the curiosity of the existing fish. It is also a good idea to turn off the light in the aquarium while adding new fish. The existing fish in the aquarium will not see the new ones arrive, and will therefore leave them alone. If you keep very aggressive and territorial species, you will have to use other methods when you introduce new fish, but such species are not recommended for beginners and thus beyond the scope of this e-book.

How many fish do you begin with and how many can you add at once? The rule of thumb regarding the number of fish is: "One inch of fish per gallon of water", but this rule is very general and frequently inadvisable to follow. While stocking your aquarium, you have to take the needs of your particular fish into consideration.

- Territorial fish require more space and boundaries.
- Room for swimming and other activities like schooling or other common behavior patterns in your particular fish species.
- Taller fish needs more vertical space. While they swim, they need enough room above and below their fins.

Aggression due to lack of space is one of the common reasons why many fish die after a few days in captivity. If you put a fast swimming schooling fish in a small aquarium, it will never be able to swim freely. Some fishes become aggressive when they are packed together into a small space. Putting more fish in a smaller aquarium will also increase the debris in your aquarium, thus poisoning the entire habitat.

Fish compatibility is a matter of great importance while selecting fish. Not all types of fish mingle well. Being able to predict what species will do well together comes from research or experience.

Every school of fish has a certain natural pecking order. The dominant male, followed by the dominant female typically take up the center of this order. When you add a new fish, this pecking order completely changes. The fish that are already in the aquarium have established behavior patterns and the new member has to adapt and find a niche for itself. Meanwhile, if it is a perceived threat to the order, the others in the school may harm it. This is a bigger problem for some fish than for others but it is best to avoid it for all species. You should therefore always try to buy the entire school you want at once.

You should also try to avoid unnecessary aggression and territorial disputes. For instance, putting two male Gouramis into the same small aquarium will give rise to unnecessary competition among them. Adding a second male to an aquarium that already contains a male can have even worse consequences since the first male has already claimed the aquarium as his territory. The established male will attack the new comer viciously if it enters his swimming space. The newcomer has no place to swim or hide. Things might get worse, and you may lose either or both the fish. All this can be avoided if you do a little bit of research before you stock your aquarium. Try to buy all the fish you want of one species at once.

Fish, like any other pet, need care and devotion. You need to keep the conditions in your aquarium just right for the fish to thrive and be happy. Healthy fish can be spotted easily. They swim briskly, eat well and generally look sturdy. Every aquarist dreams of having a well stocked aquarium and a flourishing ecosystem. Some care taken at the early stages will help you to achieve this easily.

Doing the following things regularly will help you to keep your aquarium healthy and happy:

- The aquarium has to be checked daily to make sure that there are no dead fish lying around. Remove any dead fish immediately. Remember, dead fish will spread infection and is a breeding ground for bacteria. Dead plant material is less dangerous than dead fish, but will also affect the water quality and should be removed as soon as you notice it.
- On a weekly basis, clean out the plants and decorations in your aquarium. Trim the plants and cut away any decaying parts. Scrape away the algae forming inside the glass.
- Always make sure that your filters are working smoothly.
- Changing the water partially every 1-2 weeks will also greatly reduce the debris and algae collection in the water. This can be done by gently siphoning the water from near the gravel. This is where the most debris collects.

- Check for symptoms of stress in your fish. Once found, the conditions that are causing the stress must be determined and changed as soon as possible.

Stress in your aquarium

Fish are subjected to stress due to various reasons. Stress weakens the fish and causes the fish's immunity to be greatly reduced, thereby making it susceptible to diseases. Stress also leads to decrease in feeding. Breeding is almost non-existent in fish that show symptoms of stress. Eventually, over stressed fish become ill and die. Thus it is best to know the reasons of stress in your aquarium.

Stress is frequently species dependent. Some species thrive in an environment that may weaken others. For example, if you have hard tap water, you need to purchase fish that thrive in such conditions or alter the water conditions before you introduce your fish to the aquarium. An unsuitable or unstable pH-value is also a common cause for stress in aquariums. Some fish are very sensitive to changes in pH, while others are not too susceptible to this. Always research your particular fish species in order to find out their preferred pH-value and the span which they will tolerate. Find out the pH-value of the water that the fish is currently living in before you purchase them and introduce them to their new home, since fish unlike rapid changes.

As mentioned earlier in this book, increased levels of ammonia, nitrite and nitrates also lead to stress and you will need a test kit in order to monitor these levels. We have already discussed the different actions that will help you to keep these levels down, such as using several types of filtration, performing frequent water changes, choosing an aquarium that is large enough and never over-feeding your fish.

Salt can also lead to stress. Some fish species have zero tolerance for salt. As a general rule, fish that have no scales or very small scales will not tolerate salt water. Add salt to your water only if ALL the fish species in it can tolerate salt. Some fish species will become more prone to illness in an aquarium with no salt, even though they are not marine species. Fish species living in brackish waters will usually stay healthier in a slightly brackish aquarium, even if they are capable of tolerating freshwater.

An unsuitable water temperature or temperature fluctuations can easily lead to stress in an aquarium. Some fish are comfortable in cooler temperatures, while others require tropical temperatures. Care must be taken while mixing up species, so that they all have a general tolerance for the same temperature. The goldfish is one example of a fish capable of surviving in cool temperatures, while a lot of the common beginner species – Guppy, Molly, Tetra etc – prefer much warmer temperatures. A daily thermometer reading will keep the temperature stable and well under control.

Physical space or the lack thereof is another factor that leads to stress. Even normally peaceful fish species can become extremely territorial when they have to fight for space. Also, putting in different varieties of territorial fish with similar behaviors is like asking

for trouble in a small aquarium. Introducing competition in your aquarium by adding fish that cannot cohabit will lead to stress; and frequently death due to direct injuries or due to illnesses brought on by the stress. Also keep in mind that the onset of the breeding period triggers a number of changes in the fish's behavioral pattern. Some fish chase stakes out breeding territories at this time and chase away any intruders.

What are the symptoms of stress in fish? From the very beginning, you will need to observe the patterns of behavior of each species in your aquarium. After a few days, you will notice that each species has a behavior particular to it. Some fish keep swimming briskly, while others are happy staying almost stationary. Some like to be on the surface, while others linger near the bottom. Deviation from their normal behavior is the first indication of stress. Some fish start hovering near the surface all the time, indicating poor supply of oxygen. A stress fish can also stay away from its usual haunts and keeps itself hidden. Sometimes fish shows nicks or spots on their body that are not healing quickly.

Prevention is definitely a better approach than waiting until the stress begin to manifest and then trying to cure the symptoms. So, being aware of the 'character' of your species before you bring them home and introduce them to your aquarium will help greatly in warding off stress. As soon as you notice any symptom, make sure to explore the cause and remove it at your earliest. Fish that falls sick and eventually dies harms not only itself, but also the entire aquarium. Infections can spread quickly and you may find your fish succumbing fast to these.

Water problems and their solutions

One of the most common problems in an aquarium is that the water becomes smelly, foamy or cloudy. Each of these conditions adds to stress among fish. This is an unhealthy sign.

While setting up your aquarium, water may become cloudy when you disturb the gravel or sand at the bottom of the aquarium. As mentioned earlier, this can be avoided if water is put in properly. This problem will sort itself out in a day or two. If your water becomes cloudy or foamy after introducing the fish, bacteria is the most common cause.

When an aquarium is not cleaned thoroughly or regularly enough, fish waste and other debris start collecting in the water. Even plants in your aquarium need to be trimmed regularly and their dead parts have to be removed to keep the aquarium balanced.

Foamy or smelly water indicates that there is too much debris in your aquarium. Changing small amounts of water every day will help to resolve the problem. Weekly water exchanges will then ensure that debris levels remain low. This will also help to control the levels of soluble waste in your water. Dissolved wastes in the water will thus get removed and this will cause the bacteria to starve. Care must be taken not to change too much water each time as this may harm the fish.

Excessive amounts of fish food can also make the water foamy. There is no need to give extra food to your fish, and any extra traces left at the top should be removed immediately. Check regularly whether your filters are working properly and clean the mechanical filter from debris and excess food.

Tropical fish aquarium problems

When you decide to keep a tropical fish aquarium, there are certain things that you absolutely must NOT do. Even a very dedicated aquarist can encounter a wide range of problems, especially during the start up period or when new fish is added that disrupt the balance. Being aware of some of the most common pitfalls will help you to avoid these mistakes and loss of precious life.

One common mistake that many beginners make is assuming that a small aquarium is easier to care for than a larger one. The beginner should always go for a larger aquarium, and keep small aquariums later when he or she is more experienced. The reasons for this are quite obvious. Even though your aquarium is small, you will still have to pack in quite a number of things. Most beginner aquarists want to keep at least half a dozen fish, if not more. Even when keeping just one single fish, such as a goldfish in a goldfish bowl, a small aquarium gets filled up with debris surprisingly fast and fish easily use up the oxygen in small aquariums. Larger aquariums have larger volumes of water. This means more oxygen for the fish, more space, and comparatively less dissolved wastes. It is possible to get by with partial water changes less frequently when you use a larger aquarium. A larger aquarium will be less prone to rapid changes in temperature and water chemistry than a small aquarium, since there will be more water to preserve the temperature and dilute any pollutants. You also have to be extra careful when you select the kind of fish that will go into a small aquarium. Some fish need to school and can thrive only in groups. Some fish are territorial by nature and will harm any other fish that comes into its territory. Mixing different species, especially in a small space requires a lot of know-how.

Adding too many fish too soon is another common mistake made by beginners. Always keep the Nitrogen Cycle in mind when you set up your aquarium. The microorganisms living in your water need time to develop. Only a rich culture of beneficial bacteria will keep your aquarium healthy for a long period of time. Once the cycling process is over, it is important to add only one or two fishes to start with and then to add all the fish you indeed to keep of a certain species at the same time. Always give the fish time to adjust slowly to their new environment, using the introduction method described earlier in this book.

Over feeding is another trait of the over zealous beginner. Never over feed your fish. If you feed too much, the uneaten food gets deposited in the crannies of the aquarium or just float in the water. It will pollute the water and also consume oxygen when being decomposed. Uneaten food can therefore make the water cloudy and also lead to an

increase in the bacterial population of your water. The amount of food you give your fish should be roughly dependent on their body weight. Usually, one or two feedings per day is enough. Feed your fish five or six days a week. This changes only if you are rearing young stocks. In this case you will need to give the fish small meals more frequently.

A lot of the problems that you can encounter can be solved by frequent water changes. It is important to find a good balance, since large water changes can be just as harmful as too small or too few water changes. Ideally, change about 15% of your water at least once a week. Do not change water fully, since this will throw away too much of the beneficial bacteria and cause your fish large amounts of stress due to changes in water chemistry and sometimes also temperature. It is therefore much better to change a small percentage of your water as frequently as possible. Changing 15% of the water once a week as is a good rule of thumb, but smaller and more frequent water changes are just as beneficial.

Another common beginner mistake is to choose unhealthy fish, since it can be hard for the novice fish keeper to distinguish normal fish behavior from warning signs. Fish that do not look very healthy at the store is a definite NO. Fish that float near the top, gasping for breath are not a good buy. Fish that shows spots, sores or nicks should not be taken home. If you find that your new fish topple over or cannot keep their balance in their new home, this is due to shock from being moved and can kill even healthy fish. Make sure to always introduce your fish slowly to avoid shock.

A pet shop that forces their fish to cohabit with dead fish or sick fish should also be avoided. Though the fish you plan to buy look very brisk and healthy, they may be silent carriers the infection. Getting this fish into your aquarium will transmit the infection and can have disastrous consequences. Always buy fish from a reputable pet store that remove sick fish to special quarantine aquariums.

Fish that are transparent with neon colors running along the sides should also be avoided. These are not natural fish. The neon colors are injected into the fish, and will fade after some time. The dyes injected into these fish make them sick at a later stage. It also a very inhuman process in which the dye is applied.

Vacation care for your fish

Fish are the easiest pet to take care of because they do not need to be trained. They also do not run around your house and cause havoc littering the place. But, when you plan to go on a vacation, there are certain measures that you have to take to keep your aquarium healthy and safe until you get back.

Change your water a few days before you leave. Never change the water just before you leave. That way, you will be around till the fish get acclimatized to the new water. It is better not to rely on well meaning friends when you need your aquarium taken care of. Most people do not know how much to feed, and end up feeding more than what is needed. Uneaten food will add to the toxicity of your aquarium and you will not be around to change the water. Never give into the compulsion of giving your fish one last

extra feed, or one last live feed before you go. Most probably, this last 'extra' meal will be uneaten and will later foul up the water.

The cheapest way to feed your fish while you are away is Time-Release Blocks. These are bars of food that slowly dissolve or are fed upon by the fish. These kinds of bars are however best suited for fish like Tetras that will eat almost anything with gusto. In an aquarium that has territorial fish, the dominant fish will eat up this bar and the others will be kept away from the bar. It should also be noted that quite a few aquarists have had bad experience with these blocks. It is therefore recommended to try the bars when you are still at home and can monitor your fish behavior and interfere. Do not rely on bars until you know that they are suitable for your particular aquarium.

Another better but more expensive option is mechanical feeders. Most feeders are designed to feed granular food and flake food. The timing mechanism can be set so that the fish are fed on the times you decide, and the amount you decide. Don't forget to adjust the portion size so it suits your aquarium.

It is important to set your thermostat to optimum temperature when you go away. A closed up home in a hot area can become an oven for the fish. Many people will return from vacations to find that their fish have 'boiled' to death. Another precaution is to desist from adding new fish just before you go. Postpone this till after you return. Adding in new fish a few days before you go is begging for trouble. Any diseases that come in with the new fish will spread throughout your aquarium and you will not be there to treat your fish during the early stages.

Safety

While dealing with electrical equipments you should always take steps to stay safe. The various equipments used in your aquarium like filters, lights, heaters etc work on electricity. Water is an excellent conductor of electricity and it is easy to get a nasty, or even lethal, electric shock if you do not follow the safety guidelines. Electricity is however not the only safety hazard connected to aquariums. A broken aquarium can for instance cause severe damages to your apartment. In order to prevent aquarium related accidents, there are a few basic steps to keep in mind:

- Use materials that have been specifically made for aquariums. Even if some of them appear to be a bit expensive, it is recommended that you go in only for equipment that has the necessary protection to be used in water.
- A power strip that has a circuit breaker built inside it is very safe.
- All wires that go into your aquarium should be UNPLUGGED when you do any work in your aquarium.
- Regularly check the equipment for any damages, burns, leaks etc. In case of any problems, get a qualified electrician to make the necessary repairs. It will however often be cheaper to replace that part of the equipment with a new one.

- Mixing Ammonia with bleach will produce chlorine gas so never use bleach to clean anything in or from an operative aquarium.
- Get a stand that can withstand the weight of your aquarium. Remember glass aquariums are quite heavy when you fill them up with water. Most aquariums come with a warranty against cracking and leaking. Check your aquarium for any signs of these before you start setting up your aquarium. You should also check that your home insurance covers damages that can be caused by a broken or malfunctioning aquarium.
- The aquarium is a dangerous combination for little children. Glass, water and electricity makes it unsafe for small kids. You should therefore keep children a safe distance away from the aquarium, especially when you work on it.
- Always wash your hands before and after working with the aquarium. Your aquarium and its inhabitants carry a lot of debris and microscopic organisms that are not desirable. It is also important to keep in mind that soap and other detergents will harm you fish, even in minute concentration. Always rinse your hands well before putting them into your aquarium again after washing your hands with soap.

An aquarium is a beautiful world in itself. Fish, plants, and invertebrates - all make up a miniature seascape that is a joy to behold. Setting up an aquarium along the lines described above is not at all difficult. I have pointed out a lot of potential problems, safety issues etcetera in order to prepare, not discourage, you. There might be some pitfalls on the way but those shouldn't deter you. As you go along, you will find alternate ways to look after your own aquarium. Trial and error and experimentation are the keys to success and also one of the things that make fish keeping so fascinating year after year. Do not be disheartened when a few of your fish die. It is inevitable that a beginner will see at least a few of the fish floating dead in the aquarium. The steps, tips and procedures described above will guide you through the different stages when setting up your own aquarium. Always remember that looking after any pet is a job that requires dedication. Taking care of the life of your pet is a matter of great responsibility.

Chapter 2 – Plants

Choosing plants for your aquarium

Most hobbyists are quite naturally drawn to making their aquarium look as natural as possible. Adding plants is one of the better ways to make your aquarium look stunning. Plants have some obvious advantages when it comes to looks as well as use. Most viewers are stunned by the beauty of lush green plants that grow abundantly in water. As described earlier in this e-book, live plants have a much more serious role to play in your aquarium than being mere decoration. The plants provide a hiding place for the fish too. So, you will find that many fish species are happier and more relaxed around plants. Plants will also produce oxygen and use up the nitrogenous wastes that the fish give out. This alone makes them desirable in your aquarium.

Natural plants have some inherent negative aspects. You should be aware of these before you decide whether you want to keep them in your aquarium. Keeping real plants in your aquarium requires an equal amount of dedication as keeping live fish. Plants need to be maintained, nurtured and propagated. Dead and decaying parts will need to be pruned and cut off regularly. Real plants may also introduce snails and hydra into your water and they can be the transmitter of fish infections too. If your fish love to nibble on the plants that you have decided to put in, you will have a hard time keeping these plants alive. Real plants require some particular kinds of nutrients, fertilizers etc. That means you will have to go in for a particular combination of materials in your substrate. When the substrate becomes old, you will have to change it or fertilize it. A planted aquarium with real plants generally needs more light than a fish-only aquarium, since fish do not rely on photosynthesis. Without sufficient lighting, your plants will not be able to generate oxygen and can even begin to die and decay.

If you do not have that much of time for the aquarium just at the moment, you can go in for fake plants. There are numerous gorgeous looking fake plants available in the stores. Fake plants are of course much easier to keep. And hopefully, your fish will not develop a taste for it. A combination of fake and real plants can also be a good solution and give a more natural look to your aquarium. Maintenance will be less because a large chunk of your plants will not need to be maintained. When you select fake plants, it is usually better to choose silk plants rather than plastic plants. Silk is easier to clean if you need to scrub out algae. Plastic plants tend to fall apart while cleaning. This will however vary from manufacturer to manufacturer and high quality plastic plants can still be a good choice.

So, why put in live plants at all, when you can have equally beautiful artificial plants? After all, artificial plants are so much easier to look after and maintain. And they NEVER wither or die. Well, here are some very valid reasons to go for live planting, at least partially, in your aquarium.

- Oxygen, the byproduct of photosynthesis, is a necessary ingredient for any fish aquarium to thrive.

- In addition to keeping Carbon dioxide levels low, plants also keep a check on the nitrogen levels, thus protecting your fish.
- The natural surroundings that the plants provide give the fish in captivity a sense of freedom and security. This is especially important if you plan on breeding your fish.
- Plants are a source of food for many species of fish, provided of course that they do not nibble away too much and kill the plant.
- Plants also help to keep your substrate in place, especially if you are using sand at the bottom. The tiny root systems of the various plants help to anchor the substrate to the bottom of the aquarium.
- Small amounts of algae are a natural part of an aquarium, but excessive algae growth can be an aquarist's worst nightmare. Real plants inhibit the growth of algae by releasing certain chemicals. They will also compete for nutrients, since they live on the same substances as algae.

Plants are also a sure shot indicator of the health of your aquarium. Unfavorable conditions within your aquarium will typically first affect the plants, and this will warn you that the fish will soon be sick too. This helps you to take timely precautions and emergency protective measures.

Before you can make up your mind regarding the kinds of plants that will go into your aquarium, there are some style statements that you should know about. There are two main planting styles that have evolved among aquarists over a period of time. A quick overview of these styles and their usability will help you decide which way you want to go, or if you want to think up something entirely different.

The natural style: As the term suggests, the natural style is just that - natural. Here, we strive to mime nature as closely as possible. Introducing a variety of plants without any particular order is the most important thing in this style. Think natural - in nature, you would not find groups of similar plants sitting pretty in some order. The aim is to cultivate a 'wild' look. It may seem that no planning goes into this kind of style, but this is far from the truth. Plants may seem to be placed at random without any serious coordination, but to achieve that striking display of 'wilderness' in your aquarium, you need to sift through the various plant varieties, and pick and choose the right ones.

The Dutch Style: This style is for the more serious planters. The aquarium is more for the plants, and the fish seem to be added in as an afterthought. You will hardly find these kinds of aquariums with superbly colored fish. There will just be a few colorless fish hanging about. The style tries to replicate a verdant garden, in all its green glory. An important element in this style is terracing or layering. You will find that the aquarium is divided into terraces, with different kinds of plants growing on different layers. The back of the aquarium will be higher than the front. The plants are the main focus of this display.

There are two ways in which you can adapt the natural planting style to your aquarium. Firstly, there is the open style aquarium. In this kind of aquarium, the top of the aquarium is left open most of the time. The plants are allowed to grow right out of the aquarium. The tops of the plants are never trimmed. You need to be extra careful when you keep an open aquarium. If you have any jumpers in this aquarium, you will find that you are poorer by a number of fish after some time. An open aquarium is therefore not suitable when you keep such fish species.

A habitat aquarium can also adopt the natural style. The habitat aquarium is one in which you place ideally suited species of fish and plants that have the same requirements. A habitat display will take plants and fish from some particular geographical location, and mimic their ecosystem.

You can categorize the natural plants that should go into your aquarium depending upon their behavior. Very broadly, there are three kinds of underwater plants:

- Plants that float at the top of your aquarium
- Plants that will stay firmly rooted to the bottom
- Plants that come in a bunch and keep moving or floating around

Keep in mind that you cannot put in just any plant. Common household plants should naturally be avoided. Any plant that is not a water plant is bad news in the long run. They may adapt to the water initially, but may not be able to cope with their surroundings after a period of time. Changing your set up after some time is not very easy, and plants also take time to adapt and grow.

Factors that affect plant growth

Water

The first consideration would of course be the water in which the plants will grow. The kind of water you that you have and the temperature in you aquarium all play an important part in your plant life. Most aquarium plants found in marshes do well in warmer temperature, and 75 degrees Fahrenheit is usually the ideal temperature for most tropical plants. It is seen that plants flourish even better if the heat generated is from the bottom so that their roots get enough heat. This can be achieved by placing a submersible heater right at the bottom of the aquarium where the water meets gravel. Another way to keep your plant life healthy is by leaving their roots undisturbed. When you are cleaning your aquarium or changing water, care must be therefore be taken that the roots do not get disturbed. The reverse is true in case of the leaves. Plants seem to do well when their leaves move more. Therefore, regularly aerating your water using bubblers is a good idea. Just like fish, plants also need fresh supplies of water frequently. This is one more reason for making frequent water changes, but keep in mind that you should only change small parts of the water at a time.

Lighting

Since photosynthesis takes place in the presence of light, light is a necessity for healthy plants. Natural sunlight is made up of a number of light waves that have different wavelengths. The plant pigment chlorophyll will absorb only certain light waves.

Sunlight will promote the growth of algae. Long exposure to sunlight will also heat up the water. Artificial light is therefore more advisable for plants growing in a aquarium. Full spectrum or broad spectrum fluorescent light is best suited for plant growth. Aquariums usually need about 1.5 watts of light per gallon of water and about 12 hours of light per day. Of course, if your aquarium is deep, you may need additional wattage, and need to keep the light on for longer hours. Using light colored gravel is a good way to create a light bottom for a deep aquarium.

The wattage of light required for healthy growth in plants is also species dependent. Some plants, like the Anubias, Java Fern and Java Moss, require only low to moderate lighting. So, a single fluorescent tube will give enough light for these plants. The Water Wisteria, the Indian Fern, the Water Lily, and the Waterweed are some plants that need bright light. These plants will require at least one additional fluorescent tube to survive and flourish. Some species like the Bacopa and the Cabomba require extra strong light. These plants are of course not very suitable for beginners.

Substrate

In nature, plants are continuously receiving nourishment from their surroundings. Aquarium plants derive nourishment from the substrate. There are different varieties of substrate available now, but for the beginner a substrate that is low maintenance and stable is the ideal choice. A substrate that needs constant watching and gets messy is not recommended. Similarly, a substrate that is capable of changing the water chemistry is also something to keep away from. This kind of substrate will require constant monitoring of the water. Organic substrates, rich in nutrients, will mess with your water quality and give out excess nutrients.

Since the substrate lies at the very bottom of your aquarium, it is difficult to change it once the aquarium has been established. So, in many cases you are stuck with your substrate for a long time. That is why you need to be wise when you choose it. Ideally, you should select a substrate that is inert and that will not alter your water chemistry. The perfect substrate will also have a high Cation Exchange Capacity. The Cation Exchange Capacity refers to the ability of the medium to absorb nutrient ions. Simply put, this means that your substrate will hold on to the nutrients and make them available to plant roots.

In this respect, sand is a very poor substrate. It has none of the qualities described above. It can be used only as an anchor for your plants. Gravel will usually also have a very low Cation exchange Capacity and some types of gravel will alter the water chemistry.

Fluorite is a great substrate. Though it is a bit expensive, it is very nice looking and nutrient rich. It will not get soft when in water. It also has iron and other trace elements that are good for your plants. Vermiculite is a soil additive that is very rich in nutrients, but it is also very light and needs to be placed below a layer of heavier material. Otherwise, it will start floating around and make your water cloudy.

Using suitable additives in your substrate will be beneficial to plants. Commercially available products help to induce plant growth. Some of these are to be mixed in with water, while others need to be pushed in near the roots of the plant. You will find more detailed information about plant nutrients later in this e-book.

Do NOT use peat moss, bagged potting soil or compost in your substrate. These will decay after some time and prevent root growth in plants. A soil that has only a little organic matter and has a higher concentration of fine clay particles is best suited for plant growth.

Nutrients

Both micro and macro nutrients are required by plants for growth. Macronutrients include nitrates, sulfates and phosphates. The plant requires these in large quantities. If you introduce a lot of macronutrients to your aquarium, it can lead to an undesirable 'algae bloom'. Micronutrients are nutrients required in trace amounts. Nutrients like iron, copper, zinc and calcium are some of these. Excessive amounts of these can prove harmful for the plants.

Carbon Dioxide is the most important nutrient that a plant needs. Sometimes, fish alone are not able to provide the optimum levels to support adequate plant growth. Carbon dioxide injections for your plants are an easy but pricey way out. Carbon dioxide levels in your water should be between 5-15 Mg/l. If you go any higher, your fish will be harmed.

Using commercially available tablets that dissolve in water and provide a lot of nutrients for your plants is also a good idea. Unless you feed your fish a lot, they will not provide all the nutrients that your plants need. And even if the fish produce enough nutrients, these are available to the algae and other microscopic organisms too. Plants can have a hard time getting it. That is why using additives in the substrate as well as tablets in the water really assist plant growth. When using additives, take special care that they are not harmful for your fish.

The use of aerators is also a factor in the growth of your plants. Constantly keeping your air pumps or bubblers on will deplete the carbon dioxide levels in your water. On the other hand, you need the aerators to keep your water rich in oxygen. The easy way out is to turn on the bubblers only for a few hours a day, preferably at night. This will provide enough oxygen for your fish while not depriving your plants of the vital Carbon Dioxide. Keep in mind that plants require oxygen too.

Plants will suffer when there is a deficiency in the nutrients. A deficiency in nitrogen and sulfur is indicated when the leaves turn yellow faster than usual. If the leaves seem to be very brittle, you probably need more iron in your aquarium. Over fertilization may lead to problems too. The leaves getting yellow spots can indicate an excess of iron, zinc or copper.

Filtration

Almost any kind of filtration system will do for plants. Only a few things have to be kept in mind. Constant use of aerators should be avoided. Use a filtration system that will filter out floating particles. These particles will block sunlight and also form a deposit on plant leaves. The filtration should not produce too much of water disturbance, as this will deplete Carbon Dioxide levels. On the other hand, the filtration must create some currents in the water, as this will help easy circulation of nutrients.

Suitable plants for beginners

Before you start planting your aquarium, it is a good idea to have a rough sketch of what kinds of plants you will put in. Plants can be categorized depending upon how tall they grow.

Foreground plants are species that are quite short and small. They mostly form carpet-like matting at the bottom. They do this by producing numerous runner plants. These plants are often used in shallow aquariums because they need plenty of strong light.

Glossostigma sp. is one of the most popular carpet plants around. It is not very easy to grow but looks absolutely stunning. Water Wisteria can be used a carpet plant too, if you put some stones on the stems till they catch root. The middle ground plants are taller than the foreground plants. Their main use is in hiding the stems of the background plants that are much taller. The background plants grow quite fast and can be used effectively to hide all the accessories in your aquarium. They usually need lesser sunlight too.

Bunch plants – plants that look good in a group – are usually middle ground or background plants. Some plants, called the specimen plants, are large decorative species that are usually highlighted at the center. Floating plants are an attractive option, but care must be taken to place floating plants away from the heat of the light bulb. Floating plants also propagate very quickly and may block out all the light in your aquarium.

Java Moss and Java Fern are some of the most common aquatic plants and they are very suitable for beginners. Initially, Java Fern should be attached to a piece of driftwood or rock. After the roots are formed it will stick to its surface. Java Moss and Java Fern are very hardy plants that can thrive in a wide range of soft and hard waters and even do well in a brackish aquarium. These plants will also tolerate a lot of different pH-values. New plants form on the older leaves of existing plants. The new plants will break themselves off from the original plant, but can also be cut away. These shoots can then be replanted. They grow quickly and give a very lush appearance to your aquarium.

The Amazon Sword is another very popular aquatic plant. Just like Java Moss and Java Fern, the Amazon Sword is a very hardy plant that is popular both among beginners and expert aquarists. Amazon Sword grows pretty fast and therefore prevents algae formation.

Wisteria is yet another example of a beautiful and undemanding plant that is suitable for your first aquarium. The plant grows quickly and also helps to inhibit algae growth. But Wisteria also sucks a lot of nutrients from the water. Pale leaves indicate that there is a shortage of nutrients in the aquarium, and that fertilizers need to be added to the substrate. The *Anubias Nana* plant is also popular among beginners, since this plant thrives in virtually all conditions. Best results are obtained by tying the plant to a tree root or stone. This plant often flowers in water and is usually left alone by herbivorous fish. If your aquarium is provided with strong light, you can keep *Lillaeopsis*. *Lillaeopsis* looks more or less like grass. It grows fast, but does need bright lighting and can therefore be an unsuitable choice for your very first aquarium before you have learned how to control the algae. If you want to keep an amphibious plant, you can try the *Cryptocoryne Beckettii*. It is a popular plant among aquarists and it grows really well when it is submerged.

Beginners must take some factors into mind when they select plants. Since you are new to the whole concept, it is best to stick with plants that are not very exotic or pricey. As a rule of thumb, very colorful plants are unsuitable for beginners and green plants are a better choice. This is mainly because colorful plants typically require more direct light. Providing this light may play havoc with the temperature and algae levels in your aquarium. If you are not equipped with enough know-how and experience in dealing with these situations, you will find that your aquarium will turn green with algae in no time. Availability is another matter to consider. Some plants propagate themselves and give off shoots that will develop into new plants. Such plants are usually available in most pet shops since they are easy to grow. You will also be able to plant new shoots without spending more money. Plants that are not easily eaten by fish are also good for the beginner.

Caring for plants

The first and most basic needs of a plant are sufficient amounts of light, oxygen and carbon dioxide. Nutrients like iron, copper, zinc etc are also required in trace amounts. As described earlier, these can be provided through the use of various fertilizers and additives. There are certain things besides these that will be beneficial to plants.

Thinning and pruning of plants is very important for them to grow well. Many aquatic plants will flourish if proper conditions are provided. The taller plants will grow right out of your aquarium. They will also become too thick and block sunlight, and take up too many nutrients. After pruning, many plant species can be replanted since the cut-off parts are capable of growing into a new plant. In some of the leafy plants, like Swords, older and bigger leaves will need to be removed to provide sufficient light for the younger ones. Some plants that have floating leaves also need their leaves removed. These will otherwise block the sunlight from the lower leaves as well as from other plants. After

several pruning sessions, you will sometimes find that the branches are becoming too dense. Such plants can be thinned by removing the older branches.

Here are some tips for basic aquatic plant care:

- Be careful when you select your plants. For your first aquarium, it is advisable to go for the popular varieties that are easily available.
- Young plants that are in good condition have greater chances of survival.
- Be very thorough while planting your plants. Enough spacing and anchorage are important.
- Plants should be groomed before you put them into the water.
- Before planting, any dying roots should be removed. Otherwise, they will rot in the substrate. Decaying or dying roots will appear dark brown and limp, while the healthy roots will be rigid and pale.
- Remove any yellowing or sickly leaves on your plant before you put it in. The plant will ultimately shed these leaves anyway and they can pollute the water and consume oxygen.
- Protect the leaves of your plants from unnecessary damage. Snails and plant eating fish should be kept to a minimum.
- If you intend to put in tubers, then position them at an angle, so that the growing tips of the plants will be exposed to water.
- Once your stem plants reach the surface, cut them and replant the cuttings. They will soon grow a new root system. This will also give the younger leaves enough sunshine.
- Some plants like the Java Fern and the Java Moss will do better if they are attached to rocks, rather than planted into the substrate.

Plants are good indicators of nutrient deficiency in your aquarium. One way to keep your planted aquarium running smoothly is to measure the nutrient level in your water by analyzing plant growth. In aquariums with low growth, plants do not show many deficiencies because the nutrients present are quite sufficient for them. In high growth aquariums where you have lots of plants and where you are using Carbon Dioxide injections, plants are growing so fast that nutrients may get depleted. In such an aquarium, it will typically be the fastest growing plants that show the first symptoms of deficiency.

The first thing you must ascertain while looking for nutrient deficiency is to see whether the symptoms are showing up in the older leaves or in the younger, fresher leaves. This will help you narrow down the nutrient causing the problem. "Mobile" nutrients are those that the plant can re-claim from the older leaves and use while producing younger leaves.

So, deficiency in these nutrients will usually show up in the older leaves. Mobile nutrients include Nitrogen, Phosphorous, Potassium, Magnesium and Zinc. The immobile nutrients do not move, and their deficiency therefore usually shows up in the younger leaves. Examples of immobile nutrients are Copper, Iron, Calcium and Sulfur.

Though analyzing nutrient deficiency using leaf changes is not an exact science, here are some symptoms and causes that will help you. Deficiency in Iron usually causes the leaves to become brittle and pale. If the older leaves show pinholes that gradually enlarge, it may be a Potassium deficiency. Twisted and bent or cupped leaves with yellowish to very pale edges are an indication of calcium deficiency. Withered edges and dead leaf tips show a deficiency in Copper.

Though the aforementioned list is not very exhaustive, you will find that this provides a general guideline to check for nutrient deficiency. With time and experience, you will find your plants speaking to you about the ecosystem within the aquarium. Moreover, if you take them seriously, plants will flourish and thrive in your aquarium. Your fish will benefit a lot from this too.

Propagating plants

Propagation refers to the process of making more plants to keep a plant variety alive. Propagation is mainly done to improve plant health. Dividing a plant and replanting it stimulates new growth.

Commonly, aquatic plants show two types of propagation. Vegetative propagation takes place when a part of the plant itself is used to propagate the plant. This could be a stem cutting, a tuber, corn or any other part of the plant. Most aquatic plants propagate in this manner. Sexual or seed propagation takes place when a new plant grows from the spore or seed of the parent plant.

There are different ways to prune and propagate different types of plants. Long stemmed plants should be trimmed to keep the balance of the entire layout intact. One should use long sharp scissors to do this. Each cut will sprout 2 or 3 new leaves. After a number of trimmings, the plants can become top heavy and the branches become heavy and break off.

The Amazon Sword usually propagates when its leaders have been clipped and replanted. Tiny new plants will grow from these. The American Cress is a beautiful plant that grows easily and is easy to maintain. It will also flower easily. Propagation occurs when the aerial stems that are near the base of the plant are clipped and replanted.

The Cabomba, being a rapidly growing plant, requires to be pruned regularly. It is an excellent oxygenator and propagation takes place by replanting the lower leaves. Anubias do not grow enough to dominate any aquascape and they easily fall prey to algae infestation. Old leaves should be removed immediately after they show signs of weakening. The Floating Fern is an easy plant to take care of, and you can propagate it

by replanting the buds of matured plants. In the case of Wisteria, which is another excellent plant, replanting the stems will produce new plants.

Cuttings are the easiest way to propagate aquatic plants. Foreground and Sword plants usually produce runners that will take care of propagating new plants. When some aquatic plants produce side shoots, their rhizomes should gently be cut away along with a few leaves. They can then be planted along the surface of the substrate.

Algae

Put very simply, algae are a greenish/brownish growth that forms along the walls of your aquarium, or on plants and aquarium decorations. Algae are mostly chlorophyll producing photosynthetic organisms that resemble plants a lot. Contrary to plants, algae are single celled and are therefore not really plants. Excessive algae growth can be very frustrating for aquarists, especially for beginner aquarists and for those that have recently installed stronger lights. Since fish provide enough food for plants to grow, the chlorophyll filled algae too find your aquarium a safe breeding ground. Algae look ugly, and are difficult to eradicate completely. A small amount of algae is a natural part of the ecosystem and can even be an appreciated food source for many fish species. Once a thick carpet of algae forms in your aquarium, they will however begin to compete viciously for all the nutrients that your aquarium can provide. The "Algae Bloom" plagues almost every aquarium at one time or the other. Algae grow fast, especially when there is a regular supply of warm sunlight and rich nutrients.

Before we start off, it is necessary to know some inevitable facts about the relationship of an aquarium with algae. If you have an aquarium, then algae are inevitable. Algae can even be beneficial. When nutrient levels are very high in your aquarium, the algae consume the extra nutrients, thus making the water healthier for your fish. Algae also indicate that the ecosystem within your aquarium is healthy. Do not resort to chemical controlling of algae if you can get by with the natural method. If you try to chase away your algae too regularly, you will be causing too much of stress for your fish.

There are several types of algae. The main categories include:

- The Green Algae
- The Blue-Green Algae
- The Red Algae, and
- The Diatoms

The filamentous green algae form long green threads. These need abundant sunlight to flourish. They can be very damaging to plants as they rob them of vital nutrients. Filamentous green algae can be controlled by algae-eaters or by physical removal.

The suspended green algae look like green water. Large and frequent water changes will help to get rid of these. It will sometimes be necessary to use algaecides.

The green spot algae form round spots on leaves and on the glass. Snails and algae eating fish can be used to remove these.

The blue-green algae are much more harmful than the green algae types and produce substances that are toxic for fish. Excessive illumination and high nitrate and phosphate levels create an ideal environment for these algae. Fish do not eat blue-green algae and the best way to get rid of these algae is a week of total darkness in the aquarium. Several water changes are also a must to get rid of them.

Diatoms form a layer of a brownish slime like substance on rocks, glass and plants. They are quickly eaten off by algae-eaters. They also subside when lighting intensity goes up.

Since Algae are unsightly and parasitic, it is necessary to keep their count low. There are some things that you can do to hamper the growth and spread of algae. The first and most important step is **REGULAR** water changes. Nothing can help you more than this. Remember, the reason you do not find algae floating in running streams is because the water in the streams keep changing at least a hundred times a day. Excess algae growth will instead be found in pools and puddles where the water is still. We can simulate nature very poorly when we change 20% of the water twice in a week. Change a little of your water as often as you can, and much of your algae problems will be solved.

At least once a month, take a special kind of aquarium scrubber and clean the glass of your aquarium completely. Some rocks contain certain minerals that will cause algae to grow rapidly. If you feel this could be the reason, remove the rocks immediately. Most algae need lots of sunlight. Keeping sunlight levels down, and using fluorescent lighting most of the time is also a simple way to keep the algae growth to a minimum.

New plants that come into your aquarium need to be treated to prevent algae from entering your aquarium. You can use Potassium Permanganate or Alum to treat your new plants. After soaking the plants in this for about 10 minutes, they should be rinsed thoroughly and then planted. Also remember to remove any weights or ties around the plants that you brought home. You should clean the fake plants or decorations in your aquarium by soaking them in a 1:20 solution of bleach to water for a few hours. These then need to be soaked in dechlorinated water. If you will be emptying out the entire contents of your aquarium, it is a good idea to soak your entire aquarium in fresh water with a dechlorinator.

Using algae-eating fish species and grazing snails will greatly help to keep down the amount of algae in your aquarium. As mentioned earlier, introducing algae-eaters as the first fish in your aquarium will greatly help to keep the algal growth at bay from the very beginning. These fish will eat the algae that grow on the sides of the aquarium and on the leaves. Snails will also help to keep the sides of your glass aquarium clean. Algaecides are the chemical way to get rid of algae, but they work on a limited type of algae only. Using natural methods of control are a much better option.

Chapter 3 - Fish

Choosing Fish

You are now equipped with all the important details on how to get a good aquarium up and running smoothly. So, how about some fish? After reading so much on how to go about providing the best surroundings for the fish, it is finally time to go shopping for your first fish. Whilst this is the most exciting part of the whole adventure for many aquarists, it is also one that is fraught with a little anxiety for most beginners. It is hard not to feel tempted by all those beautiful, colorful fish swimming so happily at the store. Should you get them all, one of each species? Which would be the best, the easiest, the hardest? Here are some pointers that will help you to start in the right direction.

A beginner's best choice is naturally a fish that is easy to feed, hardy, can adapt well to its new surroundings, and that is generally not too sensitive or too "picky". Many a time, though you have all these points right at your fingertips, you get duped at the fish store. Sellers will swear by the hardiness of their fish, but unfortunately many of the fish that are sold as beginner's fish are really the least suited for a beginner.

There are certain precautions that need to be taken right at the store where you are buying your fish. When you get to the store, you should ideally already have decided which species you are going to buy. Depending on the salesman to point you in the right direction is always risky, unless you know for sure that he or she is knowledgeable and has a good reputation. It is also important to look at the adult size of the fish you are going to get. If you have a small aquarium, the fish may soon outgrow the size of the aquarium and that would be a pity after all the trouble you have taken to acclimatize the fish.

Make sure that the species you are getting comes from a good stock. Examine all the fish in the aquarium and look for the healthiest of the lot. These should be the ones you take home. **DO NOT** go for fish that seem to be gasping for breath or just plain tired. Fish that are unhealthy in the store rarely recover from their lethargy. One good test is to put your hand against the glass on the aquarium, and see which fish will try to peck at it. These are generally the best fish in the lot. **DO NOT** knock on the glass. Imagine how stressed the fish will be by an endless amount of customers that keep banging on the walls of the aquarium.

Once you have spotted the fish you like it is advisable to ask the salesman to take them out gently. Put them into a big bag with enough water in it. Since the bag is much smaller than the aquarium, the fish will get stressed. You should therefore carry them home as soon as possible. Remember to keep the temperature in the bag stable while you carry it home. Reduce the amount of water in the bag to give room for more air and oxygen if you know there will be some time until you get home.

When you start out, it is best to get a small school of a small schooling fish. Some of these include the White Cloud Mountain Minnows, and several species of Danio and Rasbora. You should always get a school when buying schooling fish. You should not get less than 6 specimens of a schooling fish, and at least 10 is preferred.

Here is a brief list of some other hardy fish for the beginner:

- Guppy fish is a species that has been domesticated for many decades by fish keepers and Guppies are therefore well adapted to a life in aquariums. They are also quite inexpensive, have very sociable temperaments and are pretty. They are a somewhat schooling fish, and you will need to get a group of at least 4-6 guppies for them to do well. Don't buy the most elaborate types of guppy since these are more sensitive than the more basic types.
- Swordtails are very handsome and are easy to recognize. The male fish has a 'sword'; a long point at the very end of the tail fin. You can get Swordtails in a variety of colors, like vibrant orange and deep red. Swordtails can be slightly aggressive, and the males tend to fight each other for dominance. For this reason, you should purchase only one male and 2-3 females if you have a small aquarium.
- The Platy are distant cousins of the Swordtails, but are not aggressive. They also come in a large variety of colors. Platy fish should always be kept in schools.
- The Molly can be jet black, marbled or pure white. Mollies are quite peaceful by nature and are therefore great aquarium fish for beginners. Some of the males can get aggressive towards each other. Only keep Mollies if you keep an aquarium with a pH of above 7 and preferably some salt in the water.
- The Barb fish are also favorites among beginners. They are fast swimming schooling fish that brings life to the aquarium. Barbs are very easy to feed.
- The Danios is another fast swimming group of fish. They are very easy to keep, breed and feed and are therefore ideal for beginners.

Biotopes

Biotopes refer to a particular kind of ecosystem that has the physical conditions as well as the type of organisms that are found in that particular environment. More and more aquarists now strive to mimic a particular kind of biotope in their aquarium.

One of the main advantages of a biotope is that it is very stable. Since we are basically striving to rebuild a particular kind of habitat, we will be using ONLY the kinds of species and organisms found in that environment. Since the model in nature is an

excellent working example of your biotope, you just cannot go wrong if you follow the model as closely as possible.

There are many kinds of biotopes that you can set up, and here are two examples suitable for beginners.

The Root biotope of South America

You would need a big aquarium for this set up, about 75 gallons or more in size. The bottom should be filled in with fine sand and gravel, to about one and a half inch of height. Place bogwood and driftwood in the aquarium. Take care to leave some space for swimming. The wood will provide the fish enough of nooks and crannies as shelters, you do not need any plants in this kind of a biotope. Slight water circulation and a single fluorescent light will be enough for this calm and peaceful setup. The pH of the water should be low, and the temperature should be kept in the low eighties. The kinds of fish that go in here are very pretty to the eye. 4-6 Angelfish, a school of Hatchet fish and some armored Catfish make this a stunning display of that ecosystem.

The Asian Lowland Still water Biotope

This is a biotope for slow moving species like the small barbs, danios and catfish. You would need a standard 40-50 gallon aquarium for this one. This biotope is richly planted. Hydrilla, Water lilies, Java Moss, Water Lettuce and Nitelia are some of the native plants. Use a dark substrate and spread this to a depth of 2-2.5 inches. Laterite is a good addition to the substrate. With so many plants in the aquarium, lighting has to be bright. Two fluorescent full spectrum lights left on for about 12 hours a day should suffice. The pH of the water should be around 6.5 and the temperature should be in the low eighties. The best fish to go into this biotope are a school of Danios, 2-3 pairs of Gouramis and some Catfish.

These are just two of the easier biotopes that a beginner can try out at first. Since they make use of easily available plants and fish, and need conditions that can easily be set up and maintained, they should put you well on your way to your first biotope. There are many more complicated design structures that simulate biotopes such as the Zaire River Rapids, the Congo Basin, the Lowland Swamps of Africa etcetera.

The Community Aquarium

A community aquarium, as opposed to the Biotope, is an aquarium that has a large variety of fish living together peacefully. The fish may have originated from different parts of the world, and the aquarium does not seek to simulate any particular ecosystem. This aquarium can hold a lot of your favorite fish in one go. The only restraint you need to exercise is that they should all be compatible with each other and able to tolerate the same general living conditions.

A community aquarium requires more planning than a biotope. You should start out with a clear understanding of what your aquarium should look like. You should also have a

deeper understanding of aquarium set up and maintenance. Remember, the first aim of a community aquarium is to provide a stress free, healthy and stable environment for all the various species of fish that go into your aquarium. Remember a community aquarium is one that will take up quite a lot of time and effort and should receive that much attention.

The best-suited aquarium for this kind of a setup is the large aquarium. The larger it is, the more fish and flora it can accommodate. Also, larger aquariums are easier to maintain. Keep in mind that a large aquarium will rest safer on a special aquarium stand than on a piece of furniture. If you can afford it, an outside power filter is good in a large aquarium because they are easy to use as well as clean. As for lights, unless you are using plastic plants, double fluorescent lights are the minimum requirements. Just like with other types of aquariums, you will need a cover to keep the fish in the aquarium if you keep jumping species. A hood also keeps evaporation to a minimum. Make sure that the aquarium is away from direct sunlight. Adding Laterite to your substrate will help your plants to flourish well.

Adding fish to a community aquarium can get a little tricky if you have not done some research on the fish. The main idea behind such an aquarium is to get various specimens from a wide geographical area that can co-exist well. You must therefore be careful and create a fish community you can live well with each other. For instance, if you mix a small Tetra community with a group of Cichlids, you may see that your Tetras have vanished silently, and that your Cichlids are not very hungry when you feed them. Of course, all you need in this venture is just a bit of common sense. To make your aquarium more lively and interesting, you should ideally also think about choosing fish that inhabit all areas of your aquarium. For this you need to put in some top, middle and bottom dwellers. As variety is what will keep this layout attractive, you can put in nocturnal, diurnal, large, small, lively and calm fish - just about any kind of fish as long as they can co-exist peacefully.

Some species that are ideal for a community aquarium are listed below:

- Rasboras and Barbs: Not all fish are peaceful and some grow quite big. The Cherry Barb, the Golden Barb and The Harlequin are ideal additions to a community aquarium.
- The Corydoras Catfish: Being generally peaceful fish that are small in size, they also do well in a community aquarium. The Bronze Cory and the Peppered Corydoras are ideal.
- The Danios are active and hardy shoaling fish that can survive most conditions easily. Of these the Zebra Danio, the Leopard Danio and the Pearl Danio are worth selecting.
- The Dwarf Cichlids, unlike their larger cousins are generally peaceful and grow only to around 5 centimeters in length. They do however require very good water conditions and will become territorial at the time of spawning. The Ram Cichlid and the Cockatoo Dwarf Cichlid are good varieties.

- Guppy, Platy and Swordtail are the most popular among the Livebearers. Livebearers are typically easy to breed in aquariums and give birth to free swimming fry.
- Loaches are a good addition to any community aquarium. Though some species are a bit aggressive, they are mostly peace loving fish, and do especially well when in groups of 4-6 or more. The Clown Loach and the Zebra Loach are some of the best in this group.
- The Rainbow fish are active and colorful shoaling fish and a welcome addition to most aquariums. Though the younger ones are not very colorful, they become very attractive as they grow and mature. The dwarf species like the Dwarf Neon rainbow and the Banded Rainbow will do well in a community aquarium.
- A small shoal of Tetras is also a good species to have. The Black Neon Tetra, the Glowlight Tetra and the Neon Tetra are worth mentioning in this group. The Buenos Aires Tetras are also very hardy fish suitable for beginners.

Danios, Platy, Golden Barbs, Black Neon Tetras and Buenos Aires Tetras are some of the best of the lot to start with. As you gain experience, you can explore the other species and add one more specimen at a time.

Here is a small list of fish that are often sold as community fish, but are not very sociable in their attitudes. These may harm the other fish too:

- Angelfish is normally peaceful, but during the spawning season males tend to get aggressive towards other fish. They also grow too big for a small community aquarium.
- Gouramis too are often territorial and quite aggressive, especially towards other males of the same species. Some species grow quite large later on.
- The Red Tailed Black Shark will become very aggressive with others of its own kind. As they age, they become more territorial.
- The Tiger Barb is active and colorful, but they may nip the fins of other fish, though keeping them in a shoal can reduce this tendency.

The Fire Eel, Paddlefish, Red-Tailed Catfish, the Pacu, and the South American Leaf Fish are some varieties that you should keep away from. Some of these grow very big, and tend to bash themselves against the glass sides and other obstacles in the aquarium. They will thus injure themselves and may also be the cause of an infection in the aquarium. Some of these species also chase the smaller fish relentlessly and become very territorial as they grow in size.

The number of fish, their type, and the kinds of plants that go into your community aquarium can be as large and varied as you can afford. Only your imagination and your budget can limit you in this. A well-stocked community aquarium is a dazzling display of Nature at her best. As you keep going ahead with your project, you will find many ways to make your aquarium even more beautiful.

Chapter 4 - Aquarium Maintenance

Once you have got your aquarium all set up and running beautifully, you can sit back and enjoy the view. Well, not exactly sit back. There's maintenance work to be done! The good thing about maintenance work is that if it is done on a frequent basis it is relatively simple and quick. If steps are not taken in time, maintenance can instead turn into a dreaded chore. Before we go into the details, it is important to understand why it is necessary to give regular care to your aquarium and its occupants.

Your aquarium being a thriving ecosystem generates a lot of waste and toxic materials in the normal course of its day-to-day operation. The fish give out ammonia and solid fish wastes that collect in the aquarium. The plants will also generate waste products and growing plants will need to be pruned, cleaned and replanted. A minimal amount of algal growth is unavoidable in any functional aquarium. Microscopic organisms will build up in the water over a period of time. If you are keeping any invertebrates in your aquarium, these will also need special care. The substrate in your aquarium is like a garbage bin that collects all the material wastes. And like any garbage left unclean for a period of time, this will begin to fester and give out infection causing germs. The water in the aquarium is regularly getting depleted of vital nutrients. It is also collecting a lot of diluted waste that needs to be thrown out. It is therefore vital to clean and replenish your aquarium regularly to keep your aquarium in good health.

Here is a basic outline of what you need to do on a periodic basis.

Daily routine

Checking the fish

You should check your fish EVERYDAY for signs of stress and disease. An observant aquarist will be able to spot abnormal behavior in his fish in the earlier stages. Speed is definitely an important factor here. The faster you are able to spot any undesirable signs in your aquarium, the faster you can start rectifying matters. Any infection needs to be stopped in its initial stages to limit the damages. Here are some obvious signs of stress that will help you to help your fish:

- Clamped Fins is a very bad sign. In this case, the fish holds its fins very close to its body, not letting it move away from the body. You need to treat these fish immediately.
- The fish seems to be swimming very fast, but it stays at the same place. This is called Shimmying. Shimmying is easy to spot and if treated quickly, you can cure the fish completely.
- Sores on the body of a fish can usually be spotted with the naked eye. Fish develop sores for many reasons, e.g. when fighting with other fish, scraping against the obstacles in the aquarium and when affected by disease. Many a time, the sores get cured

automatically. If the conditions in your aquarium are not optimal, or if the fish is already much stressed, the sores will instead become bigger. In that case they have to be treated, not only to save that fish, but also to prevent spread of infection. The underlying factors must naturally also be corrected.

- White spots on the body of the fish are called "Ich Spots". This is a very common disease of the fish, and if treated early it can be controlled and cured.
- Fish that have crashed at the bottom of the aquarium are usually down due to sheer exhaustion. Quite often, this fish has shown other signs of sickness like sores or shimmying, and these have been ignored. Now the fish are too stressed out and tired. The chances of curing these fish are more remote.
- When a fish rubs itself on the sides of the aquarium, or on the rocks, this is called "Glancing". It does this because it is itchy. Itching can be caused by a wide range of problems, including Ich.
- Lack or loss of appetite is another bad sign. If the fish does not eat properly, or throws out the food immediately after it takes it inside its mouth, there is something to watch out for.
- If the fish seems to be hovering at the top of the aquarium and "gasping" for breath, there is a lack of oxygen in its aquarium

These are the common symptoms that indicate the start of a disease or extreme stress. Ignoring these symptoms will lead to more serious symptoms. Once the initial stages have been crossed, it is very difficult to bring the fish back into good health.

Checking the water

The water is the medium in which all your aquatic life depends. This medium has to be kept as clean and as fresh as possible. The word "clean" does however have a special meaning when we are discussing aquariums. A clean aquarium should for instance contain a large amount of beneficial bacteria. This is where knowing your water chemistry is important. The pH level of the water, Ammonia, Nitrite and Nitrate levels, Oxygen levels etc need to be kept just right. The water may become cloudy if it is not kept clean. It can also start giving out an odor and there may be a collection of foam at the top of the aquarium. This foam usually contains waste materials and bacteria. The temperature of the water has to be checked regularly. There are some fish that cannot survive in cooler temperatures and may start showing signs of stress. So, the thermometer readings of your aquariums need to be taken on a daily basis.

Checking the Filter

The filters are among the most important items in the aquarium. As you know, it filters out the waste, thus trapping most of the waste and toxic materials. Mechanical filters need to be cleaned every 2-4 weeks; or more often if large debris become stuck. Never clean your filter too often. This will destroy the bacteria culture in the filter and prevent it

from working properly. It is for the same reason important to never use hot water when cleaning your filter. Some bacteria must be allowed to survive in the filter and re-colonize it. When the waste deposit near the filter becomes high, then filtration becomes ineffective. When using mechanical filters, you need to check whether the system is working properly every day to ensure water quality. If you discover the filter for some reason has been turned off you'll need to clean it before turning it on again. This is due to the fact that the filter may contain toxic water after being turned off. The toxin is created when the oxygen is depleted when no new water is pumped into it. If you start the filter without cleaning it, the toxin is released into the water and might harm or kill the fish in the aquarium.

Feeding the fish

It is enough to feed fish once or twice a day. Do not feed the fish more than they will eat within a few minutes. Remove all uneaten food after 10 minutes. Check whether all the fish are eating.

Weekly Routine:

Since the water in your aquarium is stagnant, it needs to be partially changed as often as once or twice a week. Water will build up large residues of waste, dissolved gases and debris if left unchanged. When you replace a little of the water with new water, you are effectively reducing the total amount of waste concentration in the aquarium.

In a regular aquarium, nitrate and nitrite is the primary source of toxin. Since fish excrete nitrous wastes, the nitrate and nitrite build up in an aquarium with a large number of fish can be quite high even after a short period of time. Regular water change is the safest, surest and cheapest way to detoxify your aquarium.

If you have used medications in the water, these also will need to be removed as soon as their presence are not longer required. You should not leave ANY unwanted chemicals in the water of your aquarium.

There are two important factors that decide how effective your water change will be: The frequency of the water change, and the percentage of water you change each time. The overall effectiveness of the water change is dependant on the amount of water you change in a period. One water change should however never be very large. When there is a sudden change in your water quality (pH and temperature etc), the fish in your aquarium will be subjected to stress. If your aquarium water has the same pH, temperature and hardness as your new water, then changing up to 50% of water at a time will not stress the fish. If there is a significant discrepancy in pH levels, temperatures etcetera, changing large amounts of water may stress your fish enough to even kill them. During emergencies, it can still be necessary to do large water changes quite often. In some cases, this is the best line of defense as it would be more stressful for the fish to stay in the unsuitable water.

To facilitate this, you need to get replacement water that is as near a match to the existing water in the aquarium. Another factor is that in the course of time, the water in your aquarium will tend to change its chemistry a little. Thus, it is necessary to keep a check on your water chemistry every time you make a change. You can push the acidity of the water up or down by using non-inert materials like crushed corals, rock etc, or through the use of certain chemical additives.

How frequent should the water change be? If you can change the water more frequently, then you need to change only lesser quantities of water. The longer the gap between changes, the more stressed the fish become because you will need to change larger portions of the water. One way to start off is by replacing about 25% of your water once a week. But this should only be taken as a starting point for you to assess the needs of your particular aquarium. For the water change to be effective, you must take into account the number of fish you have in the aquarium, invertebrates if any and also the algae build-up in your aquarium.

If you notice that the pH of your water changes sharply, then making more frequent changes of small quantities of water will be the safest way to go. There are certain things to keep in mind each time you change your water. The water should be treated when you change it. Remember to add water conditioners every time you change the water. If you add salt into your water, these levels also have to be adjusted. Dechlorinate the water if you are taking it from your tap. Also keep in mind that the chlorine amount in your water is sometimes weather dependent.

Water changes helps to remove nitrate and nitrite after it have been produced. Effective biological and mechanical filtration is another excellent way to combat the waste build-up in your aquarium. For this, you must clean your filters regularly. It is however also possible to remove some of the nitrogenous waste before it turns into nitrate and nitrite. Debris like uneaten fish food, fish waste etc will typically collected near the filter from where it can be scooped up.

Thus, water changes are largely aquarium dependent. More frequent water changes are said to be especially beneficial while breeding and raising fry. A much improved growth rate is seen in such cases. Also, if you are keeping messy feeders like Cichlids, you will need to change your water frequently. While you decide on how much and how often you need to change your water, remember that in nature, the water often gets changed many times in the course of a day. Also, large water bodies like a river or lake has very high quantities of water to dilute the wastes formed in them. Here is a rough calculation on species-dependent water changes:

- A community aquarium that is not fully stocked up does well with 20% water changes every 2 weeks.
- A fully stocked community aquarium can do with a 20% water change every week.
- If you keep large Cichlids and predatory fish, 25% water changes every week is recommended.

- If you are rearing fry up to 1 month old, change 10-15% of water every day.

One of the most important steps in your weekly routine is vacuuming your substrate. Removing dirt and debris from your substrate by siphoning it out is highly recommended. Thus the solid waste in your aquarium will be removed. This also prevents these wastes from further breaking down into nitrates and phosphates in the aquarium.

If you have a gravel substrate, the end of the siphon tube should be plunged into the gravel to suck the dirt out. Special siphon tubes with wider end pieces are available for this purpose. Stir up the gravel slightly as you go along. The debris will rise away from the gravel, and they can be siphoned off. After that, the gravel will subside back into its place gently. Siphoning is particularly important in aquariums that have Under Gravel filtration in place, since it will help keep the filter bed healthy.

In case of sand substrate, hold a clean garden hose half an inch or so above the surface of the water. This will help to remove the visible debris without disturbing the surface of the sand.

In aquariums that are richly planted, vacuuming the substrate may be very difficult. This will churn up the substrate and disturb the roots. Plants tend to get damaged when their roots are disturbed. The plant roots themselves will keep the substrate healthy. So, vacuuming a planted substrate is not necessary. Plunging a siphon into a nutrient rich layer of the substrate will make the water cloudy. If this happens, then nutrients may be released into the water column. This will lead to an increase in the algae population in your aquarium.

Monthly Routine

The fluorescent lighting in your aquarium needs to be checked once a month. The lighting provides heat and if your light has reached its last legs, it is better to change it quickly. Remember all kinds of fish will not take kindly to sharp changes in water temperature. Inspect tubing, air-stones and other equipment to see if they are in proper working order. Also remember to check the expiry date on the boxes and bottles of the supplies you are using in your aquarium. Your test kits also have a date on them. Using these after their expiration can give you wrong readings, and will prompt you to take unnecessary precautionary steps. Scrape the glass surfaces of your aquarium to remove algae from them. A special kind of scrubber is available to clean the aquarium surfaces thoroughly.

The “Old Aquarium” Syndrome

Just when you feel that everything has settled down and that your aquarium is doing extremely well, disaster strikes. And you don't know why! The water seems crystal clear, there has been no fish loss and your plants also look very healthy. Then, how does the sudden loss occur?

This is called the "Old Aquarium" syndrome. In a closed aquarium, the balance in the aquarium is dependent on many factors. The closed aquarium is actually precariously poised when it comes to equilibrium. Everything in the aquarium affects the other things in one way or the other. Even water evaporation causes the impurity level in the water to rise as only water evaporates. This leaves behind the dissolved wastes as well as any salt you have added to the water.

When you take the above into account, you will notice that there will be a continuous decline or accumulation of various elements in your aquarium. But the fish, once it gets habituated to your aquarium, will adjust to these changes and initial signs of stress may go unnoticed too. Lack of proper maintenance will add to the potentially dangerous situation, and this will prove disastrous to your fish in the long run.

Most of the times, the problems will start snowballing when you add new fish. Often, people blame the store for giving them infected or stressed fish. In reality something totally different is happening. The fish in the store were used to a more stable and probably healthier environment. When they are introduced into your aquarium, they will be shocked and stressed by the harsh conditions in your aquarium. The older inhabitants in your aquarium have already adjusted to this, albeit slowly. The shocked fish will be susceptible to diseases and once an infection has developed in your aquarium, it will catch on like fire. All the fish will soon show signs of stress, affected as they are by the negative conditions in your aquarium.

Rising nitrate levels show the first indications of the "Old Aquarium" syndrome. If left unchecked, the pH level in your water will drop drastically. This will in turn affect the beneficial bacterial growth in your aquarium. Ammonia will start building up in your aquarium. Even at this stage, noticeable signs of danger are not seen in the aquarium, except in the basic water parameters. When the pH level in your aquarium is below 6.0, this high level of ammonia will not affect the balance in your aquarium. But the pH level may go up due to additives used, or due to evaporation etc. Then, the ammonia becomes toxic.

There is only one way to remedy this: frequent water changes. Regular maintenance of the aquarium will keep the "Old Aquarium" syndrome at bay.

Filtration

If you consider water clarity to be any indication of water purity, you are going to be shocked out of your complacency soon. Water will harbor millions of microorganisms even when it looks crystal clear. Ironically, though the algae growing in your water look ugly, they also indicate that your aquarium is healthy and has the right combination to support life. We can definitely not see the nitrate, nitrite, ammonia and phosphate levels in water. Nor can we see the disease causing microorganisms that settles in substrate or on decoration and plant surfaces.

This is where effective filtration can be a lifesaver. Mechanical filtration basically aims at removing the larger particles and debris from the aquarium. Uneaten fish food, dying plant parts that fall off from the parent plants etc can be easily caught by the mechanical filters. Thus, this filtration technique allows you to trap and remove debris before it decays. For mechanical filtration to be effective, you must clean the filter material every 2-4 weeks.

If you are in an area that is prone to power outages, then you need to invest in some additional hardware. Power outages, even for a few hours, can wreck havoc in your aquarium. The first thing that occurs when the power goes is the shutting down of the mechanical filtration. Within a few short hours, the nitrate and ammonia levels in your water begin to escalate. The heating in your aquariums also becomes non-existent and the lights turn dark.

In such a scenario, it is always better to have a lightly stocked aquarium. A fish aquarium that is stuffed to its capacity is very delicate in its balance. A small change in a single factor can cause disaster.

The next step would be to procure battery powered air pumps. A single air pump along with an air stone will suffice for every two feet of aquarium length. A sponge filter that runs off an air stone will also be a good option. Thus your water will remain oxygenated as well as filtered.

Feeding your fish well is also a part of the maintenance process. Many beginners are confused by how much they should feed their fish. A good thumb rule is to feed fish only as much as they can eat in the first 5-10 minutes. Remove any left over food particles immediately after each feeding. Do not let it accumulate in your aquarium, since it will start decaying. A feed followed by a partial water change will minimize the collection of food waste and associated waste problems in your aquarium. Also remember that more food also means more fish waste. So, feed sparingly. Removing fish waste becomes a bit of a problem if your power goes. So, in case of a power outage, do not feed your fish for a day, and then feed them minimally.

Here are some steps to be followed if your power outage is going to last for more than a few hours:

- Remove the top of the aquarium. This will help to introduce more air into your aquarium. If your room is cold, you should however keep the lid on.
- All the electrical equipments should be switched off or unplugged. There may be fits and starts of power supply and you need to ensure that your equipment does not bear the brunt of this.
- Get the battery-powered filtration in place and running smoothly.
- All the canister filters should be opened up to expose them to air. Rinse out the canister media in dechlorinated water and put

them back gently again. Rinse out the sponge filters also in dechlorinated water. This will help to preserve the colonies of beneficial bacteria stuck to the filters. At a time like this, you definitely do not want to lose the beneficial bacteria.

➤ The last thing to do is to ensure that your water's temperature remains as constant as possible. In case of extreme heat, leaving the tops open will substantially reduce heat. But during the cold months, you will need to increase your water temperature using other methods.

As can be seen from the descriptions above, aquarium maintenance can be as easy or as tough as you want it to be. Regular maintenance will reduce your load as well as keep the fish happy. The most important thing to remember is that when you are trying to copy such a complex thing as nature, things are bound to be a little complicated. But, with a little effort and patience, you will see that your fish are thriving in their beautiful new home.

Chapter 5 - Food

Feeding Fish

Like all living species, fish too need nutritious food. There are a number of varieties of fish food available in the stores today. Just like mammals, different fish species require different food types. That is why you should know your fish before you buy their food. The feeding of fish and their nutrition is one of the most important factors in keeping them healthy. Since fish are very diverse in their habits, there is a large diversity in their eating patterns too. Some fish, for instance, are bottom feeders, while others are mid-water feeders or surface feeders. Some fish species will even jump out of the water to catch insects! You will also notice that some fish enjoy eating your plants while others enjoy eating your other fish. So, how do you find out your fish's favorite food; food that is nutritious as well as delicious? How much should you feed them, how often should you feed and what do you do if they do not eat? Are they just not hungry or are they showing signs of stress? It can sometimes be very confusing to interpret the signals your fish are giving off. As any successful aquarist will tell you, observing feeding patterns is one of the most enjoyable as well as important steps in aquarium keeping.

Obviously, a single type of food will not be enough to meet the requirements of the fish. That is why many of the exotic varieties of fish shouldn't be maintained in an aquarium by anyone but an experienced aquarist. Their native food and the varieties that they need to survive and do well are too tough for less experienced aquarists to provide. Most of the fish that have adapted to aquarium life can be trained and habituated to eat different kinds of food. The first step is that the fish has to be able to recognize food. Even the most nutritious of food goes to waste if the fish does not understand that it is to be eaten. Both instinct as well as training affects this recognition. Hunger is not the only thing that leads a fish to food. Security as well as good health is also necessary.

Upon introduction into its new home, a fish may not take to its food right away. If your aquarium does not resemble its natural habitat or is completely devoid of friendly objects like plants, the fish may feel insecure. Sometimes, the temperature in your aquarium is just not right, or the intensity of the glare coming from your lights can be too harsh. Dimming lights a bit until the fish get used to the lights is a good idea.

Various visual and chemical clues point out the food to the fish. Once the fish has located the food, it may taste it before it accepts the feed. Some fish may take in the food, and regurgitate it if they feel that it is not acceptable. Predatory fish have a different kind of feeding pattern. Generalizations about the sensory characteristics of diverse kinds of fish will therefore not be accurate or appropriate, but here are some general traits in food that can attract fish.

Flavor and taste

This characteristic of food is especially important in case of bottom feeders. Smell can be detected by the specific anatomical receptors in fish, but flavor has to be dissolved in water for the fish to locate it. Some fish have receptors in their mouths, or on the head or lips. Some even have taste receptors on their skin. These receptors carry messages to the brain and tell the fish to swim towards the food. Some kinds of food can strongly stimulate fish to feed by their flavor, but these stimuli need not be the same as in humans. Therefore, desist from giving your fish sweet and fatty food.

Sound

Through water, sound travels about four times faster than it does through air. So, a fish can actually "hear" sound through the vibrations that take place in water. By picking up these vibrations in water, the fish become aware of the feeding frenzies that cause many fish to conglomerate when the feeding begins. Also, there are fish that are so used to a routine in their feeding that they start grouping when they hear sounds that normally precede feeding.

Smell

The sense of smell is highly developed in fish. In nature, fish needs to be able to identify their food and also their mates through the sense of smell. So, many fish species have nostrils that help them to identify the various things they come across. These sensors thus help the fish to zero-in on their food.

Color and Buoyancy of food

Some fish that are used to feeding on floating food may not take to food that has sunk to the bottom. Similarly, bottom feeders rarely come to the top of the aquarium to eat food. A majority of the fish species in the tropical variety are however not very picky when it comes to the buoyancy of food.

Understanding feeding and digestion in fish

When compared to humans, the digestive system in fish is relatively simple. There will of course be variations that are species-dependent. Some species of fish have teeth. The teeth in fish are generally adapted for performing special functions. Predatory Catfish will for instance have small sharp pointed teeth, while the Pacu fish have teeth adapted to crushing fruits and nuts.

The stomachs of fish are also generally adapted to the kind of food they eat. Predatory fish generally have sac shaped stomachs that allow them to pack away enormous amounts of food. The Puffer fish has a stomach that can be inflated with air or water in order to scare off enemies. Food that is partially digested moves from the stomach into the intestine. Here it is digested further and the nutrients are absorbed into the body. The

herbivores have an elongated intestine and their systems are more complicated than the carnivores. Food that is not completely digested and absorbed leaves the body through the anal opening, together with other waste products produced by the metabolism.

Giving your fish the right kind of food at the right time and in the right amounts is crucial to their growth and development. In a closed system, the fish have no choice but to eat what they are provided with. If you want fish that are full of energy, you have to feed them according to their particular needs.

- Every type of fish has a specific feeding requirement. Herbivorous fish require lots of fiber in their diet, while carnivores require food that is rich in protein. Some predatory fish eat food only after chasing the live food.
- Do not make your fish obese. Yes, fish also gain unhealthy fat from over eating. Some fish like the catfish will eat just about any amount of food. They become too big and lose health. Remember that fish in your aquarium do not expend energy looking for and chasing food. They only move about within the confines of your tiny little aquarium. So, feed your fish only according to their nutritional needs.
- Overfeeding introduces a lot of unwanted toxins into your system. Mostly, fish are able to take in the food they need within 5-10 minutes of their feed. Food left in the aquarium after the first 10 minutes of feeding is not needed by the fish, and will collect in the aquarium as waste; decaying and releasing toxins.
- Obtaining food can become a problem in a community or biotope aquarium at times. Hyperactive fish and fast swimmers will get the first pick in the aquarium. Small fish can be scared away by larger fish and newly introduced fish may be too shy to get to the food.
- Give your fish a variety of food. Feeding fish the same kind of food day after day tends to dry up their appetite. Besides, they also need a variety of nutrients, which can be provided only by rotating the feed.
- Be very careful when and if you introduce live food into your aquarium. Many fish species love worms, insect larvae etcetera and will stay much healthier when provided with live food. Care must however be taken to ensure that these food varieties do not carry infections, such as germs or other parasites, in them. This is very difficult to ascertain, unless you culture your own live food. So beware when you feed live food to your fish.

Food for the fish has to encompass a large number of nutrients. All these together make your fish healthy and able to adapt to changing conditions in the aquarium. Remember, the healthier the fish, the more resistance will they have to disease and infections.

Protein

Protein is the single most important nutrient that the fish needs to grow. On a dry-weight basis, this makes up the maximum weight in their body structure. Amino acids are derived from proteins and the fish uses them to make new body tissues as well as enzymes. Fish are very adept at converting food to body tissues. That is why fish need lesser amounts of food than do most other animals. Carbohydrates are almost non-existent in the food intake for many fish species, since energy is also derived from proteins.

The quantity of protein required for the fish to be healthy depends on a number of variables like the species of fish, amount of natural food available, growth rate etc. Fry and larvae require a more protein rich diet to maximize their adaptability and chances of survival. As the fish grow larger, their dependency on protein reduces. The temperature of the water also affects protein requirements.

Fatty acids

Fatty acids are a storehouse of energy for most fish. They provide stamina. Carbohydrates can also do this job. It is also seen that some of the predatory fish species require some source of fish oil in their diet too. Fish that live within the confines of an aquarium are naturally prone to obesity. They do not use up their excess energy in swimming long distances or looking for food. In most cases, excess fat can be damaging to the general health of the fish. Some fish lose their reproductive capabilities if there is too much body fat.

Fat-soluble carotenoid

Fat-soluble carotenoid is responsible for the bright hues in some fish. Krill and brine fish are some of the foods that are rich in pigments.

Carbohydrates

Carbohydrates make up 20-30% of the common commercial foods. While they are alternate sources of energy, they are not very necessary for fish growth. Though most fish will handle some amount of carbohydrates, they develop signs of ill health if there is a high concentration of carbs in their diet. For instance, if young fish ingest too much of carbs, other nutrients will not be absorbed appropriately by their bodies. That is why cereal grains, which have very high levels of raw starch, are not ingested fully by fish.

Vitamins and minerals

Vitamins are vital to fish health. These are organic substances that act as catalysts for many of the biochemical reactions within the fish. Almost all vitamin deficiency will increase the fish's susceptibility to diseases and stress. The best way to get a rich supply of vitamins to your fish is to buy small quantities of diverse food for them. Storing excess

food in the freezer also prolongs the life of the vitamins. Providing frozen or fresh vegetables and live food can also supply the much-required vitamins to your fish.

Minerals are also necessary for you fish. Bones, teeth and scale tissues require lots of minerals. The minerals also carry out many supportive functions. Your tropical fish will most likely suffer from a lack of Calcium and Phosphorous, if any. If they are kept in hard water, fish are able to extract some amount of calcium from it, but soft water has absolutely no supplies of calcium. Though mineral supplements will help to compensate this deficiency, excess of some minerals can be poisonous. Therefore, mineral supplements should not be used indiscriminately.

Types of food

Most commonly, fish food can be divided into 3 main categories:

- **Manufactured food:** This includes floating and sinking pellet, granular and flake food.
- **Freeze-dried feeds:** Worms, larvae, brine shrimp and krill etc.
- **Live foods:** Maggots, fresh insect larvae, live worms, and feeder fish - all come under this category.

Flake food refers to a kind of food that is most commonly eaten by both marine as well as tropical freshwater fish. This is ideally suited for top dwellers and mid-water fish. Once the flake food has settled down, it can be eaten by the bottom dwellers too. If your aquarium consists of bottom dwellers mainly, it would be a good idea to pre-soak the flake food so that it will sink to the bottom as soon as it is introduced into the water.

Flake foods have evolved over the years and come much closer to providing for all your fish's nutrient needs. They are an excellent source of various minerals too. They are easy to keep and have fairly long shelf lives. They come in various flavors. You can even get different kinds of flakes in one can. This is a great way to feed wholesome food to the fish. Drop a pinch or two of the flake into the water and observe the rate at which this is eaten. Then you can decide how much needs to be put in the next feeding.

For vegetarian fish, there are vegetarian flakes available, such as algae flakes. One serving of algae per day is enjoyed by almost all fish except for predatory fish. For the bottom feeders, you probably should go in for algae wafers and discs. If a disc has not been eaten within 24 hours, it has to be removed otherwise it will start putrefying in your aquarium, and releasing toxins.

An unfortunate truth about flake food is that the nutrients in the flake food get deteriorated quite quickly. So, it is important that you buy only as much flake as you need for a month or so. This will also allow you to check out the various varieties as they become available. Always buy more than one variety and rotate your feed. The fish too

get bored of eating the same stuff everyday. A good flake food is one that meets the needs of most of the fish in your community aquarium.

If you have larger fish in your aquarium, they will prefer to eat something larger than a tiny flake. After all, they have larger mouths, and naturally, they'd prefer to eat something bigger. Sinking or floating pellets are therefore a better choice for larger fish. Pellets come in various sizes and shapes, suited for fish of different sizes. Granular feed needs to be used only if your bottom feeders are not getting enough sunken flakes or seem hungry. Bottom dwellers often need to be fed separately, so granular food is ideal for this kind of fish.

Besides flakes and pellets, there are also freed dried foods like Tubifex, krill and river shrimp.

Live foods

Despite the variety, flavor and popularity of the various manufactured food that you find in the store, there is still a need to feed your fish some varieties of live food as often as you can. In addition to adding a welcome change to their feeding routine, it also introduces a lot of nutrients that may be lacking in the store food. Live food needs to be approached with a bit of caution. You should be absolutely sure that the food you provide the fish is fresh and without any signs of decay or infection. You do not want your fish to show signs of disease after it have innocently eaten something you provided. If you have cultured the live food yourself in a healthy environment, then there is no fear of it being infected or chemically treated.

Planktons are minute floating aquatic plants and animals. They are a good source of nutrition for fish. Plankton can be trapped or netted from ponds for feeding. Tubifex worms are a hot favorite among a large number of fish. They are unfortunately also known to carry diseases and are very fatty which means that Tubifex only should be used once in a while. Rinsing out live food thoroughly before introducing it into water will greatly help reduce the chances of carrying the disease into your aquarium, but this method is naturally only effective for the germs outside the body.

Microworms are one of the simplest fish foods to culture. These are primarily used to feed fish fry. Fish that are too small to feed on brine shrimp will find these an excellent choice. Brine shrimp, on the other hand, are minute shrimps collected from saltwater ponds. Even after they are dried, they remain dormant inside cysts. These cysts can be hatched as and when needed even after storing them for months and even years. Each cyst will contain one single animal.

Earthworms and Redworms are other popular sources of food for tropical fish. These are easy to rear, but are also high in fat content. They are very popular among some fish varieties like the Cichlids.

Cultivation of some common live food

Earthworms are some of the most complete sources of food in nature. These worms are full of vitamins, roughage and calcium. They have rich supplies of proteins too. Fish that are fed on earthworms grow at a very fast rate. Large fish like the Cichlids will eat the adult earthworm in whole, while medium size fish will eat worms that are an inch or less in length. The very small fish species will need the worms chopped or shredded.

Earthworms are blind, but light sensitive. They will burrow into the soil to avoid light. They are also temperature sensitive, and will drown if their home is flooded. Earthworms prefer a rich, clay free soil. You can feed them with decaying vegetables and eggshells. Do not over-feed the worms, as this will turn the soil sour. The simplest way to culture a small quantity of worms is to gather some very heavy sacking on the ground. This should be in a shady spot. The area should be kept moist. Some scraps of vegetables should be placed in between the sack and the ground to encourage the growth of the worms. When you need the worms, just lift up the sack and remove the worms that cling to the sack.

Microworms are fairly easy to cultivate too once you get a fresh starter. Transfer your starter culture to a large container. Maintain a temperature between 65-75 degrees. Prick small holes into the lid for air exchange. Any cereal-based media, including cornmeal or oatmeal or even baby food, can be used for the microworms. Mix about one spoon of brewers yeast to the culture. The yeast should be mixed in slightly warm water. In 3-5 days, you will see that the worms have filled the surface of the medium and will start climbing over. These can then be collected using an ice cream stick. Rinse the worms, and then feed the worms to the fish using a baby eyedropper. One excellent side benefit of culturing your own microworms is that you can add liquid vitamins to the culture. Whatever you feed the worms will go directly to the fish too.

The larvae and adult specimens of fruit flies are another hot favorite among fish. You should not use the maggots supplied by your nearest fishing store. The reason being that these larvae are specially bred to be bait; they will have toughened skins as well as chemicals in them. Cultivation of maggots is best suited for the summer months. Make a few holes in a plastic container. These holes should be big enough for the flies to enter. Make some smaller holes at the bottom of the container, and place a small piece of fish or meat within the container. Place this in a large container and put it in a shady part of your garden. Within a few hours, flies will start visiting your container and would have laid their eggs on your bait. After a few days the larvae will start coming out of the inner container. These can then be collected and fed to your fish.

Water fleas or daphnia are an excellent supplementary food. They can be given once every week to the fish. They are a rich source of fiber. A starter culture of Daphnia can be store-bought or captured from the wild. Take a shallow container, clean it thoroughly and fill it with alkaline water. The container should receive plenty of sunlight, but not left exposed to the sun all day. Now, add the fleas. Various substances like rotting lettuce, green water or yeast can be used as food. Do not add too much of food, since the water will foul up and the fleas will die due to a lack of oxygen. Gram flour is one of the best substances for food. Mix the flour well with half a liter of water. Add this mixture to the

culture. The culture will look cloudy now, but the bottom of the container will still be seen. Within a week, the container will be filled with fleas that can be netted and fed to the fish. Daphnia are sensitive to the presence of other life forms in their water, and even algae should therefore be kept out of the medium while culturing Daphnia.

Brine shrimp is another excellent food for fish. They are available in 3 forms: live, frozen or freeze-dried. The eggs of the brine shrimp are easily available for home cultivation. The shrimp that come out of them are excellent food for fry, while adult Brine shrimp can be fed to adult fish (and to very large fry). The exoskeletons of the Brine shrimp are excellent sources of fiber.

Cyclops is another tiny animal that can be cultivated at home and that is a good food for large fry and small fish. Cyclops cannot be used as food for small fry as they attack the fry.

Insect larvae of Bloodworms, White and Black Mosquitoes, and Meal Worms are also good fish food. The larvae of black mosquitoes are especially good as they are full of vitamins. In some fish species, these seem to trigger the spawning process. Mosquitoes can easily be bred in standing water, and their larvae can be caught and fed to the fish.

Flies, Crickets, Back swimmers and Beetles can also be caught easily and fed to your larger fish. Several types of mollusks, including snails, can be used as food for larger fish like the Puffer fish. Goldfish and guppies are widely used as feeder fish. Larger species relish these, but feeder fish can be carriers of diseases or infection. Proper care should be taken before using them as food.

Frozen food can be made at home using some of the vegetables and meat from the refrigerator. Here is a favorite recipe: Mix 1 tablespoon each of parsley, carrot shaving, green peas and oatmeal cereal with 5 oz. of shrimp and fish filet. Add 2 tablespoons of brewers yeast, 3 drops anise extract and keep 3 packets of gelatin ready for use. Puree everything except the gelatin in a blender. Dissolve gelatin in warm water and add this to the pureed mixture. Let the mixture sit for a minute or two, before pouring it into bags. Lay the bags in the fridge to chill for a day. After a day in the fridge, move this to the freezer. Cut the food into chunks and feed the fish.

Feeding Fry

Newly hatched and just into the aquarium, fry are indeed very small and helpless. They need to be maintained with much care in order to see them safely into adulthood. They need excellent water quality and extra security, as the fry are often delicious food for the other carnivores in your aquarium. It is often a good idea to enclose the fry separately, but some fry require their parents to care for them. Usually, small sources of food suffice for fry. Live food almost always give the best results because growth rate in fish is noticed to be at least three times faster when they eat live food.

You can also use prepared mixes to feed fry. These mixtures are usually flake-based food that has been ground to a very fine powder. The obvious problem with this is that it quickly pollutes the water. Fry are often too small to be in an aquarium with vigorous filtration, and without filtration the water quality goes downhill very soon. Your fry are then at risk. Liquid mixtures tend to settle at the bottom of the aquarium, and fry are normally surface feeders, so a lot of the food does not get to them.

Infusoria refers to the various microorganisms that are present in small quantities in the water. This can be cultured and introduced in small quantities to feed fry. Just like many other types of food, Infusoria is potentially dangerous to the fry as Infusoria can foul up the water and make it toxic.

Newly hatched Brine shrimp is an excellent source of food for fry. You will be able to purchase Brine shrimp eggs from your local pet store. Take a plastic bottle; add water and one tablespoon of coarse salt to two teaspoons of brine shrimp eggs. The temperature should be around 80 Degrees F. Sufficient aeration is important. The eggs will start hatching in 24-36 hours. It is advisable to stop the aeration at this point. The Brine shrimp will settle at the bottom while the eggshells will rise to the top. Siphon out the young shrimps into a fine net, rinse thoroughly and feed the fry.

Green water or suspended algae can easily be cultured at home. Take some aged tap water and leave it in a sunny place. Remember to add some algae from your aquarium as well as a few drops of plant fertilizer to this. The algae will develop in 2-3 days. Use an eyedropper to feed this to the fry.

Egg yolk prepared at home can also be used to feed fry. After you hard-boil an egg, take a small piece of the yolk and put it in a cloth, roughly 10cm by 10 cm in dimensions. Fold this into a bag, and screw the bag so that a bit of the yolk protrudes out from the bag. Dip this bag into the aquarium to feed fry. The yolk needs to be replaced in 2-3 days, otherwise it will spoil.

Feeding Habits

There are four basic eating groups among fish: carnivores, herbivores, omnivores and limnivores. Each group of fish needs to be fed in a particular way.

Carnivores are meat-eating fish. Whilst they will never damage your plant life, you will be lucky if you do not find any of the smaller fish disappearing mysteriously. If there are smaller fish in the aquarium with a carnivore, sooner or later the smaller fish will end up in the carnivore's stomach. Carnivores need at least 45% of protein in their food, without which they become severely malnourished. Although many of the prepared foods are spiked with extra protein to help such fish, carnivores are happiest when they are fed live food like worms. An added benefit is that chasing their prey seems to whet their appetite even further. Recommended food for the carnivores would be:

- Earthworms, Red worms, Tubifex worms and Daphnia.

- Larvae of mosquitoes or fruit flies.
- Oysters, shrimps, clams and other fish. If these are kept frozen, they need to be thawed and then sliced into slivers.
- Lean chicken, turkey and salmon. These should be cooked, but never fried.
- Supplements in the form of flakes or granules and pellets for added nutrition.

Herbivorous fish are those that will eat only plants. These fish need to graze very often, and whether they are fed regularly or not, they will nip at your plant life. Many aquarists who like herbivores keep plastic plants in their aquarium. If real plants are used, the aquarium runs a risk of having a badly mauled garden. It is a good idea to feed these fish with fresh veggies. Planting leafy vegetables like spinach into the substrate is a good trick. The fish will keep nipping at these. Care should be taken to remove the frayed plants before they start decaying and rotting in the water.

Recommended foods for this variety are:

- Cucumber, peas and potatoes. These can be kept frozen and be chopped into tiny pieces at mealtime.
- Vegetable flakes come in a variety of flavors.
- Algal flakes will also be a favorite among this kind of fish.

Omnivore fish will eat pretty much anything, and that makes them dangerous to plants as well as to other smaller creatures in your aquarium. They are also voracious eaters and aquarists can sometimes mistake their eating frenzy for hunger. It is a common tendency to overfeed these species, and they do tend to pile on the fat very quickly if overfed.

Limnivores are also known as mud-eaters. Limnivore fish feed mainly on algae and on the microorganisms in your aquarium. These kinds of fish are constantly eating, and can be given pellets and algae based foods.

Proper feeding practices are a matter of habit. They require some amount of patience, observation and consideration. Understanding your fish and appreciating the differences between the different species help a lot when you feed them. The type of food, the culture conditions and the individual fish will all affect the quantity of food you should provide. In nature, there may be times when an adult fish starves for a day or two, or even for longer periods of time. The younger fish need more frequent feedings than the older ones. The fry have their own feeding needs.

Most feeding problems arise due to overfeeding. More food also means more waste. The excess food will putrefy and degrade the water quality. Under gravel filters can get clogged with uneaten food wastes. Frequent water changes along with cleaning of decorations, rearranging of plants etc will help to control the debris collection in the aquarium. Loaches, catfish and other common bottom-feeding fish will help keep the aquarium clean.

Deficiencies in vitamins can cause stunted growth, loss of appetite, cloudy eyes, weakness or tumors in fish. For this reason it is advisable to give your fish vitamin supplements from time to time. No supplement should be left too long in your water. Adding any unnatural substance into your aquarium should be followed up by a water change in a day or two. This will keep the fish as well as the beneficial bacterial colony thriving.

Chapter 6 - Breeding Fish

Breeding fish is considered to be a very complicated procedure by many beginners. People believe that one needs expert knowledge to make fish breed while in captivity, but this is far from the truth. Breeding, like any other aspect of fish keeping, is a science. If you get your facts right, and follow the right procedures, you will find your fish multiplying fast.

Several livebearing fish species will spawn even in suboptimal conditions, while egg laying species typically are a larger challenge for a novice. Since it is a new experience, there are some tips and techniques that will make the whole procedure easy as well as enjoyable. For successful breeding of fish, the first step of course is to be able to distinguish between the sexes. When you have grown both the sexes of the same species and feel that they are ready to spawn, the next logical step would be to recreate the natural surroundings that will best suit breeding. Natural conditions stimulate the spawning process.

Spawning Methods

Sexually, fish can be classified into two groups: the sexually dimorphic and the sexually isomorphic species. The sexually dimorphic species show obvious primary and secondary characteristics of their gender. The males of this species are often larger and more colorful, and they usually have a much more elaborate finage. The sexually isomorphic species show hardly any apparent differences in the two sexes. It is therefore very difficult to distinguish between the two sexes in this group. Often, the only deciding factor could be the shape of the genital papilla. This becomes visible at the time of spawning. In some of these species, the female have a more rounded belly or is slightly larger than the males. There are some species that show no visible difference at all between the two sexes.

External fertilization followed by egg laying is the way most fish in aquariums will reproduce. Egg layers are classified into five groups:

Egg Scatterers

These species, as the name indicates, scatter their eggs on any surface. The eggs may be adhesive or non adhesive. After laying eggs, the parents do not look after them, and may even eat their own eggs. These are mostly schooling fish, and they often spawn in groups. Their eggs hatch fairly quickly.

Egg Depositors

These fish deposit their eggs somewhere on the substrate. They lay fewer eggs than egg scatterers. Some species within this group show advanced care for the eggs and fry. They

will deposit eggs in an enclosure, cave, a pit or similar, and protect and clean the eggs. Some species of Cichlids come under this category. Not all egg depositing species care for their young. Some just deposit their eggs and then abandon them. Egg depositing species generally don't eat their own eggs. Their eggs are usually larger than those of the scatterers.

Mouth Brooders

There are two basic types of mouth brooders. In some species, the female fish carries the eggs and/or larvae in its mouth. The female in this group receives a mouthful of sperm from the male, and the fertilization takes place in the mouth of the female. In the second type of mouthbrooders, the females lay the eggs on a substrate and guard these eggs till they hatch. Once the eggs hatch, she picks up the fry and carries them in her mouth till the fry have become a little bigger. There are also paternal mouthbrooders where the offspring is carried by the male fish.

Nest Builders

These fish build a kind of nest that is made of plant debris and saliva. They may also dig a pit in the substrate to lay eggs. They take care of their young ones.

Livebearers

Livebearers are fish that do not lay eggs. The fry come already hatched out of the mother fish. Livebearers are able to give birth to young ones because of internal fertilization which takes place inside the female. Sometimes contact between the cloacal apertures of the male and female fish leads to fertilization. In some species, the eggs produced by the livebearer will be heavily yoked. In other species, the young are in direct contact with the mother and are fed and nourished by her. In this case, the mother carrying the young ones needs more nutrition and overall care.

Fry of livebearing fish usually takes about 30-32 days to develop. Many factors will affect this development period, e.g. the water temperature, the female's age and her level of nutrition. The good thing about livebearer females is that they are immediately ready to breed again after they drop their young ones. The competition to get to these females is intense among the males.

For beginners livebearers are the easiest fish to breed. If given enough space, the livebearers will do most of the hard work. Once the fry become noticeable and have started swimming, they need to be removed from the aquarium unless the aquarium is densely planted. Failure to do so will surely land a large percentage of them into the stomachs of bigger fish. Many people breed livebearers to provide food for predatory fish. Some livebearers will cross breed with other fish and to avoid hybridization these species should not be kept together.

Equipment management while breeding fish

The first and foremost need for successful spawning of many species is space. Fish often become territorial when their breeding time approaches. Most males are very aggressive during this time, and will chase away any potential competitors. This becomes especially dangerous for the younger fish, and more so if they are unable to get to a safer place, out of reach of the aggressive male. The primary need of fish that are going to breed is enough space for them to chase, hide and move. There are species that need very little space and that don't get especially aggressive, such as the very popular Guppy.

Some species of fish get into the spawning mode when they are fed highly nutritious food. Thus it is a good practice to give the breeders some special attention. This kind of special attention aims at bringing the fish to their topmost reproductive state. If you have some extra aquariums, place the two sexes separately in the two aquariums.

A delivery aquarium is advisable when your fish are ready to spawn. This will save the fry from being eaten up as food by the other fish. A tight cover should be placed on the aquarium as some fish species can become very nervous during this stage and show a tendency to jump. The conditions in the delivery aquarium should be as close to those in the original aquarium as possible. This will save the parent fish from any undesirable stress at such a critical stage in the breeding cycle.

A special aquarium for rearing fry is also advisable. This can be the same aquarium as the delivery aquarium if the parents are moved from the aquarium once the eggs are laid. If the species guards their young, they should not be removed until they have stopped rearing the fry and started to prepare for a new spawning. The needs and requirements of fry are very different from bigger fish. They need special kinds of food, at least till they grow a bit bigger. Filtration too has to be varied in order to accommodate fry. As the fry start developing you can perform a 10% water change the first few days, and then raise this up to a 40% water change every day to keep the water clean. Clean water helps keep your fry healthy and fast growing. Optimal survival of the fry is ensured if you segregate the fry depending on their size. The fastest growing fry are almost always the males. The bigger fry will eat the smaller ones if they are not separated.

Some people use a breeding trap as the place where the female livebearer can drop her fry. The fry are thus out of reach as they will be dropped into a separate plastic compartment attached to the rim of the aquarium. If the breeding aquarium is too small to accommodate the female, the chances of her miscarrying while struggling to escape are very high.

The spawning aquariums for different kinds of fish should be set up according to their particular characteristics. Egg scatterers will eat their own eggs. So, care should be taken that their eggs fall away from the reach of the parents. For small species of this kind of fish, a 5-10 gallon aquarium would be the best. The parents should be removed after spawning. If the fish lays non-adhesive eggs, it is better to put nylon netting just above the aquarium floor. The eggs will then fall out of the reach of the parents. In case the eggs are adhesive, then they will be laid among the leaves of plants.

Egg depositors should get aquariums decorated in accordance with their egg depositing behavior. If they are the types that care for their young, the parents can stay in the aquarium after laying the eggs. It is advisable to provide these fish with broad-leafed plants, flat stones, upturned flowerpots, coconut shells, or rocky caves. If your fish species inhabit rocky areas in the wild, they will appreciate caves or flat stones as breeding sites, and so on. Putting in plants and caves will give fish a sense of security even if they are not plant spawners.

Mouth brooders can be left in the main aquarium even when they are spawning because the eggs as well as the young are well protected by the parent. Brooding does however bring out aggression and brooding fish can cause harm to any other fish in the aquarium. For this reason alone, it may be better to put these fish into a new aquarium while they are breeding.

Setting up a new aquarium for breeding purposes is fairly easy. You do not have to go through all the steps and wait for the Nitrogen cycle, plant your aquarium etc since you can use water and bacteria from your established aquarium. An additional aquarium for breeding purpose need not be very big. Usually an aquarium with a capacity of 2-6 gallons would suffice for most fish. The best way to set up your aquarium easily is to take water from your existing aquarium and use this to start your new aquarium. Since the fish are being transported from the old aquarium, they will already be acclimatized to this water. Using a foam filter for a few weeks in your old aquarium will help you collect a good quantity of beneficial bacteria that can be easily moved to the new aquarium. Decorations and plants can be kept to a minimum for most species. Changing water in this aquarium regularly is a must. The best way to clean out the material wastes in this aquarium is to siphon it out using a flexible pipe. Keep in mind that it is easy to siphon out some fry also along with the waste. So, it is best to siphon out the waste into a clean bucket. This will help you to save any nosey fry.

Choosing the parents

When Charles Darwin laid down the Theory of the Survival of the Fittest, he was only stating what was so very obvious in nature. The best male of the species will try to impregnate the females, and the females prefer the best male since his DNA increases the chances offspring survival. That is why many animals like the lions etc will have only one dominant male who has successfully defeated all other males in the group. This male alone impregnates the sexually active females. He continues to be the leader until a healthier and stronger male defeat him.

There is something very vital in this theory for the aquarist too. When your fish are ready to breed, it will not do to select just any pair. You need to select the male and female very carefully, unless you are breeding to provide food for other fish. Here are some pointers that will help you choose the right pair:

- Fish that have brighter colors and good markings are the healthiest in a stock. Fish that have good finage, movements and vitality are also healthy.
- The appetite of a fish is often an indicator of its general health and vitality. Only fish that have a good appetite should be selected for breeding.
- Do not use fish that appear stunted or deformed in any way.
- The age of the fish is also important while you consider mating partners. It is better to go for younger fish that are in their prime rather than choosing older fish that have almost reached the end of the reproductive lives. An exception from this rule can be if you have an older specimen with exceptional coloration, finage or other qualities that you want to breed on.
- Compatible pairs make good partners. Always see that the pair you are choosing are able to get along well. For instance, in Cichlids, fish form pairs only after they have been put together in an aquarium for many months. If the fish are not compatible, one of them may even bully the other to death.
- Unhealthy fish and fish that are not mature enough will not produce healthy fry. You should therefore only choose healthy and mature fish for breeding.
- In case you want to experiment crossing two different strains, please keep in mind that the resulting fry may be unattractive. Never sell crossbreed fish as pure fish. Do not mix impure strains with pure strains.
- Hybrids made by crossing two different species are often sterile. It is possible to mistake the females of different species, because some of them look very similar. Hybrids should be avoided and should never be sold as anything other than hybrids.

Conditioning the parents

After choosing the parents, you need to condition the fish so that they spawn. One of the most effective ways to do this is to simulate their natural habitats as closely as possible. Making certain changes in the environment will also help you to encourage the fish to spawn.

Providing the right water conditions is one of the first steps. Conditions that are as similar to their natural habitats should be provided. Proper aquarium set-up that provides for enough "security", hiding places and crevices is essential. The water current, lighting and temperature should also be taken into consideration. Some fish mate only when they are in schools. Isolating these fish will discourage spawning.

Providing the right food is the next important thing to do. The mates that have been selected for spawning should be given food that is very high in protein. Live food seems

to be a catalyst in this process. You can feed the fish up to three times a day. Of course, remember to clean up the aquarium after each feeding.

Some fish spawn during the rainy season. It can therefore be a good idea to simulate these conditions in the aquarium too. This is actually a very simple procedure. Reduce the water level in the aquarium to half the normal height. Add 5% of the aquarium volume everyday. Add soft water that is slightly cooler than the aquarium water. A drip system or a spray bar will help to add to the notion. During this time, fish should be fed heavily. This process can be repeated till fish show signs of spawning. Most fish respond to the first change in water conditions - like soft water or altered water temperature.

Tips for effective breeding

Anything that you have placed in the aquarium traps debris. As soon as the fry come out, remove any breeding traps that have been in the aquarium before. You can also add one or a couple of apple snails into the aquarium. Apple snails are very laid back and do not attack any fish. These snails will eat debris, and will also eat any dead fry. Apple snails will not eat live fry. Apple snails also produce a good supply of infusorians and can even provide the fry's first supply of food.

Keeping a detailed log of the entire process is a very good idea. This will help you when you need to repeat the process. You should keep accounts of the species name, the detailed water chemistry, filtration and aeration methods, approximate ages of the parents, when the female was added, the date on which the fry was released/hatched, the fry's first food and the body size of the fry till it reaches about three months of age.

Sometimes, even in spite of doing just about everything to ensure success, you will find that your fish just does not breed. All conditions are as they should be, but still there is no success. In this case, it is best to use a "target" fish to jump-start the process. This works best in territorial fish. A target fish is a perceived threat to the territorial fish. The male fish sees the new fish as a possible encroacher in his territory and he will then pair up with the female fish to isolate the target fish. The important thing here is to ensure that your target fish is in reality not a threat to the existing fish or vice versa. For instance, when trying to breed small cichlids, using some zebra danios as target fish will not pose any threat to either fish. It should be noted that some species of fish will kill any kind of target fish, and such situations should be avoided. If this is the case, it will also suffice if you place the target fish in a different aquarium alongside the mating aquarium so that the male can see but not touch.

Sometimes, fish introduced into a new aquarium are too nervous to come out into the open. They will remain hidden for days and will refuse to settle down. Fish that are stressed in this way will never pair up and breed. In such cases, you can use a "dither" fish to calm the other fish. A dither fish is an easygoing, harmless fish. A hyperactive and aggressive fish is definitely not the right dither fish. Calm and peaceful midwater fish makes the best dither fish. Once the nervous fish see the dither fish swimming about happily without being consumed by predators, they too will settle down and come out of

their hiding places. This is just to reassure the nervous fish that nothing will harm them when they come out into the open.

Raising Fry

Once the eggs are laid, you can remove the parents in none fry guarding species. This is especially important if the fish are the types that eat their young. In case of fish that care for their brood, it is recommended to keep the parents with the fry.

Taking care of your fry requires some special attention. Some young ones, like the Goldfish, will not eat for the first 40-48 hours of their life, while other species need to be fed immediately. How do you know when to do what? And what are the best conditions for keeping the fry alive. These are some of the many things that you need to keep in mind when the fish start spawning.

In some livebearers, the female may release only a few of the babies at the beginning. She may take a few hours or even a day to release the entire batch of fry; and some of these fry will likely be stillborn or even eggs. Even after this, a female can be full of fertilized eggs that will soon begin to develop into fish. Livebearers can release several more batches of fry even if there are no males around, due to their ability to save sperm.

The fry may take up to a few weeks to develop. Do not expect your fry to come out ready for a swim and a feed. The larvae that hatch have almost nothing in common with their parents. They will be enclosed in a big yellow yolk sac and will not be able to swim at all. The larvae will eat up the egg sac until the yolk is fully gone. Once this is over, the fry begin to get hungry and look for food.

Infusoria is a good food for tiny fry. "Green water" or egg yolk can also be fed to the fry. Powdered flake food is commonly fed to fish fry in aquariums, but powdered flake food is not the best fry food. Powdered flake food is however better than nothing if it is all you got when the fry arrives. Take a plastic bag and put in 1-2 tablespoons of flake food. The bag should not have too much air in it. Then squeeze the bag in your hand and mash the flake as well as you can. The more powdered it is, the better.

Putting in only a small amount of food for the fry is also a bit difficult. The best way to add in small amounts of powdered food is by using a toothpick. Wet the end of the pick in water, and wipe it with your finger so that it is only a little wet. The wet toothpick should now be dipped into the powdered flakes. Touch this tip in the water just above the fry. You will need to feed them several times a day.

This powder is quite fine and is acceptable for many fry to start off with. But some fry find even this too big to eat. For instance, the newly hatched Angelfish cannot eat this powder. It needs to eat infusoria or baby brine shrimp for the first few days.

Baby brine shrimp is a very important food for most fish fry. Most livebearers will eat lots of baby brine shrimp, and this definitely makes them grow faster and healthier even

if livebearers are among the fry that can be raised on powdered flake food alone. The eggs of Brine Shrimp are carefully processed and collected and are sold in many pet stores. The aquarist can purchase these eggs, hatch them and use them to feed fry. One advantage in hatching the eggs at home is that these can then be fed special additives that will directly be transferred to your fry. Some fry are too small to be able to eat newly hatched brine shrimp and such fry will need infusoria the first few days before they can start eating brine shrimp.

After they start feeding, the fry usually grow pretty fast. Feeding should be done several times a day for optimal growth. Aquariums that are well lit, well planted and nicely filtered provide the best conditions for rearing fry. Having a fixed feeding schedule also helps the fry grow faster. Frequent water changes are a **MUST** if you want healthy fry. Remember that the filtration in an aquarium that contains small fry will be less efficient than the filtration in a proper aquarium as the circulation has to be kept lower. The number of feedings is also higher and the wastage will also be more. Thus frequent water changes; stable water chemistry and sufficient warmth contribute greatly towards the well being of your fry.

Failure in Reproduction

Reproductive failure is one of the most frustrating experiences for the aquarist, especially a beginner. These failures can occur at any stage of the reproductive cycle. The first major stumbling block for the beginner aquarist is failure to get the fish to spawn. For success, some species need the perfect set up. A deep knowledge of the species, the right food, the right temperature for the species you select in addition to any necessary spawning triggers have to be used efficiently. For the beginner it is also important to choose the right species to breed as some species are much easier than others to breed. A separate spawning aquarium with or without plants according to the needs of your species is the first step in the right direction. Novice breeders also need to be very careful with the water chemistry. You cannot just put your selected pair in a tub of water and expect them to get on with their work. You have to get a fully working testing kit and learn how to use it. Higher quality in the breeding stock directly influences the viability of the spawn. The quality of the offspring will be affected by the kind of water in which it was bred.

Sexing the fish correctly is the next big step. In some species, differentiating between the two sexes is very difficult indeed. So, this is not to be taken lightly.

Do not keep checking on your fish every few minutes. This will make them stressed. Stressed fish will not spawn. Fish that are too young or too old must be avoided at all costs. Left to itself in nature, the female fish will select the male fish that is in its prime. Males that are too young or too old will not have viable sperms, and the eggs that are laid as a result may not get fertilized.

Once the fish has spawned, problems may arise at the time of hatching too. The biggest impediment to hatching is water quality. Bad water quality is not conducive to spawning,

and even if the fish do spawn, the eggs will not develop properly. As a result the eggs may catch fungus and die. If the eggs are removed to a hatching aquarium, care must be taken that they are not exposed to the atmosphere for long. The eggs dry up when they come into contact with air. The water in the hatching aquarium must be as similar to that in the original aquarium as possible. Sudden changes in temperature will halt the development of the egg. Hard water will cause the shells of the eggs to harden, and in very hard water the shells can become too hard and make hatching difficult or impossible. If the water is too soft, the eggs may instead collapse.

Sterility is also a common cause for reproductive failure. In some species, it is seen that the absence of any male will cause two females to pair off. Obviously, no eggs will be fertile after such a spawning. Pairing off a female with a male that is too old or young will also cause the eggs to be underdeveloped. Again, hatching of such eggs will never take place. Disease and vitamin deficiency are some other factors that play a decisive role in the ability of a fish to spawn. Over-feeding the fish and making them obese will rob some male species of their virility.

There are some varieties that are highly suited for the novice to breed. As stated earlier, livebearers are among the easiest to breed and will most likely spawn spontaneously in your aquarium without you even trying to coax them. Of these, the Guppy, the Molly, the Platy and the Swordtail are the easiest to spawn. Mollies and Guppies are very similar in their breeding patterns. However, newborn Molly fry are susceptible to protozoan infection. Sometimes, the Molly may also give birth to unformed fry that appear almost at the same time as the swimming fry. They appear as white eggs and must be disposed off without delay. Among egg-layers, the novice may want to try Steel Blue Killifish, some Dwarf Cichlids like Kribbs, the Tiger Barbs, various Danios or the White Cloud Mountain Minnow.

Obviously, breeding fish is a reasonably challenging task, but it can be achieved quite easily, if the right steps are followed. Remember that as in humans the female carrying the eggs as well as the eggs themselves must be in the best possible surroundings. Maintaining the right condition inside the aquarium will help the dwellers of the aquarium to go about their work in a healthy manner.

Chapter 7 – Diseases

One of the most trying times that you will need to face as an aquarist is when your fish fall ill. This is bound to happen at one time or the other. Since you are trying to recreate an open and unlimited ecosystem within the confines of your 50 or 60-gallon / 200 L aquarium, there are many things that can go wrong. Many of these ailments cannot actually be termed a disease. The symptoms shown by the fish are merely reactions against improper conditions in the aquarium. These conditions can range from improper water chemistry to the actual presence of undesirable parasites in their water. It is possible to keep your fish stress free and disease free if you provide them with the right environment, the right water chemistry and the right kind of food.

Buying healthy fish

Most of the fish you will start out with are store bought. That means that they were living in a particular habitat before you got them home. The fight against disease begins from the moment you go to get your first fish. Here are some things that you should keep in mind while selecting and buying new fish:

- Go by the looks of the fish. Physical characteristics of good health include bright colors, good finage etc. Do NOT go for fish that look dull or pale. Before you buy a particular variety, it is important to know what that fish looks like in normal conditions. Dark or patchy coloration may be an indicator of stress.
- Look for any signs of disease. There should be no boils, ulcers or peeling scales.
- Look for any visible parasites clinging to your fish's body. Parasites can appear as small white crystals, black tiny nodules etc.
- Individual parts of the fish need to be closely examined. The eyes should not be bulging and or clouded. The fins, especially the dorsal fins, should be erect and spread well. The gills should be a nice pink. Fins should not appear ragged or torn, and they should definitely not be clamped close to the body of the fish. Flat and smooth scales, well-rounded stomachs and a well-proportioned body are all indications of a strong and healthy fish.
- Fish waste should be dark in color.
- Behavior of fish should also be observed. Fish should not gasp for air. Breathing should be normal. Gill movements that seem to be very quick may indicate stress.
- Look for positive interactions. You do not want fish that seem to be hiding or creeping about. Also, do not choose fish that seems to bully or getting bullied. Healthy fish will swim horizontally throughout the aquarium.
- Choose fish that eats well. Feeding traits are very good indicators of fish health.

These indicators are true for most fish and all beginner fish. You will however notice that there are exceptions from these rules as you grow more experienced.

If you know what to look for, you will be surprised at how much information you will be able to collect by just observing the fish you are going to buy. Never buy a fish that looks stressed in the store. Any hopes that you will nurse it back to good health are misplaced. Fish that act "weird" in the store hardly ever settle down at home, especially if you are a newbie.

Once you have bought the fish, there are some more things that you need to keep in mind. Introduce the fish slowly into your own aquarium. Allow the fish some time to get used to the new water that is his home now. If you can, it is a good idea to use an antibiotic dip before you introduce the fish into the aquarium.

Prevent diseases

Providing the right water chemistry is one of the most important things you can do in order to prevent disease in the aquarium. Having a number of fish in a closed aquarium requires some amount of hard work and only a responsible aquarist can keep his or her fish healthy. Here is a list of water properties that need to be checked as often as possible:

- The temperature of the water has to be kept stable.
- The pH of the water should be at level that is most suited for the species you are keeping in the aquarium.
- Nitrite, Nitrate, Ammonia, Carbon Dioxide and Oxygen levels need to be monitored regularly. These are the various elements that can tip the balance in your aquarium.
- Filter out as much waste as possible. A completely waste free environment is a dream, but getting as close to it as is humanly possible should be the endeavor.
- Some traces of algae are healthy for the fish and are also indications of a healthy habitat within the aquarium.
- Regular water changes are a MUST for any disease-free aquarium
- The Nitrogen Cycle is another important step that many impatient beginners loath to perform.

Strong and healthy fish are typically very resilient toward disease attacks. It is only when the fish are weakened by stress or by factors like persistent aggression that they give in to sickness. Unfortunately, there are times when even the best care falls short of the required care. When fish do fall sick, the best chance for easy and fast cure is when you can catch the sickness in its earliest stages. If you observe your fish regularly, this is not a difficult task at all. Sick fish will start exhibiting strange patterns in their behavior. Many times, it is when the initial signs have been ignored that the fish really become too ill and reach a sad end.

Sick fish will almost always display at least one of these symptoms:

- Clamped Fins - fins that are held very close to the body and not spread out
- Head standing - Fish swims with its head down.
- Tail Standing - Fish swims with its tail down.
- Lethargy - Fish seems to be tired and stays put in one corner of the aquarium.
- Listing - Leaning on to one side or the other.
- Scales pointing out - The scales of the fish stick out, almost like on a pine cone.
- Red sores on the body.
- White sores and/or spots, or thread like marks on the body.
- An anus that is red or protruding from the body.

Quarantine Aquarium

It is very advisable to have a simple quarantine aquarium. This is the aquarium in which you will first keep your new fish. You can use this aquarium to isolate and cure diseased fish too. In such a case, it is called a hospital aquarium. This is the aquarium in which the fish will recuperate. A small aquarium is all that you need. There is no need to put in any substrate. This will make the aquarium easy to manage. The quarantine aquarium also does not need any plants. A planted aquarium is more difficult to look after. Since there are not plants, you do not need to use a lighting system. The fish will feel more secure in a subdued and dimly lit aquarium.

Filtration can also be kept simple. Chemical filtration, especially if it uses carbon, can deprive your aquarium of any medications that you put inside the aquarium and should therefore not be used. Using a power filter may disturb the ailing fish due to the water disturbance it can cause. A single sponge filter that was kept running in the main aquarium can be used in this aquarium. This will also transport the beneficial bacteria into the new aquarium. It is advisable to put some kind of scenery at the back of the aquarium as this makes the fish feel more secure and protected.

Keep all decorations to the barest minimum, though providing some simple hiding places is advisable. A 50-100W heater will suffice for a small aquarium. Provide an air stone that will maintain high oxygen levels in the water since some medications deplete the oxygen content in water.

Once the fish are out of the hospital aquarium, the aquarium must be cleaned thoroughly before it can be used again. Disinfect the aquarium using Potassium Permanganate or Diluted Hydrochloric Acid. Leave the chemical in the aquarium for a couple of days, and

then clean and rinse the aquarium thoroughly. The aquarium is then ready to be setup again when needed.

Columnaris

Grayish white marks or patches on the body of the fish or around its mouth are the first obvious signs of Columnaris. These patches appear like threads, especially in the vicinity of the mouth. Hence, this is often confused with another disease called "Mouth Fungus". The fins of the fish may show signs of deterioration, the gills get affected and slowly sores start appearing on the body. During a later stage the fish can hold its fins very close to the body and not spreading them. Columnaris disease is caused by bacteria, and is mostly a direct result of poor water quality. Sometimes, the shock of being introduced to the new aquarium leads to Columnaris disease in newly imported fish. Anti-bacterial medications will be enough if the disease is discovered and treated at its early stages. The disease will however invade the internal organs during the later stages and antibiotics are then required to cure it.

Gill Disease

Gill disease make the fish appear to be swimming in a great hurry, but it does not move at all. The fins flap very fast, and the fish gasp for breath at the surface, or lie listless at the bottom. The gills become swollen and discolored. Bacteria, fungi and parasites in water can cause gill disease. The first step in the treatment is therefore an immediate improvement in water quality. Frequent water changes, conditioning and dechlorinating the water to ensure its quality are steps to take to threat and prevent gill disease. The chlorine in water often irritates the gills of the fish. Adding an anti-bacterial solution to the water may be needed to cure the fish.

Ick

Ick is a disease that causes your fish to get small, grain-like spots on their body. Ick is also known as White Spot Disease or Ich. The fish may try to rub itself against the décor or the hard surfaces in the aquarium, giving an impression of scratching an itch. In freshwater, this disease is caused by protozoa named *Ichthyophthirius Multifilis* and is very contagious. The parasite spends a part of its life within the skin of the fish, where they form the white spots. These are the cysts. Once the cysts mature they fall down to the substrate and give rise to thousands of new free-swimming parasites that are free to prey upon other fish. An outbreak of Ick is very difficult to control if not noticed in the earlier stages. Since the parasite is released into the aquarium, the entire aquarium has to be treated. One of the effective ways to treat it is by adding salt to the water. The salt should be added gradually, slowly building upto 5-8 tsp per gallon / 4L. Different fish have different tolerance level for salt. In the case of more sensitive fish, it is better to keep the level at 5 tsp. per gallon / 4L. Using medications based on Malachite green and formalin is also a way to control this parasite, but Malachite Green may be harmful to scaleless fish.

Killing the parasite can be done only when the cysts have fallen down and the parasites are released into the water. Increasing the water temperature speeds up the life cycle of the protozoa. Keep in mind that increased water temperature may deplete the oxygen in the aquarium.

Dropsy

The common physical characteristic of this disease is a hollow or swollen abdomen. The fish's scales may stand out in these swollen areas. It is easy to mistake such fish for pregnant females. The fish appear listless and lose appetite. Viruses as well as bacteria can cause dropsy. Bad water or infected food is things that can lead to dropsy out brakes in your aquarium. Once the damage reaches the kidney, the condition becomes almost incurable. The disease must therefore be caught early if you should be able to save your fish. This disease is unfortunately very difficult to cure even if discovered early. Dropsy is however is not highly infectious. Dead fish should still be immediately removed from the aquarium; otherwise healthy fish may come and eat the dead one. Commercially available remedies do best.

Fin-rot

As the name suggests, fin rot causes the fins to turn opaque and they may even become blood-streaked. The erosion of the fin may continue till it reaches the base of the fin. At this point, the fish dies. The bacteria that cause this generally do not affect healthy fish. When fish are stressed, or when the fins have already been damaged due to excessive fin nipping, then the disease takes root. Commercially available anti-bacterial medicines have to be used to treat the fish.

Fungal Infections

The spores of fungus are always present within the aquarium, and can become infectious when the fish already have damaged gills or skin. Fungal infections are typically secondary infections. White, cottony growth on the body of the fish is the main physical symptom. Anti-fungal medicines are usually the best option to fight the infection. Most of the anti-fungal medications available on the market also fight bacteria, thus providing double protection.

Hole in the Head

As the name suggests, the fish develop small pits mainly in the region of the head. The holes are usually white in color and have a yellowish mucous trailing from them. The fish become listless, lose color and stop feeding. Hole in the head disease is cause by protozoa and is usually a secondary infection. Low levels of the protozoa that causes hole in the head disease live within the fish, and poor water quality and/or poor diet leads to the infection. The fish should be isolated in a quarantine aquarium and then treated. Direct injections or medicated food are some ways to treat the fish.

Pop-Eye

The name suggests the physical symptom. The fish's eye starts to enlarge and looks almost as if it is ready to pop out of the body. The cause could be bacteria. Too much dissolved oxygen in the water may also lead to this condition. There is no universal cure. Isolate the fish, and treat it with general anti-bacterial medicine.

Cloudy Eye

The eye becomes cloudy almost to the point of whiteness and the fish lose vision. The causes behind this disease can vary. An increase in parasites in the aquarium is the most common cause but severe stress, old age, or malnutrition can all lead to this condition. Treating this condition requires an investigation of water quality. Once the water quality is high enough, the fish will usually recover by themselves within 1-2 weeks. Thus, it is advisable to wait for 1-2 weeks before administering antibiotics.

Swim Bladder Disease

This mostly affects fish that have a globoid body shape. A loss of buoyancy is one of the first indications. The fish stays at the bottom of the aquarium, unable to rise, or float at the surface only. This is due to the fact that the swim bladder is what helps the fish to remain buoyant. Any damage to this membrane causes this disease. There is considerable debate about the cause of this disease and the best way to cure it.

Fish Lice

Small, white lice are apparent on the body of the fish and the fish rub themselves against the hard surfaces in the aquarium. Red spots or sores develop. The best way to treat fish lice is to remove the lice using a set of tweezers. Siphon the substrate daily to get rid of eggs. If the infestation is heavy, medication will be needed.

Nematode Worms

The anus of the fish may protrude a little, and a thin threadlike worm will drift out of the anus. The fish becomes listless and bloated. It refuses to feed. Anti-worm medication developed for aquariums are usually effective against nematode worms. Nematodes are commonly present even in healthy fish, but can turn into a problem when the fish becomes weakened due to some other reason.

Water Quality Induced Diseases

The most common among these are caused by an imbalance in the water chemistry. Ammonia poisoning is caused when too much organic waste is present in the water. If the pH of the water goes above 7.0 the ammonia turns deadly and toxic for the fish. The first indication is that the gills turn a different color and the fish gasp for breath and become

listless. The source of the waste has to be removed and the pH of the water should be reduced to treat this condition.

Carbon Dioxide poisoning can be caused by too much of Carbon Dioxide. Good aeration and frequent water changes are the best way to treat and prevent this problem.

Nitrite or Nitrate poisoning shows itself by making the fish appear too bright. The fish remain panting for breath and hang just below the surface.

Poisoning may also occur by using untreated tap water.

Treating Fish

There are several ways in which fish can be treated. Unlike other pets, visible changes are not very quick and you can never be sure whether your fish are taking a turn for the better or not. Compared to many other pets, fish are also very delicate. They cannot be taken out, treated and put back into their homes without exposing them to great risks. So, how does one apply medications, feed medicines or help the fish to recuperate?

Giving the fish a bath is a good way to treat some disorders. The fish will be introduced into a bucket containing medicated water. You should use chemicals like formalin or additives like salt in the water you bade the fish in, depending upon what you are treating. The duration of the bath and the concentration of the additive are species-dependent and also depends on the disease. Always follow instructions that are based on the need of your fish species and the disease in question.

Heat therapy is used when it is necessary to kill certain parasites by raising the temperature. One has to be careful while doing this because some fish get too stressed when there is a change in temperature. The temperature of the water should be increased gradually by no more than 1 Degree C per hour until you reach the desired range. The fish should be constantly monitored while the treatment is going on. Any negative reactions call for an immediate cessation of the therapy.

Medicated food products are another effective way of fighting parasites, especially if the disease is inside the body. These medicated foods are not governed or monitored by any governmental agency, so the food concerned may never have been tested for effectiveness or for safety. Therefore, the medicated food that you give your fish may be practically useless or even harmful to some fish. You should purchase only such food that has a detailed list of the ingredients along with their concentration printed on it. Some well known brands can be trusted to deliver quality products, but lesser known brands need to be tested with caution. Awareness of the use and effect of the various medicines is a must before you can start using this kind of treatments.

There are certain steps that should be followed when treating fish. If these steps are followed one after the other, they eliminate not only the symptoms but also the cause of the disease.

The first thing to do when you need to diagnose a fish is to observe it. Observe what signs of disease that are seen and what behavioral patterns have changed, if any. Next, go on to eliminating the possible causes of the signs you see. Check if all environmental conditions are in proper order. The first and the most widespread cause of ailment, disease, stress and death in aquaria is bad water. The ammonia, nitrate, nitrite, pH and oxygen levels have to be checked. If these are within the optimum ranges, the next step is to check whether any toxic substances have dripped into the water by mistake. Paint fumes, cleaning agents, pesticides etc are some things that can get into water quite inadvertently. If the problem is the water quality, changing the water frequently and in smaller quantities will help. If none of these seem to be the cause, then move to the next step.

Now it is time to check the various accessories in the aquarium. Filters, heaters, air pumps etc have to be checked carefully to see that they are working correctly. You should also check if any aggressor has attacked the fish and if that may be the cause behind the symptoms. If you find a problem, fix it immediately.

The fish need to be treated once you have identified the disease. Start by moving the infected fish out of the community aquarium and into the quarantine aquarium. Make sure that your quarantine/hospital aquarium is ready to receive patient/s. The water in the quarantine/hospital aquarium should be changed daily. About 30-50% of the water should preferably be changed each day. While changing water, care must be taken to add more medicine if required. Also remember that some medicines will remove oxygen from water and aeration is therefore a must in a hospital aquarium. After one day, it is time to move the fish to a shallow bowl or aquarium. Closely examine the fish for any parasites or new signs of infection. Treat the water accordingly. Return the fish to the hospital aquarium once the inspection is completed. This process should be repeated if you are unsure of the proper diagnosis, but not more often than once a day since it is very stressful for the fish. The fish should be kept in isolation for about 10 days even if the fish is showing signs of improvement. This will remove all traces of infection and leave the fish germ free by the time it returns to the community aquarium. This ensures that the spread of infection is curtailed.

While medicating the fish, care must be taken to follow the instructions given. Too low a dose will be ineffective, while higher doses could damage the fish further or even kill it. Carbon, and all absorbing filter media, along with UV sterilizers and ozonizers should be removed before using medications since these will render the medicine ineffective. Never mix two medications in the same aquarium unless there are specific instructions to do so. Once the use of medicines is over, make sure that there are no traces of the medicine left in your aquarium.

In spite of the best of care, if your fish still ails, it is perhaps better to put it out of its misery. This is sometimes the most humane thing that can be done. Severing the spinal cord quickly with a very sharp knife is one of the most painless ways to put a large fish out of its misery. Smaller fish can be dropped into boiling water for a quick death.

Many times your fish will recover when you take care of the water chemistry. It is also important to introduce new fish carefully into your aquarium. New fish are sometimes carriers of harmful parasites. That is why the importance of the quarantine aquarium never can be overstressed.

Do not stuff your aquarium with too many fish. Aquarium overload is another factor that can lead to disaster. The risks of infection are high in an overloaded aquarium. The chances of the infection spreading to other fish are also very high.

Keeping an aquarium is very easy if you understand the various principles behind it and approach it scientifically. There are certain procedures that need to be followed at every stage. When you adhere closely to the beaten path and try to give your fish the best possible conditions, your fish will thrive. Once you have gained more experience and gotten to know your particular specimens better, you can work more freely and improvise in order to suit their particular needs.