

Caring For

Your Pond

By

A.J.Hartley

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About the Author.

Since leaving school with a good general education, Alan Hartley has had an interesting and varied career. The sometime bank clerk, lifeguard, nurseryman and fish-keeper eventually entered the family business of nurserymen with a thriving garden centre.

As a diversification, Alan began keeping fish in the nursery's water system reservoir and a natural progression soon saw him selling fish. There were relatively few aquatic retail outlets and expansion came quickly, rapidly becoming an important facet of the garden centre.

The philosophy of growing all the stock plants in house was followed as far as was practical with pond plants bought in as cuttings and grown on for sale. After his parents retired, Alan studied for the City & Guilds of London Institute Certificate in Pet Store Management in order to become licensed to run his own aquatic outlet at another garden centre. Whilst there, he began writing articles for the Pets column in the local newspaper in which he advertised. The response to these many contributions to the newspaper encouraged Alan Hartley to assemble them and to edit them into book form and they now form the basis of this book, *Caring For Your Pond*.

POND PLANTS.

Marginal plants are plants that go in the ponds margins or edges around the sides of the pool. They come in a wide variety of shapes and sizes, some with flowers and some are grown just for their foliage. This is by no means a comprehensive list of all marginal plants available but it does detail the most popular.

Acorus. This grows like an Iris but with out the flowers. It comes as a plain green or variegated variety. The height of this plant is about 2 or 3 foot or 60-90 cm. Its numbers are increased by dividing the tuber.

Alisma. Water Plantain as it is commonly called grows to about 2 foot or 60 cm and has very attractive leaves but a non descriptive flower. *Alisma* is not to fussy about the depth of water.

Butomus Umbellatus. This is a flowering rush which grows to about 2 to 3 foot or 60-90 cm in fairly shallow water.

Cotula. Golden Buttons is the common name for this plant as it has very attractive little golden balls as its flowers. *Cotula* only grows to about 6 inches or 15 cm and grows best in damp soil or very shallow water.

Calla Palustris. The popular name for this very pretty flowering plant is the Bog Arum. The flower is white with a yellow centre and grows amongst large oval leaves about 9 inches or 23 cm tall in several inches of water.

Caltha. These are the Marsh Marrigolds of which there are several species including a rare white variety. They are a clump forming plant which grow in shallow water to a height of about 12 inches or 30 cm apart from the giant King Cup which will grow up to 2 foot or 60 cm. The Marsh Marrigold is the first pond plant to flower in the Spring and heralds the start of a new season.

Eriophorum. This is the common cotton grass so called because it has seed heads that look like cotton wool. It reaches a height of between 1 and 2 feet in shallow water.



Iris. There are many water varieties and they must not be confused with the garden varieties. They look and grow identically except for the fact that they grow in shallow water. Water Irises are available in several colours and also in a variegated form.

Lobelia Cardinalis. This is

actually an herbaceous plant that will tolerate very wet conditions. It is a little tender so it is best to bring the plant in for the winter and keep it somewhere frost free. Lobelia grows to a height of 2 or 3 feet or 60-90 cm and has very unusual red leaves and red flowers.

Lysimachia Nummularia. This plant is the same Creeping Jenny that grows vigorously on the rockery. However it will quite happily tolerate being in shallow water. It has an abundance of pretty yellow flowers and like a lot of pond plants will die back in the winter.

Menyanthes. The common name for this plant is Bog Bean. It grows in shallow water and trails everywhere throwing up leaves and pretty pink flowers to about 9 inches or 23 cm in height.

Mysotis Pallustris. Foget-me-not is a very popular cheap and cheerful little plant growing to about 9 inches or 23 cm in height in shallow water. This plant should not be confused with the garden variety. It has an attractive blue flower but does grow very quickly.

Mimulus. This is another cheap and cheerful flowering plant that is available in several colours.

Orontium Aquaticum. Commonly called Golden Club because of its unusual golden club like flowers. This plant likes slightly deeper water and grows to about 18 inches or 45 cm.

Pontederia. The popular name for this plant is Pickerel Plant. It has large leaves and a blue flowering head. Pontederia likes slightly deeper water and grows to about 3 feet or 90 cm in height.

Ranunculus. This plant comes in 2 varieties known as the Great and Dwarf Spearwort and is a cheap and cheerful plant with yellow flowers.

Scirpus Albescens and Zebrinus are 2 tall striped rushes. The former is striped vertically and the latter is striped like a zebra, horizontally. As large rushes that are not fussy about the water depth.

Typha. The popular name for this plant is Reed Mace or Bullrush. It typically grows to 4 feet (1 ½ meters) or more but a smaller variety called Typha Minima is available. This dwarf species only grows to about 18 inches or 45 cm. Both varieties have the attractive seed heads on for which the Bullrush is well known.

Veronica Beccabunga. This cheap and cheerful plant grows very quickly in shallow water with its pretty blue flowers. It will however only grow to about 6 inches or 15 cm. The common name for it is Brook Lime.

Zantedeschia. This plant like the popular Arum Lily has spectacular large white flowers commonly known as funeral flowers. It grows to about 2 feet tall in fairly deep water.

PLANTS TO SURROUND YOUR POND WITH.

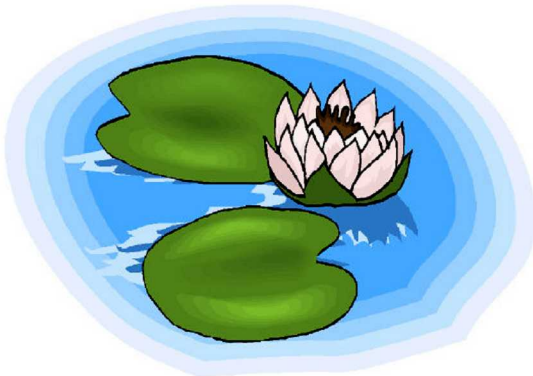
If you have a very large pond you may be tempted to plant a willow as this tree likes water but it really isn't a good idea. The leaves will fall into the pond in the Autumn and pollute it. If it is a lake on a farm or golf course however this shouldn't be a problem and another very large plant for such surroundings is the Gunnera which looks like something straight out of the jungle. For most ponds these are just too big and smaller plants should be chosen that like the damp conditions which will prevail. Hostas make a good choice if the area to be planted gets some shade, They make good foliage plants and have a flower as well. Ferns come in many varieties and also love damp shady spots. Nowadays there are many types of bamboo available from large growing varieties to dwarf ones suitable for planting round the smallest of ponds.

Variegated grasses such as Phalaris Picta make quite a nice show with its striped leaves. Indeed this particular plant can also be planted in the shallow areas of the pool so that the outline of the pool can be merged in with the planting on dry soil. Garden irises can be used in a similar way, planting them in the soil next to the pond with its water varieties inside. Another plant that can go in the pond or in damp soil is Houttuynia Harlequin which is very colourful. The leaves

are red, white and green on a good healthy specimen. This plant spreads very quickly by its root system throwing up new shoots everywhere. Astilbes like damp conditions but these plants grow a little taller producing masses of tiny flowers clumped together to make a large flowering head. They come in several colours, red, white and pink.

There are dozens of varieties of Primulas, some more common than others. Primulas come in many colour variations and are ideal for the poolside making small clumps. What to plant around waterfalls is often a problem. Some of the best plants to hide the pipes, earthworks and plastic edges are alpines. There are literally hundreds of varieties of these available and most are suitable but the most common are blue Aubretia, white or pink Arabis, yellow Alysum Saxatile and yellow Lysimachia, They can all be bought for a very modest sum as small plants but they will grow quickly if cared for hiding everything unsightly.

CHOOSING A LILY



Lilies for your pond come in a range of prices from a few pounds up to 20 or 30 pounds. They are usually young plants when you buy them

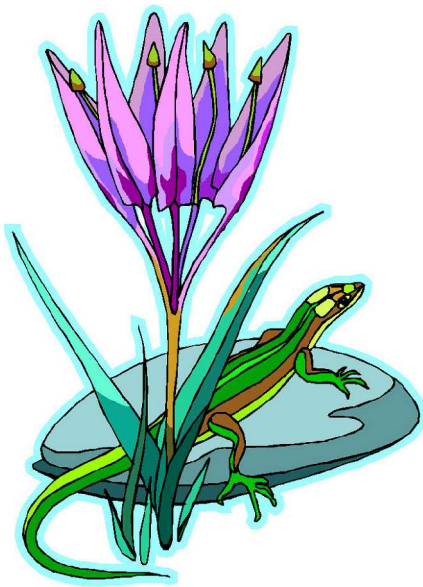
and may take a year or two before they mature and flower. Lilies are best bought in the green, ready potted and shooting but sometimes you can see them sold loose. All lilies need regular feeding to flower well and plenty of sunshine. They don't like the moving water of a waterfall or fountain except for Nuphar Luteum. With this plant the leaves develop under water until the plant is growing well and then it throws a different kind of leaf up to the surface as a normal lily does. The flowers are not as spectacular as on an ordinary lily but are yellow and like an overgrown buttercup. They are scented of brandy hence its common name of Brandy Bottle.



If a lily is fairly cheap then the chances are it is a vigorous grower so it will need regularly dividing in an average sized pool.

In a small pool miniature lilies such as the red *Pygmaea Rubra* or the yellow *Pygmaea Helvola* are best. They can be quite expensive though and a cheaper alternative to a miniature lily is a Water Hawthorn or *Aponogeton*. This has long oval leaves and an attractive highly scented white flower. Another cheap alternative for a lily in a small pond or shallow water is *Villarsia* or *Nymphoides Peltata*. These plants have tiny lily pads and a very attractive yellow flower held above the surface. The only problem with them is that they spread by sending out off shoots like a strawberry and can become quite invasive.

Popular lilies for a decent sized pool are Alba or Albida as a white with yellow centre and Carnea as a pale pink. This could be mistaken for a white when young but the flowers get a deeper pink as the plant gets older. Reds and yellows are generally more expensive such as the red Attraction, Escarboucle or James Brydon. Yellows such as Chromatella or Colonel Welch are popular. Amongst the more exotic lilies is Paul Hariot in which the flowers change colour from apricot to orange to red, although it is quite expensive.



It is possible to buy blue lilies but they are tropical so they wouldn't stand outside in Winter as the frost would kill them. If you have a heated conservatory with a pool or large water tub in you could grow them in there.

Sometimes people buy lilies and when they flower the flower stands proud of the water. They think they have done something wrong with it or the plant is not in the right depth. This need not be true as some lilies such as Yellow Sunrise have their flowers on long stalks held above the water and no matter what depth you put them in they will always grow like this.

Some lilies to be avoided at all costs are those such as the white Gladstoniana or Colosea which grow very large and

are best suited to lakes or very large pools, All aquatic retailers will have a selection and if you go in mid summer it may be possible to pick one out with a flower already on it.

FLOATING PLANTS.

When summer comes the fish ponds start to warm up nicely. This makes the algae grow more vigorously turning the ponds green. One way to help clear the pond is by putting some floating plants into it. These will cut down the amount of sunlight falling on the water and so inhibit the growth of the algae. Lilies are always the first choice but they can be expensive and may not always suit the pond if there is moving water in it. True floating plants are an alternative. These are plants whose roots simply trail down from the surface and the plant is free to be blown about the pool.

Duckweed is one such plant that often finds its own way into the pond. This plant should be discouraged as it will quite quickly smother the surface. It can be killed with certain pond herbicides or persistent netting will remove it. A variegated form can now sometimes be seen at aquatic retailers which should be slower growing .

Another fast growing tiny leaved plant is Azolla Caroliniana or Fairy Moss as it is commonly called. If you examine a tiny individual plant it looks like a miniature fern with tiny fronds. This plant is green when growing vigorously but will turn red under adverse conditions such as cold. Fish will nibble at both of these plants, especially koi carp which may keep them in check.

Water chestnuts grow in a similar way to Hyacinths but these are red foliated. After flowering these produce an edible seed or nut which we are all familiar with in chinese cooking. Water lettuce is another floating plant sometimes to be found but it is very delicate and not to be recommended as even a cold summers night can be enough to kill them.

A tough native floater is the water soldier or Stratiotes Aloides. These plants have long thin leaves like a Yucea but they are stronger and spikey. This plant will also throw out offsets which will develop into new plants. It is only suitable for the larger pond as a mature plant can be several feet across. A curious fact about this plant is that when the winter comes, it will sink to the bottom only to float to the surface again in the spring when the water gets warmer.

WATER HYACINTH.

Water Hyacinth, or to give it its Latin name *Eichornia Crassipes* is a free floating plant sold for fish ponds. The plants roots trail downwards like feathery gills and the plant floats due to its own little buoyancy chambers. These are grossly enlarged hollow stems with the leaves of the plant held above the waters surface. It does have a very attractive mauve flower but it rarely flowers in this country outside as it is not warm enough. It will flower quite readily in a greenhouse or conservatory. Because the plant is imported from warmer climates it must not be put outside on the fish pond before all risk of frost has gone and then will only last outside until the colder nights of the autumn come. It is sometimes possible to bring them in for the winter and keep them for the following year in a fish tank or bucket in the kitchen.

The water hyacinth is a very fast grower under good conditions and spreads like a strawberry by offshoots. Indeed in Florida it grows so well it chokes the waterways and is considered to be a menace although some fish eat it. Because of its fast growth it is a greedy feeder taking the nitrates out of the water thereby helping to keep the water sweet. It is now catching on for use in vegetable filters that supplement the ordinary biological filter. These are simply a large container holding as much water hyacinth as possible through which the pond water is pumped.

The plant also provides valuable shade for the pond in mid summer when the sun can be fierce. We have all heard about John Majors sun burnt goldfish.

Fish will nibble at its roots taking the algae that they collect and the insects that they attract which helps their diet.

Another use for the water hyacinth is as a spawning medium for fish. In Japan it is much favored for spawning koi, which lay their eggs in its long filamentous roots. Goldfish also like to spawn in and because its a natural medium success may be better than with artificial spawning mops.

One thing which must be remembered is that water hyacinths don't tolerate algicides at all and some other chemicals may also affect them so it is advisable to remove them from your pond for a couple of weeks if you treat it with any medicine.

Water Hyacinths are available in season from all good aquatic retailers and will cost between one and two pounds each but as they grow quickly they are good value for money.

POND OXYGENATING PLANTS.

During photosynthesis all green plants produce a surplus of oxygen which they expire. In the case of pond oxygenating plants the gas is released underwater causing some oxygen to

be absorbed by the water as it bubbles up to the surface. Any plant that grows with leaves submerged can be considered an oxygenator. Most of them are weeds in their natural habitats but some have been cultivated and are now sold for fish ponds.

Hottonia Palustris or the Water Violet is one of the more attractive as it produces a flower which rises out of the water. The leaves are feathery and grow entirely submerged.

Tillaea Recurva is another oxygenator sometimes seen for sale. It is an Australian plant which has very fine leaves and stems growing entirely submerged.

Myriophyllum or Parrots Feather is sold both as an oxygenator and a marginal as its foliage will grow both in and out of the water but it can prove a little delicate to grow in this country.

By far the most popular oxygenating plant is elodea which is sold by all aquatic retailers in small bunches. This plant is often fondly termed pondweed. Elodea can be planted or just thrown into the pond as the bunches are weighted with lead and will sink to the bottom. It grows very vigorously and can get out of hand if left unpruned. Sometimes the fish will eat it as fast as it grows keeping it in check. Koi love it so much that it is impossible to grow it in a koi pond with large fish. In fact it is a very important part of most fishes diets.

Oxygenating plants do many things for the pond besides oxygenating the water. They provide shade and shelter for

the fish giving them a sense of security from prying eyes or predators. Perhaps the most important function is to help to keep the water clear and sweet. Because they are vigorous growers they take a lot of nitrates out of the water thus preventing algae from growing. It is possible to keep the water in a fish pond clear simply with the use of elodea and no filter, but it does need a lot and it will take time to get it established. Oxygenating plants make a good spawning medium for goldfish that will readily lay their eggs on them.

Also a large clump will provide a nursery area for the fry to feed and grow in some degree of safety. So when you are stocking a fish pond it is a good idea to add a few bunches of oxygenating plant some weeks before adding the fish to allow them to start growing before the fish need them.

TESTING THE WATER

There are many ways of testing water in which fish are to be kept so as to measure its suitability for them. Whilst temperature is not so important for pond fish it is crucial that it is maintained correctly for tropical fish. 75 to 80 F is quite suitable for most tropical fish although some such as Silver Sharks like it a little cooler. If a fish pond were to get that high the fish would start gasping for oxygen and some sort of aeration would be required. However it does not happen very often in this country except in freak summers.

Oxygen levels can be checked and there are now test kits available for it. However sensible stocking levels and good aeration should remove the need for testing in both the fish tank and pond.

Where temperature is more significant in the pond is when Autumn comes and it gets cooler. As the pond temperature starts to drop to around 55F the feeding of high protein fish meal based foods should be stopped. Wheatgerm based foods should then be given until the temperature drops further still so that the fish go into a semi dormant state and just lie on the bottom of the pond.

All fish keepers should be aware of the problems that high Ammonia, Nitrite and Nitrate levels can cause. They are all

Nitrogen based compounds produced by feeding fish and the decay of vegetation. Ammonia is highly toxic to all fish and if its presence is detected a water change should be carried out immediately. If the water is agitated, ammonia will oxidise to produce white bubbles that are a simple warning of its presence.

Nitrite levels of even 1 part per million are too high and a partial water change should be carried out. Nitrate levels on the other hand can go much higher before they become harmful. If nitrate levels are high the addition of quick growing plants such as ELODEA will help matters as this is a natural plant food.

Another quite important thing to test is the P H level. This is a measure of the degree of acidity or alkalinity of the water. A P H reading of between 7 - 8 is suitable for most fish. Pond or Aquarium water may become acidic with age or become alkaline due to presence of lime from cement. If this happens P H buffers or adjusting chemicals are available to make the water safe for fish again.

You can also test the hardness of water but this should not concern the average fish keeper other than the fact that hard water may leave scale deposits on pipe-work to the pump.

Salinity can also be tested using a hydrometer but again this only concerns the specialist fish keeper who may keep marines, unless salt water is being used as a medicative treatment for freshwater fish,

OXYGENATION

Fish like all animals need oxygen to live even though they live in water. So it is necessary to maintain oxygen levels in the pool. In a densely stocked pond additional aeration will probably be needed. This can be achieved by the addition of a fountain or waterfall.

The action of agitating the water will cause more oxygen to be absorbed by the water. Some people use an air pump as used on fish tanks to blow air into the water that will also increase the amount of oxygen in the water. One method very popular with koi keepers is the use of a VENTURI. This is a simple device that is attached to an outlet pipe from the pump where it reenters the pond. Within the device is a restriction of the tubing with an air hole leading off it. This causes a change in pressure in the water flow that sucks in air, forcing it out in a stream of bubbles with the water.

The VENTURI works well with a fairly powerful pump and is available in various sizes. If no oxygenation devices are to be used in the pond stocking levels must be kept to a minimum. The maximum number of fish that a still pond will safely hold is 5 inches of fish per square foot. Only a fool would put in this many when stocking a fish pond as this doesn't allow for growth. One or two inches would be a better stocking level.

Temperature also affects the absorption of oxygen into the water. The higher the temperature the lower the oxygen levels. This often explains why golden Orfe, which have a

high oxygen requirement, die in a hot summer for no apparent reason. It is advisable during hot weather to apply some form of oxygenation to all ornamental ponds.

In the winter the temperature is low so the water holds more oxygen. This is very fortunate for nature because it means that when the pond is frozen over for a short time life can still go on underneath the ice. In prolonged cold spells it may be advisable to make an air hole to allow the gaseous exchange to occur. It is possible to buy test kits that check the oxygen levels but they are expensive and a little common sense will remove the need to make tests.

ARE YOU POISONING YOUR FISH?



After getting a pond established people often find that fish suddenly start dying for no apparent reason. Various medicines are added with no benefit and the fish continue dying. Another cause should be looked for other than disease and this could well be poisoning. There are many innocent ways to add harmful chemicals to your pond. Often

a freshly installed concrete waterfall is to blame or a newly slabbed area adjacent to the pond. This is because the run off water running over the new cement will leach the lime from it. In a large pool this isn't so much of a problem but in the average back garden pond it is often fatal. Lime will alter the PH value or the water making it deadly for the fish. It is also a problem that will not go away so the best way to cure it is to treat all new cement work with a neutralizing agent, carefully following the manufacturers instructions or paint it with a special pool paint.

Garden sprays used on nearby bushes can be just as deadly as the spray may drift onto the water. Lawn fertilizer must also be used carefully as the run off water from a lawn can

be poisonous. If any nearby fences are to be creosoted then great care must be taken not to splash the creosote into the pond. Any foreign chemicals in the pond should be avoided at all costs because fish do not have the same ability to remove poisons from their bodies the way that most mammals do.

Even things that wouldn't harm us such as copper pipes should be avoided as the chemicals in such an enclosed system as a pond can build up in the fishes body until it becomes fatal.

Both copper and lead pipes are often used in stone fountains which shouldn't be a problem but no more such piping should be used and plastic or rubber should be used as an alternative. Even plastic can be harmful to fish as a lot of cheap plastics contain cyanide compounds that can leech out. This is why plastic filter materials and plastic hose-pipes should be of a good quality and specially made for the job. Some cheap butyl pool liners can even be harmful as they can contain too much butyl that in itself is poisonous in small pools.

Another very common problem is autumn leaves that fall on to the pond and sink to the bottom. There they will rot and if not removed before the winter will produce a high concentration of poisonous gases dissolved in the water. If ice forms the gases will not be able to escape and will build up to toxic levels. Conifer needles are especially harmful as they will change the PH value of the water making it acidic as well as rotting.

A relatively new problem that is starting to emerge is that caused by the incorrect use of UV sterilizers. If they are not used in conjunction with a biological or chemical filter the ammonia levels can build up in the pool to toxic levels. The pond may stay clear but be very poisonous to fish so don't think that a clear pond is automatically a healthy pond because the reverse is very often true. Indeed there is some evidence to suggest that a slightly green pond is healthier. The reason for this is that there is a vitamin in the algae that causes green water that is therapeutic for the fish.

One problem that can only be put down to carelessness is the incorrect use of medicines. Incorrect dosage is a big problem as people often think that if a little is good for the fish a lot must be better.

Mixing of chemicals can lead to problems with them interacting to produce a poisonous product. Whenever using chemicals in the pond the manufacturers instructions should always be followed carefully and to the letter. Always leave at least a couple of weeks between using different chemicals and a month would be better. Some chemicals remain in the water for even longer so do read the bottles.

The use of salt can be a problem, Table salt is poisonous and should never be used but sea salt, rock salt or a branded pond salt is a very good tonic in small doses. Always remember that until you change the pond water the salt will remain in it. Don't keep adding more and more every few weeks or

months because it doesn't go away and eventually it will kill your fish.

When changing pond water remember that tap water has chlorine and often flourine in it. These chemicals are both harmful to fish as they burn the delicate gill membranes. To a healthy fish a partial water change once or twice a year or an annual clean out shouldn't hurt. If you are doing regular water changes then steps should be taken to neutralize the chlorine. There is a chemical which all aquatic retailers sell which does an admirable job of this and also removes the dissolved metals such as copper, lead and zinc.

The simple rule is to keep all foreign chemicals out of your pond and remember that most metals are poisonous. Above all use medicines very carefully and keep your pond clean. If you do these things you wont poison your fish.

THE POND AND MEDICINES.

Many people keep fish and some are fortunate enough to never have to resort to using medicines for treatment but for most of us there comes a time when the only recourse is some kind of treatment for an ailing fish. Salt has been used for decades if not centuries as a cure all treatment. Used carefully in the correct dosage it is a powerful treatment against most problems with fish and a lot of people only use this type of treatment spurning modern medicines. However there are many medicines, tonics and remedies that are possibly safer and easier to use and in some cases much more effective. Chemicals are available to specifically treat fungus, white spot and other parasites, ulcers, fin rot and other bacterial infections.



As with any medicine non are guaranteed to work in all cases and you may develop favourites which you have tried and tested to your satisfaction, but, there is a quite bewildering range to choose from and if in any doubt you should seek advice

from your retailer who should have a reasonable working knowledge of the medicines that he sells. In some cases there is a need for a more powerful medicine to cure a valuable fish and in this case you need to seek the help of a good vet who can administer more potent drugs than can be bought over the counter. Medicated foods can also be bought on prescription to treat fish.

Along with medicines there are many pond remedies such as algicides which are designed to clear the water in the pond by killing the algae. Also available is a dechlorinator for removing chlorine and flourine along with poisonous metals from fresh water.

As with all treatments you need to know how many gallons of water your pool holds. If it was a preformed one the shop where you bought it will be able to tell you but if it is made with a liner you will have to work it out. Measure the capacity in cubic feet by multiplying the length x width x depth and then convert this to gallons by multiplying by 6.25, Although now this should be done in meters and liters now we have gone metric. If you don't want to have to use medicines you can avoid a lot of problems by installing a UV system along with your filter. This will sterilize the pond water as it is circulated killing most of the disease causing organisms, parasites and algae.

FISH DISEASES AND PARASITES.

Fish, like any other animals can catch various diseases and are also afflicted with a range of parasites. Some are relatively trivial and easily treated with a salt bath or proprietary medicine but others need much stronger medicine which can only be prescribed by a vet.

As with most ailments prevention is better than curing the problem after it occurs and maintaining healthy water in your tank should prevent most problems. Below are listed some of the most common problems affecting fish and their symptoms.

ANCHOR WORMS. This parasite is quite large and easily seen with the naked eye as they grow to about 2cm in length. Their very distinctive shape, as the name suggests, is recognizable as an anchor. The parasite makes a sizeable wound in its prey and grips on tightly. It can damage the fish quite severely if they are removed clumsily, but a parasite treatment should easily kill them. They are most often seen on Koi Carp.

BLACK SPOT. This is another parasite and not to be confused with the natural black markings that a lot of goldfish have when young. It is actually caused by a cyst forming in the fish around the parasite that gradually gets bigger making a black circle on the fish. It is relatively

harmless but as with any infection should be treated with an anti parasite treatment.

CARP POX. As this is a viral infection there is no treatment for it, but the one consolation is that it does not kill fish, it merely disfigures them. It can be likened to a Human catching a cold as it is relatively harmless. The symptoms seem to be most prevalent at low temperatures such as winter in a pond.

In the summer the symptoms often disappear as they do when the fish gets older. An infected fish will develop white lumps on its body. It is contagious so infected fish should be isolated from other carp related species. Again this problem seems to be most common with Koi keepers.

DROPSY. There are some new medicines on the market that claim to be able to treat this viral infection. If a fish is badly infected it should be destroyed as the disease is slightly contagious. It is thought that the infected fish has caught the disease by eating fish droppings. Dropsy cause the fish to swell up as the osmotic process that regulates the fish's body fluids fails resulting in the fish storing water. This eventually makes the scales stick out like a pine cone. Dropsy is quite rare in ponds but a fairly common problem in aquariums.

FIN ROT. This is a bacterial infection that is very common in poorly maintained aquariums. It is caused by bad filtration leading to polluted water. The bacteria often cause the fins to be reddened and will gradually cause the fins to slowly be eaten away leaving only the bones. However with prompt

treatment the fins usually re-grow as good as new. Any bacterial treatment will cure this disease and it should never be fatal.



FUNGUS. This looks like a tuft of cotton wool growing on the fish. In very green water it may appear green but is otherwise white in colour. The infection is actually secondary in nature . That is to say that the fish must already have a problem such as an

open wound before fungus develops. The problem may be caused by any number of things including pollution so to cure it you have to find the original cause as well as to treat the fungus.

GILL FLUKES. These are small parasites that embed themselves in the delicate membranes of the gills. In an infected fish the gill flaps often stick out and appear reddened making breathing difficult for the fish. Any proprietary anti parasite treatment should cure the problem quickly and effectively.

GILL ROT. This bacterial infection is particularly nasty and difficult to treat. It is often seen in Koi that have just been

imported from a breeder who was not fussy about his water conditions. In a badly infected fish not only will the gill smell and be seen to be rotting but the gill flap will have a hole in it. In extreme cases the fish should be destroyed.

LEECHES. These are of course a parasite and as such are easy to get rid of. They can be removed physically but it is advisable to wear gloves because they can latch onto your hands and if pulled off will leave a barb in the flesh which will fester. They do not appear very often in aquariums but are quite common in ponds as they can arrive on plants as eggs.

LICE. these are a special variety specially adapted to live in water on fish. They irritate the fish causing them to rub on ornaments and the side of the pond but don't cause any great damage. However they can spread disease and if suspected should be treated with any parasite treatment to destroy them.

MOUTH FUNGUS. This is not actually a fungal infection but is caused by a bacterium. In an infected fish a small wisp of fungus may be seen to emerge from the fishes mouth and gradually part of the mouth will be eaten away. If the infection is not too severe it may be treated with a good medicine but in bad cases the fish will have to be destroyed. It does not seem to be contagious.

PROTOZOAN INFECTION. Protozoa are tiny organisms that are bigger than a bacteria but smaller than a parasite. They invade the victim by entering its bloodstream and

devastating the immune system. It is a particularly nasty problem as some fish are naturally immune and can act as carriers which then infect other fish .Hence two apparently healthy batches of fish mixed together can result in one batch dying. Infected fish die quickly but the organism can also exist free swimming in the water. It is best eradicated by carrying out a water change before treating with a protozoan treatment. However treatment is difficult and heavy casualties can be expected from any infestation.

S.V.C. This is short for Spring Viraemia of Carp and is a notifiable viral infection that only affects carp related species. Any dealer who gets infected with this disease has to cease trading and advise The Ministry Of Agriculture and Fisheries immediately, so it is very unlikely that you will have any fish with this disease. It is a devastating disease that sometimes breaks out in the Spring but there have only been a handful of cases in recent years.

ULCERS. These are often the result of minor damage to a fish such as occurs in the breeding season or from a parasite infection. The minor wound may not heal properly and infection can then set in. In minor cases it may be treated but with severe damage it may be very difficult to effect a cure and may be best to kill the fish.

WHIRLING DISEASE. This is not actually a disease but is a parasite infection. It sometimes appears on newly imported fish that have been reared in dirty overcrowded conditions. The parasite bores its way into the brain of the fish and affects the way it swims causing it to spiral through the

water. Any infected fish should be destroyed as there is no cure for this condition.

WHITE SPOT. This problem should not be confused with fungus as it is very different. Firstly it is caused by a tiny parasite that becomes active when the fish has had a chill. This usually happens with newly bought fish that have not been acclimatized properly to their new pond. That is to say they have been taken out of relatively warm water and placed in a cold pond. Any infected fish will exhibit tiny white spots the size of a pin head all over their bodies. The problem spreads rapidly from fish to fish and if left untreated will, in a few weeks, kill all the fish in the pond. However it is relatively easy to treat and treatment works best at higher temperatures. In fact some cures claim to work within 24 hours.

SWIM BLADDER DISORDER.

Swim Bladder Disorder seems to affect Fancy Goldfish such as Black Moors and Fan Tails more than other varieties of fish. This could be due to the fact that it is caused by air being trapped in the swim bladder that is connected to the stomach. In fancy varieties of goldfish the fish is ball shaped unlike the streamlined shape of most normal fish. This compresses the stomach and intestines into a tight tangle instead of being stretched out. Indigestion then causes air to sometimes get trapped leading to the problem.

The non-functioning swim bladder means that the fish then loses its buoyancy control. This results in the affected fish swimming at odd angles in the water, upside down or even

causes it to remain at the surface unable to sink. This problem can be very difficult to cure but there are several treatments that may be tried. The first is to raise the temperature of the water. This can safely be done in a tank by adding a thermostatically controlled aquarium heater to the tank. If this does not work the next best treatment is to feed foods with a laxative quality. For larger fish washed, chopped earthworms or maggots are very good. For smaller fish any of the live foods commonly available for aquariums such as bloodworms are ideal. Even dried insect foods have some laxative qualities but they are not as good as fresh, live food.

Another perhaps more palatable food for the squeamish to give their fish with swim bladder problems is Elodea or oxygenating plant. Not only is it very nutritious for the fish but it has laxative properties as well. Even well tried and tested remedies such as these are not always effective and there are no proprietary medicines as yet on the market for swim bladder problems. If the fish is still feeding then it might as well be left alone because sometimes this problem will cure itself naturally.

On the other hand in extreme cases where the fish cant feed any more it may be more humane to simply kill it in the approved method. It is worth remembering that dried foods are often to blame for swim bladder problems and indeed a fish that swims normally most of the time will often exhibit symptoms shortly after being fed dried food. To prevent this occurring an occasional treat of some diced fresh earthworms is advisable.

DISAPPEARING FISH.

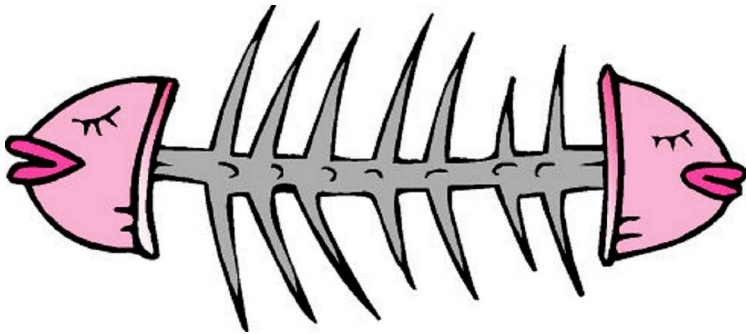
There are many predators of fish both big ones and small ones. Perhaps the biggest predators are the fish themselves, as big fish will always, given the chance, eat small fish. Big goldfish will eat small goldfish and big koi have huge mouths enabling them to take fair size fish. Usually small fish are faster than big ones so when fish spawn you always get some surviving to maturity. However when you think that the average goldfish will lay 1000 eggs, most of which will hatch, and you only find a dozen or so in your pool you can see the scale of the problem.



Most fish will nibble at dead fish but will not bite pieces out of a live fish apart from the odd fin nipper with the exception of catfish. If you see fish in your pool with gaping wounds it may be ulcers or if a catfish is present, that is the likely culprit. Coldwater catfish are very aggressive unlike most tropical varieties and have stomachs that expand like snakes. They also have very large heads which are all mouth. Catfish are said to be able to swallow a fish their own size. They should not be confused

with loaches which look more like eels, and have small mouths and however big are quite harmless.

If fish bones are found at the side of the pond then the problem is almost certainly a cat. Most cats are skillful fishermen and have a great deal of patience waiting at the side of the pond for a fish to come within reach. Even the



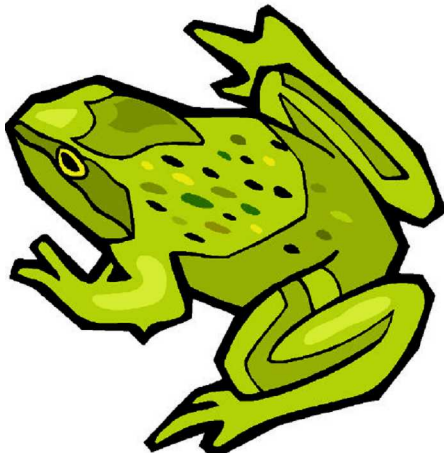
occasional ducking does not deter most cats when they have found that there is a tasty meal to be had from the fish pond. A dog may help to deter a cat but the only foolproof method is to erect a 12inch high fence around the perimeter of the pond very close to the edge as this will stop them sitting on the side. This may also help to deter herons that can also be a nuisance as they are said to walk into the water rather than land in it.

A predator that most people don't usually think of is the seagull. If you live near ploughed fields where flocks regularly gather it is only a matter of time before they spot the water in your pond and investigate. I have seen them dive bomb a large pool where there were small fish and from the

frenzy that they were in I am sure they weren't just taking a drink. However like kingfishers they will only take small fish. Kingfishers will only be found near a large open, body of water and a net over the pond will soon stop them.

If you live near a canal or river there is one predator that is almost impossible to stop and that is the mink. In recent years the actions of animal activists have caused it to become naturalized in many parts of the Country. It is a fierce predator with very strong jaws and razor sharp teeth that can cut through any net effortlessly and they are quite partial to the odd Koi carp. The only cure for this pest is a shotgun.

A somewhat smaller pest is the greater diving beetle that can fly like all beetles and will eventually find your pond. They grow to well over an inch in length and will quite happily



kill and suck the juices out of small fish. The best thing to do with these little predators is to regularly check you pond and scoop any that you find out with a net and kill them.

Frogs won't eat fish but they are often blamed for killing them. When it is time for the

frogs to spawn the male will grab anything in the hopes that it is a female frog and can sometimes be found gripping a dead fish. However in practice a healthy fish is likely to be too fast for a frog to grab and it is probable that any fish that

it does manage to grab is already very sick and likely to die anyway.



The most alarming cause of fish to disappear is that of burglars. You might think that nobody could catch fish in a pond in the middle of the night. It is hard enough when you are trying to clean your pond in daylight, but they do and this is a growing problem. Koi are what they usually go for and they will overcome all obstacles to get them. One garden centre had an

8 foot high wall round their fish department but that didn't stop the burglars getting away with thousands of pounds worth of big koi. Alarms and movement sensors on floodlights may help but where there is a will there is a way.

THE PROBLEM WITH HERONS.



Heron are Large fish eating birds about 3 feet tall with long legs for wading and a long neck. The body is about the size of a chicken. They nest and lay eggs like most birds in spring. Their nesting sites are communal and are called heronries. In medieval times they used to be hunted, roasted and served as a delicacy at

banquets held by the local lords and ladies. This is a practice that many pond keepers would like to see revived. But since herons became a protected species some years ago their numbers have soared. Many sanctuaries have been made for them each with its own body of water and heronry. It is true that they nest in them and fish for food but it is also true to say that their desire for more fish takes them many miles away from the heronry to well stocked fish farms, reservoirs and to private pools including of course many back garden fish ponds. All those bright, colourfull goldfish and koi make easy pickings for a hungry heron in the middle of winter when the fish in the rivers and canals are at the bottom.



Hérons are said to walk into the water from the edge so a 12 inch high wire strung around the perimeter of the pond very close to the edge may help to deter them. However this



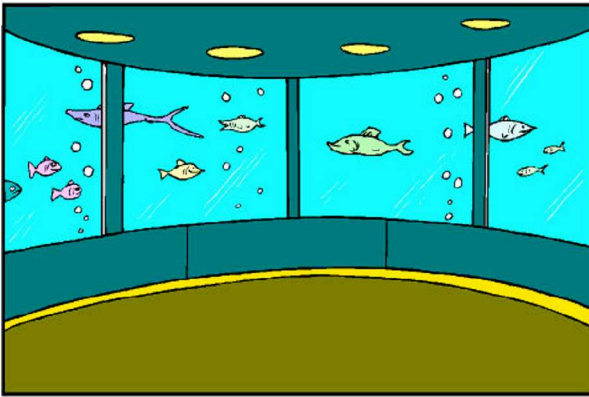
sometimes fails as herons have been seen landing in the middle of a 3 foot deep pond and diving for fish before flying away. Herons will keep coming back once they have found the pond until they are sure it is empty. Even if they cannot swallow the fish and they have a prodigious appetite, they will spear the fish and leave it to die.

Wires strung across the pool zig-zag fashion should deter them and are a lot less unsightly than a strong net.

Another method is a trip wire with a small explosive device attached that can be bought from some aquatic retailers. Artificial herons placed at the side of the pool are said to deter them from landing but we have all heard the classic story of a real heron trying to mate with the plastic one.

WHEN TO BUY FISH.

The first golden rule of fish keeping is if you have a disease problem in the pond then don't add to it by buying any more fish. Sort out any problems you may have first and then set about adding more fish afterwards. The second golden rule is don't add big fish to a pool full of small ones because the small ones will get eaten. So if you have fry in your pond leave it for a year or remove the fry.



If you want to add fish to your pond summertime is the best time to add them, most reputable aquatic dealers will run down their stocks in the winter, indeed some turn

off their pond fish tank systems altogether. As the days warm up in Spring they will stock up again. Traditionally Easter is the first weekend of each new year that fish are sold. This is because the warmer weather will mean that the fish are more active and will start feeding immediately. This is most important because they will have spent several weeks in starvation conditions during the process of being imported.

When buying fish in mid summer avoid buying them on very hot days because it will be more of a shock to them and they will not travel as well. Most dealers have special offers in the Autumn to clear stocks. This can be a good time to get bargains but remember that you will lose some of them because they wont have time to acclimatize before winter sets in.

A lot of Koi auctions are held in late Summer and Autumn but be warned. Ideally such fish should be over-wintered in an indoor tank, garage or even in a heated pond.

CHOOSING FISH FOR A POND

Before actually choosing your fish its a good idea to know what can be put together in a fish pond and what can't. Be warned that unless your pond is very deep catfish are not a good idea as they can be very aggressive. Other fish such as koi carp need a large pool to be happy and grow to their full potential as do golden orfe which can also reach 3 foot in length under good conditions. Shubunkins, comets, sarasas, goldfish and tench can all be mixed together in the average back garden pond. Fantails and Black Moors can be put into the pond for the summer but it is recommended that they are removed for the winter and brought indoors.



When actually buying fish for a pond always inspect the dealers tanks carefully. If there are any fish floating dead in the tank then don't have any from that tank. However well dealers look after their fish stocks they often lose one or two because the fish are under so much stress and so overcrowded in their

tanks. But they should remove any dead ones as soon as they become aware of them. If some fish in a tank are hiding in a corner away from the others then that is a sure sign that they are off colour so don't choose any of those. If fish have obvious problems such as, ulcers, or fungus then tell the dealer if he's not aware of them but don't buy them.

When you have selected your fish examine them carefully before they are bagged up. A few scales missing is nothing to worry about but if the dorsal fin (the fin on the back) is down instead of being erect then ask to put them back and change them. Take the chosen fish home carefully trying not to bang the bag about and keep it cool and out of the sun if it is a hot summers day.

When you get them home you should isolate them in a tank or small pond for a few weeks before introducing them to your main pond. This will prevent the risk of infecting your existing fish if there is a problem with the newly acquired ones.

Before releasing the fish into the pond float the bag for about half an hour. This equalizes the temperature of the water containing the fish and that of the pond. If you don't do this properly the fish can get a chill and get white spot. After opening the bag spend a few minutes slowly mixing some water from the pond with that in the bag before releasing the fish. It is a good idea to treat the pond with a general medicine immediately after adding new fish as a preventative measure. This is because the fish will have undergone many arduous weeks being caught and sorted at

their place of rearing. Then they will have traveled in overcrowded conditions, been starved for several weeks and then will have spent some time in the dealers tanks. All this stress weakens the fish and makes them susceptible to minor infections.

If you follow all of the above it won't stop you losing some newly bought fish but it will give them a better chance of surviving.

QUARANTING FISH.

When you buy fish to add to your pond they are almost certainly from a different fish farm or even country to your existing fish and they may have a variety of minor or even major problems with parasites or disease. It is for these reasons that you may consider it worthwhile to quarantine them for a few weeks to ensure that they are healthy.

To quarantine fish effectively a special pool must be built. It has to be big enough to cope with both the quantity and the size of the fish likely to be bought. It needs a good air supply to increase oxygen levels and ideally it should be heated to speed up treatment. The best place for such a pool is an unused garage where it will get extra protection from the elements. The water should be filtered in it and the filter must be mature and ready to cope with a sudden influx of fish. To do this it has to be kept running at all times and the pool must have some fish in it to provide food for the filter. The fish can be removed immediately prior to adding those to be quarantined and then replaced afterwards.

An Ultra Violet system added to the filter will help to reduce bacterial and parasitic problems but all new fish should be dosed with anti parasite treatment as a matter of course. The fish should be closely observed for about a month and if necessary other treatments should be given. Pond salt is a very useful tonic in small amounts and a potent treatment for most problems in stronger doses.

After treatment the fish may be added to the main pool but do keep an eye on them as problems could still develop.

Hopefully all fish bought from retailers have been quarantined when they were imported or when the retailer acquired them, but there will always be some problems with newly bought fish. This is mainly due to the high stocking levels in the dealers tanks and the constant stress that the fish live under in such conditions.

FISH UNDER STRESS

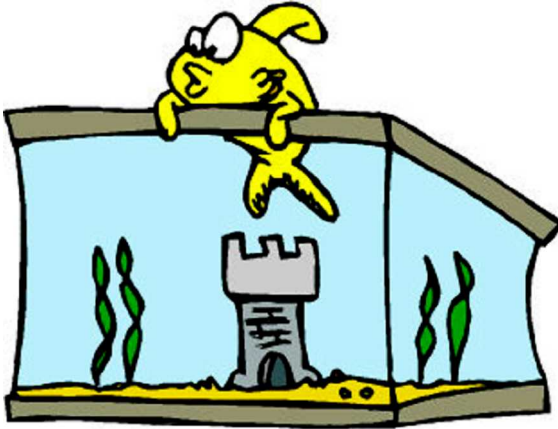
People now acknowledge that stress is a big problem with modern day life, but what a lot of people don't realize is that animals can also suffer stress. Some people understand that animals in cages suffer from the stress of being confined and that is perhaps one reason why zoos are on the decline. But who ever gives a thought for the humble goldfish or prize koi carp. There are many ways that fish can be put under stress and it can lead to many problems some even fatal.

The first time a fish is subjected to a lot of stress in its life is when it is exported from its place of rearing in perhaps Japan and put into dealers tanks in this country. Bigger fish are often drugged to stop them thrashing about and reduce the stress levels. The fish are guaranteed disease free when they are packed but transporting them can lead to high stress levels which in turn leads to mysterious disease outbreaks and sometimes many fatalities.

After you have bought your fish you take it home in a plastic bag and it is again put under stress. Without pure oxygen in the bag it will survive for about 2 hours or so before it goes into shock. All you can do for it then is to get it into some fresh water as quickly as possible and pray.

When fish get too big for the tank or pool they get frustrated and jump out. The fish can be under so much stress and get so excited it bleeds from the gills. However in good water

conditions no permanent harm will be done to it. If a white koi is under stress the blood vessels will dilate and give the fish a pink colouration. This is why at koi shows it is important to rest fish prior to showing to allow the fish to relax and regain its normal bright colours.



Mating time is another cause of stressful conditions and a weakened female needs good food and a general medicine added to the water as a preventative measure. There are other things that can put fish under

stress such as changing water conditions, temperature, PH and chemistry. All will make the fish more susceptible to mysterious diseases that suddenly appear in healthy fish.

So when you suddenly lose fish don't first blame the dealer where you bought the fish from, think of anything you might have done wrong to put the fish under stress and try to remedy the situation for the next time.

FEEDING YOUR FISH.

All life needs food to live and fish are no exception. However they are different to most animals in that they can live off body reserves for considerable periods of time so regular feeding of fish in a pond is not essential. Fish in a well established pond will forage for themselves finding insects, algae and some plant life to their taste. Oxygenating plants are a great favorite and large goldfish, or Koi will rapidly devour any in the pond.

In spring and early summer the pond temperature will rise above 55°F and the fish will become more active. This is when it is a good idea to start feeding your fish. Although not essential it will boost growth, strength and resistance to disease. When feeding them don't put in a lot of food all at once but give the fish a little so that it is all gone in 5 minutes. When it is very warm in mid summer fish can be fed 2 or 3 times a day but always scoop off any uneaten food as this will go moldy and pollute the pond.

There are many foods on the market, but basically there are 3 types;- 1)Flakes, 2)Pellets and 3)Sticks.

Flakes are concentrated goodness and produce little mess. For this reason they are usually fed to aquarium fish but they can equally well be used to feed small pond fish. They are expensive however and so as the fish grow a cheaper alternative should be sought.

Stick foods are also very nutritious and usually of high quality. They are an extruded food that makes them float far longer than flakes and so are useful when judging the amount to feed.

Pellets are generally the cheapest type of food weight for weight although some Japanese brands are extremely expensive. They come in a variety of sizes from tiny pellets that look like sand to pellets the size of marbles for very big fish. Some foods have colour enhancers in them that bring out the reds and oranges in fish.

Live foods are often given to aquarium fish and this practice is to be encouraged in the pond. The most suitable live foods are maggots and earthworms but the worms must be washed first to remove the dirt. These are very good for bringing the fish into peak condition for breeding. Lettuce leaves will also eagerly be taken by Koi carp and brown bread is a firm favorite.

As the autumn comes and the temperature drops below 55F then feeding should be lessened and stopped altogether as it gets colder. Below 55F the food should be changed from the normal fish meal based foods to wheat-germ based foods. This is because at low temperatures fish based foods take longer to digest whereas the wheat-germ can still be safely digested. Wheat-germ is available as Pellets, Sticks or Flakes but it is a little more expensive. Brown bread is a safe alternative. All good aquatic retailers will have a wide range of all types of food and will be happy to advise on their usage.

HOLLIDAYS AND FISH.

If you are planning to go away on holiday for a while there are several steps you can take to ensure the health and well being of your fish. If the fish are in a pond then clean out any obvious rubbish and carry out a partial water change before you go away. If the fish are kept in a tank then it is probably a good idea to clean it out completely a few days before your departure so it has chance to settle again before being left.

Another simple precaution you can take when leaving your fish for any length of time is not to add any new fish to your tank or pond within a month prior to going away. If you do add new fish and there is anything wrong with them the least that could happen is that they die and pollute the tank/pond. The worst is that the disease that they had could spread to the rest of your fish and kill them all while you are away on holiday.

The most important thing when leaving fish is don't leave food with a neighbor unless they keep fish themselves. Overfeeding can lead to pollution very quickly and many subsequent problems. Fish in a well established pond can safely be left to forage for themselves for many weeks as they will find insects, algae and even some plant-life palatable.

Well fed goldfish in a tank can be left for a couple of weeks as they will survive on body reserves but fry and tropical fish will be in greater need of food as they are more active and have less reserves. In this case an automatic feeder may be a good investment. They are available for tanks and ponds and work best with stick foods or pellets.

Another cheaper means of providing food for your fish while you are away on holiday are feeding blocks. These are available as very small ones for aquariums for a week end, larger ones for up to two weeks and bigger ones still to go in the pond. They consist of food particles, minerals, essential vitamins and water stabilizers to help keep the water sweet, Most aquatic retailers stock them along with automatic feeders and will be only too happy to give you further advice on leaving your fish.

BREEDING COLDWATER FISH

The first problem that faces the amateur breeder is that of sexing the fish. In most fish the only sure way is to dissect them but as this is not practicable you can make an educated guess. Koi Carp are easy to sex because the pectoral fins in the male are pointed and in the female they are more rounded. With all coldwater fish the female is broader across the beam. Mature male goldfish sometimes develop little tiny white modules on the leading edges of their pectoral fine during the breeding season. In all species the male fish will chase the female prior to spawning and a deft scoop with a net will sometimes mean that they can be separated. This must be done with the sexes to make sure that the female is full of eggs ready for spawning. Rough handling must be avoided as this will cause the eggs to released prematurely.

Spawning will take place early in the morning, last for several hours and can often be induced by pumping cold water into the pond a few hours previously. Somewhere for the fish to lay their eggs such as a spawning mop made out of wool or bundles of oxygenating plant should be provided. If it is mid summer water hyacinths will be available which are much favored in Japan.

Prior to spawning and afterwards the fish should be fed good quality food especially live foods such as maggots, washed earthworms, bloodworms etc. Commercially fish are brought

into breeding condition by hormonal injections, then the eggs and sperm are removed from the fish by hand and gently mixed together to fertilize the eggs.

It is probably easiest to spawn the goldfish related species in an aquarium because after the eggs have been laid the adult fish must be removed otherwise they will eat the eggs. Goldfish may lay 1000 eggs or more and if left to their own devices in the pond only a dozen or so are likely to survive to maturity. Even after the fry have started growing they must be kept separate from larger fish for at least the first year.

The eggs may be kept warm in an aquarium by the use of a small heater and will take a few days to hatch. After hatching the fry will hang on the side feeding off their eggs sacs for a couple of days and then they should be fed with either a proprietary fry food or Infusoria. This can be prepared by pouring some boiled water over some lettuce leaves and leaving it to stand. After a day or so the water will go cloudy and then clear. This is when the infusoria solution is ready. A fresh preparation should be made every 3 days to provide a constant supply.

As the fry get bigger they can be fed on newly hatched brine shrimps and then on powdered flakes. The tank must be kept clean and well oxygenated at all times. Many fry will die and must be removed but hundreds will survive if looked after. They grow quickly so must be given plenty of space.

Goldfish fry will soon darken to a brown colour and may take a year or two to change to the true goldfish colour.

Some goldfish never change colour and revert to the colour of a natural carp. These are said to be ferral carp. Shubunkins and Koi fry will show colour earlier but the colours will change as they grow older until they become fixed. Goldfish need to be about 5 - 6 inches or 15 cm before they will breed and Koi about 10-12 inches or 30 cm. Golden Orfe also need be about one foot long but Golden Rudd only need to be about 8 inches. Orfe will usually breed true but Rudd vary quite a lot so when the fry are changing colour you must cull them killing the poorly coloured ones.

Breeding Black Moors, Fantails and the other fancy goldfish species is just the same as for ordinary goldfish. The main difference is that very few of the fry will make good specimens and you must start culling the fry as soon as possible to allow the others to develop. Black Moors may take a year or so before they achieve the deep black colouration that they are well known for.

CHANGING COLOURS OF FISH

People often ask why their goldfish has changed colour and there can be several explanations. The most popular colour change is from black to red. Sometimes people buy a fish because it has nice black marks on its otherwise normal colour of orange. The black disappears and the fish ends up pure orange. This is a normal colour change, as all goldfish, start life black and turn to orange as they grow.

Age and temperature affect the change as can food. Some foods, especially koi foods have a colour enhancer that is based on carotene and brings out the reds and oranges in the fish. Sometimes goldfish turn white and this can be compared to hair turning white as people get older. Some people's hair turns white quite young and others never do. This is the same with goldfish with most staying orange all their lives. Black Moors sometimes turn orange like a goldfish.

This is because the fish is a genetic throwback and has not bred true to the Black Moor colouration. Very occasionally a goldfish will develop small black patches as it gets older. This not natural and could well be due to a tiny parasite which will slowly spread if left untreated and may eventually kill the fish. An ordinary parasite treatment should cure the problem.

Other fish will change colour as a normal development when the fish matures. Baby Shubunkins start life as a very pale fish with no colour and gradually assume their characteristic red blue and black colours. Koi carp also develop better colour markings as they get older. This is why it is always a bit of a gamble buying small koi as you never know what colour they will finish up when they have matured. Indeed koi enthusiasts are always searching for the perfectly marked koi for their collection. They sometimes go to extreme lengths to achieve perfection, even to the point of surgically removing scales to remove small blemishes in the markings.

POND FISH

When people have a fish pond they often think of goldfish and don't realize that there are now quite a few different varieties of fish available to the outdoor aquarist. Another thing that people don't realize is just how big fish can grow in the right conditions or how long they can live. Goldfish or comets that are long tailed goldfish can live up to 20 or 25 years and grow up to a foot or 30 cm long. In a small pond or cramped conditions this size is limited and they may only grow a few inches.

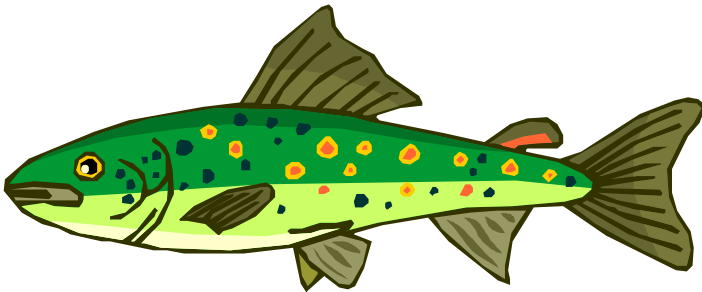
The growth of fish is governed by a hormone that all fish secrete and the higher the concentration of the hormone, the slower the growth rate.

Another popular fish that is closely related to the goldfish is the Shubunkin. These can be blue as in the Cambridge Blue or multi-coloured with reds, blues and blacks making every fish look different. The less popular Sarasa Comet is also closely related to the goldfish but was originally bred in America. These fish have a long comet tail but are red and white in colour.

Golden Orfe are another fish which can grow very big, often reaching one foot in quite a small pond. Unfortunately when they reach this size they often jump out of a small pond but will grow up to 3 feet in a lake. They are a golden yellow colour, very hardy and resistant to disease but they also need a good supply of oxygen as they get bigger. This can be

supplied either by a fountain or a waterfall and is most important on a hot summer night when oxygen levels are at their lowest in the pond. The Blue Orfe is a hybrid from the Golden Orfe but has a pink underbelly and a blue back. The species has not been perfected yet and a lot of specimens are not a good blue colour but if you look through the tank at your aquatic retailer you will always see some good ones which he will be happy to catch for you.

Golden Rudd are very similar in their habit to Golden Orfe in that they swim around on the surface always after insects. They are more of a red colour and don't grow anywhere near as big, so they are more suitable for a small pond.



A lot of people like to put water snails in their pond to eat the rubbish that accumulates on the bottom. However snails also like to eat fresh green vegetation and are quite partial to lily leaves. A much better idea is to put scavenger fish in the pond such as Tench. The common green tench is widely available but once you have put it in you are unlikely to see it again until you clean the pond out because of its colour. A much better seen fish is the golden tench which is sometimes sold.

Fancy goldfish such as Black Moors and Fantails are sometimes put in fish pond, but they are not the hardiest of fish so are best brought inside the home for the winter. Other varieties of fish sometimes sold for fish ponds include Gudgeon, Weatherloach and Minnows but all of these are best kept in an aquarium where they can be seen to their full advantage.

STARTING A KOI COLLECTION.

In recent years fish keeping has taken off as a hobby and the biggest growth sector has been that of Koi carp. These fish have a universal appeal because they grow very large and can have an almost infinite variety of colour patterns that mean you can identify individual fish. Also they become very tame feeding out of your fingers. The first golden rule about koi ponds is the bigger the better. Koi carp can easily reach 2 foot (60 cm) or more in size. Indeed you can buy them at this size if you can afford it as at this size they can cost many hundreds of pounds or even thousands for a good specimen.



Koi carp also need a large pond to give a stable water temperature as they are susceptible to shock with rapid changes. A shallow pond will warm up quickly in the spring and autumn sun and cool down at night. All the books say that a koi pond should be a minimum of 10 x 5 feet ie; 50 square feet or 5 square meters surface area and it should be at least 3 feet or 1 meter deep. This will enable the fish to exercise their back muscles by going up and down as well as round and round.

A lot of serious Koi enthusiasts make their pools anything up to 8 or 9 feet deep. Which may sound excessive but when housing large numbers of very large fish it can be necessary.

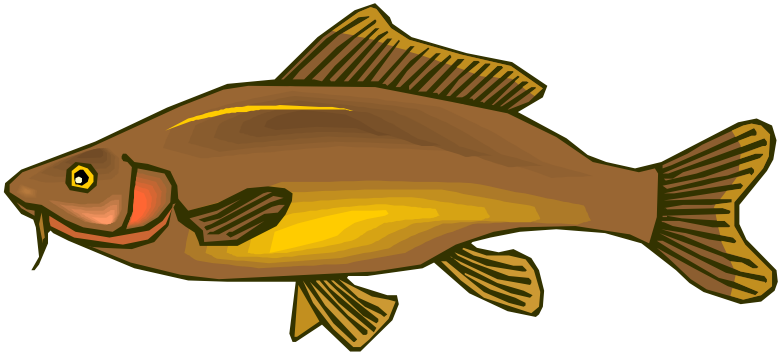
It is almost impossible to grow plants successfully in a Koi pond because Koi love to eat them and are natural foragers digging into the pots. Lilies are tougher and will usually survive but they need large stones on the pots to hold the compost down.

Consequently most Koi ponds are formal which seems to compliment the many colour varieties that are available. Some are highly prized in their native Japan and the national champion can command a price of tens of thousands of pounds. When first starting to keep Koi carp it is probably better to buy small fish for a few pounds and to watch them grow. It is less of a risk if you lose them and can be very satisfying growing them on to large specimens. Some people on the other hand want an instant Koi pond and buy large specimens.



Koi are now bred in Japan, America, Israel, China and even Britain. As every year goes by the standard of colour markings improves although the Japanese fish always command the highest price. All aquatic retailers sell some Koi, some specialize in large specimens whilst others content themselves with selling the smaller cheaper sizes. All will be happy to chat to you about the needs of these fascinating fish.

GHOST KOI



In recent years more and more aquatic retailers have started selling a fish of the carp family called a Ghost Koi. This is a misnomer as the true ghost Koi is a thoroughbred Koi which changes colour as the season changes from Spring to Summer to Autumn and Winter. The fish sold as Ghost Koi do not do this. They remain a dark coloured fish with bright highlights of either white or gold, nor are they true Koi. They are nevertheless a very attractive fish.

A more correct name for these fish would be Ghost Carp as they are indeed a cross between the common carp and a white or gold Koi.

They take a little of the colour of the Koi but the strength and resistance to disease of the common carp. This makes them much better survivors than thoroughbred Koi carp which have been inbred so much that many diseases take a heavy toll on them. Ghost koi are a streamlined fish but are also full bodied and will develop a large belly on them as they

mature. They mature sexually at about 1 foot or 30 cm in length.

The ghost Koi grows very fast and is a prodigious eater just like Koi with all the same habits. In good conditions they can grow up to 2 or 3 feet or more in length and weigh 30 or 40 pounds. Because of their size they need plenty of space but will survive in quite cramped conditions and unlike Koi are not so fussy about water quality. They will eat just about anything and will quite happily eat most plants. They are also foragers and will uproot water lilies as fast as you can replant them.

Like their cousins, Koi carp, they will become tame and eventually, with regular feeding, will swim up to you when you feed them and take food from your fingers. Indeed they will mix in a pond very well together with Koi and if permitted will inter breed. This is not to be recommended as the progeny will be a poor mixture of fish. As the Ghost Koi is a cross, the quality of colour markings is very varied and you need to select your fish carefully when buying as they will not get any better markings when they get older. They are a very popular fish and good marketing has helped their sales. Most aquatic retailers sell them and they vary in price from about £1.00 for a small fish up to £30.00 or £40.00 for a large specimen.

FANCY GOLDFISH.

When people set up a coldwater aquarium they usually think of goldfish, a few oxygenating plants and a clay ornament. Sometimes they will buy a Black Moor or red Fantail but that's as adventurous as they get in their choice of fishes which is a shame because some aquatic retailers now carry quite a wide range of exotic fancy goldfish. Fancy goldfish don't like to get too cold as this can lead to fin problems and stomach upsets. They can go into the pond for the summer as they need a minimum temperature of about 55F. Although they will of course stand a much higher temperature as long as the water is well oxygenated. The temperature of a tropical tank is really too high although sometimes people do put them in their tropical tanks.



There are more and more species of fancy goldfish arriving from China as the years go by, some of which people think are hideous mutations or freaks but it is all a question of taste. The most popular is probably the Black Moor which has large

protruding eyes and as its name suggests is black in colour, although you sometimes see Red Telescopes, which are

identical to Black Moors except for their colour, labelled Red Moors.



Red Fantails which when bigger resemble a little football with fins on are also quite popular and come in a variety of colours including the calico variety like that of Shubunkins. Orandas are sometimes found in aquatic retailers but usually it is the

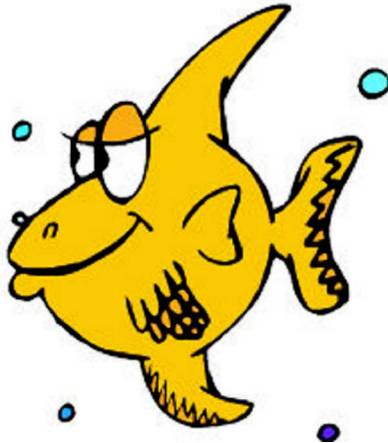
more common Red Cap that is white with a red patch over its head. Calico, Chocolate and Blue Orandas are also available but when they are small they are often mistaken for Fantails.

The difference really becomes noticeable as they get older because they develop a fleshy growth on their heads. Special foods are available to encourage this hormonal change in the fish. Closely related to the Orandas are the Lionheads and Ranchus. These come in the same colour variations but with the difference that they have no dorsal fin which when viewed from the side makes them look quite strange.

Perhaps the most weird and exotic of the fancy goldfish varieties are the Bubble Eyes and Pom Poms. These are really delicate and need careful handling at all times and will definitely not withstand low temperatures. The Bubble Eyes have large fluid filled sacks under its eyes which will burst if clumsily handled. The Pom Pom has little Pom Poms of flesh under its eyes and a good specimen is very scarce and can be

quite expensive as are many of the fancy Goldfish. The Celestial is another extremely weird fish as its protruding eyes point upwards making it a very clumsy feeder so it should not be kept with ordinary goldfish.

If you decide to seek out some of these exotic Goldfish for your aquarium or your pond they are usually to be found in the aquarium section with the tropical fish at your local aquatic retailer.



COLDWATER CATFISH

Catfish derive their name from the fact that they have feelers that look like whiskers. They use them for searching the bottoms of the waters they inhabit for a tasty morsel such as an insect. They come in many varieties both tropical and coldwater. The tropical are for the most part fairly harmless scavengers but the coldwater are not as they will become ferocious hunters as they get bigger.



The most infamous variety of coldwater catfish is the European Wels Catfish. In the Giant Russian rivers there are tales of them reaching 15 foot in length and weighing 1000 pounds. Their diet is varied and they will eat almost anything that they can get into their enormous mouths

including water creatures such as rats and even ducks. There are tales in Russia that small boys swimming in the rivers have been swallowed and eaten by large catfish. Catfish are said to be able to swallow a fish their own size so perhaps

these tales aren't so fanciful. Movement and importation of the Wels Catfish is banned in this country and it is illegal to release them into open Waterways such as canals and rivers. There are some in a large lake at Woburn Abbey that are said to be quite big.

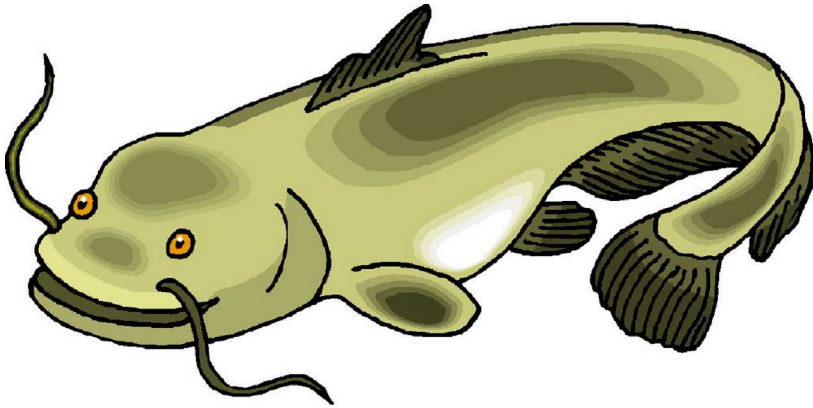
There are several American varieties that are freely available from aquatic retailers such as the Channel catfish and the Bullhead. The Black Bullhead is the smaller variety growing up to about 2 foot in length. As its name suggests it has a very large head and extremely large mouth. This variety is very popular with little boys who like its ugliness and many are sold to be kept in goldfish bowls or small tanks.



What people do with them when they get too big is a mystery because as its not a native species it is illegal to release them into the wild.

The Channel Catfish comes in 2 varieties, the gold and blue. The blue channel catfish is more of silvery grey but the gold is much more attractive and is very popular with little girls who think it looks cute and sweet. However both channel catfish can grow to 3 or 4 feet or more than 1 meter in length in good conditions and weigh 30 or 40 pounds. They are bred at fish farms in America the same way we rear trout as a food fish and catfish pie is a very popular dish in many states.

You can't really keep catfish with other fish in a fish tank but there is no reason why you can't keep 2 or 3 catfish of different varieties in one large tank for added colour as they wont attack each other. They can be fed a variety of foods but pellets are perhaps the best to fill their large stomachs. They also love live food such as maggots and washed earthworms but care must be taken to keep the tank clean and with their prodigious appetites this means having a good filter.



Care must be taken with medicines as catfish can be sensitive to them and also chemicals such as chlorine and lime. Catfish make good scavengers for a deep fish pond where they will stay at the bottom in the dark murky water and not bother the other fish. However be warned that there will come a time as they get bigger and become more aggressive when they will go hunting. One morning you will get up and find your prized goldfish missing and the catfish with a large swollen tummy. Also be warned that a catfish

has a bony lip which it can use to bite pieces out of a fish too big for it to swallow.

If you don't want to keep piranha because they are too dangerous but you fancy something a little bit different with a bit of a reputation then perhaps the catfish is for you. It won't bite you but it needs careful handling because when it is scared its fins stick out from its body at right angles and they are needle sharp.

Most aquatic retailers have some coldwater catfish in stock from time to time and if you shop around you are bound to find a suitable specimen for you.

STURGEON.

As pond keeping has become more and more popular the variety of fish available at aquatic retailers has increased. The Sturgeon is such a new arrival. The sturgeon used to be abundant in the large rivers of America and Russia and some were even to be found in Britain. In the late 1800s however vast quantities were caught for food and the other products the fish yielded. Caviar is the most well known. This is the Sturgeons roe or eggs and is considered a delicacy all over the world. Isinglass is made from the fish and was used in making and clarifying wine.

Because the fish was so useful its numbers diminished through over fishing. The construction of dams has also inhibited its natural breeding, reducing its numbers still further. Nowadays there is an intensive breeding program in America trying to re-establish the sturgeon in the great rivers. In Britain it is considered Royal property and any caught must be handed over to the Queen.

The Sturgeon in its native habitat can grow to over 20 Feet in length and weigh over 1000 lbs. This is obviously too big for most fish ponds but a variety now becoming available, the Sterlet is considerably smaller. This fish in good conditions will grow up to 3-5 Feet or 1 - 1 ½ meters in length, which is still quite large.

The fish is covered in bony plates and has quite an unusual appearance with its long shovel like nose, The fish uses this long snout to root around in the mud for insects, worms and anything else edible. The mouth is underneath and set well back from the tip of its nose. This makes the feeding of certain foods quite difficult but it soon learns to feed upside down to eat floating foods.

The fish is very attractive in an aquarium but its dark colour doesn't show it off well in a pond. Another unusual feature about this fish is that it is always swimming, If it stops moving it sinks to the bottom. Water conditions have to be very good making it a difficult fish to keep.

GRASS CARP.

These fish are a member of the carp family but are unusual in as much as they are vegetarians. As a carp they grow quite quickly and large, eventually reaching several feet in length under good conditions. They need plenty of space like Koi carp because they get very frustrated in cramped conditions and will jump vigorously.

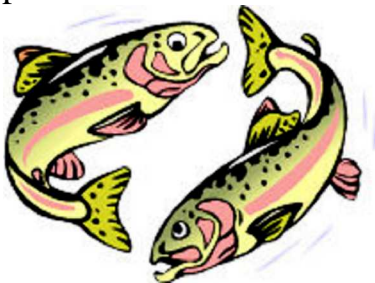
In America grass carp are widely grown as a food fish in the same way we grow trout. The Farmers who rear them actually cut the grass of the fields and scatter the grass cuttings on the water to feed them although they will take commercial fish food as well. Grass Carp are prodigious feeders and have been used in the Everglades experimentally to clear the vegetation that threatens to block the water ways. In many states of America however they are considered a pest stripping rivers of all their vegetation so they have been banned.

Some Grass Carp are imported into this country for sale in the aquatic trade but they are not to be recommended in a well planted pond for they will strip it bare as they get bigger. Grass Carp are rather plain being the colour of an ordinary carp but an albino form is sometimes available which is yellow in colour. This will show up in the pool very well but large specimens are horrendously expensive to buy and even small ones cost many pounds each.

REARING TROUT.

Rainbow trout are extensively reared in this country as a food fish on relatively small fish farms. There is no reason why under the right conditions the ordinary person with a large garden couldn't rear some trout for his own dinner table. There is a golden variety that is now sometimes seen at aquatic retailers but these may cost £2 or more as fingerlings. If you intend to buy them to grow on for eating then you want to buy them as cheaply as possible.

A visit to a friendly trout farm owner may result in the purchase of a few small fish for a pound or two although this is technically illegal. For trout to survive the water must be very clean, well oxygenated and cool in the summer. For this reason stocking levels must be kept to an absolute minimum and the pool must be as deep as possible. Most reservoirs are stocked with trout successfully and are ideal for them but trout have been reared up to eating size in a back garden pool.



It is not advisable to mix trout with other fish as when they get bigger they can become cannibalistic. Ordinary fish pellets can be used to feed them but this would make the adult fish a bit expensive to eat so when you visit the trout farm buy some proper trout pellets as well. These are more oily than

goldfish pellets and make them put on more body weight which is what you want.

If you have never seen a number of trout feed it is quite something to behold. The water seems to boil as the trout greedily come up to the surface to eat a mouthful of pellets. They grow quickly and should reach about 3/4 of a pound or more in one season. After two years they should be a good eating size.

Mature female trout get egg bound so their life span is limited to a few years but males can live longer and get quite large. It can be very satisfying to know that you have grown the delicious trout that has made a good meal for all the family.

SWAN MUSSELS.

Swan Mussels are often sold to fish pond keepers as an aid to filtration because they are filter feeders. This is perfectly true as they do filter the particulate matter out of the water at the rate of about one pint of water per hour for a mature mussel. However as the average fish pond holds in excess of 100 gallons or 800 pints of water it is easy to see that one would need a very large number in deed to give effective filtration.



When mature Swan mussels measure 6 or 7 inches or about 15 cm in length but they start out life as tiny eggs which float around in the water slowly developing. As they develop they go through a stage where they become parasitic on fish. They catch a ride on a passing fish and cling to it boring a tiny hole in the fish. They continue developing and after a few weeks they drop off doing no serious damage and become free swimming. At this stage they are tiny miniature adults and will cling to the sides of the pool. Here they grow over several years until they reach maturity. Mussels like a good layer of mud on the bottom of the pool into which they can bury themselves. They do this with the use of their pseudopodia or single foot with which they move.

Swan mussels have an unusual relationship with a fish called a Bitterling. The female fish develops an ovipositor or egg

laying tube in the breeding season down which she lays about 50 eggs directly into the mussel. The eggs develop inside the shell of the mussel until they hatch and then the baby fish swim out. This prevents the eggs from being eaten by other fish. In return the fish act as hosts to the baby mussels.

One problem with this arrangement is that the adult fish find the mussel very tasty to eat as do most other fish especially tench and carp. For this reason unless you intend to breed Bitterling, mussels can end up being an expensive type of fish food if added to a pond.

VISITING A KOI AUCTION

There are many ways of acquiring new fish for your pond. You can buy them from a pet shop or you can visit a specialist aquatic dealer who will have more of a selection. A friend may be emptying his pond or tank and give some surplus fish or you may be given some fry to grow on. Perhaps the most exciting and risky way of gaining new fish is to visit a Koi auction. These are held at some of the larger specialist aquatic retailers throughout the summer, although Autumn seems a popular time for them. This could be because the foreign breeders are trying to clear out surplus stocks that have not sold during the season and offer them at an enticing price to the retailer who then has to find some quick way of selling them. This does not mean that the fish offered at auction are rubbish, merely surplus to the dealer's requirements.

With careful buying some real bargains can be had but it is only too easy to get caught up in the excitement of the auction and bid over the top. The best advice is to shop around first and get a good idea of the value of different size fish. Then get to the auction early so that you can examine the fish that will usually be held in big blue vats. Make notes if needed but get a good idea of what you want and the price you are prepared to pay for it. If the auction is well attended it could be organized chaos but if it is less popular you may get a real bargain. Indeed you may be the only bidder on certain fish.

After the auction and you have got your fish, take them home and ideally you should isolate them for several weeks before adding them to your pond.

They will have been freshly imported and will need some time to settle down to normal pond life. It is a good idea to give them a dose of a good general purpose medicine and treat them for parasites. It is also a good idea to feed your newly acquired fish frequently with a good quality food to boost its depleted reserves in preparation for the winter which may be a lot harsher than its used to.

FISH CLUBS AND SOCIETIES

Fish keeping can become more than just a case of having a pond in the garden or a little fish tank holding a couple of goldfish for the kids to look after. It can become quite a full time hobby with the building of large ponds with complicated filter systems or indeed for the indoor aquarist it could mean the conversion of the garage into a fish house holding many tanks. If this is how the bug has caught you, you might like to meet like minded people. This can be done at one of the several societies that exist not too far away. There are others that can sometimes be seen featured in one or other of the Aquatic magazines.

These societies hold shows where you can exhibit your prized Koi or Black Moor or whatever alongside other fish and stand the chance of gaining recognition for your efforts in looking after your fish. Also the societies hold lectures from time to time on various aspects of fish keeping by well known aquatic figures or by representatives of various manufacturers on their products and how they work.

Occasionally the societies organize day trips out to places of interest such as fish farms. If you are interested in joining a society, the best way to contact one is through a hobby magazine on fish keeping, who will only be too glad to give you their address.

USEFUL FACTS AND FIGURES.

1 Cubic Foot	= 6.25 Gallons = 62.5 Ibs
1 Cubic Foot	= 25 Kilos
1 Cubic Metre	= 35 Cubic Feet
1 cubic Metre	= 220 Gallons = 2200 Ibs Or 1 ton = 1000 Litres
1 cubic Metre	= 1000 Kilos
10 Litres	= 2.2 Gallons
1 Gallon	= 4.5 Litres
1 Gallon	= 10 Ibs
1 Gallon	= 4.5 Kilos

Pump running costs, 100 watts = 16.8 KWH per week
ie, 17 KWH units of elec cost £2.55
ie, 1 watt costs 2 ½ P per week
continuous pumping,

Measuring Liner Size,

(Length of hole +Double depth +1 foot) By (Width of
hole + double depth + 1foot)

eg, Hole 6x4 Depth 2 feet

= (6 + 4 + 1) By (4 + 4 + 1)

= 11 feet By 9 feet

To calculate cost at cost per square foot, eg, 60P

Multiply cost by total length of liner by total width,

is, 11x9 = 99 by cost per square foot

= 99 x60P

= £59.40