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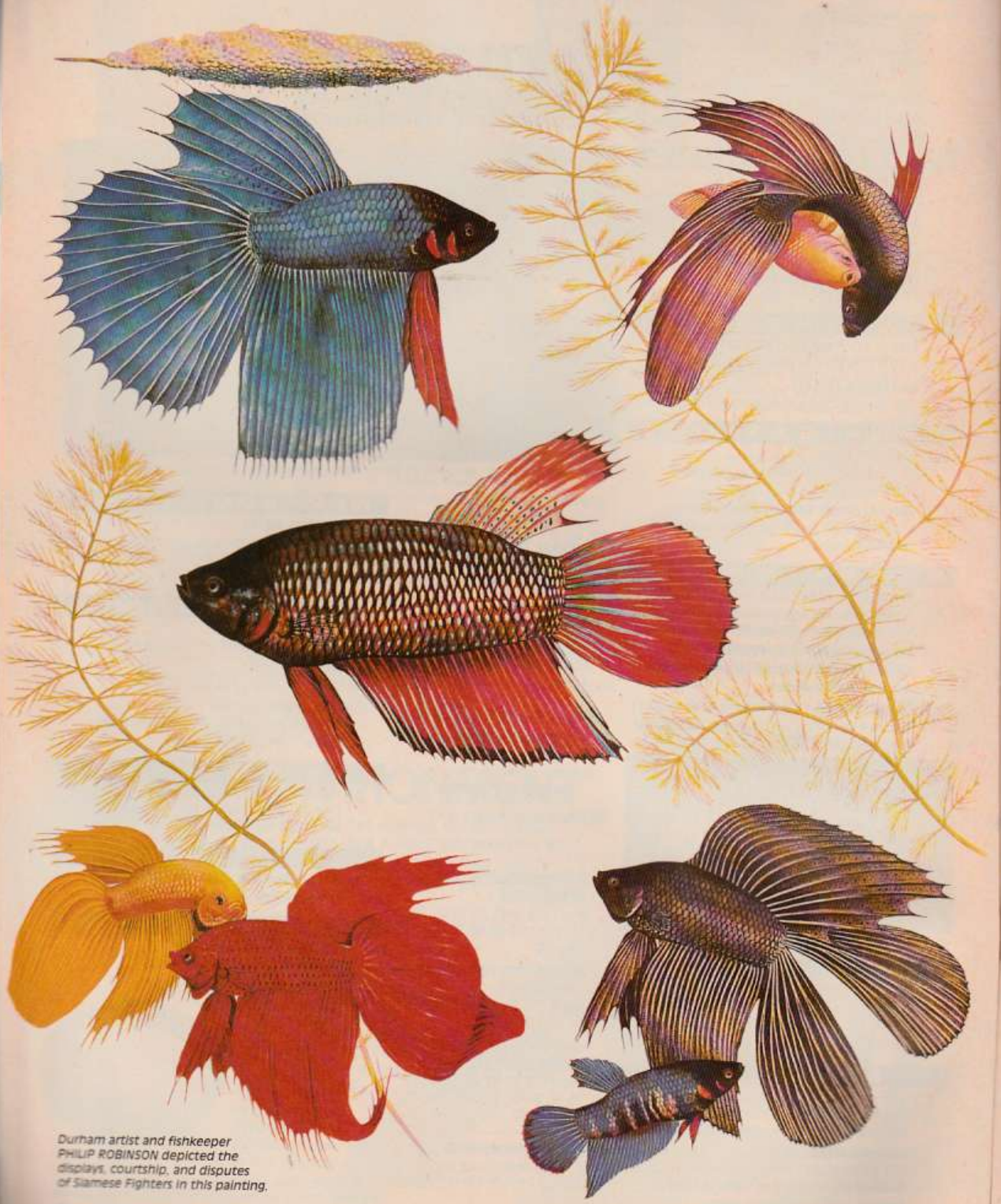
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● Cover pic. shows an Oranda from wholesalers Star Fisheries, Sutton, tel: 081 643 8126. Photo by Angus Murray.

AT 41,548 (ABC) BRITAIN'S BEST SELLING FISHKEEPING MAGAZINE



Durham artist and fishkeeper PHILIP ROBINSON depicted the displays, courtship, and disputes of Siamese Fighters in this painting.

Opposite page: The spawning embrace.

Siamese that please

DEREK LAMBERT remembers his first egg-laying breeding success....



The Siamese Fighting Fish is one of the most beautiful of the "man-made" fish kept in aquaria today. They come in just about all the colours of the rainbow from pure red to deep blue and an infinite number of combinations.

Despite their common name they are generally only aggressive with members of their own species, though very occasionally a fish may turn rogue and attack anything in sight.

My first aquatic disaster happened when a male Siamese Fighter turned rogue and killed all six of my Neon Tetras. Despite this early setback I still loved this species enough to buy myself another male the next year.

Sexing Siamese Fighters is easy. Males have long flowing fins and females usually bulge just behind the pectoral and pelvic fins. The male I selected was spreading his fins and displaying to the male in the jar next to his.

Into the tank

When I arrived home I carefully opened the bag and floated it in the quarantine tank to allow the temperatures to equalise before the fish was released. The quarantine tank was a bare 24" X 10" tank with a heater/thermostat set at 78°F. The water was just London tap water (which is hard and alkaline) and had been allowed to stand for a couple of days. This was to be his home for the two week quarantine period.

To my new arrival who had spent almost all of his life in a small jar this was paradise and

he immediately started blowing bubbles in preparation for spawning.

This left me in quite a dilemma, do I ignore this activity or buy a female and try to breed them? At that time (about 20 years ago) I had never bred an egg-layer and was under the impression that they were infinitely more difficult than the livebearers I had already been successful with.

Woman wanted

Still, I decided to have a go and phoned all the local aquarium shops to locate one which had some females in stock. Just about the last one on my list said, Yes, they did have a tank full of females and some of them were in breeding condition.

I selected the best red female he had and placed her in a jar floating in the males tank. Both fish were fed live Daphnia and Bloodworms to help condition them for spawning. The water level in the tank was lowered until it was only 5" deep.

A few days later the male had built a large bubble nest about 3" across and almost 1" tall and was courting the female in her jar. She in turn was responding to the males advances by trying to swim towards the male through the glass wall of the jar.

First time out the male flared his fins and the female started to respond, but too slowly for the male, so he started to knock hell out of her!

Back to the jar she went and the pair were left for an hour to cool off. Then the female was released again and this time all went well. The female nudged the male near his vent and they went into a nuptial embrace with

the male curled round the female. He tightened his grip and the female was turned right over and shuddered.

At this point eggs and milt were released. The male recovered first and collected all the eggs which had started to fall to the bottom of the aquarium and blew them into the nest.

When the female recovered she helped him in this task.

Once they were sure all the eggs had been collected they went into another embrace and repeated the whole process.

This went on for well over an hour during which time over 150 eggs were laid. Once finished the female then moved away from the male.

Lucky escape

In my small tank she was unable to escape far enough for the male's liking so he attacked her again. Luckily my family and I had sat through the whole spawning and we were on hand to remove the female before the male had a chance to do any serious damage.

The male now set about the task of guarding the eggs from anything that came near the nest - nets and fingers included. His other duties entailed maintenance of the nest and blowing back any eggs which fell out of it.

After three days the eggs hatched and hundreds of tiny fry could be seen with their tails hanging down out of the nest. The father would have continued to look after the fry and nest for the next two days, but once the babies were free-swimming he would be likely to mistake them for food and eat them. So the day after they hatched, I removed the male and put a few drops of Liquifry in the tank to

start an infusoria culture going.

Infusoria is a general term for various organisms which live in water. Very small fry such as those of Siamese Fighters and other Anabantids live off these minute organisms for the first week to 10 days, once they become free-swimming.

Thereafter, they are large enough to eat newly-hatched brine shrimp and microworms.

For the first month or so the tank was still only half filled with water and topped with a tight fitting (but not airtight) cover to prevent cold draughts reaching the surface of the water.

One of the biggest danger periods with all Anabantids is when the labyrinth is developing and the young are taking their first gulps of air. If the air is of a vastly different temperature or very dry, then the fry can die at this time.

Ideally the air temperature should be the same as the water temperature and very humid. The tight-fitting cover helps create these conditions, but even so the mortality rate when the fry reach two to three weeks old can be high.

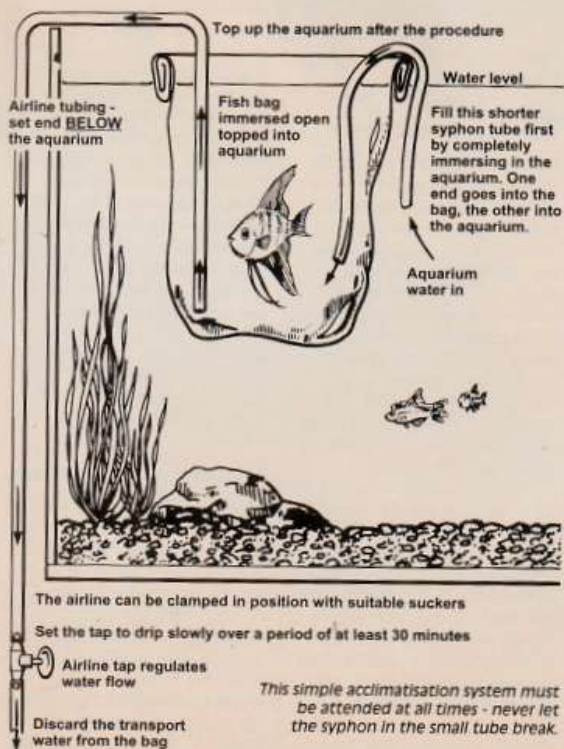
Once past this point a filter was added to the tank and the water level raised. Partial water changes of about 10% weekly were also instigated.

Housing problem

The next problem I encountered was the housing of all my male Siamese Fighters. For as they reached about 1" they started to sex out and develop the long finnage. They also started to squabble so something had to be done - and soon! Old Jam-jars which had been thoroughly cleaned out were used to isolate my males until they were big enough to sell to local shops. ■

Practical Fishkeeping's A to Z OF FISH HEALTH

This new series of monthly articles by JERZY GAWOR will take you, the fishkeeper, through an alphabetical listing of important topics relating to the health of the fish in your aquaria and ponds.



Each of the topics discussed will contain 'Key-Fact' information of a practical nature to assist you directly in maintaining and hopefully in some instances improving the health of your fish.

Acclimatisation

Although water is the universal medium in which all fish exist, it is probably true to say that no two bodies of water, be they from rivers, lakes, oceans or mountain streams, are ever the same. Water is often called the 'universal solvent' meaning that ultimately all organic and inorganic matter will be dissolved and carried in solution. It is the amount and variety of these dissolved products that differentiate the water chemistry of the Amazon Delta for example, from that of the Red Sea. Obvious but true.

Chemical change within individual bodies of water occurs slowly, taking many millions of years (until that is, Civilised Man began dumping his waste into every conceivable watery niche available on this planet - but that's another story).

Hence the aquatic life that has developed and evolved over this time has become specifically adapted to the prevailing chemical conditions in any particular habitat.

To keep fish successfully in an aquarium or pond, we must provide as near a perfectly-matched environment for the fish as they encounter in the wild or in the case of the many captive-bred species, as found on the farm.

However closely we are able to match the natural aquatic environment in our aquarium or pond (thanks mainly to the tireless efforts of aquatic scientists and manufacturing companies) there is still the problem of ensuring a stress-free transition from the one habitat to the other - **acclimatisation**.

Probably the greatest amount of stress takes place during the time that the fish spend in transit across the world. Agents and wholesalers obviously take great pains to ensure maximum safety and comfort for the fish. If they didn't they would soon be out of business.

Transport from wholesaler to

retailer is another stressful step, but again in expert hands this is minimised and with several days of rest, quarantine, and a good diet, the fish are up and swimming, ready for their final journey to your aquarium.

Once you have chosen and purchased your fish, they are generally transported in plastic bags (preferably inflated with oxygen) to your home. This is where you have to be careful and expert in your handling of the situation. Simply tipping the contents of the bag into your aquarium will not do. Gentle and patient **acclimatisation** is required.

KEY FACTS

- Plan to return home immediately on purchasing your fish.
- Keep the fish bags insulated and darkened, ideally in a box. Turn off the aquarium lights and dim the lighting in the room.
- Unpack the fish bags gently, open the tops and float them on the water. Gradually add aquarium water to the bag and remove transport water. Take between thirty to sixty minutes for the above procedure.
- Dip the top of the bag into the aquarium water and allow the fish to swim out.
- Add some food to the aquarium.
- Keep lights off preferably until the next day.

Acidity/alkalinity

Known collectively and measured as the 'pH Level' the **acidity** or **alkalinity** of your aquarium or pond water is not immediately obvious in any simple way. To us water at pH 3.5 looks identical to water measured at pH 12.5.

But for a fish it can be likened to the extremes of fire and ice. When fish encounter pH levels well outside of their 'normal tolerance limits nasty things begin to happen.

For example -

- Increase in stress levels
- Damage to delicate skin and gill membranes
- Interference with oxygen uptake
- Altered balance of body fluids
- Rapid death in severe cases of rapid pH change

It is a fact, as already mentioned in the above section, that fish have adapted over millions of years to

very specific conditions of water chemistry, among which pH is one of the most important factors. Although some tolerance is exhibited by some species to a fairly wide pH fluctuation, you should try to ensure that you know what levels your particular fish species requires.

If in doubt ask your retailer or consult one of the better books or encyclopaedias before you buy.

KEY FACTS

- Make sure you know the acidity or alkalinity your fish require
- Test your water conditions (aquarium & mains) with a pH kit
- Adjust water conditions as necessary
- Add extra buffer to marine aquaria in soft mains-water areas
- Never mix fish species with widely differing pH requirements

Aeromonas

Many cases of fin-rot, skin and mouth ulceration, haemorrhagic septicaemia, lesions and sores found in ornamental fish can be attributed to the **aeromonas** group of bacterial disease-causing organisms. Although highly infective, they are often opportunist pathogens rapidly affecting debilitated-fish already suffering from parasitic infestations or fish with physically damaged fins and skin.

With their phenomenal growth rates and generally high level of infectivity these bacterial invaders can quickly decimate a population of fish within an aquarium or pond. Death of the fish occurs through the absorption of toxins released by the bacteria as well as through imbalance of body fluids due to skin membrane deterioration.

Rapid disease identification and treatment is required if you suspect this problem in your system. Often improving the conditions within your aquarium or pond and treatment with a proprietary anti-bacterial product from your local aquatic specialist will suffice. In severe cases or where large and expensive fish are concerned the services of an expert fish veterinarian should be sought, as antibiotic treatment is required. Prevention is however always better than cure.

Practical Fishkeeping/March 1992

KEY FACTS

- Never buy fish with any of the symptoms mentioned above
- Don't overcrowd your system - prevent aggressive behaviour
- Keep a regular check on water chemistry - adjust as necessary
- Bacteria thrive in organic matter - keep your system clean

Ammonia

How simple fishkeeping would be if it wasn't for ammonia. No need for elaborate filtration, no worries about nitrite or nitrate. No deterioration in water chemistry for extended periods of time. However, life is not perfect and our fish have developed through the ages as animals that excrete **ammonia** as their main waste product from the use and breakdown of protein.

Their life, health and growth depends on **ammonia** elimination from their bodies. This they do very effectively via their gills in the most part, as well as through their solid faecal waste.

Nature, apart from providing vast volumes of water within which the fish's excretor products are effectively diluted, has also developed a highly efficient 'microbial army' made up of an array of bacteria, fungi and moulds that munch their way through all the **ammonia** and excretia that any fish can provide.

They utilise these 'waste products' for their own growth and development and render them harmless, which is just as well because **ammonia** at levels as low as 0.01 parts in a million (ppm or mg/l) begins to stress and damage fish.

At higher levels **ammonia** can kill fish very rapidly, severe gill damage being just one of the

KEY FACTS

- Never overstock or overfeed your system
- Always install an efficient aerator and filtration system
- If fish look lethargic or unhealthy - check ammonia level first
- Always allow sufficient time for biological filters to mature
- Use of zeolites and bacterial maturing agents is recommended



This faded picture shows the original Horniman museum aquarium around 1912 - things have changed radically in 80 years as the recent PFK feature on the new exhibition Living Waters showed.

Aquarium

Since the days of P.H.Gosse, the man who first coined the word **aquarium** and who also happened to be in regular correspondence with the Curator of the Aquarium at the **Horniman Museum** in South-East London around 1912.

The Science and Art of Aquatics has progressed in amazing leaps and bounds. The photograph illustrates this point rather poignantly I feel, showing the **Aquarium Gallery** at the time.

Only a mere 80 years later you can now visit the very same gallery at the Horniman, but instead view the **Living Waters** exhibit which uses some of the most sophisticated technology to be found in any Public Aquarium

anywhere in the world. Oh yes, the library still has a collection of beautiful original Gosse Manuscripts depicting aquatic life. Exciting, educational and well worth a visit.

KEY FACTS

- Keeping fish is fun and educational for all the family
- Keeping and enjoying fish actually lowers your stress levels
- Read as much as you can about aquatics, systems and fish
- Purchase your equipment and stock from knowledgeable dealers
- Introduce others to the hobby

more serious effects. An interesting feature is that **ammonia** is more dangerous or toxic the higher the alkalinity and temperature levels.

Although Marine fishkeepers keep their water pH levels at around 8.20 - 8.40 (fairly alkaline) it is also interesting to note that **ammonia** becomes less toxic with increasing salinity. It is never enough to measure only one chemical parameter in any water analysis, as many factors are often seen to interact with each other.

In the aquarium or pond where there is relatively little water (compared to the natural habitat) **ammonia** can build up to dangerous levels, especially in conditions of overcrowding and overfeeding.

Efficient filters are therefore required which not only remove the organic solid waste but also change the **ammonia** into a less harmful product - nitrate. This process is called **ammonia** oxidation and is conducted via the action of our 'microbial army' especially the bacteria **nitrosomonas** and **nitrobacter**, through the process of biological filtration.

I would always advise that you install efficient aerobic filtration in all aquaria and ponds. I am aware that there are some fishkeepers who prefer a different approach to the subject of filtration - encouraging the breakdown of **ammonia** via anaerobic bacterial action. More on that subject at a later date. ■

■ **Jerzy Gawor** is a Chartered Biologist. Member of the Institute of Biology and Member of the Institute of Fisheries Management. He has been involved in the Aquatic Industry for over fifteen years and runs his own Aquatic Consultancy Practice - **AQUALITY**. If you have any queries, questions or criticisms to put to Jerzy please contact him c/o **Practical Fishkeeping** enclosing an SAE. All correspondence will be answered personally.

There are four main reasons for moving big fish.

- When you first buy them - but this is mainly a case of four to eight inch juveniles.
- When a fast-growing fish outgrows the present tank
- When a tank develops a serious problem.
- The transfer or resale of a large fish.

Naturally juveniles are easy to transfer from a retailer, and are the easiest to handle, though care should be taken.

Newcomers to an existing set-up

If an established aquarium has already held fish which have been removed to accommodate the newcomer, then an 80% water change should be undertaken.

The gravel should be removed; or washed within the tank (retaining 20% of the old water first) and the dirty water discarded. Fresh water should be aerated over 48 hours before being added to the tank. Leave everything for a 48 hour settling period, then clean the filters in the aquarium water.

If stored freshwater is not available (buy a dustbin) filters should be switched off before adding dechlorinated freshwater (you can add water from the hot tap to lift the temperature). Filters can be switched back on after 12 to 24 hours in order to protect the essential filter bacteria from a chlorine wipe out.

Time for a free transfer?

You can catch a large established fish in a well-rinsed pillow case or a large wet towel, once the water level has been reduced.

Handling has to be conducted with real confidence or else a, for instance, writhing catfish could

As DAVE SANDS helps you move a big fish into a new tank everything you need to know is....

TRANSFER LISTED

Right: TC shows his great head, before leaving on the flight to Guernsey.

Below: Wrapped in a towel he is subdued enough to be lifted into his new home. It took him a week to settle into the larger tank.



end up bouncing about the lounge.

Here's the regime leading to a successful transfer.

- Don't feed the fish for a few days, perhaps a week before the intended transfer. The larger the fish the longer the fast.
- If possible, establish the new aquarium alongside the old one, filling the tank completely with fresh water, and simply aerate for 48 hours. After this time check that the heaterstats are keeping the temperature within the desired range (78 to 84° F for a Red Tail) over 24 hours. Then transfer the old filter or filters over to the new tank without cleaning them. Wait

another day then transfer the fish. If the filters are not very mature - less than a few months old - then transfer some aged water to help seed the system.

- Check the pH to confirm it's in the desired range (6.9 to 7.7 for a Red Tail). If it's too high add an acidifier in this one-off situation; if too low (rarely, but it happens) add very small amount of coral gravel into the filter to act as a buffer.

- Keep the lights out. Do not feed the fish for the next few days. The fast should again match the size of the fish.

- When food is offered always keep the amount down to a minimum. Red Tails and other large cats may regurgitate food which can have fatal consequences to stressed filters.

If you can't run both tanks simultaneously, you must store and aerate as much water as possible for at least 48 hours. In the weeks prior to transfer undertake more water changes than usual to condition the fish to fresher water. You'll also need to transfer more of the existing aged water. On transfer of the filters, wait 12 hours before switching them on again.

Case study - Where am I?

In a new tank your large fish has to adjust to a new geography, and to do this it has to explore its new surroundings and boundaries.

Swimming frantically up and down, your fish is not saying thank you for its new tank, but is most likely traumatised by the transfer.

In the case of TC, the Red Tail I moved to Guernsey, as reported in September's PFK, he went from 250 gallons to 2000 gallons - and from two feet of water into four feet, with a subsequent increase in pressure. It took him nearly a week to come to terms with his new situation.

In an old tank, the filters and the bacteria on the walls of the aquarium, in the substrate and free in the water will have established a balance. In a new 'fresh' aquarium, this balance can take some time to re-establish.

Problems with free ammonia can quickly occur and damage the fish. ■

When a tank reaches its sell-by date

There are some clear indications that the time has arrived for a new (larger) tank, two being high nitrates (regularly over 75 to 100ppm) and falling pH.

Red Tail Cats (and some other tankbusters) will give their own indications; shedding mucus, coughing, itching and yawning which are all symptomatic of falling water quality irritating the fish's gills.

There is nothing sadder than a large fish in a small tank. I would advise that for every foot of fish, a minimum of 75 gallons should be available. A recent survey of Red Tail Cat owners found that many did not reach this standard.

Genial GIANT

The *Osphronemus gourami* can be bought small and cute or big and bouncy. PETE TREVETT took the plunge . . .

The *Osphronemus gourami*, also sometimes known as the Giant or Common Gourami originally comes from the areas of Java, Sumatra and Borneo.

It has also been introduced into other parts of South East Asia and to Australia because of its value as a food fish.

Air breather

It's a Labyrinth fish, belonging to the family Osphronemidae, and like all species of this type of fish, it's able to extract oxygen from the water using its gills, but has an additional respiratory organ, which enables it to breath air.

This fish is available from aquatic outlets in dramatically different sizes - either full grown or as a far-smaller youngster.

As a juvenile, it has a pointed head, is a reddish brown in colour, with dark vertical bars running down its body and could be confused with a Chocolate Gourami, which has similar markings.

When young this fish can be kept in a Community Aquarium with other similar sized fish. However it will soon grow very large (in the wild, they can grow to 24" or more in length with a body depth of 12" or more) and anyone seriously considering keeping one should be prepared to eventually house it in a tank size of at least 6' x 2' x 2'.

The body of the adult fish is oval in shape and "Ossie" (the one I have) is greyish/silverish in colour with some light brown mixed in and is 18" long and 10" deep.

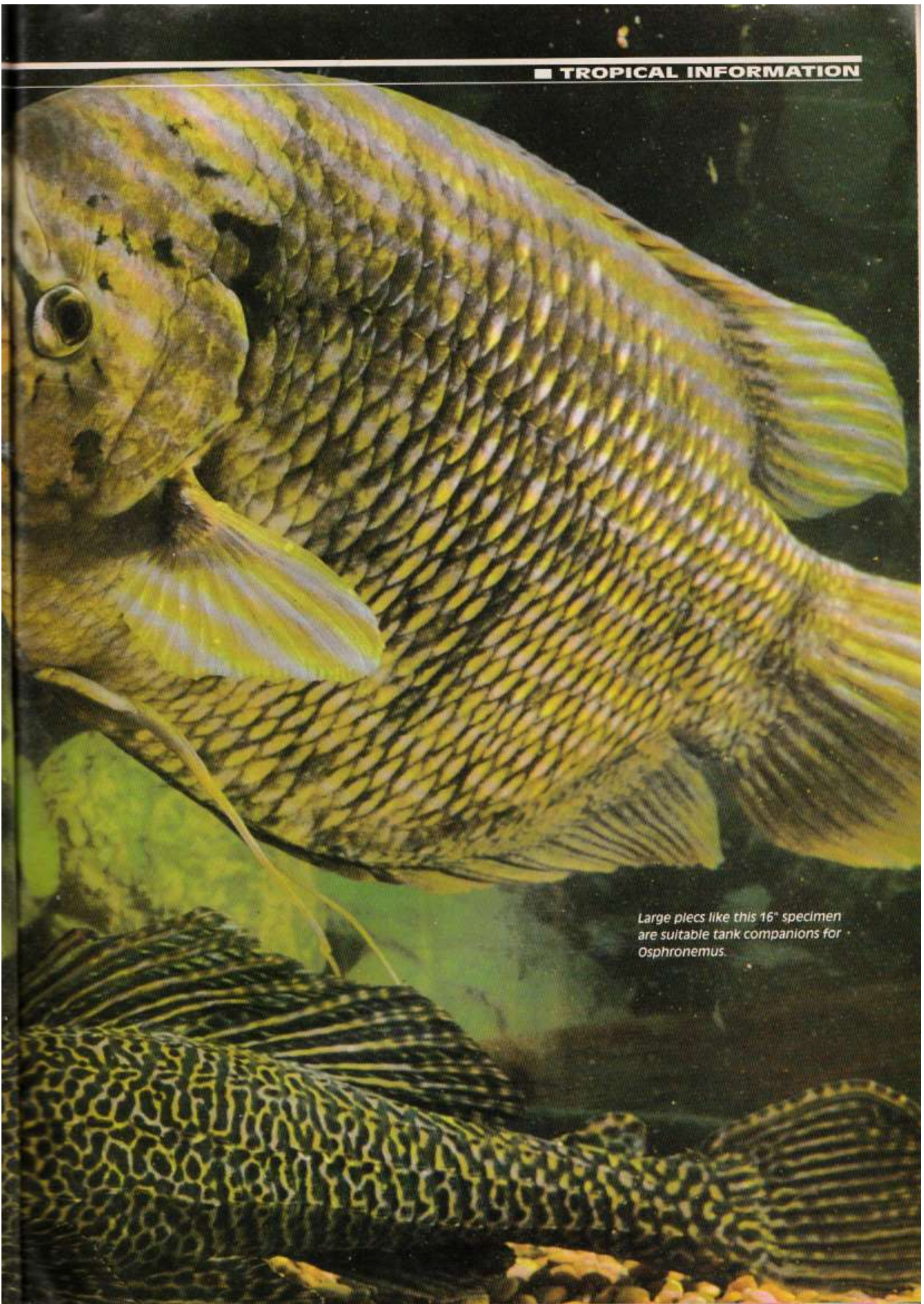
Although they can be kept together when young, this fish prefers its own company when it reaches adult size. It should therefore be kept in an aquarium on its own.

If you wish to add a companion (not another *Osphronemus*) then something like a large *Plecostomus* is suitable. Its armour will protect it from the odd playful nudges it is likely to get from

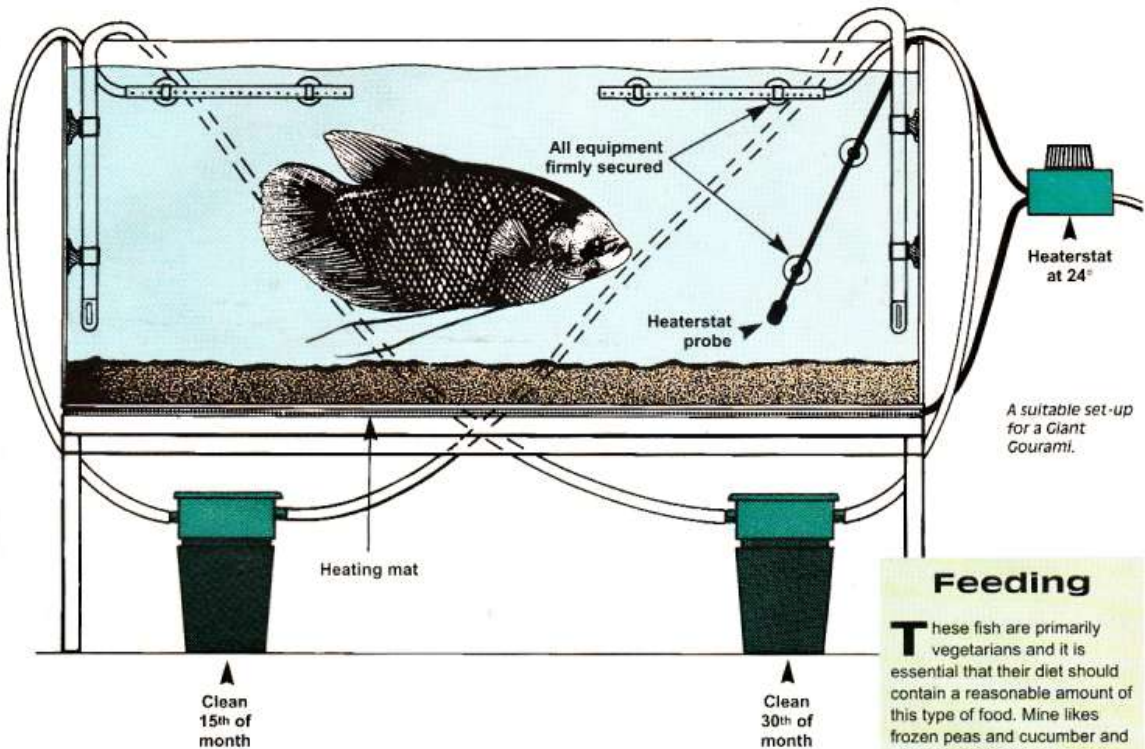
the Gourami. My club chairman (Nick Cronin) keeps his "Ossie" in a 6' x 2' x 2' aquarium with a Red Tail Cat.

It would be feasible to try and breed this species - the male can be identified from the fact that the dorsal and anal fins are longer than the females and they are also pointed. He builds a bubble nest the same as the smaller Gourami's. But due to the size of this, and the fish, spawning would only be possible in a very large tank. ▶





Large plecs like this 16" specimen are suitable tank companions for Osphronemus.



Feeding

These fish are primarily vegetarians and it is essential that their diet should contain a reasonable amount of this type of food. Mine likes frozen peas and cucumber and these are supplemented with Wheatmeal-based Koi pellets and Cichlid pellets.

Lettuce will also be gratefully received along with oatmeal flakes. A vegetarian-based flake food can be fed to young specimens along with scalded lettuce leaves and cucumber. Remember to remove any uneaten food daily to avoid water pollution and its inherent problems. As the fish grow, they will also become partial to other fish of a size they can swallow, so if you keep young specimens in a community tank when they get bigger, keep an eye on your Neons and Cardinals.

Tank care

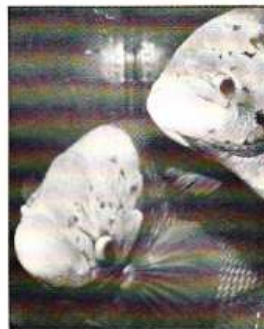
General requirements: The need for a big tank is pretty obvious, and because this, like all large fish, is a messy feeder and produces a lot of waste, a good filtration system is required.

Filtration: My recommendation for a 5-6ft aquarium would be two large external power filters such as the Fluval 303/403 series or the equivalent from another manufacturer. These would have to be cleaned at alternate two weekly intervals. I do not recommend an undergravel filter for this species when it is at adult size, because this type of system might not be able to cope with the size or quantity of waste produced.

Heating: Like the venerable Oscar, this fish tends to like to play with or move items in its aquarium - it finds things like heaters and filter spray bars extremely attractive toys. The best way to heat the aquarium is to use an under-tank heating mat with an external electronic thermostat. This avoids the consequences of possible damage to an internal heaterstat. Temperatures in the range 68 to 85°F (20 - 30°C) can be used. I would recommend 24°C as the optimum, unless you have a large enough tank and wish to try breeding when the temperature will need to be raised to at least 28°C. Because these fish can breathe atmospheric air, the composition of the water is not critical. A pH between 6.5 and 8.0 will be suitable, but as with all fish, care must be taken to ensure that there is no build-up of Ammonia or Nitrite.

Maintenance: I carry out partial water changes of about 10% weekly ensuring that any detritus on the gravel is removed at this time. Once every four weeks a larger water change of about 25% is done.

Prior to doing this, I stir the gravel up with my hands, allow the detritus to settle for an hour and then remove it with the siphon tube. If you do use an internal heaterstat ensure that it is checked regularly for damage by turning the mains supply off and removing it from the water for close inspection. Also check any filter connections inside the tank to ensure that your friend has not tampered with them.



Here's a challenge for the big fish fanatic - try to breed the Giant Gourami - in a HUGE tank if these two are the happy couple.

You won't regret an Osphronemus!

I have personally enjoyed keeping this fish. It is a large creature but has many endearing traits not unlike the Oscar. They have an inquisitive character which often makes them do amusing things, and they are cute in an ugly sort of way.

I have recently noticed that this fish is available in a colour morph called the Red Osphronemus (more pinkish than red) which makes a change from the normal colouration.

If you have (and only if you have) a decent-sized aquarium and wish to try something a little different then have a go at an "Ossie" - I am sure you will not regret it!

How to make hard water

The water flowing out of our taps varies considerably from region to region. Some live in areas where the water is naturally hard and has a high pH. For them keeping hardwater fish and plants is the obvious solution. The alternative is to try to adjust the hardness and pH to suit more acidic, soft water species. Where the tap water is too soft it is a relatively simple matter to increase the water hardness. The following methods are widely used.

1. Introduce limestone chips, coral and cockleshell into a box filter or onto the base of the aquarium. As the water comes into constant contact with these alkaline "hard" substances, salts will dissolve in the water and increase its hardness. The water will usually reach saturation point when the hardness is between 15 and 25°dH. If it rises above this value, or you require a lower value, the quantities of alkaline substances should be reduced, or removed when the desired values are reached.

2. Add sodium bicarbonate into the water. If this method is selected the Carbonate Hardness will be increased. Such hardness changes are very rapid and so, should never be undertaken in aquaria where fish or plants are present. Instead, alter the hardness in a container before adding the water to the aquarium.

3. Adding marine salts or cooking salt will increase the hardness of the water. Care should be taken if you keep Rift Lake Cichlids as there is evidence to suggest that adding salt can increase the incidence of the disease, "Malawi Bloat". As with sodium bicarbonate, the salt should be added to the water before introducing it into the aquarium.

4. Use commercially available pH and hardness adjusters. If used correctly, such products will successfully adjust the hardness. However, they are very strong and will cause sudden changes when added to the water. Therefore, only use them outside the aquarium.

● If fish are present, hardness changes should always be undertaken very slowly. Just 2°dH per day.

COMMUNITY COLLECTIONS

HARD But easy...

Dr DAVID POOL of the Tetra Information Service with tips on hard water aquaria.

Most fishkeepers keep a community aquarium containing some of the more popular and widely-available fish and plants. In many areas of the country, however, the tap water is relatively hard and alkaline, either naturally or commonly now, because the water companies add lime to protect the pipes.

Such water conditions may make it difficult to keep fish such as Discus and Cardinal Tetras which prefer soft, acidic water, but there are many other species which thrive in harder more alkaline water. In this article we will look at which fish and plants can be kept in hardwater conditions, together with the problems that are most likely to occur.

What is hard water?

The hardness of water varies from region to region and reflects the quantities of dissolved mineral salts. When water falls as rainfall it contains very few salts and so is termed soft water. However, as it flows over rocks and soil, small amounts of salts are dissolved which increase the hardness. If these rocks are limestone or chalk, large quantities of salts are dissolved and the water is classed as hard.

The quantities of salts in the water can be easily measured using a test kit, which gives the water hardness in German degrees of hardness (°dH). Water which has a value of around 15-20°dH can be



There's more to hardwater fish than just the well-known Sailfin Molly.

regarded as being moderately hard, and over 20°dH or so, as hard.

Water hardness is conveniently divided into General and Carbonate Hardness. General Hardness is a measure of the quantities of magnesium and calcium salts (and is very close to the Total Hardness), whereas the Carbonate Hardness is a measure of the metal carbonates and bicarbonates.

The General Hardness is usually the value that is quoted in the literature when the needs of the fish are described. However,

the Carbonate Hardness is also important as it acts as a buffer to prevent sudden changes in pH. Consequently, in hardwater where there are large amounts of Carbonate Hardness the pH is very stable.

The pH of a body of water and its hardness are closely-related. This is largely because many of the metal salts which cause the water to become hard also tend to increase the pH (ie they are alkaline salts). So we find water that is soft and acidic, or hard and alkaline.

Problems with hard water

There are some problems that are specific to this type of aquarium. Though water pollution is a problem in all fishtanks, it can be particularly troublesome in hard water aquaria.

To understand why, we have to consider the first stage in the Nitrogen Cycle which involves the breakdown of organic waste (eg uneaten food, fish waste and dead fish) into ammonia (very toxic) or ammonium (non toxic).

These two compounds can easily change from one to the other, with the ratio of ammonia to ammonium being largely dependent on pH. Above a pH of 8.0 there are increasing quantities of toxic ammonia. With a hard alkaline aquarium, this means that even small quantities of organic waste will form toxic ammonia.

◀ FISH FOR THE HARDWATER AQUARIUM

There is a surprising number of fish which can successfully survive in hard, alkaline water conditions.

Mbuna

Rift Valley Cichlids have become increasingly popular in recent years largely due to their intense colouration, interesting behaviour and the relative ease with which they breed.

The cichlids living near the rocky outcrops in Lake Malawi, or the Mbuna as they are known, make particularly good aquarium inhabitants. These cichlids are very territorial and will aggressively defend a small area within the aquarium.

To overcome this problem it is often recommended that the tank be slightly overstocked. In this way the dominant individuals spread their aggression over a greater number of victims, preventing any single fish being excessively attacked.

Introducing one male and one female of a particular species can also lead to these troubles, with the male constantly courting or bullying the female. It is therefore wise to stock one male and two or three females. Adding more than one male is also asking for trouble, unless the aquarium is sufficiently large.

In the wild the Mbuna live around rocky outcrops and will defend small holes and caves in these rocks. In the aquarium it is advisable to have more caves than fish, so that each fish can

Decorating the aquarium

The choice of decor is up to the individual fishkeeper and depends on personal taste, and the needs of the fish being kept.

Rockwork is always popular in aquaria, and is particularly suitable in a hardwater aquarium where if anything it will help to maintain the high pH and hardness.

Consider the fish you intend to keep before introducing the rockwork. Some species, such as the Mbuna Cichlids from Lake Malawi or the Blind Cave fish from Mexico, benefit from plenty of rockwork with abundant caves.

In these cases the rocks can be built up until they reach the surface. Silicising the rocks together is a sensible precaution to prevent them falling and smashing the glass, particularly if you are keeping cichlids that dig.

Rainbow fish and livebearers, on the other hand, prefer large areas of open water for swimming and so few rocks should be added.

Certain plants are well-suited to living in hardwater conditions and can be included in the aquarium, though your choice of fish may limit which plants can be added. Some plants like Java moss will actually take up carbonates and soften your water.

The algae-eating Mbuna from Lake Malawi, for example, will readily consume soft-leaved plants as a part of their vegetable diet.

The use of bogwood is not advisable, unless it has been carefully treated to prevent the release of peat extracts and humic acids. Several coats of a non-toxic waterproof varnish should seal the bogwood, making it safe.

have its own cave to escape into.

The Mbuna feed on algae, and the invertebrates contained in them, in the wild. To keep them in good condition it is important to reproduce this diet, and in particular, to ensure that there is a vegetable component in the diet.

The use of vegetable-based flake foods or lettuce leaves and peas, together with the regular diet of specialised flaked cichlid food, will keep the fish healthy in captivity.

The choice of cichlids is very wide and the fishkeeper should consult a knowledgeable local dealer for advice. Other fish can also be introduced.

Many fishkeepers keep

Synodontis species such as *S. multipunctatus*, *S. angelicus* or *S. njassae* with their Mbuna collection. These species are some of the few that can withstand the aggressive behaviour of the cichlids.

Most of the Mbuna cichlids are mouthbrooding species which means they raise the eggs and fry to the free-swimming stage in their mouths before releasing them. Not only does this improve the survival of the fry, but also provides a very interesting spectacle for the fishkeepers. Spawning usually occurs in the caves, with the eggs being taken into the mouth of the female immediately. If the fishkeeper

wishes to raise these fry it is advisable to remove the female and fry to a different aquarium. Otherwise the constant contact with other fish can cause the female to eat her fry.

Rainbows

A more peaceful selection of fish for the hardwater aquarium could include the Rainbowfish. These fish from Madagascar and Australia, include the Madagascar Rainbow (*Bedotia geayi*), Celebes Rainbow (*Telmatherina ladigesii*), New Guinea Red Rainbow (*Glossolepis incisus*) and the Dwarf Australian Rainbow (*Melanotaenia maccullochi*). All are peaceful shoaling fish which can be kept together or with other fish species.

The Rainbowfish are particularly susceptible to raised levels of ammonia, nitrite and nitrate in the aquarium. Even low levels of pollutants result in the fish being very lethargic and susceptible to disease.

Careful aquarium hygiene and regular water changes are therefore essential. In the wild, considerable quantities of algae and vegetation are consumed. This vegetable component is important if the fish are to remain healthy. Fish that are not given such a diet are known to behave unusually, not breed, and in severe cases may even die.

If the diet and water quality are correct, it is relatively straightforward to spawn the Rainbowfish. The fish tend to spawn in groups, with the eggs being scattered among plants and on the substrate. In most cases the parents are not great egg eaters, but it is advisable to remove them soon after spawning to help maintain perfect water quality.

Other species

A hardwater community need not concentrate on one group of species as in the previous two examples.

A mixed community containing livebearers such as Sailfin Mollies and Swordtails, together with Blind Cave Fish and Rainbow fish will happily live together and provide an interesting aquarium.

● If you are in doubt about the compatibility of certain fish ask your local dealer who will be able to suggest numerous possibilities. ■

FISH SUITABLE FOR THE HARD WATER AQUARIUM

Fish Species	Common Name	pH	GH	KH
<i>Poecilia sphenops</i>	Black Molly	7.7-8.0	10-18	5-10
<i>P. latipinna/velifera</i>	Sailfin Molly	7.5-8.0	10-18	5-10
<i>P. reticulata</i>	Guppy	7.5-8.0	10-18	5-10
<i>Xiphophorus helleri</i>	Swordtail	7.5-8.0	10-18	5-10
<i>Melanotaenia maccullochi</i>	Dwarf Rainbow	7.5-8.0	10-18	5-10
<i>Bedotia geayi</i>	Madagascar Rainbow	7.5-8.0	10-18	5-10
<i>Telmatherina ladigesii</i>	Celebes Rainbow	7.5-8.0	10-18	5-10
<i>Brachygobius xanthozona</i>	Bumblebee Goby	7.5-8.0	15-18	5-10
<i>Chanda ranga</i>	Indian Glassfish	7.5-8.0	10-18	5-10
<i>Astyanax mexicanus</i>	Blind cave fish	7.5-8.0	10-18	5-10
<i>Pseudotropheus zebra</i>	Zebra cichlid	8.0-8.5	4	7
<i>Melanochromis auratus</i>	Golden Malawi cichlid	8.0-8.5	4	7
<i>Lamprologus brichardi</i>	Lyretail cichlid	8.5-9.0	9	17
<i>Juliidochromis marlieri</i>	Golden Julie	8.5-9.0	9	17

More information?

The following books will provide a useful starting point.

Rainbow fishes of Australia and Papua New Guinea by G Allen and N Cross (TFH Publications Inc.)

Aquarium Atlas by R Riehl and H Baensch

A Fishkeeper's Guide to Livebearers by P Scott (Salamander)

The Cichlid Aquarium by P Loiselle (Tetra)

ADI 41 Rift Valley Cichlids (Tetra)



PLANTS SUITABLE FOR THE HARD WATER AQUARIUM

Indian Fern (*Ceratopteris thalictroides*); **African Spear Leaf** (*Anubias barteri*); **Java Fern** (*Microsorium pteropus*); **Java Moss** (*Vesicularia dubyana*); (*Vallisneria* spp); **Hornwort** (*Ceratophyllum demersum*); **Amazon Swords** (*Echinodorus* spp); **Onion Plant** (*Crinum natans*), (*Sagittaria* spp); a few **Crypts** (eg *Cryptocoryne ciliata* and *C. affinis*)

Top: Medium hard water is the requirement for the Madagascar Rainbow *Bedotia geayi*.

Left: Specimens of the New Guinea rainbow, *Glossolepis incisus* can be found in all shades of red from rusty orange to almost black.

Right: The Celebes Rainbow, *Telmatherina ladigesii* is also known as the Celebes Sailfish on account of its beautiful trailing fin filaments. It can actually be kept in brackish water.

All rainbowfish pictures by Max Gibbs of the Goldfish Bowl, Oxford.



■ Fish and gas

Our house is currently being surveyed for Radon gas for the second time. The first showed that our summer level was above the action level. We are now checking the winter level which is even higher than before.

Is the Radon gas likely to be having any effect on my fish?

G. Mills, Devon

Radon is an inert gas. This means it doesn't react with anything, or dissolve in water. So there is no danger to the fish. The danger is not in the gas but the radiation it gives off... the fish are more protected from this in their water than you are. DF

■ Not a bubble-nester

I have an 8" pink Gourami which looks like the Moonlight variety. It is living in a tropical pond of 150 gallons containing Angelfish, a Butterflyfish, and a Plec. The Plec is 10" long and keeps harassing the Gourami. What should I do?

Please could you give me any information on the Gourami?
Hambali Leonardi,
Singapore

There are two morphs of the species *Helostoma temminckii*, the Kissing Gourami - a pink variety from Java and a green form from Thailand. Both forms have been bred for many years in the Far East fish farms and Florida for the trade.

It requires a roomy tank, so a tropical pond is ideal. They are tolerant and peaceful although they will mouth wrestle, the weaker giving way with no damage.

It's difficult to sex this fish, but a shoal in a pond should breed. They do not build a bubble-nest, so float lettuce leaves to catch the floating eggs pressed from the female by the male. The fry can sieve plankton through their gills as food, so pond-raising is ideal. In the aquarium cooked vegetables are used because the fish are partly herbivorous.

As regards the Plec, any fish can become a bully - all you can do is remove it. DF

Tropical Answers



The Black Widow Tetra is more attractive in its juvenile form, as the black tends to turn grey with age.

How do I breed Black Widows?

Q Please could you give me some information on breeding the Black Widow Tetra?
• Kayleigh Hughes, Lincs.

A The Black Tetra, or Black Widow is a peaceful community fish which reaches a length of 2.5". It prefers a

temperature of 72-80°F. A long-finned version is available.

The female is larger at the rear than the male and she lacks the white spots which are present on the caudal fin. The pair should be placed in a separate tank of about 18" length with plenty of feathery leaved plants in which they will

scatter their very small, transparent eggs. Condition them with live brine shrimp prior to breeding.

After spawning, remove the parent fish. The eggs will hatch in about 24 hours and the fry become free-swimming three or four days later. Feed them on newly-hatched brine shrimp or rotifers.

To salt, or not to salt...

Q I have a pair of Mexican Sailfin Mollies in a three foot brackish set-up. I have been told that this particular variety of Molly will be perfectly happy in a freshwater tank. Is this correct, as I would very much like to move them to my community set-up?
• L. Harris, Leics.

A As with the short-finned variety of Mollies, Sailfins are happier in an aquarium containing salt. They can be kept in freshwater tanks, but the water must be kept scrupulously clean to avoid fungal infections. In addition, the Sailfin varieties are prone to bacterial infections in their fins if the water conditions are not up to scratch. This may prevent the large dorsal fin from developing properly.



Sailfin Mollies may suffer bacterial damage to their extensive finnage if the water conditions are not to their liking.



Gouramis and Bettas can usually be kept together without squabbles.

Males prefer fatter females

Q I have a three foot tank with a Siamese Fighting Fish and a Three-Spot Gourami among other fish. Whenever the Fighter appears in open water all hell is let loose between it and the Gourami. Is this common between labyrinth fish?

A Please could you give me some information on breeding Siamese Fighting Fish?

• Simon Aunt, Herts.

A There is no special enmity between Gouramis and Bettas. However, any species can become a bully and it sounds as if you have two. Perhaps it would be wise for you to swap one.

Bettas will breed in quite a small aquarium. It should be half full so there is plenty of warm, moist air overhead - especially at the fourth week when the fry fill their labyrinth organs ... if chilled they all die.

Place a young vigorous male in the tank and let him build bubble nests with floating plants to help. Keep an older female separately. If well-fed she should swell with eggs. The fatter she is the better the male will treat her. When he has squeezed the eggs from her you should remove her, otherwise she will be attacked. Let the male look after the eggs until hatched. Then remove him.

Feed the fry on freshly hatched brine-shrimp and crushed flake.

Don't forget that Bettas are annual fish and any lifespan of over one year is a bonus. **DF**

■ These Cichlids prefer plants

I purchased four young *Herotilapia multispinosa* in the summer. I have them in a three foot tank. At the moment they are 2" long. Please could you give me some information on these fish?

Adam MacPhee, Fife

Herotilapia multispinosa is a small (up to 12cm) Central American Cichlid which is easy to keep and breed. Its popular name "Rainbow Cichlid" reflects its variable colouration.

It is unfussy in its requirements but prefers moderately hard, alkaline water with a temperature in the upper 70'sF.

A three foot tank should be regarded as a minimum size for an adult pair. As you have four, then you will need to thin them out as a pair forms, as your tank will not be large enough for two conspecific males. If the spares turn out to be females you may be able to keep them all, but they are likely to be chivvied rather mercilessly at breeding time. You will know if you have more than one male by the fighting that will ensue. It is not easy to sex these fish when young, but fully grown males are appreciably larger than females and generally develop a slight hump on their forehead. They also have longer extensions to the dorsal and anal fins.

The tank should be equipped with plenty of caves. Pebbles should be placed around the bases of plants to stop them being uprooted. These fish do prefer plant life.

Natural diet consists of small aquatic organisms, such as insect larvae and these, or their frozen equivalent, should form part of the captive diet. They will also readily take flake and pellets, beef heart, liver and mussel. They relish earthworms. Newly swimming fry should be given *Artemia* nauplii or microworms as a first food.

If you want to keep other fish with them, go for some of the larger, more robust community species, such as Barbs and Sharks. Catfish will probably eat the eggs. **MB**

What killed the Angels?

Q Two months ago I purchased a 48" x 18" x 24" tank with a built-in trickle filter.

I introduced three Black Mollies and two Angels after the tank had matured.

After a couple of weeks I purchased two Gold Marble Angelfish and six Cardinal Tetras. Within three days the new Angels were dead, closely followed by the two I had previously.

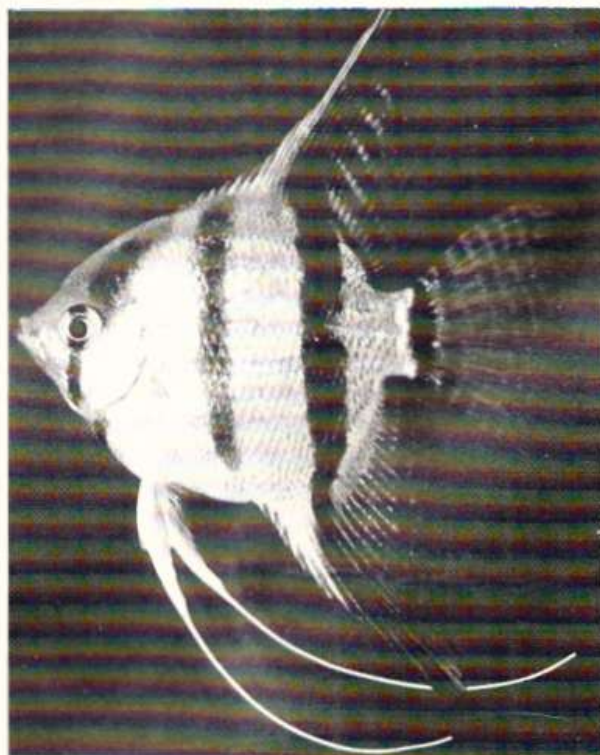
Before they died the Angelfish gasped at the surface for air, so I tested for ammonia and nitrite but these were fine. Then the Angels began to lose control of their movements and bobbed around on the bottom of the tank unable to swim. They began to lose scales, though there was no obvious sign of disease or red areas. Gill movements increased until they eventually died.

I purchased six more Cardinals and some Barbs. These and the other fish were perfectly healthy. So I introduced another two Angelfish. These were dead within a few days. I asked the shop owner if he had any ideas, but he told me he'd had no problems. On investigating his tank I found that the bottom was covered with scales.

Could you give me any ideas as to the cause. Will I have to start again from scratch?

• D. P. Green, Worcs.

A I think you may have experienced the nasty Angel Disease which has been affecting Far Eastern bred stocks for the past few



The Angel Disease does not affect other species, but there is no known cure.

years. There is no known cure. The littering of scales in the shop suggests the dealer was aware of the problem and it might be prudent to take your custom elsewhere in future.

The disease, as far as I know, does not affect other fish. However, your tank may be carrying the infection. Given that there is no

cure for the disease I cannot suggest a method of sterilising the tank and there is little point in trying random chemicals without knowing the pathogen involved.

I suggest you avoid keeping Angels for about six months and then try again with just one from a reputable source. **MB**

■ Large tank is too small

After setting up a successful three foot tank, I decided to buy a 48" x 18" x 18". I would like to keep a Giant Gourami, or four Red Bellied Piranhas.

If I choose the Gourami, will a four foot tank be big enough?

D. J. Barnes, Cumbria

Considering the Giant Gourami reaches a length of almost two feet, your 48" tank would not be large enough for an adult, although it would house a youngster. Where will you house it when it reaches adulthood? For a fish of this size, I would consider a tank of 2m x 1m x 1m minimum.

Your desire to keep a shoal of Piranha is, I am afraid, also not a good idea. Piranhas are predatory fish and any attempt to keep them in a shoal would gradually see their numbers decrease as they eat one another - this also applies to any fish kept with them. In my experience, they are best kept by themselves. PD

■ Take them back...

I have a medium sized community tank housing Neons, Pearl Gouramis, a Kissing Gourami, two Clown Loaches and a Flying Fox. I have just added two *Pseudotropheus lombardoi*. Please could you tell me what other Cichlids I can keep in the tank?
Ian Warner

The best advice I can give you is to take the *lombardoi* straight back to where you got them from as they are totally unsuitable for your community tank.

These fish are Mbuna, from Lake Malawi and they require hard, alkaline water which is very clean and well-oxygenated, with huge amounts of rockwork forming caves. They need to be kept with plenty of other Mbuna in a tank of at least four feet in length.

If you want to keep Cichlids with your fish, then go for dwarf species, such as *Kribensis*, *Thomasi*, *Nannacara* etc. Or, if you are prepared to provide soft, acid water, you could try Rams. You can keep *A. cacaotoides* in hard water as long as your pH isn't too high.

The number of Cichlids you can keep will depend on the size of your tank - a pair of *Kribis* will need a territory of 24" in order to set up home and breed. MB



Only mature male *Ancistrus* develop the characteristic nose bristles.

Males have the bristles

Q Please could you give me some information on Bristle Nosed catfish as I have just purchased one for my community tank. A friend of mine said that the females do not develop bristles. If this is true then I have a male. Please could you tell me if it is possible to breed them?

• Chris Stevens, Surrey

A The Suckermouth or Bristle Nosed catfish (*Ancistrus*), from South and Central America are ideal for the community aquarium as they are not predatory and often breed in captivity.

There are well over fifty species ranging from Panama down to Argentina. They are very difficult to identify from each other without exact information, such as which river they have originated from.

Mature males develop head bristles as they come into breeding condition and dominant fish will chase off contenders for the ripe females in a way reminiscent of stags with their antlers.

Most species reach 4-6" and will spawn in aquaria when they are 75% grown.

You should provide them with a regular supply of spinach, peas, fine shrimp and frozen bloodworm. DS

Problems of pollution

Q I am writing to you regarding what I think is a bacterial problem. I have twenty-four pairs of breeding Angels. Some are showing blood-lines at the base of their fins. They are still breeding and eating normally. I have been producing about 3000 fry every 2-3 weeks but their survival is nil. They are dead within three days. I rear them artificially using standard procedures.

I have tried Myxazin, Bacteriad and medicated flake. I've cleaned all my hoses and pipes. I do a 20% water change every week. My tank bottoms are bare and they are spotless. The central filters are cleaned monthly.

I am beginning to think I have been treating the wrong thing. Some of the fish have bloated stomachs and these are being treated with Octozin.

I would add that I have had no deaths in my breeding stock and that the red lines have been evident for four months.

• R. Moggie

A Red marks at the base of fins is generally a sign of bacterial problems. It's no use treating with chemicals as the problem will not go away until you find the root cause. This will almost certainly be polluted water in your tank. In fact the use of bactericidal treatments may well only make the problem worse as these will destroy the useful bacteria which convert waste products to relatively harmless nitrates. The bloated stomach could also be caused by poor conditions, or an unsuitable diet, especially if you are feeding them heavily on dried foods.

Take care when you clean your filters. If you are too thorough you will again be removing the useful bacteria. It is quite possible that the problems you are experiencing are not due to a pollution problem, but to the repeated stress resulting from over-enthusiastic filter cleaning.

Test your nitrate level. If this is high, make 20-25% water changes daily until the level becomes acceptable. Any response by the fish may be slow. Any further treatment with chemicals can be done in a sterile hospital tank so as not to damage the filters again.

Your fry may be dying as an extension of your other problems. It may also be due to an incorrect diet. Use *artemia* nauplii rather than infusoria and liquid fry food. Microworm is also acceptable. MB

Hatchets are a good idea

Q I have a 36" x 12" x 18" aquarium in which I would like, if possible to keep the following:

Four Blue Discus, three Angels, three *Corydoras hastatus*, ten Cardinal Tetras, twelve 'normal sized' *Corydoras*, one *Hoplosternum*, one Plec and four Marbled Hatchetfish.

The tank is planted with Vallis, Amazon Swords and Java Fern. I intend to wait a few months before adding the Discus.

Will this set-up work?

• Ross Burreddge, Dorset

A You are working along the right lines, though please make sure you get a very small Plec, as a big one will probably frighten the life out of your Discus, even if it does nothing but sit there. They should get used to a small one and not mind too much

when it grows.

So long as your tank is mature, I would add the Discus immediately. If you add them to an established community tank, they may feel threatened as strangers in a tank full of fish. It's better to add the Discus first and then introduce the other fish.

If you want to breed the

Discus, you may need to thin out the population and remove the catfish and the Plec, as these are liable to eat the eggs.

Incidentally, the Hatchets are an excellent idea - they are very sensitive to metabolic wastes and will act as a 'barometer' of tank conditions. Make sure you have a tight-fitting cover, as they are liable to jump. **MB**



Hatchetfish are good indicators of water quality, as they require optimum conditions to do well. Make sure your tank has a hood - they are excellent jumpers.

Red light for go?

Q I have recently invested in two catfish which I have rarely seen and the rest of my family do not believe exist.

I have heard that fish are unable to see red

light and I have been considering placing a sheet of red, translucent perspex between the lighting tube and the glass tank top in the hope that the fish may become more active. What do you think?

• T. P. Hoskins, East Sussex

A I have heard of red light being invisible to catfish and I have tested a light bulb, intended for submarine use. I can't say it helped much.

Catfish prefer subdued lighting (one side of the tank shaded from light helps) but the fact remains that most of them are nocturnal. **DS**

Catfish are nocturnal and it's not always easy to tempt them out during the day.



■ Nipping leads to finrot

I have a six foot community tank which has been in operation for five months. During this time I have frequently lost fish. The majority of the symptoms appear to be bacterial in nature and indicate poor hygiene in the tank.

Three of my four Silver Sharks died after displaying fin damage and reddening at the base of the fins. I have also lost a *Corydoras* and have recently had to separate a male *Betta splendens* from the rest of the fish.

Anomonia, nitrite, nitrate, pH and hardness are all at recommended levels. Regular water changes are carried out and the tank is by no means overcrowded, as I only have about twenty small to medium sized fish.

What do you think is the cause?

S. P. Holmes, London

Although you do not indicate which community fish your aquarium houses, I would hazard a guess that the root of your continued deaths lies in one or more of your fish being a fin-nipper. Most, although not all damage to fins can usually be traced to this diagnosis.

Once damaged, the ragged fins are usually susceptible to finrot. Usually finrot is often associated with other factors such as rough handling, poor water quality, overcrowding, fighting and feeding problems. Treat the symptoms with a commercial based medication and the cause of identifying the potential fin-nipper. **PD**

■ Floating plants

I would like to breed Dwarf Gouramis and I wish to use floating plants for them to build their bubble-nests with. Please could you tell me which types of plant would be the most suitable? P. Davies, Oxford

You could try Azolla, Lemna, Pistia or Salvinia. These plants also provide excellent refuges for live-bearer fry. Don't use a condensation tray with floating plants, as the drops of water can spoil the leaves.

■ No way of escape

Recently I purchased a pair of *Kribensis* and have housed them in a small tank measuring 18" x 10" x 10".

Please could you give me some information on these fish?

M. Waters, Devon

Kribensis are good breeders and attentive parents. Give the pair a cave in the form of a flower pot. A clay pot is best.

The pair will spawn in the pot and the fry will stay in the cave after hatching until they are free-swimming, then the pair will lead them out.

The fry are quite large and will take crumbled flake straight away. Freshly hatched brine shrimp aids growth too.

You will soon find your tank is too small for the growing family. Additionally, beware of the female spawning again. If she starts swelling with eggs and the male gets a glint in his eye, remove the fry. The parents will chase away the old family to make way for a new one. In an 18" tank the older fry may well be killed by the parents as there is no room for escape. DF

Crowd them out

Q I have recently dismantled a marine tank and I have a quantity of tufa rock which I would like to use in a three foot bow-fronted species tank for Mbuna (preferably *Pseudotropheus zebra* or *Pseudotropheus socolofi*.) Filtration will be by undergravel method.

I understand Mbuna should be crowded. How many can I keep? I am not at present interested in breeding.

• J. Page, Walsall

A A three foot tank is the absolute minimum for

Mbuna - and then only if the more peaceful species are kept. Both *P. zebra* and *P. socolofi* should be fine.

Mbuna should be crowded to reduce the capacity to hold territory. I would happily put about fifteen 4" Mbuna in your tank.

If you buy juveniles you must be prepared for a World War III equivalent when they reach maturity as there is a tendency for young males to go slightly berserk when they first "feel their oats".

There is little you can do about this, except to allow a few extras for wastage and a prison tank for any Attila-the-Hun that goes too far - prison for the aggressor is better than hospital for victims, as it is



Pseudotropheus socolofi should be crowded to reduce territoriality.

easier to re-introduce a strong fish than a weak one. The strong fish is better equipped to withstand the aggression released against any such intruder. MB

Give it earthworms

Q About eight weeks ago I bought a couple of Two-Spot catfish which have settled into my tank well. Please could you give me some information on these fish?

• Matthew Lawless

A The Two-Spot catfish, *Mystus micracanthus*, is one of the scale-less *Bogridae* family.

It grows to around four inches in length and is one of the most attractive of this large genus. They are exported from Indonesia and Singapore and will thrive on a shrimp and earthworm diet, providing they are given spacious conditions and bright, fairly neutral aquarium water.

All *Mystus* are predatory but smaller species are fine for a medium-sized fish community aquarium. DS

Red varies from fish to fish

Q About a month ago I purchased a Red-Bellied Piranha which was no bigger than my finger nail. It's now about 1.25" long, but has not yet developed its red belly. I was told that the growth rate of the fish was slow. I know that they may exceed 12" in the wild, but how big do they grow in captivity?

Its tank is three feet in length and heavily planted, with soft, acidic water with a pH of 6.8. I carry out two water changes a month. I have a 48" tank. Would this be better for the fish?

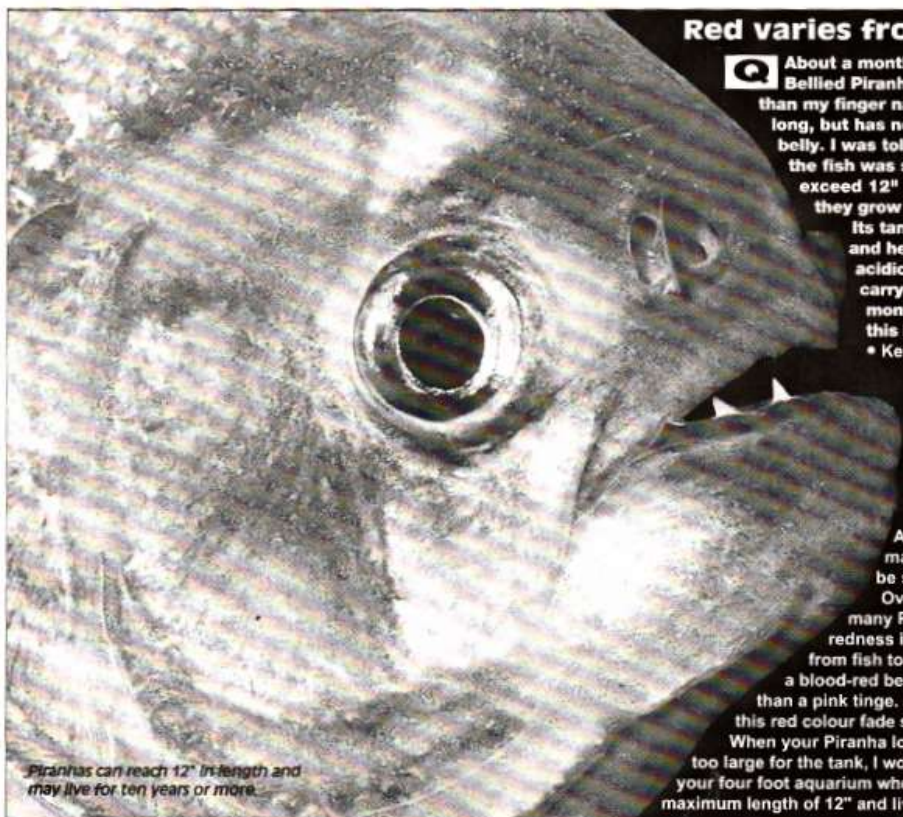
• Kevin Coxon, Co. Durham

A The growth rate of your young Red-Bellied Piranha should be quite rapid during the early stages of its growth cycle, particularly if it is fed on a diet of earthworms and fish.

As it begins to reach maturity, its growth rate will be slower.

Over the years I have kept many Piranhas and the degree of redness in the belly varied widely from fish to fish: while some developed a blood-red belly, others showed little more than a pink tinge. In any case, maturity will see this red colour fade somewhat.

When your Piranha looks as though it is growing too large for the tank, I would suggest you move it to your four foot aquarium where it should reach its maximum length of 12" and live for about ten years. PD



Piranhas can reach 12" in length and may live for ten years or more.



Corydoras sodalis, as shown here, can be distinguished from *C. reticulatus* by the missing spot on the dorsal fin and its lighter pattern. Both species have the same requirements.

A good impersonation

Q I have three *Corydoras*, which I originally thought were *C. reticulatus*. It now appears I have *C. sodalis*. I don't know anything about these fish. Please could you give me

some information?
• Jonathan Watts, Herts.

A *Corydoras sodalis* is often confused with *reticulatus*, which it mimics. *C. sodalis* has a lighter reticulation

and lacks the dark spot in the dorsal fin. The two fish have very similar requirements and both reach an average size of about 2". They prefer neutral to slightly alkaline water and are generally hardy and undemanding.

Neon disease in Danios

Q I am writing in the hope that you can shed some light on what killed all but one of my Zebra Danios.

I have a four foot tank filtered by a Marathon 400 external filter. pH is neutral, nitrate levels are negligible and hardness is 4°dH.

All was well until a couple of months ago when I introduced four new Zebra Danios to the tank, to expand my existing group of three. Twenty four hours after introduction one of the new fish had died followed by another two days later. The symptoms were a white discolouration on the right side of the body mid-way between the head and dorsal fin which turned into an open sore after 24 hours. Then the fish died.

This has now spread throughout my Danios and I have just one left. Only one was affected at a time and none of the other fish suffered any ill-effects. The tank includes Clown Loaches, Tiger Barbs, Black Neons and Blackline Tetras.

After the first two Danios died I used a general tonic which seemed

to work for a few weeks, but then the problem re-occurred.

Please could you give me any ideas?
• C. Sells, Plymouth

A If you have not suffered from a disease outbreak before the introduction of the new batch of Danios, it sounds very much as though your fish could be suffering from 'Neon Tetra Disease'. Don't be thrown by the name - this disease is not confined solely to Neon Tetras, but will affect Danios and most other Characins.

The parasite responsible for the disease is *Pleisophora*. It affects the fish by destroying muscle tissue and when this is evident, the skin takes on a whitish appearance.

Pleisophora forms spherical cysts and when these burst, they release spores through the skin into the water. These are then ingested by the other fish and the cycle begins all over again.

As for treating the disease, most cures prove ineffective, however some success has been achieved with furazolidone, which is available from your vet. All fish suffering from the disease should be separated during treatment. If they do not respond to treatment they should be painlessly destroyed.

Strip down your aquarium and give it a thorough disinfection. Rinse it and allow it to dry. When you set it up again, use new decoration and buy any new fish from an alternative source. PD



Don't be thrown by the term 'Neon Tetra Disease'. It will affect Danios and most other Characins.

TROPICAL ANSWERS is our FREE reader service designed to help YOU get more from your hobby

■ Answering general queries are DR DAVID FORD, Senior Consultant to the 'Aquarian' Advisory Service, and NICK FLETCHER.

■ Plant problems are the realm of BERTI GESTING of Aquatic World.

■ Cichlid fans deal with MARY BAILEY, treasurer to the British Cichlid Association.

■ Discus queries go to STEVE DUDLEY of Euro-Discus.

■ For all your "Oddball" queries, you can now write to PAUL DONOVAN.

Just tick the appropriate box below and attach the coupon to the front of your letter. Send with SAE to: Tropical Answers, Practical Fishkeeping, Bretton Court, Bretton, Peterborough, PE3 8DZ.

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TROPICAL ANSWERS

- General queries
- Plants; Berti Gesting
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- Cichlids; Mary Bailey
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TROPICAL INFORMATION ■

Tantalising Tanganykans

MARY BAILEY endured many frustrating years before she bred *Tropheus duboisi*. Now we can learn from her experience.



A pair of young still white-spotted *Tropheus duboisi*.

Many years ago (rather more than I care to remember!) when I first became interested in cichlids, I fell in love with *Tropheus duboisi*, at that time available to hobbyists only in photo form - and then only rarely!

The friend who was guiding my first faltering steps in fishkeeping told me to forget it; they were not available, and, like the Lake Malawi Mbuna, they were so aggressive as to be quite impossible to maintain in the aquarium. Telling me that something is impossible is the best way to get me to try to do it; and the existence of a photo of a juvenile in a German hobbyist's tank proved to my satisfaction that it could be done.

But there was no way round the availability problem, so I had to content myself with proving that Mbuna were possible as an interim measure.

First duboisi

In the mid-seventies a dealer with whom I had become friendly told me that his wholesaler had managed to obtain three *duboisi*, and that I could have them at the wholesale price of £40 for the three. That was a lot of money at that time, but as the retail price in Germany was the equivalent of about £80 each, I leapt at the chance. I would probably have mortgaged my soul to raise the retail price if necessary. As far as I know these were the first *duboisi* to reach the UK, and they were the recently-discovered "Yellow Band" variety.

They were just as beautiful as I had imagined; one, which I subsequently realised was female, still had a lot of her spots. The two males were fully adult.

Rarely have fish been so pampered, and eventually I was rewarded with a spawning - the only problem was, although they went through all the motions, not a single egg was laid!

Then came disaster in the form of a sticking thermostat, and overnight my *duboisi*, and my best Mbuna, were no more.

It was another 8 or 9 years before I was again able to obtain some *duboisi*, this time two juveniles, of indeterminate sex, of the white-banded type.

Practical Fishkeeping/March 1992

Second duboisi - and success

Shortly afterwards I managed to outbid the opposition for a pair at a BCA auction. These four fish were introduced to my 48" x 18" x 18" Tanganyikan "community", until then a monoculture of *Neolamprologus brichardi*, the original two pairs having increased to two pairs plus a harem, all merrily breeding at regular intervals.

I had expected the *brichardi* to be nervous of the *Tropheus*, but in fact they attacked them without hesitation - and, luckily, without much damage - and the *Tropheus* were restricted to the upper levels for some weeks, until the *brichardi* realised that there were no designs on their fry.

There followed over a year of frustration during which the pair spawned repeatedly, with the female brooding for the five

weeks; normal in this species (and in other *Tropheus*) - but brooding eggs that did not hatch.

Towards the end of this period the two juveniles both proved to be females, likewise producing successive clutches of infertile eggs. Eventually I gave up in disgust and frustration, and concentrated my TLC on the *Apistogrammas* and West Africans which were by then my main interest.

Not long afterwards I was in the fish-house, feeding the multitude, and noticed a small dark fish lurking in the Tanganyika tank. An unhealthy juvenile *brichardi* was my first thought, so I sat down to watch, as such a fish can be the first sign of a tank going seriously wrong, and I prefer to nip any trouble in the bud. Then I realised that my "sick *brichardi*" was a little black fish with white spots. My joyous shrieks brought next door

running to see what I had done to myself this time, with a view to hospitalisation or warm sweet tea, as circumstances dictated!

Thereafter little groups of *duboisi* fry became a regular occurrence and I never tired of watching them, retaining the fascination that had been with me for some 15 years - and still is, even though I don't have this species at the present time.

Tropheus and mbuna?

It is quite normal practice to keep *Tropheus* with the more peaceful species of Mbuna, and although purists would disapprove, the mixture works quite well even though optimum water conditions are different for the two groups.

Both groups are mouthbrooders, and so there is no major behavioural conflict. In my experience, however, the two



One of the many colour forms of *T. moorii*.

Keeping Tropheus

T*ropheus duboisi* is restricted to the northern parts of Lake Tanganyika, and is known from three localities, each of which harbours a different colour form.

One is the white-banded type; the other two have a pale golden yellow banding, but in one the band is narrow, in the other rather broader. I know of no record of the different types being cross-bred, and must stress that it would be irresponsible to allow this, as the results would be unlikely to be any improvement on nature, and it is always best to keep the strains pure.

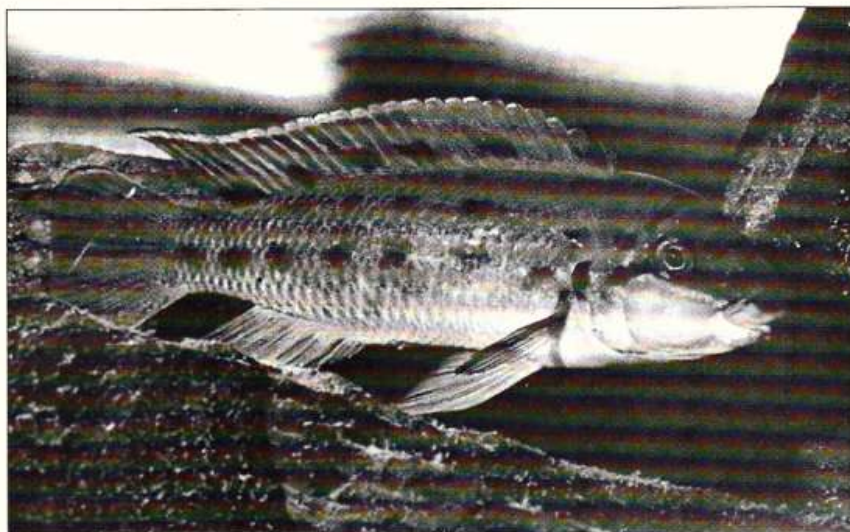
Forms of the closely-related *T. moorii* are found at all three localities, but *duboisi* is normally found at greater depths, and there is little contact between the two species.

Like other Tanganyikans it prefers rather hard (10 dGH or more) water with a pH ideally above 8; the pH must never drop beneath neutral or losses are likely, but hardness is not so critical, and mine were breeding happily at about 3dGH.

The water quality should be 100% (or better!), and maintained by good biological filtration and regular partial water changes.

A temperature of 78-80°F (25-6°C) will suit for both maintenance and breeding - this species is not a seasonal breeder, and so does not require a change of conditions to stimulate spawning.

The tank should be decorated with large piles of rockwork to simulate the natural habitat; the type of decor normally used for Mbuna is totally appropriate, as *Tropheus* are the Tanganyikan analogues of the Mbuna.



Compatible with duboisi - *Chalinochromis ndhoby*.

groups hardly interact at all when kept together, i.e. the Mbuna take little notice of the *Tropheus*, and vice versa.

I have tried keeping the rather more aggressive *T. moorii* in an Mbuna tank, in the hope that the Mbuna would provide sufficient distraction to prevent the *moorii* from harassing each other - but it doesn't work. The dominant *moorii* persecutes the others as if there were no other fish in the tank!

T. duboisi can, of course, also be kept with other Tanganyikans; if these are substrate spawners, however, care must be taken to respect the territorial requirements of the latter, and there must be a low overall population density so as to allow the substrate spawners scope for breeding. *T. duboisi* mixes well with the small rock dwellers with which it is sympatric in nature, i.e. *Julidochromis*, *Neolamprologus*, *Chalinochromis*, or *Telmatochromis*. Or it can be kept with other Tanganyikan mouthbrooders, always providing the tank is large enough to provide suitable habitats for all the species present.

T. duboisi does not naturally consume as much vegetable material as *T. moorii* - possibly because algae does not grow as densely in the deeper waters it inhabits. Its mouth is almost terminal - that of *moorii* is clearly an underslung slit designed for scraping - and more suited to a generalised diet.

It thrives on a mixed diet of meaty foods with some vegetable matter chopped earthworms, pond

foods (or frozen equivalent), beef heart, chicken, prawn, mussel, together with cooked peas and/or scalded lettuce/spinach. It will also readily take dried foods, but these should not be fed in bulk. Remember, these are very special fish and well-worth the extra effort!

Aggression

I have found this species to be relatively unaggressive though must admit to having heard reports to the contrary, some involving "my" fry when they reached adolescence!

Adolescent aggression is, however a common problem with tank-bred mouthbrooders, and adults are generally less combative. A combination of several females per male seems to work well, but I had no problems with a single female and two males - the "spare" male became a little frayed when the female first matured, but as soon as he gave up and left her to the dominant male he was ignored by both.

Sex

Sexing is a matter of practice - experienced *Tropheus* fans can do it "by eye" with ease, even with bagged fish. Males tend to be larger than females; females lose their spots later; females always retain their band, while fully adult males often lose theirs, especially in the white-banded form.

There is also a facial difference, apparent, it seems, only to female aquarists (who can almost always see it, but are

mocked by their male counterparts!), but none of us seems able to point to just what the difference is.

Spawning

Spawning takes place over a solid substrate - rock or gravel, or sometimes in mid-water, with the female catching the eggs before they "land". She then nudges the genital area of the male, ingesting sperm to fertilise the eggs in her mouth. There are no egg-dummies in this species, so there must be some other factor assisting in ensuring fertilisation.

The eggs are very large, and few in number - clutches are normally 1-6, with 10 being a huge brood. The eggs and fry are brooded for 35 days, and when the latter are finally released they are "enormous", a good 1" in length and quite capable of taking Grindal Worms or Daphnia as a first food.

It is not usually necessary to remove females from the community to brood, and it is far more fun to see the fry in a "natural" environment. They are fairly easy to catch when the time comes. Position the net a few inches above the water at one end of the tank, scatter a little flake, and a rapid sweep should secure several of the greedy little rascals. Repeat daily as necessary!

Infertility

The infertility problem is common in *Tropheus* - with tankbreds one can even say it is the norm.

Malawi bloat

As this species (as other *Tropheus*) is prone to the so-called "Malawi Bloat", it is better to avoid trying to increase hardness with any of the various "Rift Valley Salts", as these generally contain a significant amount of common salt (Sodium Chloride), which is believed to be a causative factor in Bloat.

If your water is "too" soft, it is better to harden it gradually by including some calciferous material (coral sand, crushed shell, limestone chips) in the substrate - and this is in any case a wise precaution, as it will buffer the pH and ensure it remains alkaline.

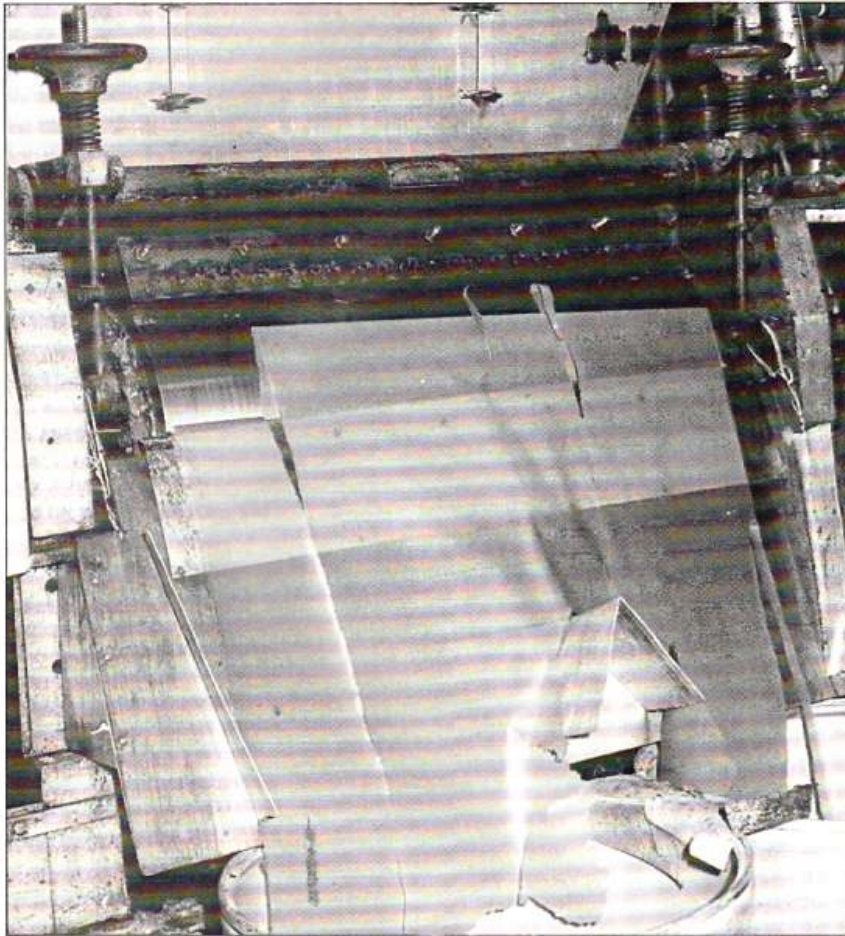
Do not feed flaked food to excess and concentrate on the balanced diet suggested.

There are various possible reasons for the problem: possibly females mature well before males, and while the latter appear to be performing their natural function, they may not be producing sperm. Perhaps young females do not instinctively seek out the genital area of the male for fertilisation. Eventually we may know the answer, but in the meantime the would-be *Tropheus* breeder must be prepared to be patient.

Because *T. duboisi* is not often imported from the wild, and because broods are so small, this has always been - and will probably continue to be - an expensive fish, especially if purchased retail.

It is, however, sometimes possible to buy fry at realistic prices from breeders who are happy to help out other hobbyists as long as their costs are covered. Some dealers may be prepared to accept a reduced profit margin on a special order with a guaranteed sale, especially if you collect the fish still bagged from the delivery. Even if you do have to pay a high price, the charm of the parents and the eventual reward of seeing those delightful fry in your tank makes it worth every penny. ■

There is a BCA Information Pamphlet on this species, price 50p + SAE from BCA (PFK) 7 Delamere Avenue, Sale, Cheshire.



FO A

How was your free food sample made - and what went into it? We visit the Bradford base of King British to find out.

What goes into a typical flake?

It may or may not be a sign of the times, but natural is the keyword for fish food ingredients. Meat is not used due to the BSE scare and exportation problems if it is.

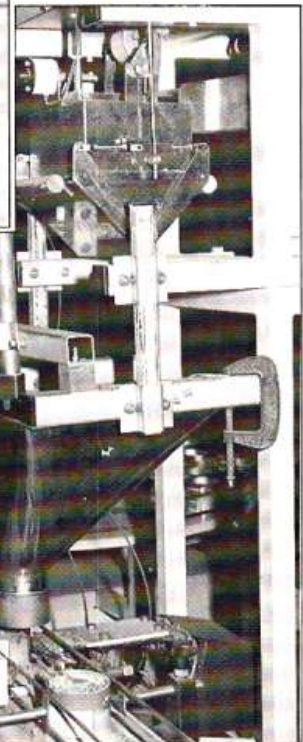
The need then, is for a natural protein, close to the real diet of the fish, and fish meal supplies most of this. Most tropical flakes offer around 47% protein (coldwater foods will contain rather less).

Fat or oil is needed to bind the product and for the fish's health. King British opt for Cod oil which also adds to the vitamin A and D content of the flake. Other vitamins are supplemented to further improve the flake.

You'll also see fibre and ash listed in the ingredients of many fish foods. Fibre is necessary to bind the flake together and can affect flake size and sinking speed; ash is simply the non-food products left after analysis.

Some fish also need a vegetable content in their food, and this has been supplied by sea weed in the past. This has too high a salt content, and the vegetable content now is largely spirulina algae and various cereals such as maize.

Even the colouring of foods (which is tailored towards the customer more than the fish - that is red for "meaty" food, green for vegetable) is natural, with carotin used for the reds for instance, and the natural spirulina algae green colouring the vegetable foods.



Top left: The emulsified flake flows onto hot rollers, is baked "crisp" then falls back and is split into the collecting vats. Setting up this machine calls for extraordinary accuracy.

Above: An automatic filler drops the sorted and blended flake into tins. Lids are then automatically attached.

GOOD FIT FOR KING?

Your free sample of tropical fish food this month comes from King British. The Bradford-based outfit, which now also owns the Uno company, famous for heaters and thermostats, makes a wide range of fishkeeping treatments along with their tropical and pond food ranges.

But it was livestock with which the firm began, and it still has a flourishing fish importation business, holding 50,000 fish at any one time, and importing three times a week.

All the remedies and foodstuffs are based on King British's experience with these fish, which is just as it should be. The fish are quarantined, treated and fed on King British products, which is a pretty good test ground.

Like every company King British has its trade secrets - but much of the following information is relevant to all flake foods. ■



Above: Every tin of food is now date stamped in accordance with new "Best Before" regulations.

Below: Your food sample being packed? Each packet contains a week's supply for ten tropical fish.



How is flake food made?

1. The dry ingredients are imported from all over the world. Fish meal, prawns, cereals, algae, vitamins etc., all arrive in a dry form which is carefully measured and blended then pulverised to the consistency of talcum powder.
 2. The ingredients are then emulsified to a very smooth paste. This is a sensitive stage of production when errors can easily be made. The mix must be perfect first time, and cannot be saved by adjustments.
 3. The emulsion is pumped to the rolling machine, where superheated rollers skim off and "bake" a thin wide flake which is split into collecting vessels as it's produced.
 4. The flake is then agitated on a vast vibrating tray which serves both to select the sizes of flake and to break the flake up.
 5. The various flakes are then collected and blended for the finished mix.
 6. The flake is packaged, sealed, and (a new requirement) date stamped, "best before".
- The finished product: British hobbyists prefer a large flake (which they then crumble into little pieces) and despite the illogical idea of fish feeding at the surface - which the vast majority don't do in the wild - they like floating food. King British once made a slow sinking food but it wasn't what the market had got used to.

All pet foods are subject to regular independent analysis to ensure that they contain what they say they contain.

TROPICAL INFORMATION ■

Main picture: Delicately interwoven
Lace Couramis - *Trichogaster leerii*.



Forever blowing bubbles

This month's gallery of popular tropicals features some members of the vast family of air-breathing labyrinth fish

How can we recommend members of the labyrinth fish family in this series which is, after all devoted to the most popular and easily-kept tropicals? Several of the fish on these pages have a reputation for aggression - and in one case predation second-to-none.

On the other hand, because of their air breathing ability and the wide-ranging temperatures that many of the Asian species will tolerate the majority of these fish are hardy tank subjects. Most of them are easy to breed, too - though the fry are often famously difficult to raise.

Gouramis

The best-known of these fish are the Gouramis, ranging from the mighty *Osphronemus gourami* (see Pete Trevett's feature this month) to the Pigmy Gourami (*Trichopsis pumilis*) shown on the next page.

Arguably the most popular of these is the Three Spot Gourami,



Trichogaster trichopterus a fish with prolific breeding habits. Line breeding has led to a wide range of colour variations (two of which are shown on these pages). This widely-distributed fish (found in Thailand, Malaysia, Java, Sumatra and Borneo) can reach six inches long, and prefers temperatures between 75 and 84°F.

The Lace or Pearl Gourami (main pic.) comes from the same regions, and is slightly smaller, reaching 4½".

Paradise Fish

Several species go under the name Paradise Fish, but the commonest and perhaps most attractive is *Macropodus opercularis*. This is a tough fish - tough in tank conditions and tough to live with. It will live in water between 59° and as high as 80°F, and survived the primitive tanks of the late 1800's when it first reached Europe.

Very aggressive - particularly the males and particularly at



Above right: A pair of Opaline Gouramis - one of the many *Trichogaster trichopterus* variations.

Right: A male Paradise Fish, *Macropodus opercularis*.

Editor STEVE WINDSOR starts a new series intended to gently ease new fishkeepers into the hobby.

Planning for TROPICAL

Taking up tropical fishkeeping need not be a traumatic experience. Indeed, with modern equipment and tank treatments, and perhaps most importantly, a little patience, your entry into the hobby can be smooth and problem-free.

This month we look at the essential planning that can avoid so many pitfalls. Your first question should be:

■ **What do I want from fishkeeping? Is it a simple, easily maintained room decoration.....?**

This basic question will immediately give you a few guidelines to help you in your choice of equipment. If all the care you want to give to your tank (or have time for) is a fortnightly water change, and a little cleaning, you probably have two very different choices.

OPTION ONE

You can set up a simple **community tank** with a gravel substrate, some rocks and plastic plants, and stock it slowly up to its limit with "bread-and-butter" easily-kept tropical fish. Whichever method of **filtration** you choose to use can be cleaned at the fortnightly **water change** -



"Think, too, about the viewing of the tank - will you be able to enjoy it in comfort?"



"Tank buster - The 'Jokey' name given to one of the fish that grows very large and requires its own tank - sometimes a tank of swimming pool proportions." Two mighty Snakeheads patrol a huge tank - definitely not for beginners.

and if you neglect this change for a week or two, you're unlikely to find yourself with major problems. Other maintenance will mainly consist of making sure that everything is working as it should in the tank.

OPTION TWO

You could also splash out on one of the many superb "systemised" tanks (a tank with built-in filtration, lighting, and heating). With most of these it really is almost a case of just add water and plug it in.

The advanced filtration of many of these systems may even make water changes almost redundant, confined to topping-up the system now and then. (But the difference in price between this and the first system, bought new, could be as much as £1,000. Simpler set-ups are far, far cheaper.)

.....or am I prepared to get more deeply involved in the hobby?

If you wish to make fishkeeping your main hobby then there are

How much water do some standard tanks hold; and what does water weigh?

2' x 1'	12.46 gallons	124lb (or 8 stone)
3' x 1'	18.69 gallons	186lb (or 13 stone)
4' x 1'	24.92 gallons	249lb (or over 17 stone)

- One gallon of water = 10lb
- One cubic foot of tank x 6.23 = capacity in gallons.
- The actual water volume in furnished aquaria may be up to 10% lower including gravel and other items.

no limits. While there are some fish that the beginner should not attempt to keep, there is no reason at all why you shouldn't actually begin your tropical fishkeeping with a simple **breeding project**, or a **planted tank** like an indoor underwater garden.

■ **Are there no basic rules for beginners, then?**

You can apply some of these after that "essential planning" we mentioned. First decide where your tank is going to be sited. Use plenty of common sense here. Your main concern is for stability, in both senses of the word.

- You need a flat, strong, stable floor or other surface to site your stand, cabinet or tank.
- And you need stable conditions in the environment. Keep the tank clear of: **extremes of heat**

or cold or rapidly changing temperatures; draughts; areas beset by loud noises or vibrations; fumes of any sort; strong sunlight; and obviously areas where it might be knocked or otherwise disturbed.

Think, too, about the viewing of the tank - will you be able to enjoy it in comfort?

Economy is important too. A conservatory may not be the ideal setting for many of the reasons mentioned above, and if your tropical tank is constantly in a cool area, the heater(s) will work overtime keeping the tank warm (though you could "lag" your tank on three sides with polystyrene).

Finally decide how much room you realistically have for your tank - consider depth, length, and height including any stand or cabinet.

for the L TANK

■ What are my basic considerations now?

Within reason, you should aim for the largest tank you can accommodate/afford. A six foot tank will be considerably more expensive than a three foot tank (disproportionately so it seems, until you realise that the glass has to be far thicker) but will be more stable, and possibly easier to maintain.

Equally you can set up a six footer with comparatively cheap equipment, and it will still be very useful should you wish to upgrade to a big fish or marine set-up, which even a three foot tank will not stretch to.

At the other end of the scale a two foot tank is the absolute minimum for worthwhile community fish projects, and a three foot is probably the optimum first choice. Of course not all tanks are oblong, and you can get the same water volume (and sometimes surface area which as we will see in this series is also important) from square or other multi-sided tanks; tanks can also be specially made to fit spaces.

REMEMBER

● Virtually all tank equipment is powered directly or indirectly by electricity, so you will need an electrical point near, but not within splashing distance, of your tank site.

● You'll also need room to get at the tank - particularly above and behind it - for routine maintenance.

● Will you have to cart water long distances to fill and empty the tank during maintenance?

● Avoid radiators, doorways, windows and windowsills, uneven or weak floors, fume-filled kitchens, (and bedrooms, if the sound of equipment working will disturb you).

● Do you want a piece of furniture? There are some well-made tank cabinets available in finishes to suit every room. Alternatively there are both very basic, and very stylish tank stands. If standing

the tank on an existing piece of furniture, don't forget the weight factor. As the box shows, a three foot tank weighs the same as the average man.

■ What about the cost?

Fishkeeping is possible on a budget. A second-hand tank, carefully inspected, is often a good buy (even a repairable tank can be worthwhile) while a new 3' tank can be bought for as little as £20. Allow £50 for other basic equipment and even some fish, and you're almost there.



"Do you want a piece of furniture? There are some well-made tank cabinets available in finishes to suit every room." The choice is enormous and may pose quite a problem if you don't know what you want.

We'll look at what you need, and why, next month, but these figures relate to a basic fishkeeping set-up, which will give you a functional display in your lounge and require minimal maintenance.

If your aim is a cabinet and tank allow £200 more. For serious planted tank projects; large scale breeding projects; or if you wish to keep a large tank-buster also allow £200 more.

System tank set-ups begin at around £500, but in most cases, they will be as suggested, easier to set up and maintain, and will allow you to gradually build-up to a high maximum stocking level, or keep difficult fish. ■

NEXT MONTH:
What is filtration and how does it work?

WHAT ON EARTH ARE?

B Breeding projects - Given the right conditions, a great many tropical fish are happy to spawn in the aquarium. It is actually quite difficult to stop some fish spawning, or dropping live young, while others may need careful care, feeding, and water conditions before they will be content enough to mate.

C Community tank - A community of fish is the fishkeepers' term for a compatible group kept in the same tank. They need not necessarily come from the same geographical area, but they will usually have matching requirements in water and feeding, and be non-predatory (with similar-sized fish) and fairly unaggressive. A community in its simplest form is what most fishkeepers start with - but a community need not be simple when for instance it consists of acid-loving fish like Discus and Neon Tetras; or hard-water requiring African cichlids.

F Filtration - Filtration is the simplest way of ensuring lasting good water conditions in your tank. There are many effective methods - but all ensure that water is passed through something (the media) with a resultant purification.

The most common methods, using gravel, or foam as the media, ensure that the water is mechanically filtered (loose particles are removed by the media) and biologically (bacteria build up on the media that break down the excretia of fish into less-harmful substances - see **Water changes**). More complicated methods use chemical filtration to remove noxious substances from the water. Advanced systems will have all three methods as standard, and even the simplest filter can usually be adapted to use all three.

P Planted tanks - Natural aquatic plants can be successfully grown in aquaria. Your approach to these can be simplistic - you stick the plants into the substrate and hope they'll grow; or increase in degrees of complication through proper lighting systems, fertilisation, gas injection, filtration, heating, and water quality to expensive, and often very effective set-ups.

S Second-hand tanks - These are often available, but do check them for any cracks or even chips, and if possible fill them with water before buying! Repairs are often easy to make, with a new panel of glass and/or silicone sealant. Always disinfect a second-hand tank with bleach or household disinfectant to see off any diseases, then rinse very thoroughly before use. After all why did the last owner stop using it?

Substrate - The material laid on the bottom of the tank, usually some form of gravel. In planted tanks it may be a "soil" and gravel mix; sand is suitable in some others.

T Tank buster - The "jockey" name given to one of the fish that grows very large and requires its own tank - sometimes a tank of swimming pool proportions.

Tropical - Not necessarily a fish from the tropics; a general term for a fish that will require some heating in its tank to live comfortably. That said, some popular tropicals owe part of that popularity to their ability to live comfortably in unheated tanks. In fact if you have effective central heating, your tank heater may be little-used in keeping your tank at around 74°F

W Water changes - An essential part of fishkeeping in all but the most advanced systems. As water is filtered - see above - the end product is nitrates. This substance is not harmful to fish at low levels, (and can be removed from freshwater tanks by chemical filtration), but is diluted by regularly removing up to 40% of the tank water, and replacing it.



Dr IGGY TAVARES has a simple and effective method of producing broods of beautiful Mbuna fry.



There is marked sexual dimorphism between the female *M. auratus* (left) and the male (right). This pic Max Gibbs, Goldfish Bowl, Oxford.

Simply spawning MBUNA



The female *P. lombardoi* could not be more differently marked than the male.

Practical Fishkeeping/March 1992

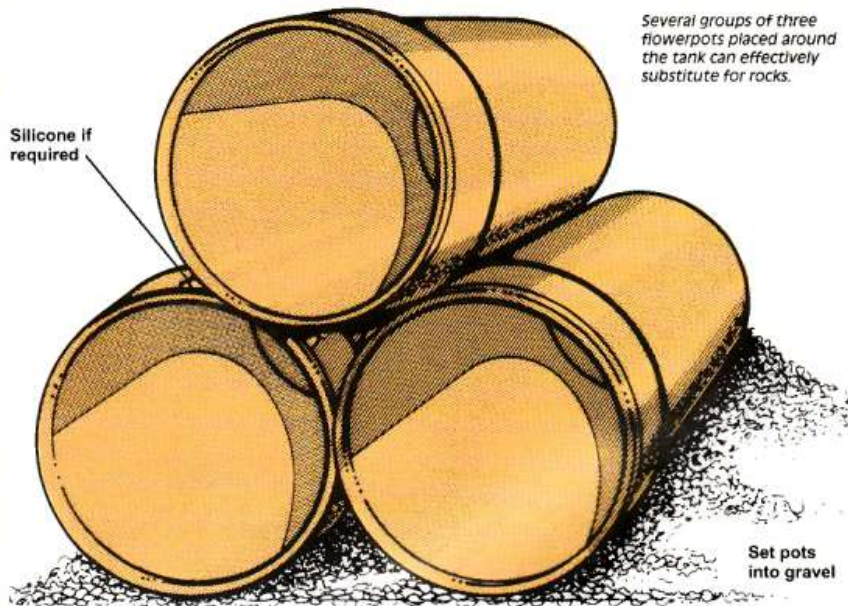
Breeding Malawi cichlids is a fascinating hobby and is made all the more interesting when the young fry are as colourful as the adults.

Not all these rock-dwelling Malawi cichlids (called Mbuna) have fry which are colourful. However, two species which are well-suited to each other and form a lovely colour contrast are *Pseudotropheus lombardoi* where the young are bright blue with black vertical stripes and *Melanochromis auratus* where the young are yellow with black horizontal stripes.

Other Mbuna

Most Mbuna species, whether they have colourful fry or not, can be successfully kept and bred using the set-up described. However, selecting other Mbuna which will have colourful fry is easy, provided that you buy young fish. If they themselves are colourful, then when they mature and spawn, they will have fry which are also colourful. Young mbuna normally have female colouration, and only as they mature, do males start exhibiting their usually different and more colourful garb. Some Mbuna which have colourful fry are *M. johanni*, *P. schofoli*, and some variants of *P. zebra*, *L. fuelleborni* and *L. trewavasae*.

Silicone if required



Several groups of three flowerpots placed around the tank can effectively substitute for rocks.

Set pots into gravel

Buying and selecting fish

When selecting cichlids it is best to start with young fish. Purchasing young fish allows them to grow on together and is much less likely to lead to losses due to bullying. Adult Malawi cichlids are very territorial, and do not take kindly to new introductions in an established tank. In any case, young fish are much cheaper than large fish.

I started with ten young fish each, of *lombardoi* and *auratus* which were just over an inch long, with the idea of ending up with one male of each species

with a harem of three to five females.

Feeding

Young *lombardoi* and *auratus* are active throughout the day but particularly at feeding time, which can be two or three times a day. They do well on a basic diet consisting of flake and pellets supplemented occasionally with shredded prawn and chopped earthworms. They are also fond of lettuce and boiled peas. On this mixed diet, the Mbuna grow at a tremendous rate and will double in size in less than three months. The following method will lead to successful spawnings. ■

Why Africans?

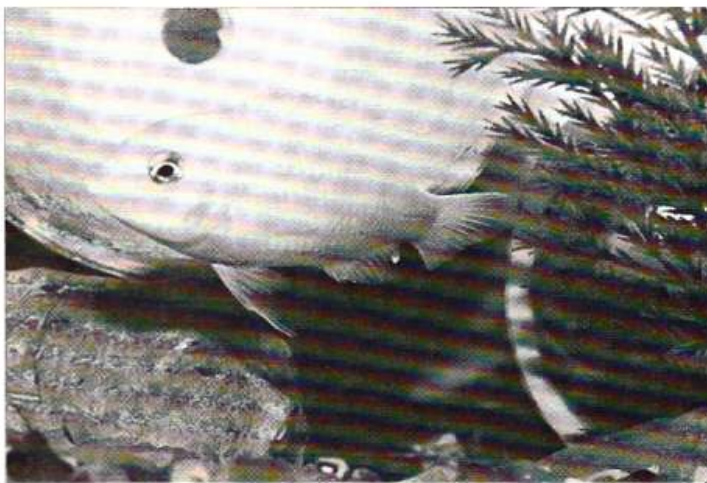
Malawi cichlids and Mbuna in particular, offer several advantages over their American cousins.

These medium-sized cichlids, where females are often as brightly coloured as males, appear to thrive in a fairly-crowded environment, provided aeration and filtration are good. This permits one to keep a mixed species community, containing one male per species with three or more females.

The fish are always active with a lot of interaction between the fish, providing a constantly-changing montage of colour and action.

The spawning behaviour and care of the fry are very interesting to watch, while the fairly large, well-developed and colourful fry are easy to raise and easy to exchange.

An aquarium full of colourful Mbuna will always provide a lot of interest for both the novice and experienced fishkeeper alike.



A male *Pseudotropheus lombardoi* - note the plastic plants and the flowerpot caves.

Problems

Do not be disheartened if the first few broods are unsuccessful and the female eats the eggs while she is being moved, or later, if the eggs are infertile. Each female, if properly looked-after and conditioned, will carry at least four or five broods a year.

Young females have ten to twenty fry per brood but this number soon doubles as the females mature. This all adds up to a lot of colourful young fry.

Step-by-step guide

Step one - water

In a mature tank, I've found that Mbuna, which come from a hard water habitat, are quite happy in untreated London water which is hard. Alternatively, water can be hardened by adding some crushed sea shells to the gravel base. A water temperature maintained between 26°C and 28°C suits the fish fine while a partial water change (25%) every two weeks is recommended and promotes growth and spawning of the fish.

Step two - the tank

A combined breeding colony of *lombardoi* and *auratus* can be set up in an aquarium as small as 30" (20 gallon) although a 36" one (30 gallon) is probably better-suited.

Step three - filtration and the substrate

I have successfully used undergravel filtration with a three inch gravel bed run with an powerhead, although I must admit to having to rearrange gravel on occasions, when the fish have exposed the filter plates.

Step four - tank decor

Mbuna need rocky caves to hide in, to defend, and ultimately to spawn in, but if the primary aim is to breed the fish, these can be substituted by ten to twelve clay flowerpots arranged in groups of three, pyramid fashion. The flowerpots although not as aesthetically pleasing as a well-arranged rockery, work very well, providing all that the fish require. Live plants do not last very long in a Mbuna tank while plastic plants last indefinitely and add colour.

Step five - sexing out

As the *lombardoi* grow, male fish will start changing colour from blue and black to a lovely lemon yellow and they develop a single large yellow egg spot on the anal fin. The female *lombardoi* stay blue, although the black stripes are not as pronounced any more. Male *auratus* on the other hand, change from yellow and black first to a yellow grey and then finally to black with a horizontal silver stripe. Male *auratus* also develop yellow egg spots on their anal fin.

Step six - select the dominant male

The mood in the tank will gradually change. Gone are the carefree days, as the males start staking out territories. Before the serious fighting starts and to avoid casualties, it is probably a good idea to select the dominant male of each species to stay in the aquarium while removing all the other males. You will probably find that an fishkeeper friend might need a replacement male or alternatively your aquatic dealer will often take them in, if the number of males is not reduced, you will observe bouts of jaw locking and other aggressive behaviour between males which will ultimately lead to some of them being killed.

Step seven - stocking ratio

Six months on after starting with young fish, hopefully one should have a male and three to five females of each species. Having several females to one male helps spread the aggression of the male over several fish and prevents one single female being harried to death. There will be some skirmishes between the male *auratus* and the male *lombardoi*, but generally they will take to defending a group of flowerpots each, usually at opposite ends of the tank. Another interesting thing to watch out for is the females establishing a pecking order among themselves.

Step eight - displays

The male *lombardoi* and *auratus* now start displaying to every passing female of their species. This display is typical Mbuna fashion and involves fin flaring and body quivering in front of receptive females.

Step nine - mating

Following many such displays, a female filled up with eggs will follow the male willingly to his den, or is coaxed and harried until she does.

Step ten - spawning

Once in the chosen flowerpot they circle each other. On the end of a half circle the male nudges the female in the region of the anal fin followed by another half circle and the female nudging the male in the same region. Egg-laying finally gets underway with this nudging behaviour continuing. One or more eggs is laid at each half turn as the male nudges the female, and the eggs are then picked up by the female on the second half of the turn prior to nudging the male and presumably fertilising the egg. The male breaks off occasionally, to chase away any intruding fish, while the female patiently awaits his return. As spawning progresses the female's buccal cavity noticeably enlarges as it fills out with eggs.

Step eleven - caring for the mother

When egg-laying is complete, usually after forty five minutes to an hour, the female takes refuge in a neutral part of the tank. A day or two later, she should be carefully removed by enticing her into a large net, and then scooping her out in a small container, so as not to remove her from the water. I move my brooding females into a small bare tank with properly-conditioned water, a small sponge filter, and a flowerpot for the fish to hide in. The water temperature and condition should be similar to that of the spawning tank in order to prevent any shock to the developing fry. Most females do not eat while brooding their young and it is probably best not to feed at all and thus prevent fouling the small tank.

Step twelve - fry release

The rate of fry development is temperature dependent. At 26°C the fry will be released after 21 days while at 29°C the fry are carried in the buccal cavity for only 14 days. When the fry are released from the buccal cavity of their mother, you will be astounded by the colours of the little gems, just like I was.

Step thirteen - maternal care

The fry are usually permitted back into their mother's buccal cavity for three to seven days, before being ignored, at which stage it's a good idea to remove her to another tank for conditioning on a rich diet for at least a week before returning her to the main breeding aquarium.

Step fourteen - feeding the fry

The fry which are about two fifths of an inch total length grow rapidly on a diet of powdered flake supplemented with small white worm or other live food and will double in length within four or five weeks.

Step fifteen - fry disposal

When the young are about an inch long, because they are so colourful, they can easily be exchanged with fellow fishkeepers or even your aquatic shop for that expensive fish that you have been meaning to breed when you have the funds.



Divided we STAND...

Sittingbourne reader RAY WOODINGS designs a simple tank divider.

Have you needed a tank-divider lately? Did you manage to find one? If so, how much did it cost?

I needed to split a 2ft tank recently, so that I could separate some particularly nice Guppies for breeding.

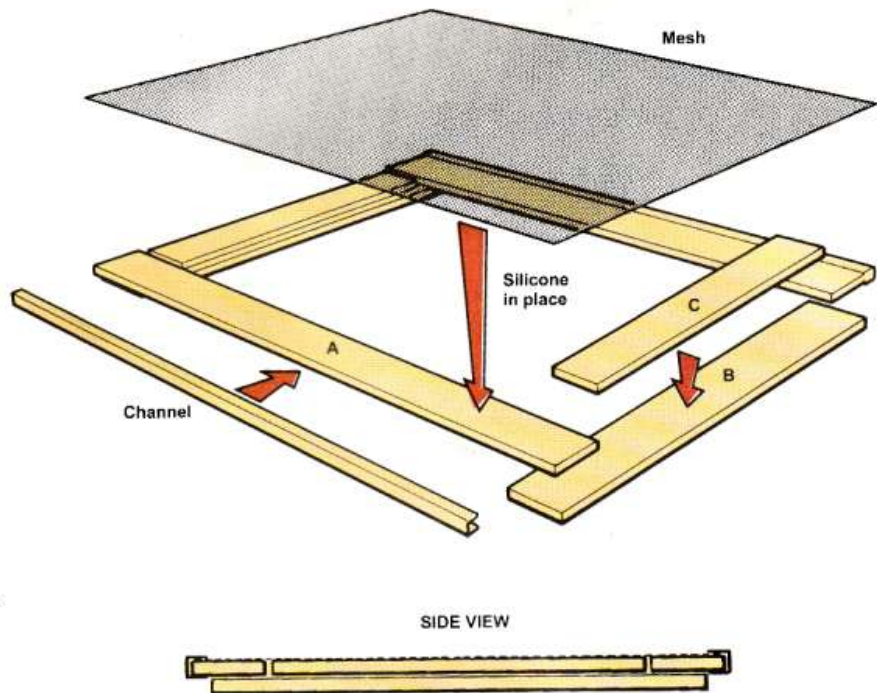
I spent over two weeks searching for a divider and, when I finally traced one, I all but collapsed when I saw the price - almost £9 for a piece of perforated plastic and two short pieces of plastic channel.

I'm not really as mean as my friends claim but, nevertheless, I determined to make my own.

I wanted a divider to fit the approximately 12" width by 15" height of the average 2' tank but the dimensions can quite easily be scaled for other tanks, of course.

Bear in mind that the vertical dimension varies according to the type of substrate in use.

Construction is extremely simple, and the cost more or less negligible - especially if you have a junk box containing bits of perspex and the like. ■



The basic parts of the divider.

Step-by-step guide

1. First you need to cut perspex, for the two vertical pieces 'A' measuring 1.5" wide, with length to match the inside height of the tank.

2. Next cut the two horizontal pieces 'B' - again 1.5" wide, but with a length 1" less than the inside width of the tank. This is so that the outer edge of the divider will be single - thickness only - to slide down the groove of the channelling.

3. Next job is to find your tube of tank silicone and glue these four pieces together as per the illustration. This is the most difficult bit of the job because it is vital that they form a perfect rectangle and that the overall width is 0.25" less than the tank width.

4. Now cut pieces 'C' 1" wide and to a length which will fit comfortably between the inner edges of pieces 'A'. With these glued in place you are left with a nice flat surface ready for the next stage.

5. Find a piece of small-mesh netting (I used greenhouse shading) and, having cut out a square slightly smaller than the divider, glue it in place with the usual tank adhesive. (A tip - do not use your fingers to press the mesh in place or you will spend a week picking glue off your skin).

6. Finally slide the assembly into place using the channel to position it. You will probably need to glue the channel in place, but this depends on the tightness of the fit.

**Hard corals?
No, easy...**

I am an avid reader of your magazine and fishkeeper. I especially like Les Holliday's Marine Section which I find very interesting. But I feel I must comment on his January article in which he suggests that "almost all hard corals imported are destined to die in a very short period"

I have in my tank at the moment two Tooth Corals (*Euphyllia pictata*) and one Daisy Coral (*Goniopora lobata*) that I have had almost three years. They have been moved from a small corner tank and placed in a five foot tank, which they share with a Brain Coral, another Tooth Coral, a Frogspawn Coral, various soft corals and a small *Tridacna* clam.

I have found these corals, easy to keep. All they need to thrive is good water and good lighting.

I supply both of these (I hope) with the following equipment: wet and dry filter filled with plastic balls, but with no wet section; Sanders power skimmer; ozone; nitrate filter; and metal halide lighting supplemented with actinic blue fluorescents.

I also have two Fluvals and three internal filters, one filled with phosphate removing material, the other with a carbon insert.

Water changes are 10 gallons per month maximum.

I do add calcereous water and Strontium chloride to make up evaporated water, and clean the algae from the front glass. This is about the only maintenance apart from cleaning pre-filters and the Fluvals. As I have said the corals are easy to keep and have grown quite dramatically (hence the move to the larger tank).

● Bobby Stewart, Wilts.

Firefish not Fire Gobies

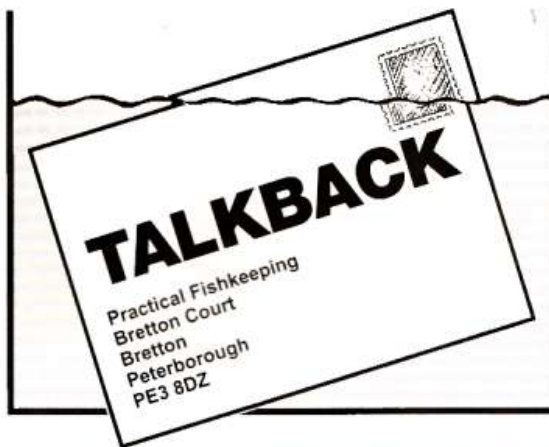
The marine Firefish, *Nemateleotris* sp. 'Burning Beauties' (Jan 1992), is no longer regarded as a goby.

Since they were re-classified by Hoese (1986) and Birdsong (1988) Firefish now form part of the family Microdesmidae, commonly called Wormfish. There are six genera within this family, comprising approximately 36 species.

It does seem a good idea to drop the common name Fire Goby in favour of Firefish, and cease associating them too closely with true gobies in future.

Incidentally, a third, stunningly beautiful species, *N. helfrichi*, is imported from time to time. These command very high prices and my own pair cost nearly as much as a Flame Angel each.

● Nick Dakin, Camberley, Surrey



**How to make
holes in drip
trays**

In your Jan '92 issue, I read that you were loathe to cut your condensation trays, as the cuts led to cracks. This is due to the shape of your cut.

If you first drill a hole in the condensation tray and then slot this to the outer edge there are no corners for the cracks to start from.

I work in the aircraft manufacturing industry and all slots are designed this way, for the very reason you have discovered.

● M Melton, Herts.

STAR LETTER

■ PAUL HARDY from Sheffield wins a year's subscription to PFK for reminding us of a rewarding species, and how to keep it.

I was particularly interested in a reply to a Tropical Answers query on Silver Dollars in January. As a keeper of 'Silver Dollars' that is *Metynnis*, *Myleus*, and *Mylossoma* for over 20 years, I feel I may have a few tips that may help the questioner.

I will assume that the Silver Dollars in question are *Metynnis hypsauchen*, as these are undoubtedly the most-common *Metynnis* species available.

First of all, I agree with Dr. Ford

that the fish are totally peaceful, and certainly are much happier in a shoal (personally, I would never keep less than four). But on the point of sexing the fish, once they reach maturity (about 3-4 inches) they are very easy to sex.

The female's anal fin stays square or right-angled at its lowest point, whereas the male's takes on a rounded appearance. (Incidentally, the redness of this fin has nothing to do with determining the sex).

It would be a mistake to think of these fish as purely vegetarian. My own *Metynnis* thrive on a diet of finely-chopped meat, flake and granules, frozen shrimp, frozen bloodworms, and

the bigger ones (these by the way are usually the females) eat whole frozen lancefish and even catfish pellets.

Greenstuff, of course, must be given regularly. But just a tip when giving them lettuce. Don't float the lettuce on the water surface. These fish are noticeably shy about coming to the top, especially as they get older. Weight it down. The fish are far more comfortable feeding this way and it's more fascinating for the viewer.

It's amazing just how many other fish will feed on the lettuce.

In conclusion, I can heartily recommend the *Metynnis* for the home aquarium.

**Unusual planted
project**

As a regular reader I am most interested in some of your reader's D.I.Y. projects. I decided to combine a few of their ideas with a few of my own.

My wife and I decided to have a stone fireplace built with a tank

fitted at one side. The tank size was 5' x 18" high but because of where it was sited it could only be 12" wide. My idea was for a heavily-planted tank with Angels and Tetras.

I purchased a bag of Aquasoil and two boxes of Everite No. 1. I mixed the contents of the Aquasoil and the Everite in a bucket with just enough water to make a workable clay.

I then used it to pot various plants I had ordered, and spread the rest on the base of the tank. I added the pots for the plants.

The next idea I used came from the Dec. '91 letter from S Levy. His undergravel filter made from plumber's tubular piping was perfect for what I had in mind after the Aquasoil and Everite mix was semi-dry.

I laid the filter on top of this.

The potted plants were then placed in between the pipes, with the bases of the pots just pushed

into the clay. My hope is as the drilled holes are above the clay, they will not clog as would a normal U.G. filter and likewise as the plants are both potted and below the holes, they should grow.

I added approx. 3" of pea gravel, some hog-wood and rocks.

I powered the UG filter reverse-flow from a Fluval 203 filled with layers of Siporax; in the middle carbon; and on top a sponge.

I intend to add a Fluval 103 filled with Siporax, peat in the middle and a sponge on top returned via spray-bar.

Lighting will be three 4' tubes, one Grolux, one Triton and one ordinary.

● R. Bates - Glasgow

Mr Bates has promised to report back on his tank in a few months. Ed.

Young fis



KIT TIP

No 2. The Undertank heating mat

How does it work?

An electrical element is contained in a pad which is placed under the tank. The pads are available in many tank-sized sizes. Heat rises through the substrate to warm the tank.

What extra equipment do you need?

To govern the heating mat's temperature you need a separate thermostat with a probe in the tank. The mats are generally laid on polystyrene.

Which fish require this type of heating?

Undertank mats are ideal for boisterous fish which might move damage or smash the standard heaterstat.

How do I use it?

You simply place the mat under the tank, and connect it to a thermostat. Then place the thermostat probe carefully and securely in your tank, and set the thermostat before you plug it in. You do not want a very thick substrate between the water and the mat - an undergravel is probably an ideal method of filtration, constantly moving the water over the mat.

Good features

This type of heating mat is extremely reliable, (and safe) and thought of as less likely to fail than many in-tank heaterstat units. Of course, your thermostat must be reliable too. Reverse-flow filtration will ensure a supply of warm water.

Are there any drawbacks?

There are almost none. Apart from needing the additional thermostat there is the problem of removing an undertank mat from beneath a full tank if this should become necessary.

Fishy BUSINESS

MAGDALA THOMAS describes how her son found a "niche market" in fishkeeping.

Many people who are not fishkeepers keep fish. Doctors, dentists, restaurants and shops find the fish relaxing and attractive assets. But fish do not keep themselves, and quite a number of these people take no pleasure in maintaining their tanks.

The elderly, housebound and disabled might also keep fish more often if the care was easier.

The sight of a murky, green coated tank is enough to infuriate any fishkeeper - and set my teenage son Peter on to a part-time business.

Not content with the regular cleaning of five tanks, Pete offered to clean up our dentist's tank.

The tank sparkled, and emboldened by this success, and with the dentist's encouragement, Pete started to run a tank cleaning business.

This is NOT a business that can provide a living - customers would not be prepared to pay the rate - but it is just right for a teenager.

Pete keeps proper books and a bank account. He produces handouts, and displays adverts. And he has expanded into offering other services - restocking, and initial setting-up.

So how do you go about starting out? Ask at local



Quick tip
Carp pox is not a killer. If your Koi is covered with strange wax-like blobs this month it may appear very ill. But the problem (see picture) is a bit like teenage acne - it's likely to fade away as the weather gets warmer, and disappear altogether as the Koi gets older.

pet shops, the dentists, doctors, hospitals, and restaurants. Offer a free trial for your first clean out, then offer a regular service - say every six weeks.

Be efficient - make sure you know what you're talking about, and reassure your customers by having an adult with you on the first visit, at least. (Not a bad idea from the safety point of view, anyway).

Take your own equipment in case your customer doesn't have what you need, and a selection of conditioners and other chemicals.

As a rough guideline, it costs £5 for a complete Peterfin tank service where the whole tank is stripped down and cleaned. The regular six weekly service costs £3, with reductions for pensioners.

Remember, most of your advertising is by word of mouth, and the better the job you do, the more work.

● Never start out on such a venture without thoroughly consulting your parents.

Underwater Safari



This month our series on aquatic insects and bugs looks at the Freshwater Shrimps

The Freshwater Shrimps are found in lakes and rivers all over Britain, where they live in the vicinity of weedbeds. Their Latin family name is Gammarus the most common species being *G. pulex* and *G. lacustris*. They are usually a pale olive colour, turning orange after death.

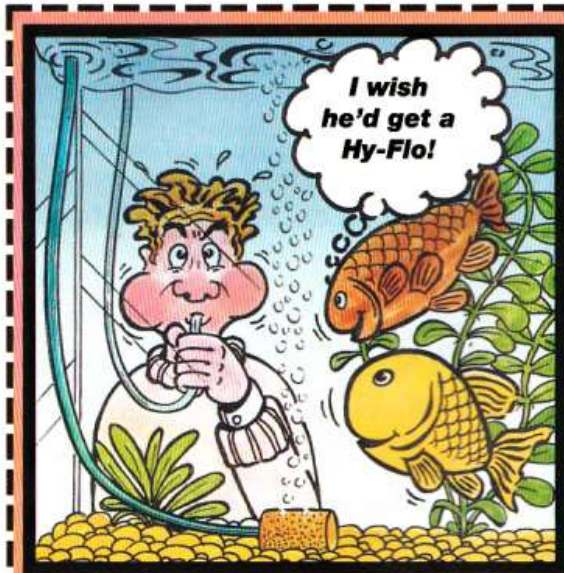
You can distinguish between the Shrimp and the Freshwater Louse by the way they are flattened across the body - the Louse resembles the Wood Louse found in every garden - flattened across the body with the legs at the side. The Shrimp is flattened along the sides of the body with the legs below, and often appears to be swimming upside down, back first.

Although many garden ponds will contain Shrimps, and fish will eat them, it's not a good idea to use them as live food in a tank as they can carry parasites.

● Picture by Pete Gathercole.

hkeeper

2 Quick tips
 1. A cheap and useful trick to clean algae from your tank glass are those pot scourers with a sponge on one side and scourer on the other. The sponge is good for cleaning the outside and removing loose dirt; the scourer deals with the algae. Always unplug before you put your hands in the tank.
 2. Avoid green scouring pads. White or light-coloured scouring pads show up the algae inside the glass you might miss.



WIN A HY-FLO PUMP

Enter this month's Spot The Difference competition and a piston pump could be yours.

One star prize this month - the ultimate in piston pumps, the Hy-Flo from Medcall Bros of Petters bar. This twin outlet model is not only quiet, powerful and efficient, it has the power to supply more than one tank, and looks good while it does it. All you have to do is spot ten differences between the two cartoons above. The closing date for entries is March 30, and the first entry drawn out of the hat on March 31 will win the pump. The winner's name will be featured on a future Young PFK page. You must be 17 or under to enter.



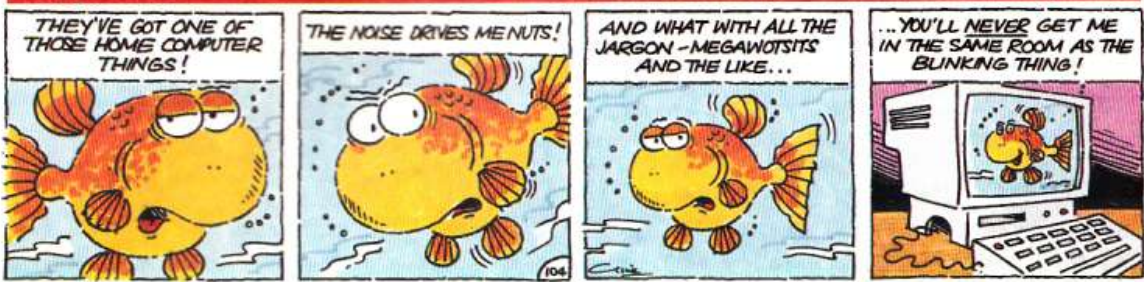
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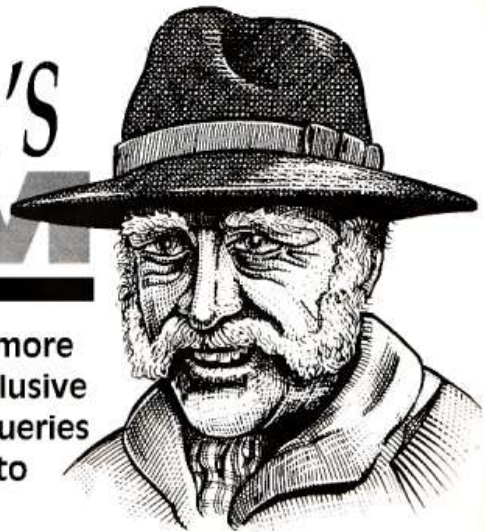
Age

YOUNG FISHKEEPER WINNERS
 December 1991 Prize: Eheim 1209.
 Vicky Davies, Cheshire.
 January 1992 Prize: Aquarian 'dip and read' test kits.
 Matt Wilson, Beds.

Floyd by fran



OLD FISHFINGER'S FORUM



Old Fishfinger has been keeping fish for more than ninety years, and now begins an exclusive column in PFK. Old Fishfinger welcomes queries from PFK readers but the Editor tries to ensure that he doesn't get any.

Dear Old Fishfinger,
I have a large Altum Angel and about twenty Neon Tetras in my tank. I say "about" because the Tetras keep disappearing. What should I do?
I.P. Daley, Water Orton.

I have regularly encountered this problem Mr Daley, and I find the best solution is to place an advert in the Missing Pets section of the local press. O.F.

Dear Old Fishfinger,
I'd like to some advice about keeping Rainbow Trout.
J.R. Hartley, London.

I have often encountered this problem Mr Hartley, and I find that they will keep for up to three days in the refrigerator and for several months in the freezer. Smoking or pickling them will also help. O.F.

Dear Old Fishfinger,
I recently bought what I thought were large goldfish for my pond, and I now find that they are koi. What should I do?
I.M. Fazed, Fishguard.

I have frequently encountered the problem of koi goldfish Mr Fazed. I find the best way to solve the problem is to starve the goldfish for a few days, when they will be forced to stop being shy and come out and feed like any other fish. O.F.

Practical Fishkeeping/March 1992

Old Fishfinger is a regular visitor to the PFK offices, from which he occasionally manages to sneak away with a few reader's queries. He is happy to receive fan mail at the following address:

Old Fishfinger, C/O The Editor, Practical Fishkeeping, Bretton Court, Bretton, Peterborough.

● Please do not enclose an SAE for a reply as Old Fishfinger's handwriting is totally illegible.

Dear Old Fishfinger,
I have recently built a pond, and I find I'm having problems with both moles, and herons. How should I deal with them?
Digger Hole, Essex

In my long experience I have incessantly encountered this situation Mr Hole. I find moles

do best under a snug molehill (you are quite wrong to keep them in a pond) and like warm milk and worms; herons on the other hand will thrive on the odd goldfish O.F.

Dear Old Fishfinger,
I have always understood that Plecostomus

were mainly vegetarian. But one of my plecs constantly nibbles around the mouths of my other catfish. Is this unusual?
Dave Beach, Lancs.

I am always encountering this problem, Mr Beach. You simply must remember that nine out of ten cats prefer whiskers. O.F.

Dear Old Fishfinger,
I have heard that coal makes an excellent substrate. Can this be true?
A. Scargill, Yorkshire

In my long experience, Mr Scargill. I have virtually never encountered a truer statement than yours. Coal makes an excellent substrate.

Indeed, in the days when I used to keep mine in the bath, I frequently ran the tap, and kept a few goldfish with it. O.F.

Ponds? Give me a nice warm hole any day...





Name: Dr David Ford
Home town: Halifax
Occupation: Consultant scientist
Hobbies (apart from fishkeeping)?
 Cosmology, modelling, DIY

FACTFILE

Our monthly question and answer session with a well-known fishkeeper

Years of fishkeeping experience? 48
Favourite type of fishkeeping? Exotic goldfish
Best book on fishkeeping? *You and your Aquarium* by Dr Dick Mills
Favourite species? Koi
Least favourite species and why? Can't honestly think of any.
How many tanks do you own? Two tanks and three ponds
What was the first tank/fish you ever had? Home-made concrete and glass goldfish tank for a Blackamoor in 1944.
What was the first fish you ever bred? Guppies in 1948
Worst mistake in fishkeeping? My 80

gallon seawater tank burst in the living room.
What's the most you've ever paid for a fish? £80 for a Koi.
What do you think is the most important current issue in fishkeeping? Keeping the interest of beginners so it becomes a lifetime's hobby (Most leave the hobby within three years)
Biggest fishkeeping gripe: The mass media who consider fishkeeping a joke.
Are there any fish you wouldn't keep - and why? Difficult corallfish, that just pine away - so sad.
Which fishkeeper do you most

admire - and why? Heiko Bleher - I wish I could zoom up the Amazon in a helicopter.
Favourite fishkeeping myth? That it's difficult!
Biggest fishkeeping ambition? To snorkel over the Great Barrier Reef
If you were reborn as a fish, which fish would you be? A shark - king of the sea
How would you like to be remembered in fishkeeping? As the fishkeepers' agony aunt. So far I've helped nearly 50,000 fishkeepers who've written to me between 1975 and 1991.
Next month: MARY BAILEY

DIARY DATES

MONDAY 2-12 MARCH

Ornamental fish care course at Sparsholt College, near Winchester, Hants. Details from Jane Lloyd 096 272441

TUESDAY 3 MARCH

Black Country Aquarists open evening for new members and table show at 8pm at the Woodside Community Centre, Woodside, Dudley, West Midlands.

SUNDAY 8 MARCH

Birtley Aquarist Society are holding their 9th Open Show at Birtley Community Centre, Ravensworth Road, Birtley. For further information contact R. Flinn, 29 Birch Terrace, Birtley Co, Durham, DH13 1JL. Tel. 4106403.

Skelmersdale and District A.S. will be holding their annual auction at the Skelmersdale Labour Club, Westgate, Skelmersdale, Lancs. Book in from 10.30am to 12.30pm. More details from Ron Lewis 0695 28971

THURSDAY 12 MARCH-5 APRIL

Fishkeeping at the Ideal Home Exhibition. Kingfisheries Ltd., in association with 'Aquarian' and Underworld feature five fully-stocked aquaria plus guest experts including March 14/15 Dave Sands; March 21/22 Dave Keecey; March 28 Dr Dick Mills; March 29 Adrian Dempsey; April 4/5 Dr David Ford. Times 10am to 8pm; 10pm Thursdays. More details on 081 650 3716.

SUNDAY 15 MARCH

Rothwell and Wakefield A. S. are holding an open show at a new venue, St Mary's Catholic School, Roys Lane, Rothwell, which is 100 yards from Blackburn Hall. More details from Kevin Swinson 0977 511464

Greenock and D.A.S. hold their open show at James Watt College, Greenock. Benching 10am to 1pm; judging to 4pm, plus auction. More details from James Sheekey on 0475 43591

SATURDAY/SUNDAY 28-29 MARCH

Doncaster Fish Show featuring on Saturday Stephen J Smith on a "Singapore Experience"

SUNDAY 29 MARCH

Central Midlands Cichlid Group hold their annual action at Penkridge Memorial Hall, Penkridge, nr Stafford at 1pm. More details on 0543 676004 or 0889 577958 or 07851 3944

ws...Fish in the news...Fish in

● First not fish, but something that according to the *Daily Telegraph*, does well in a dry fishtank. Giant burrowing cockroaches are being bought as pets in Sydney, Australia. The giant cockroaches, *Macropanesthia rhinoceros* reach around four inches long (30 times heavier than their smaller cousins), and survive happily on a piece of fruit in an empty fishtank. They breed once a year, producing 15 or so young.
 The price for the six legged pet? £26 a breeding pair.

● The *Telegraph* also reports that the government had responded to a five year campaign by ROSPA and were expected to announce that all electrical goods must have a pre-fitted plug in future. How this will affect the aquatic market is yet to be seen.

● The *Sun* reports that a 350lb concrete wishing well was stolen from a Basildon, Essex garden during the night (a whole pond plus water next?); while the *News of the World* counters with the Kippergram - fishmonger Peter Bray delivers haddock or salmon fish-o-grams to celebrating customers in Trowbridge, Wilts, dressed in a yellow mac and souwester. And follows up with a 410lb shark caught at Brixham, Devon, and said to contain some sunglasses and a pair of size seven sandals. (Why is it always a pair?)

● But the best story this month comes from the *Sun* via the *Fortean Times* and concerns one Winston Treadway a Boston shoplifter, who not content with a jacket full of stolen groceries, decided to add to his haul with two live lobsters - which he stuffed into his underpants before sprinting for home. He got as far as an adjacent alley before both enraged crustaceans clamped firmly onto the nearest soft tissue.

Police said "When we saw him he was trying to prise the claws off. He was purple as an aubergine when we got to him."

● Have you got a story for *Fish in the News*? Send us your clippings, stating clearly where they come from and the date. We'll pay £3 for every one printed.

This month's contributors: Carol Anne Davies, PFK staff.

Marine masterworks

The books reviewed last month *Invertebrates: Tube, Soft and Branching Corals*; *Damselfishes of the World*; and *Invertebrates: Stone and false Corals, Colonial Anemones* are all available from Underworld Products of Loughborough.



Follow up on the Moonshadow

Our picture shows Dave Sands presenting Simon Stevens of Aviemore with his prize in the 'Aquarian' *Practical Fishkeeping* Name the Fish Contest, recently. Simon's name for Dave's Peruvian catfish discovery was the Moonshadow Catfish.

What was the name based on, Dave wondered? Unromantically, it was the name of the paint Simon was using to decorate his house...

Simon had considered leaving his wooden Moonshadow Catfish trophy, curved by Brian Walsh, on permanent display at his local shop. But he was so delighted with the result that he chose to take it home instead.

There was a massive entry in the contest, and so good was the standard that 'Aquarian' actually increased the numbers of runner-up prizes.

Some of the other top entries were: the Emerald Catfish (from Martin Tapp of Brixham, D. Barnson of Bonnybridge, I. Markham of Redhill among others); variations on Pebbledash or Boulderdash Cat (from George Milligan of Livingstone and Richard Cartledge of Redhill and many others); lots of Stargazers (for the upturned eyes) and Inca variations; quite a few Pimpernels and other names reflecting the elusiveness of the cat; and lots of puns on the Peruvian/Aquarian theme. Congratulations to all the winners.

Practical Fishkeeping/March 1992



Female fishkeepers **RULE OK!**

A reader rang our offices the other day and on getting through to my knowledgeable but undoubtedly female Staff Writer, made some comment that he didn't see how a woman would know enough to help him with his problem.

Now however old-fashioned (and in my opinion, wrong-minded) this comment was in simple terms, could it possibly be more inappropriate than in the fishkeeping hobby?

This magazine relies heavily on the expertise of three ladies - Karen Youngs, cichlid expert Mary Bailey; and pond health expert Bernice Brewster for much of its information.

But more than that - the hobby



abounds with female fishkeepers of the highest quality. Take **Aquachamp** finalist **Marcia Hunt** of Stockton on Tees who has just opened her own aquatic shop **Billingham Aquatic Centre** at 12 Mill Lane, **Billingham**. She breeds Killifish and *Neolamprologus ocellatus* among other species.

Another expert in her field is **Paula Reynolds** of the Boston-based **Lincolnshire Fish Health Consultancy** who devotes much of her skill to treating problems with Koi - right through to operating on them.

Faced with unusual fishy behaviour, or unexpected problems, it's usually the female fishkeeper

who intuitively comes off best.

And it's often women who have the patience to clean tanks and gravel properly, and make controlled and organised water changes. While there are fishkeeping widows a-plenty we hear of hundreds of cases where the hobby has passed from the husband to the wife - and most often from the children to the mother - who carry on fishkeeping with more skill and commitment than their partner or offspring ever showed.

We're number one

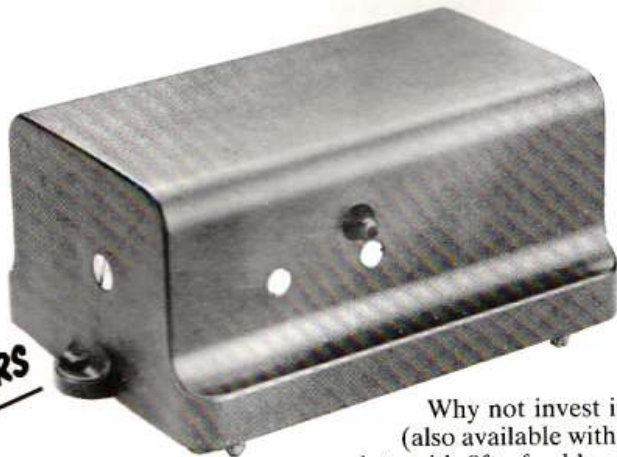
■ The latest ABC figures (Audit Bureau of Circulation) for *PFK* - Britain's biggest-selling (and best) fishkeeping magazine - show that we've come up with yet another all-time record sales figure (41,548). Very many thanks to all the readers and advertisers that make this success possible. Thanks to you, we'll be producing an even bigger and better (and still more colourful) *PFK* in 1992. Stick with us, and enjoy the ride.

Steve Windsor

HOFFMAN

If you spent £23 on a Hoffman GP500 this summer, you will **not need to spend any money** this winter on a pond heater because bubbles from your air pump will also prevent your pond from icing over this winter.

**HOFFMAN FOR
HIGH FLYING
POND KEEPERS**



Why not invest in a Hoffman GP500 (also available with a Rheostat) - comes complete with 9ft of cable and spare filter pads.

This pump is NOT waterproof and should be placed in a sheltered position near the pond to give ideal operation.

Ask at your local aquatic centre for details. In case of difficulty contact:

J & K Aquatics on 0823 664431

"Impossible" or improbable marines?

JOHN CRIPPS offers a personal opinion of the current marine fishkeeping scene.

Following Les Holliday's report in the January 1992 edition of PFK on the EEC/German classification of marine life considered to be "impossible to keep" I feel prompted to write this article. You may or may not agree with me, but right now, it is how I see the hobby.

I cannot accept that any particular species of butterfly or angelfish is "impossible" to keep in captivity. What I do find impossible, is to get it across to some marine fishkeepers the limitations, or should I say over-expectations of the systems they use, especially with regard to stocking, water quality, and feeding.

■ **From my point of view the often-quoted maximum stocking ratios for a given gallonage are wrong.**

Reducing the measurement down to one inch of fish to ten gallons would be far more advisable.

■ **Many "impossible" species are specialist feeders so why do some fish keepers still knowingly buy them and hope they will adapt and thrive on mysis shrimp?**

If you can't or won't buy the proper diet - don't buy the fish (and do the fish and the hobby a favour).

■ **Thumping great water changes every fortnight or month are as lethal as an overdose of copper** Little and often would be less

Have you got an opinion on the current fishkeeping scene that you'd like to air at length? This is your forum - or for shorter items write to our Talkback page.

stressful, but we seem to be caught up in this attitude that water changes are always beneficial. This is not always true.

■ **In recent years much has been written or said about nitrate levels. Keepers of "impossible" specimens will be well aware of the problem but for those who are not, the following experiment I conducted several years ago may be of interest.**

Sensitive fish, like large angels and butterflies will tolerate 50ppm for up to six months when juvenile. However, wild-caught adult fish of the same species will not tolerate levels in excess of 25ppm for more than three months, and if kept in those levels any longer are likely to die.

The maximum safe level was no more than 10ppm for adults and 20ppm for juveniles. As a matter of ensuring the welfare of all of my stock, "impossible" or not, all of my tanks have denitrification units on them.

■ **Contrary to what one is led to believe, keeping marines healthy and alive is not the sole lot of the fishkeeper. Manufacturers, experts, importers, retailers and others share this responsibility by making claims or giving advice.** I should imagine the novice or beginner surrounded by all this

information has difficulty in distinguishing fact from what I will call over enthusiasm.

■ **I think it's about time experts told complete beginners that keeping sensitive fish is going to cost in the region of £2,000.**

All the fully-grown butterflies and large angels I have seen reared in captivity have come from lightly-stocked total systems exceeding 75 gallons, not from 3' tanks with just undergravel filters and a skimmer.

■ **In some quarters it seems fashionable at this point in time to knock or play down the use of ozone or U/V.**

Personally, I would not be without them. One parasite or bacteria less, is better than one fish less.

■ **Frequently we are advised not to keep two specimens of the same species or like size together.**

Yes some species are tricky, but with patience, time and adequate facilities, these problems can be overcome.

I have found it is possible to establish trios of Emperor Angels and shoals of butterfly fish.

If we are to be constantly warned against attempting such communities, which after all are natural on the reef, how am I - or anyone else who wishes to try - expected to advance the area of captive breeding? I hope we have not reached the stage within the hobby that, when someone says something can't be done, we all give up.

■ **My retailer is excellent but I wish I could say the same about some of the others I have seen.**

Dead stock littering the tanks, diseased fish offered for sale, dubious advice and consolidated imports where the whole shipment arrives dead.

Many years ago I gave up the hobby on conservation grounds because of this very issue, too

Why I can still be conned!

Even after twenty five years of marines I still get caught out. The following may just be recent bad luck on my part but I wonder if others have suffered the same?

1) A certain type of manufactured rock, sold as "safe" for marine aquaria, now stands like a rockery outside my back door. Something makes my algae magnets stick to them and it's not Superglue.

2) A filtration media that requires high temperatures to carry out the function I bought it for. It works if you like boiled angelfish with your chips.

3) A synthetic salt mix that actually drops in specific gravity after a week.

4) **Disclaimers.** I am never certain that additives do what they are supposed to. If you challenge a maker about his wonderful product you are likely to be fobbed off under the disclaimer. Are we all idiots who can't read instructions?

5) Why is there no cheap test kit, or any, for measuring other metals besides copper in my aquarium water?

6) **Pricing.** It's my belief we are being ripped off every day. One item that was a "must" for my tank cost me several hundred pounds. It just about performs, moulded as it is from about £5 worth of nasty plastic.

many deaths against the number imported. I am told things are better now, I trust that they are.

■ **Within our hobby we need people who can be trusted to give unbiased guidance and advice, but what I see seems to have more to do with personal egos and the lining of pockets.**

Surely promoting a conservationist fishkeeping environment where not only the hobbyist benefits, but more importantly the fish, is not that impossible?



Butterflies like *Chaetodon lunula* can be kept successfully at low stocking densities, says John Cripps.

The coldwater anemones of the British coast are almost as lovely and every bit as interesting as their tropical counterparts. ANDY HORTON tells us what to look for.

Resplendent in a multitude of hues, arguably unequalled in the whole of the animal kingdom, the sea anemones and the corals belong to the class of *Anthozoa*; known as the 'flower-animals'.

They are important members of the phylum of animals called the *Cnidaria*, characterised by vicious stinging tentacles called *cnida*. The *Cnidaria* can vary from highly dangerous (often fatal to humans) stinging nematocysts in the tropical *medusae* called the Sea Wasp (or Box Jellyfish), *Chironex fleckeri*, to the innocuous stinging cells of British sea anemones.

Even the largest of the local anemones is unlikely to cause more discomfort than feeling slightly tacky to the touch.



The flower

Biology

Prey tend to be small in the British anemones and corals. The stinging tentacles will only paralyse small organisms, which are passed by the tentacles to the solitary opening, the mouth.

Usually sessile, movement is normally possible in two ways either creeping along on the basal

disc, (in a few species, the base is adapted for burrowing) or detaching itself, inflating, and floating to a new location.

Sea anemones will settle in locations where the tides and currents will bring them their miniature prey. In suitable locations, thousands of anemones will congregate in undersea caves and rock pools.

Anemones are one of the simpler types of animals, lacking a central nervous system, with long nerve cells, that when touched, send signals in all directions, affecting the complete, or large parts of the anemone.

Taxonomy

Anemones and corals are classified as *Hexacorallia*. The tentacles will be found in groups of six.

This class is further subdivided into at least four groups of which primitive anemones are usually found in the order of *Actinaria*, and

corals in the order of *Scleractinia*. There is a certain amount of dispute about the systematics and classifications.

British sea anemones *Actinaria*, are divided into 12 families.

Aquarium Suitability

Some of the most decorative species will be found naturally embedded in dark hidden crevices. Their spectacular beauty can only be appreciated in special marine aquaria.

If any type of animal can be used to represent the issues of whether marine creatures can be kept successfully in properly established marine aquaria, the anemones are a good case illustration.

From a welfare viewpoint, they vary from being extremely easy and long lived like the Beadlet Anemone, (captive success better than the Goldfish), to some of the hard corals from tropical seas, which are



Dahlia anemones can be found in many colours.



Beadlet anemones come in several shades.

animals

notoriously difficult, but by no means impossible. All Anthozoa are intolerant of toxins, including medicines to cure fish diseases. A single 40-watt fluorescent light will provide suitable illumination for most species.

Collection

Collection from the wild always contains the risk that the natural wildlife is reduced and damaged. A few species collected from between the tides on all but a few special reserves, is unlikely to impoverish the fauna, and spoil the rights of other people to enjoy the natural world. However, the danger of overcollection would still apply to uncontrolled removal on a large scale for trade purposes. Practical collection of sea anemones is rarely a straightforward process and in some locations will require special equipment. This aspect will be dealt with under the individual species.

Practical Fishkeeping/March 1992

COMMON BRITISH SHORE ANEMONES:

Family: Actiniidae

Dahlia Anemone (*Urticina felina*)
Temp. range: 5°C to 19°C

Attractive in a greater variety of colours than the Beadlet, the Dahlia Anemone is the largest anemone found on British shores. On the Sussex coast, it occurs most frequently in the cream and orange livery, and also in a bright scarlet quite often, but only occasionally in grey and green.

Occurrence between the tides is sporadic, from common to absent altogether.

Dahlia Anemones are mainly an offshore species that are part of the Arctic-Boreal fauna, with a distribution that includes the northern Pacific Ocean.

A further species *Urticina eques*, has been postulated, and accepted by most authorities, and will grow to a larger size, and

Beadlet Anemone (*Actinia squina*)
Temp. range: 5°C to 28°C.

With a widespread distribution on all rocky coasts of Britain, and on groynes in some sandy locations, the Beadlet Anemone, is the most noticeable of all the anemones.

It is reasonably-common and a medium-sized specie with a base diameter reaching 40 mm for the usual red and green specimens. It can be found higher up on the shore than most anemones, and becomes noticeable from mid-tide level down into shallow offshore waters.

Hues can vary to include browns, with tentacles matching the colour of the column. There is also a 'strawberry' type, which is red with green spots, and red or cream tentacles.

Beadlets acquired their popular name from blue beads, called *acropora*, that are arranged in a ring at the top of the column, underneath the tentacles, and normally hidden from sight.

These beads are used in territorial battles, and will ensure that the anemones are not intertwined with their stinging tentacles when the tide comes in. Out of the water the tentacles retract, and the anemone looks like a featureless blob of jelly.

Specimens for the aquarium should be removed by carefully inserting a fingernail underneath the adherent base, and carefully peeling the anemone from its attachment. They are easy to keep in marine aquaria at normal sea salinity of 3.4%, (S.G. 1.026 at 19°C). Naturally, it will be absent in brackish waters.

Any problems are likely to be caused by incorrect salinity or insufficient nutrition.

Food in the wild consists of plankton, small crustaceans, larvae, worms, carrion and suspended organic matter brought in by the tides.

In aquaria, they will feed readily on boiled mussel, whitefish, and prawn meat, in large pieces. Beadlet Anemones can entrap small open water fish if they are not given an opportunity to escape. Rock pool fish can usually avoid the tentacles.

Reproduction is observed frequently when minature anemones sprout from the mouth to settle on nearby rocks.



The 'strawberry' type of Beadlet Anemone can match up to tropical types for colour.

Lights, heat, ACTION...

As LES HOLLIDAY reports, in the second part of his survey, marine fishkeeping equipment has improved in leaps and bounds in recent years. This month he looks at lighting, heating, and water movement systems.

Last month we examined some of the latest technological advances and up to date thinking relating to water quality management and ways of improving the environmental conditions within the marine aquarium.

We discovered a whole technological revolution has taken place over recent years, with many new products available to help us to achieve the best level of care in terms of water management.

Of these the recent advances in aquarium filtration technology, trickle filters especially, and new high-tech forms of mechanical and chemical filtration have

brought reef-quality conditions in the aquarium a much closer and attainable reality.

The advances we have considered so far are more or less exclusively related to the chemical environment of the aquarium and the techniques for maintaining a precise equilibrium in the chemical composition and dissolved gases comprising the sea water medium of the aquarium.

To complete the picture the next logical step now is to look at the physical environmental factors of **lighting, temperature and water movement**. Again we are fortunate that over the past year or so remarkable advances have taken place in promoting a better understanding of the requirements in these areas and in the products available to put this into practice.

overawed by all of this. Gone are the days when the retailer simply recommended a light hood fitted with a Grolox and a Northlight fluorescent tube, to satisfy all requirements.

Which light for which system?

The considerations in choosing the right kind of lighting are made much simpler if at first we decide which of the main forms of marine aquarium we are trying to illuminate. There are three recognised types:-

- 1) The beginners' simple system used to house hardy fish and a few mobile forms of invertebrates only, with a very basic form of filtration and a standard light hood.
- 2) The more advanced set-up. This is what I call 'the best of all worlds option' a category which most of us fall into and attempt with varying degrees of success. This type of system houses fish mainly but usually also includes a token anemone or two (for the

clown fish) and a few mobile forms of invertebrate.
3) The miniature reef aquarium.

Simple system

The lighting requirement for the simple beginner's type of system is not a critical consideration as lighting is merely an aid in displaying the animals, and to allow them to find their way around the tank.

The Grolox/Northlight fluorescent tube combination mentioned earlier can still be regarded as perfectly adequate, as there are no intense-light requiring invertebrates or macro algae. The only algal growth is likely to be encrusting red, blue, green and brown forms.

Other fluorescent tube combinations can be used if desired. The colours of the fish and invertebrates can, for example, be further enhanced by using tubes which favour the violet to blue end of the spectrum such as Triton and Aquastar or a mix of Actinic and Northlight.



Interpet's Enhancer system greatly improves the effectiveness of strip lighting.

LIGHTING

At no other time has aquarium lighting received such attention as it did in 1991 with, the launching by leading manufacturers, of new ranges of fluorescent tube lighting, specifically designed for the marine aquarium; a much greater and more affordable choice at the top end of the market in metal halide; and, for the price conscious, better availability of mercury vapour and metal halide do-it-yourself lighting kits.

The average hobbyist, especially if new to marine aquarium keeping, must feel a little

EXAMPLES OF FLUORESCENT LIGHTING: SIMPLE SYSTEM

AQUARIUM SURFACE AREA	TYPE AND WATTAGE *			
	Grolox and Northlight	Triton x 2	Aquastar x 2	Actinic and Northlight
Dimensions 80 x 40cm (31½ x 15¾")	20w	20w	20w	A30w N20w
100 x 50cm (39½ x 19¾")	30w	30w	30w	A30w N30w
130 x 50cm (51 x 19¾")	40w	40w	30w	A40w N40w

* Recommendations apply to aquariums up to 50cm (19¾") in depth



Right: Fish mass where currents concentrate food - see the section on water movement.

Below: Metal halides are required for reef inverts.



More advanced system

The 'best of all worlds' option is perhaps the most difficult type of aquarium to choose lighting for. As the name implies we may often be trying to get more from this type of system than it can probably deliver by attempting to keep too wide a range of subjects, some of which really would be better housed in an aquarium of miniature reef standards.

Compromises tend to be made due to this, some successful, some not always so. In many ways it is the marine equivalent of the freshwater tropical community aquarium, and is invariably stocked more as a result of impulse buying than design.

Many hobbyists after mastering the basics of marine aquarium keeping with a simple system, commonly turn to this type of aquarium as a natural progression.

The aquarium might be custom-built, but in any case would be equipped to be capable of maintaining a good level of

water quality, and to allow more control over lighting than the simple system.

We could expect to grow caulerpas and other macro algae and some of the easy-to-keep light requiring invertebrates such as anemones and soft corals together with fish and mobile inverts.

Fluorescent lighting can provide sufficient light intensity for most purposes but by adding a mercury vapour spotlight or two, stronger light intensity can be arranged to fall on a chosen area for the benefit of anemones or other light-requiring subjects.

The intensity of the light from various types of fluorescent lights varies considerably, and cannot be directly related to the wattage of the tube. As a rough guide, I would recommend in this type of aquarium that you should try to aim for fluorescent lighting of around 200 watts per square metre of surface area, supplemented by one or two 80 watt rated mercury vapour lights where required.



A selection of modern tube lights.

EXAMPLES OF FLUORESCENT/MERCURY VAPOUR LIGHTING FOR AN "ADVANCED SYSTEM"

AQUARIUM SURFACE AREA	TYPE AND WATTAGE *			
	Triton Aquastar Powerglo	Trulite Powertwist	Triton x 2 Aquastar x 2 Powerglo x 2 + 80watt Mercury Vap x 1	Triton x 2 Aquastar x 2 Powerglo x 2 + 80watt Mercury Vap x 2
Dimensions				
80 x 40cm (31 1/2 x 15 3/4")	3 x 25w	3 x 20w	2 x 25w	
100 x 50cm (39 1/2 x 19 3/4")	3 x 30w	3 x 30w	2 x 30	2 x 30w
130 x 50cm (51 x 19 3/4")	3 x 40w	3 x 40w	2 x 40w	2 x 40w

* Recommendations apply to aquariums up to 50cm (19 3/4") in depth

◀ dusk reef conditions it is of benefit to gradually increase the lighting over perhaps 30 minutes before reaching full intensity each morning and reverse the procedure each night.

This can be accomplished in various ways, the simplest being to stagger switching lights on and off where a combination of lights are fitted over the aquarium. Where this is not convenient, timers and/or variable voltage dimmers can be useful alternatives.

WATER MOVEMENT

One of the major physical environmental features of a natural reef is water movement. The motion of water takes various forms but results from the action of wind, tide and ocean currents.

Constant movement and agitation of the water surface over a reef is likely to be totally-saturated with oxygen as a result of this action. This is essential to the well-being of most reef life especially sessile and non-mobile forms of invertebrates such as sponges, corals, anemones and ascidians which are totally dependent upon this movement for a replenished supply of oxygenated water.

Clean oceanic water surging over a reef is likely to be totally-saturated with oxygen as a result of this action. This is essential to the well-being of most reef life especially sessile and non-mobile forms of invertebrates such as sponges, corals, anemones and ascidians which are totally dependent upon this movement for a replenished supply of oxygenated water.

As well as surge and surface turbulence, there is the strong movement of water as a result of tidal or ocean current. This takes the form of a continuous powerful current in a single direction although, dependent on tide, time of year or day of the month, the direction and force may change, build up or subside. This movement is



Flame Angels are sensitive to high temperatures.

called linear flow, (meaning a movement in straight lines on one direction) and is very beneficial, bringing not only oxygenated water, but also food in the form of plankton for plankton feeding fish and sessile life forms.

This also causes a flushing action assisting the removal of their waste products and other detritus.

Vantage points on the reef, where this flow is strongest, are often populated by huge numbers of invertebrates and clouds of small fish all clamouring for space.

In the aquarium, water movement is often neglected. The aquarium's filter system may be the only source of water movement and this is often weakened by discharging the filtered water via a spray bar, without any direction or force.

Dead spots of almost stagnant water can occur under such conditions and mulm or other detritus will build-up in the crannies in and behind coral formations or living rock tank furnishings.

Filter turnover rates, especially those designed for trickle filters, will not provide the force of movement we require, and ideally water flow should be governed by a supplementary powerhead or powerheads.

This gives us far more control over the siting of the power source and the ability to change the direction of the flow to simulate tidal changes.

Discharge from submersible pump powered filters can be improved to obtain the maximum force by careful design of the filter system. Avoiding elbow-joints and other design features which will reduce the flow rate helps, and forming the tube discharging into the aquarium into a 'duck's bill' shape increases flow pressure.

Obviously charcoal filters or submicron filters which are plumbed in-line will inhibit flow and are best located at gravity feed points in the filter system wherever possible.

The flow from powerhead or filter discharge can be angled so the jet or jets of water are forced downwards to bring the below-surface layers of water up to the top,

Temperature – the ups and downs

Many corals, reef invertebrates and fish are easily stressed, and are often killed by fluctuating temperatures or extremes beyond the range of 18°C (65°F to 32°C (90°F).

However, today's heaters and thermostats are more than capable of maintaining accurate temperatures within this range under normal ambient conditions, and are reliable and trouble-free. Unfortunately ambient summer room temperatures above 32°C (90°F) have been achieved on a surprisingly-large number of days over the past few summers, and where the additional heat contributed by high intensity lighting is involved, aquarium temperatures have soared.

An acceptable temperature range to aim for in the aquarium would be between 22°C (72°F) and 28°C (82°F) and the optimum temperature 24°C (75°F).

Higher than optimum temperatures mean lower levels of dissolved oxygen and this is the greatest cause of stress especially with sessile invertebrates such as anemones and corals which have no respiratory organs and only simple means of absorbing oxygen.

Other invertebrates and fish from cooler parts of the tropics, the Hawaiian islands being a good example, are adapted to a lower temperature range than quoted, and may suffer more easily. Flame Angelfish (*Centropyge loriculus*) and Achilles Tangs (*Acanthurus achilles*), popular Hawaiian imported endemics often succumb without notice in hot weather and their sensitivity to high temperatures is the main reason that these species are regarded as delicate.

Unfortunately in this country air-conditioning is still regarded as something of a luxury and most of us therefore need to find alternative ways we can use to counteract the difficulties caused by hot periods.

Siting the aquarium away from windows or direct sunlight helps as does ensuring good ventilation. A cooling fan can be fitted into the lighting canopy which is close-fitting, and lighting can be shut off at the hottest period of the day for the worst periods.

The design of high-intensity light fittings should avoid transferring heat from the lighting unit to the aquarium, and this usually means hanging light canopies above and independent of the aquarium especially if metal halide or mercury vapour lighting is used.

There are commercial water cooling-devices available designed specifically for aquarium use, but these are very expensive. Alternative use can be made of a beer cooler if you are lucky to have the source of a second hand unit. Breweries which own a chain of public houses are well-worth trying.

A simple temporary means of cooling can be achieved by freezing water in sealed plastic containers and suspending these in the aquarium or filter compartment.

Naturally this method should be carefully monitored to avoid rapid changes of temperature, although past experience has taught me that even large containers of ice have only a limited effect on the aquarium.

and scarify the bottom of loose mulm in order that it can be picked up in the mechanical filter.

Some authors recommend a series of pumps with the outflows strategically-placed underneath coral and rock to cause a constant flushing system throughout the aquarium to achieve this.

Despite the interest in simulating natural water movement within the aquarium there has been little development in the design of custom-built aquariums fitted with tidal systems or custom-built turbulence units.

Chick Holland of Lahaina Aquarium Systems still maintains the lead in this type of equipment. He has introduced a

number of new concepts in aquarium design to assist in recreating natural reef conditions.

His full tidal system operates on a full lunar time sequence producing two simulated high tides and two low tides in a 24 hour period, and can recreate the turbulent environment around crashing surf or variable tidal currents in time with natural ocean movements.

The only other commercially-available units I could track down were ATech's Aquasurge unit, which is designed to produce surge currents; while Thiel Aqua Tech produce an Ocean Motion unit. Currently this is not available in this country. ■

Practical Pond

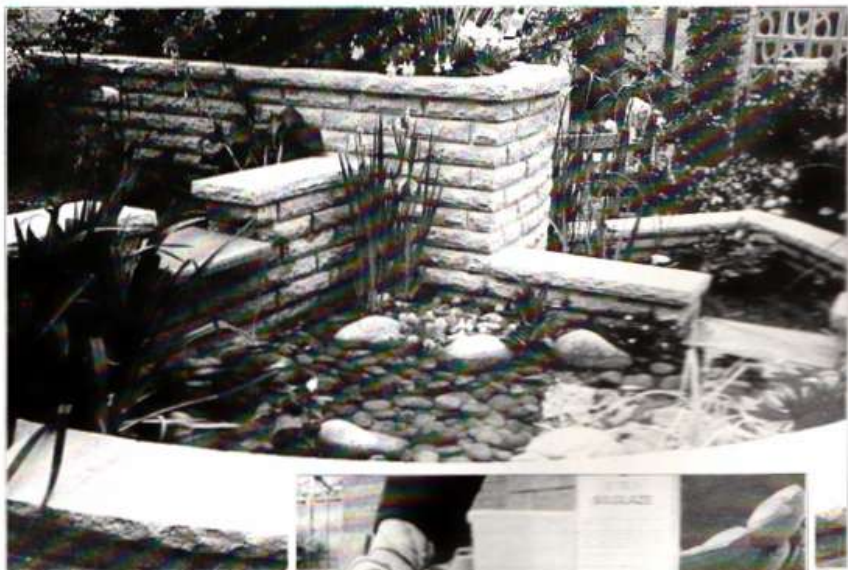
Think before you ponder

Our pond expert **NICK FLETCHER** offers tips for prospective pond builders, the main one being - engage your brain before digging your hole.

So you'd like a pond? You're in good company - literally millions of Britons are discovering the extra dimension that water, still or moving, can bring to the enjoyment of a garden.

Even the most modest of goldfish pools is following in a tradition as old as civilisation itself. Every culture throughout the centuries has recognised its elemental appeal, although it took the Japanese to elevate ornamental fish to the major status they now enjoy all over the world.

Water-gardening used to be the prerogative of the rich - who but they could afford to divert streams into culverts to power



Concrete has enjoyed a resurgence. Sealing compounds will make it entirely waterproof, and as a paving and edging material it appears in a new guise. Textured and/or dyed, it can be made to look like individual slabs or bricks of weathered stone at a fraction of what you might pay for the real thing.

extravagant classical fountains, or hire teams of labourers to maintain the illusion of nature in subjugation to Mankind? Versailles, Chatsworth and the Imperial Palace in Tokyo may fire our imagination, certainly our envy, but have little or



nothing in common with what we can achieve on our own patch.

The modern pond

We do, however, have colossal advantages over our forebears in terms of advanced pond technology. A fountain or waterfall depends on the proximity, not of a convenient stream, but of a power point. We can site our pool where we want (though not always where good taste or practicality suggest), without regard to water-tables, composition of the soil or natural water-holding hollows.

Pondkeeping has reached the stage of popularity where a whole

industry has arisen to sustain and further the hobby. We, the end-users, reap the benefits.

We buy (usually) only one pump, one filter, and so naturally there is fierce competition among the manufacturers of pumps, filters and the rest to persuade us to buy their products. Result - prices are kept down, and technical development continues apace.

The aquatic industry is an economy in miniature and, even in this recession, a healthy one. There are items within it that are renewable only infrequently (especially pumping and filtration hardware) and then there are the consumables - food, plants, medications and water treatments. Fish fall somewhere between the two categories. ▶

Healthy and long-lived?

Under ideal conditions, and barring intervention from cats and herons, a goldfish can live for 15 years or more, a Koi half a century.

At the other extreme, unhealthy fish, or those kept in less than ideal conditions, will expire in a matter of weeks.

In my more cynical moments, I wonder whether the ornamental fish trade depends for its continued survival on the ignorance of the average purchaser? What would happen if every fish bred in Japan, Singapore or Florida lived out its allotted span?

Queen of the water

Water lily expert HARRY HOOPER begins a new series devoted to the "most impressive of all aquatic plants"

To me the water lily is the most impressive of all aquatic plants. A pond or water garden is incomplete without a selection displaying the exquisite blooms they produce during the summer months.

Family

Water lilies come under the plant classification of *nymphaea*, a Greek word used to describe the plant some 300 years BC therefore the waterlily (or *nymphaea*) should not be confused with other "lily like" aquatic plants such as the Spatterdocks (*nuphar*) or the Sacred Lotus (*Nelumbo*) - these are quite different plants.

Colours

There is a very wide range of waterlilies to choose from, varying in colour from white, pale-pink, deep pink, yellow, and red, to the copper-coloured types normally referred to as variables or changeables. With these varieties the shade of the bloom deepens with age.

Depth and size

Depending on variety water lilies grow in various depths of water from the more vigorous cultivars that will tolerate 4 to 5' of water to the pygmy varieties that are happy growing in a mere 6".

The pygmy varieties are obviously the best types to use for the patio tubs or the miniature water features that are becoming extremely popular in modern-day gardening.

Root varieties and their uses

Water lilies come in three main groups, *odorata*, *tuberosa* or clump root varieties, the latter is sometimes referred to as the Marliac types.

The difference between these groups is normally distinguishable by the rhizome or root stock of the plant.

The *odorata* and *tuberosa* forms tend to be more invasive growers than the clump root types. For this reason when planting *odorata* or *tuberosa* varieties, adequate-sized containers should be used to allow plenty of growing space. With natural or earth-bottomed ponds, these types of lilies will perform perfectly well.

If a water garden has been constructed using a flexible liner or a pre-formed pond where aquatic planting baskets are normally used for growing lilies, the clump root varieties are undoubtedly the best choice.

Tropical lilies

Within the water lily family there are numerous varieties of tropical lilies that produce some of the most outstanding flowers. Usually the blooms are held well



above the water surface.

Some varieties of tropical lilies produce their flowers after dark (and are of course referred to as night-blooming varieties). Unfortunately tropical lilies are only suitable for warmer climates but can be grown with success in a warm greenhouse or conservatory.

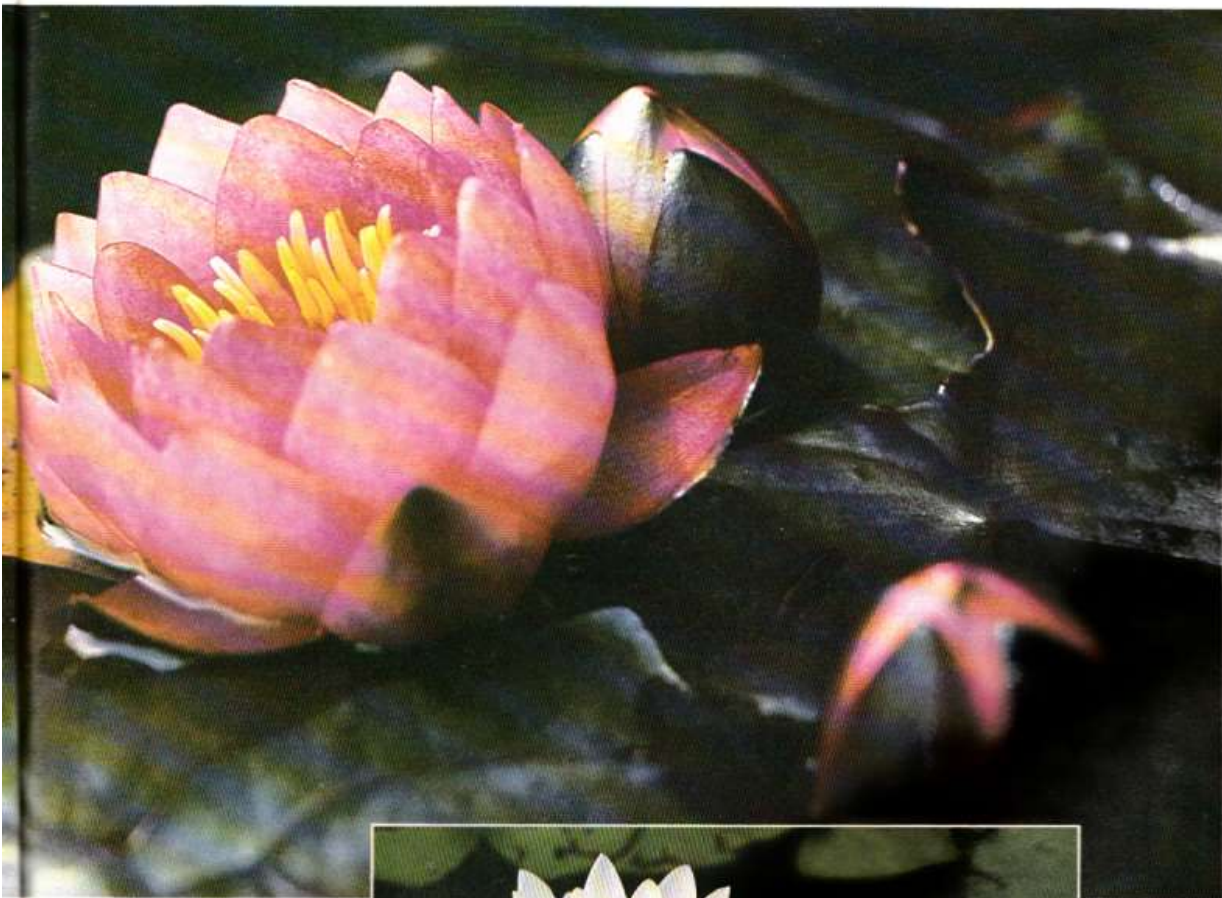
Buying and selecting lilies

It is very important when purchasing water lilies to obtain your plants from a reputable

Right:
Chromatelle lily.

Below: A
glorious display
of James
Brydon lilies.





Above: A close-up on James Brydon.

Left: Marliacea carnea lilies.



source. Many garden centres and nurseries and even some water garden centres seem to lack knowledge on the subject of water plants.

When selecting water lilies make sure the plants are well grown and healthy, as good-quality waterlilies, especially some of the rarer varieties, can be fairly expensive.

Select plants that will suit the size of your pond, as well-chosen plants will give you pleasure year after year.

Marliac the master

Many of the water lilies available today must be attributed to the French hybridiser Latour Marliac who from the mid 1800s until his death in 1911 spent many years of his life hybridising hardy water lilies at his nursery near Bordeaux in south west France. This nursery is still in operation today and has been managed for many years by the Laydeker family.

Practical Fishkeeping/March 1992

Recently it has been taken over by a British company who intend to restore the nursery, and hope to include a museum to commemorate Marliac.

Apart from the success of Marliac with his many water lily hybrids there have been many freaks of nature and natural cross pollination, that have also created some outstanding varieties.

Now, with the increased interest in water gardening, there are water lily enthusiasts regularly producing new varieties.

Lily society

So great is the interest in water lilies that an International Water Lily Society has been formed and now has some 600 members from 23 different countries.

In March 1991 a U.K. branch of the I.W.L.S. was formed with over 70 members who have regular meetings and gatherings throughout the year. ■

● NEXT MONTH we look at buying and planting water lilies

● HARRY HOOPER is Secretary of the U.K. Branch of the I.W.L.S. He will be pleased to forward information on the society to potential members. Write to Harry Hooper, Mill Lane Nursery and Water Gardens, Mill lane, Bradfield, Manningtree, Essex CO11 2QP. Please enclose an SAE.

Coldwater Answers

■ Lumps and bumps

I have a large aquarium containing goldfish of about 6" long. All are in good condition with the exception of one which has developed four or five lumps on its body. They are jelly-like and are almost transparent. They do not seem to trouble it in any way, as it swims around quite happily and has a good appetite.

Please could you tell me what is wrong with him?
D. Wilkinson, Devon

Lumps on fish, especially goldfish, are usually simple tumours. These are no worse than human warts and can be ignored. The only 'cure' is surgery and that would prove too risky with any fish, except perhaps a prize-winning Koi.

If the lump is like a blob of candle-wax then it is a viral infection called Carp Pox. This is most common in pond fish in the winter or spring. There is no cure, but the fish usually develops self-immunity and the symptoms disappear. This sounds like the problem your fish has.

If the lump is red and inflamed, this indicates bacterial activity and it may be forming an ulcer. In this case antibiotic treatment is required.

DF



Fish which are happy to inspect your fingertips in a dealer's vat may not be so friendly when you get them into your pond. Pic. by Gordon Wiggins.

Why do my fish swim away?

Q I have a 9' pond. On the bottom I have put some rocks and a plastic bowl to form an underwater cave. The fish are quite happy at the surface until I go over to the pool and then they make a dive for the cave. Can you explain why they

do this - I know I am not good looking - but is this natural behaviour? When I purchased them they came to the surface and sucked my fingers - they certainly don't do that now.

• G. Hickinbottom, W. Midlands.

A I used to wonder why pondfish in dealer's vats came to the surface and sucked my fingers, too, when my own fish were reluctant to give me the time of day.

Dealer's ponds or vats are invariably stocked much more intensively than our ponds, and are shallower, without features such as the rocky cave you have given your fish. Otherwise it would be difficult to net out purchases.

Because of this stocking density, the fish would produce unmanageable quantities of waste if they were fed heavily, so they are kept 'lean and hungry' - at subsistence, rather than growth level. There is nothing inhumane about this - you rarely see obese fish in the wild, but you see plenty in garden ponds. The dealers thus spend less on food, their fish exhibit this irresistible 'come hither' behaviour which is mistaken for affection, and we buy them.

Your pond fish are behaving much more naturally: their 'flight' response is the strongest and given a choice, all fish prefer to have a bolthole into which they can flee. Give them some time and a lot less food and they will soon be eating out of your hand, if that's what you want.

NF



Most dealers only guarantee fish for 24 hours once they leave the premises. Pic. by Noreen Tan.

A Many dealers have a guarantee where they replace fish if they die within 24 hours. However this may not apply to the very expensive special breeds, where negotiation is required when buying. You will not win a case against a dealer unless you can prove negligence on their part. Since most dealers sell quarantined fish from ideal water quality systems, this would prove very difficult.

Losses are usually down to transport stress, plus unsuitable pond or tank conditions.

Do make sure the fish are properly bagged, with oxygen, in the dark and insulated against chilling. The fish should be released into the tank or pond as soon as possible and left in the dark to settle for several hours, preferably overnight.

DF

Proving negligence is difficult

Q Last year I purchased a selection of coldwater fish from my local aquatic centre. However, after 48 hours I lost some. This may have been due to transportation, or a number of things. But could it possibly be down to the retailer? If so, am I in my rights to ask for a replacement or refund? What is my guarantee, if any? Or am I responsible for them once they leave the shop?

• J. Wheat, Plymouth

Moor has red eye

Q I have a three foot tank housing a variety of goldfish including three Moors, Orandas a Pearlscale and a Koi. One of my Moors has a very red eye. I have given him a salt bath which seemed to work for a while, but the redness has now returned. The tank is planted and the pH is 8.2. I have

been told to heat the water a few degrees. What do you think? Do you have any other ideas?
 • Roy Armstrong, Middlesex

A The redness in the eye of your Moor is probably the result of a bacterial infection, probably triggered by some physical injury, since their eyes protrude more than most. Have you anything

abrasive in your tank? If so, remove it. Meanwhile a suitable antibacterial remedy can be used in the aquarium - there is no need to isolate the fish.

I do not see the need to heat your aquarium. In fact this may upset the plantlife. A pH range between 7.5 and 8 is recommended for Koi and goldfish, so yours is a little high, though not dangerous. I would leave it well alone. NF

Look for the source

Q I have six Koi and up until recently, six goldfish in a 8' x 8' x 2'6" deep pond.

Three goldfish died. They had a type of fungus on them. I tried various cures but none worked. The Koi all look healthy, but I have been told that they like warmer water at the bottom of the pond during winter. The pump is situated at the bottom of the pond. Please could you give me some advice?

• M. Machin, Derbyshire

A In a pond only 30" deep, it doesn't matter that the pump is on the bottom. Such a shallow pool will not have the warmer/cooler layers, so just keep the filter ticking over. It is impossible to diagnose at a distance what was wrong with your goldfish.

In cases like yours, check for ammonia, nitrite and pH. Get them right and at least the surviving fish may continue to survive.

Fungus is relatively rare in pond fish - most usually the result of injuries laying the fish open to this secondary ailment. But one or two conditions are mistaken for fungus, when they are either bacterial or protozoal infections causing excess skin mucus. If you got all your goldfish from the same source you probably brought the problem in with them. NF

Low temperature slows recovery

Q I have just finished building a pond which measures 7' x 7' x 3'. The pond filter is housed inside the garage. In the bottom of the pond I fitted a waste drain which I made out of pipes. The feed pipe from the pond goes through the garage wall into a settlement chamber followed by two more chambers, one with Canterbury Spar and the other containing baked clay granules. The water returns to the pond via a home-made venturi.

I have six Koi, some of which are a foot long. One has a very bad eye which is white and yellow. I can't see the pupil. The other eye is turning the same colour. I tried a course of Bacterad but it doesn't seem to have worked. Can you advise me on how to cure the problem?
 • M. Spry, Devon

A Your pond certainly sounds very good. Having the filtration protected is an excellent idea as it helps to maintain the bacteria which break down the fish waste, through the winter months.

It sounds as though your fish may have a bacterial infection. It



Koi recover slowly in low temperatures and it may be wise to separate the fish during treatment and raise the temperature to around 17 C.

would be a good idea to start by checking the pondwater for the presence of either ammonia or nitrite as these pollutants can stress the fish sufficiently to allow an infection to occur. The second problem is the current low water temperature. Once the water temperature drops below 10°C, the Koi's immune system is seriously impaired. Most treatment will only work in conjunction with the immune system and that is the reason why fish recover more quickly from wounds or infections in the summer months.

If possible, get the fish into a separately filtered unit, where the temperature can be increased to 17°C or above and add cooking salt to a concentration of half an ounce per gallon of water. It might be necessary for the fish to have a course of antibiotic feed to help it recover. You must obtain this through your vet. BB

COLDWATER ANSWERS is our FREE reader service designed to help YOU get more from your hobby

■ Taking care of your general coldwater queries we have our regular expert, DR DAVID FORD, Senior Consultant to the 'Aquarian' Advisory Service

■ Koi and pond enquiries go to NICK FLETCHER or BERNICE BREWSTER.

Just tick the appropriate box below and attach the coupon to the front of your letter. Send with SAE to: Coldwater Answers, Practical Fishkeeping, Bretton Court, Bretton, Peterborough, PE3 8DZ.

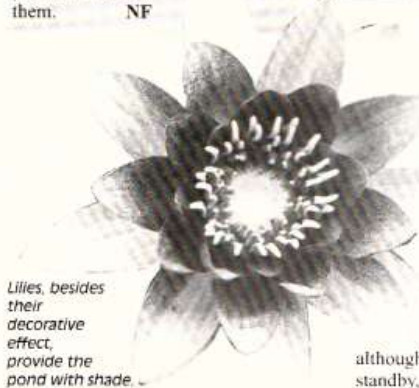
We regret that letters sent without an SAE will not receive a reply.

How many plants?

Q Please could you give me some information on numbers of plants required for my pond which is approximately fifty square feet in area?
 • E. A. Paston, Surrey

A A pool with a fifty square foot surface area will require about twenty bunches of oxygenating plants, perhaps two waterlilies, some floating plants for shade and however many marginals you require for decorative effect. Suitable lilies might include small miniature varieties such as *Ellisiana*, *Atropurpurea*, *Glorigosa* and *Rose Aray*.

The best oxygenator I have found is Hornwort, although Curled Pondweed (*Potamogeton crispus*) is another good standby, and very vigorous. NF



Lilies, besides their decorative effect, provide the pond with shade.

COLDWATER ANSWERS

General queries; Dr David Ford

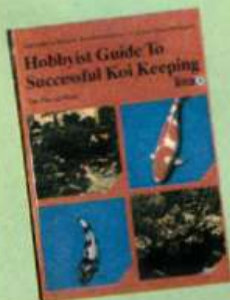
Koi or pond queries; Nick Fletcher or Bernice Brewster

WHAT'S NEW?

The latest fishkeeping equipment and books, reviewed by Editor STEVE WINDSOR and pond expert NICK FLETCHER.

Star ratings

Don't bother	*
Barely acceptable	**
Average/adequate	***
Good	****
Very good	*****



Pool on ponds - and Koi

Hobbyist Guide To Successful Koi Keeping by Dr David Pool, published by Tetra at £7.95

David Pool's new book on Koi is rather better laid out and illustrated than many of Tetra's recent offerings, although the problems of illustrating a pond-dwelling fish adequately are clear (not least to us at PFK).

Equally, like all the Tetra books it offers a thorough first grounding in the subject. A book such as this will live or die on its filtration section. This is brief but comprehensive, and comes in the right place, at the beginning of the book - it really would have benefitted from some diagrams however.

Though the experienced (and inevitably biased) Koi keeper may wrongly or rightly be able to pick holes in the advice, there's no doubt in my mind that this book offers a value-for-money first port of call before buying a Koi or even planning a pond. SW

Available from many Aquatic Outlets or phone Tetra on 0703 620500

Star rating

Readability	*****
Information	*****
Illustration	***
Value for money	*****

Filters with jaws?

A new company, Independence (UK) Ltd., have come up with a new range of internal filters and powerheads under the name Shark.

If the look of equipment is what turns you on, you'll be delighted by the styling of this kit. It's also nice and light - nothing like as cumbersome as some equipment on the market; and claims to be "acoustic sealed" (which basically means very quiet, except when pumping air, when it's still bearably hushed).

But the nuts and bolts, and the features, are what the Shark series will stand and fall on. The Sharks have two main features that are different from their competitors.

The first of these is their mouth-shaped outlet which spreads water as it returns it to the tank, and gives excellent surface agitation. This could be greater if the mouth didn't have to be submerged just sub-surface, but is still an excellent feature to promote good gas exchange at the surface.

To add to that, the equipment also offers an aeration system, dial controlled, which will give you four varying levels of water flow/aeration from just air, through to 25% air to 75% water, or no air at all.

All good stuff, though quite why, except in some sort of emergency, you should want to use the equipment just for aeration defeats me. The adjusting knob is easy to use, though I do wonder if it will be more awkward with a coat of slimy algae.

Rubber suckers are far more important in fishkeeping than the quality of what's available might suggest. I slurped across the Shark's suckers and put them on the screen of my Mac. I then had to get a knife to peel them off... Sandra Shankland of Independence (yes, it really is spelt that way) says



that special attention was paid to the sucker design, and it seems to have paid off.

That said I'm not keen on the single sucker mounting on the powerheads (designed to be supported by an uplift of course) which clings tenaciously to the glass but can't alone hold the minimal weight of the powerhead upright. But the equivalent two sucker design on the filters is brilliant, allowing you good movement of the filter and easy removal from the sucker bracket. This bracket will be available separately and also fits the powerheads (which are of course identical with the power units on the filters) and I recommend you get one for your powerhead.

There are three models of each, suitable for tanks of 150 litres (33 gallons), 225l (49 gallons) and 300l (65 gallons) pumping 400, 600, and 800 litres per hour, though of course in the case of the filters this will slow as they clog. All the units are said to be safe for use in marine tanks.

The filters and powerheads take apart easily, and in a sensible fashion and are easily-cleaned. The media in the

internals is a perfectly-servicable foam tube and there's a nice positive push fit between the central core and the powerhead itself. None of the units offer reverse flow.

While many fishkeepers will wire such units in a power centre of one type or another, the Sharks all come with a fused plug.

Lots of good features then, stylishly presented, so your main criteria thereafter will be price.

The three powerheads PH1, PH2 and PH3 have an R.R.P. of £20.25; £26.40 and £29.99 respectively; filters are only fractionally more expensive at £21.15 (PF1); £27.99 (PF2) and £33.49 (PF3) respectively. SW
Details of stockists from Independence (UK) Ltd., Units 9 & 10, Lady Ann Mills, Lady Ann Road, Batley, W. Yorks WF17 0PS Tel 0924 422644.

Star rating

Quality	*****
Practicality	****
Price (Powerheads)	****
(Filters)	*****

As these are new products, these ratings do not take durability into account.

SPECIAL PFK PRICE
Fast-flowing stream

Described as "New for the Koi Season" the Hi-Flow range of tapwater filters from Purity on Tap, may well be of interest to a far wider audience than just the pond fanatic. Designed to give you a good quantity of well-filtered tap water quickly, these filters can work at flow rates from two up to ten gallons a minute.

They use the same much-praised carbon block filter media (each cartridge has a total effective surface of 216 acres) as Purity's other units, which effectively removes all but .003ppm of chlorine, and adsorbs most of the nasties that aren't meant to be in tapwater, but all too frequently are.

They also incorporate a reusable pre-filter unit, and a pressure gauge which tells when it's time to clean that unit.

The **Hi-Flow 1** unit will produce more than 225,000 gallons of filtered water at two gallons per minute and costs £189.50 (replacement cartridge sets £79.70) **This price is exclusive to PFK readers.**



The **Hi-Flow 2** will produce more than 700,000 gallons of filtered tap at two gallons a minute and utilises two carbon blocks and the pre-filter in three sections. It costs £318.80 with cartridge kits at £140.65.

The **Hi-Flow 3** three pod system will also produce more than 700,000 gallons of filtered water, but by using three cartridges in a T formation it will allow flows of ten gallons a minute. It costs £350; cartridges at £140.65.

All the housings come with a five year guarantee. **SW**

•Available from Purity on Tap Ltd., Wickfield Farmhouse, Shefford Woodlands, Newbury, Berkshire RG16 7AL. Tel: 0488 39319.

Star rating

Quality	★★★★★
Practicality	★★★★★
Price	★★★★★

Siporax adds p

Using the A1 G.S.M.



1. The problem - pre-filter sponges clog quickly with an ugly muck and slime



2. The magnets - said to promote flocculation



3. A tray goes under and around the unit.



4. Topped-off with gravel the pre filter should not need cleaning more than once a year.

One of the less pleasant tasks your editor has laid at my door was to install a new pre-filter to my Amphibious P770 pond pump. There was, after all, cat-ice in the margins. And after five minutes' dabbling in the water, my fingers were like blue sausages.

A week on, I am pleased I made the effort. The **A1 G.S.M. filter** has been around for a few months now, to test the market, and is still in the prototype stage.

The updated version for the coming spring will look much more the part - but, within reason, I am more concerned with what a filter does (or doesn't) do, than with cosmetic appeal.

The concept of a pre-filter for garden pond pumps is relatively recent. True, most pumps are still sold with an apology for a strainer, that would be more at home getting shepherd's pie off a plate than protecting a delicate piece of equipment. But washing out a 'pot scourer' on almost a daily basis in the summer is carrying hands-on pondkeeping a bit too far.

Then came various foam pre-filters to fit over the pump intake...in their simplest form, just a cylinder or rectangle of open-cell foam, with or without an adaptor to make the connection.

These were a great improvement, offering both physical and biological filtration

and, equally importantly, preventing large particles of waste matter reaching the impeller and slowing down the water turnover, or worse. I had such a system in the smaller of my ponds for three years with four cartridges that were a push-fit over perforated manifolds.

The advantage of a multiple set-up was that I could clean the foam in rotation, so there was always a healthy residual bacterial population.

There were drawbacks, however. The system was bulky, and removing it to clean the cartridges was disruptive, especially when the plants had grown up all around it. Cleaning frequency - depending on the time of year, and how much the fish were eating (not to mention the state of health of my blanket weed) - varied from every three weeks to twice weekly.

It was not a chore I could put off. Once the foam began to block, the cartridges would pull in upon themselves, sealing off water passage through the manifolds and reducing the pump flow to a virtual trickle in just hours.

Then there was the worrying amount of water I used to rinse the cartridges. What's the point of having a filtration system that sends relatively little water to waste, if you then pour hundreds

of gallons down the sink, getting foam squeaky clean?

I am still a fan of open-cell foam - it can't be bettered in an external filter, in both sheet and cartridge form, providing it's readily accessible. But I have my reservations about in-pond foam pre-filters.

That's why I was pleased to give the **A1 G.S.M.** a whirl. I have to say that it's not the filter itself that excites - the design reminds me of the antiquated aquarium undergravels that used pipework, rather than a grid. No, it's the filter medium wherein lies the real magic. The **BKKS** first used Siporax at their 1990 National show, and raved about the stuff, since when it has been reviewed several times in this magazine.

To recap briefly, Siporax consists of cylinders of open-pored sintered glass that boast a specific surface of up to one square metre per gram. It does not significantly impede water flow, but its silicate surface is ideal for bacterial colonisation. The makers, Schott Glass, claim that the medium will not only perform the ammonia/nitrite/nitrate breakdown cycle of organic waste, but will go further, and reduce nitrate anaerobically.

Each piece of Siporax, in other words, is a dual-purpose mini-filter: oxygen rich water

Pre-filter power

encourages aerobic bacteria to flourish on the outer surfaces while the anaerobic bugs go about their business in the innermost recesses of the porous structure.

Until the advent of the A1 G.S.M. pre-filter, the problem was this: how to use Siporax effectively in a pond environment without breaking the bank! The square metre or so needed to pack a typical chamber of an in-ground filter would cost a small fortune. The A1 filter comes in two sizes, using half a litre or one litre of Siporax respectively. These relatively small quantities are housed within the pipework grid itself, and water flow through the medium is via slots cut into the lower surface.

If you merely connected up the grid and switched on the pump, solid debris would soon clog it up, and it would be no better than a pot-scourer pre-filter. The trick is, you embed the A1 in a small area of gravel, enabling the Siporax to act biologically.

The maker, Peter Oakes of Crewe-based A1 Garden Aquaria, makes some startling claims for his brainchild - most seductive being that it won't need cleaning more than once a year.

I obviously cannot vouch for that yet: all I can say is that when I first connected mine up, the throughflow from the pump was much better than with four freshly-cleaned foam cartridges. This, in itself, is a plus point, because there is nothing like a healthy water turnover to

pull out suspended solids.

Peter also says that the 'special magnets' incorporated into the pipework grid will assist flocculation of small particles of waste, doing away with the need for UV. Having finally discovered these three tiny ring magnets, I have to view this claim with extreme scepticism.

"The advantage of a multiple set-up was that I could clean the foam in rotation, so there was always a healthy residual bacterial population."

Magnetic algae control devices, in my experience, have yet to prove themselves, and those in the A1 filter seem like a token concession to gadgetry - I may be wrong.

I am not too happy, either, about Peter's universal condemnation of open-cell foam. He writes off the material as useless, on the grounds that the bacteria are held in a 'slime layer' on the foam's surface, where they thicken to produce muck that actually increases demand on the filter's resources, while reducing the efficiency of the inner structure of the foam.

So, if foam doesn't perform properly, what does? According to Peter, gravel - and I quote: "Gravel, on the other hand, does

not create this slime due to the sharp edges that are ideal for bacteria, not obvious to the human eye but there nonetheless. Canterbury Spar is very good, also Lytag and broken pebbles."

Is he saying that gravel never blocks? If so, why did the undergravel pond filter fall so badly out of favour?

Be that as it may...I installed the prototype A1 G.S.M. as recommended.

The pump sits supported on top of the gravel and is nicely accessible, should the need arise. I do hope that the 'no maintenance' claims are genuine, for lifting a gravel-filled tray from the pool on a regular basis would be even more arduous than doing the same with foam which is, at least, relatively lightweight.

A week on, the pool is undoubtedly clearer than it was, there has been no reduction in flow through the pump, and I look forward to the spring, when the workload on the A1 filter will inevitably increase.

The unit costs £39.99 complete with gravel tray. I have little doubt that, for the smaller pond, the A1 G.S.M. could be the complete answer to a reader's prayer. NF

•Details from A1 Garden Aquaria on 0279 822261.

Star rating

Quality	***
Practicality	****
Price	*****



Vivat vivaria

Pearlco's new Infra-red vivaria heater the Vivaria -75 is a compact low profile heater with a sealed ceramic element which should apparently last a lifetime. The heater has a 75 watt power consumption.

The model we saw may not be typical factory quality, but it was let down by a poor standard of finish: had two screws missing; and the top grille was already rusty.

That said, Pearlco have an excellent reputation in the vivarium world and this heater includes a number of useful features - the visual warning of a red sidelight; and a grille which stops herpetiles doing a common trick of mounting and resting on the heater until it burns them.

The unit costs £25, and will require a thermostat to control it. Incidentally, along with naming the unit at a safe ambient temperature, you'll need a separate heat source like a light bulb so that your pet can regulate its own heat by basking closer or further away. SW/NF
*For details of your local stockist ring 081 579 4142/3

Star rating

Quality	***
Practicality	****
Price	***



Pumping power

The Stuart XB Range of pool pumps are designed with swimming pools in mind -

which should make them pokey enough for any pool that has Koi swimming in.

Powered by a fan-cooled totally-enclosed induction motor with an electrical rating of 220/240 volts 50-60Hz, the smallest pump in the range the XB 90 has a 90 l. per minute flow rate, a 600W power input and a 2.5 amp maximum running current. Other pumps in the range are the XB 130; XB190 and the XB260 all shifting the litres per hour their name suggests.

In a Koi pond the pump will need to be situated between a gravity-fed filter unit and the pool. This is because the pumps incorporate a strainer basket, and any arrangement that takes water straight from the pond will find you

constantly clearing this out.

If the pumps overheat they switch off, but do come back on automatically. They do of course, require the same waterproof sheltered position as other non-submersible pumps.

The beauty of this type of relatively expensive non-submersible pump is that they aren't sealed units and virtually any fault is repairable, with a full range of spares available.

R.R. Prices start around £200 for the XB90; the largest XB260 comes in around £270. SW

•More details from Stuart Turner Ltd., Henley-on-Thames, Oxon RG9 2AD, Tel: 0491 572655

◀ Pump inside the pre-filter



Remanoid have come up with an interesting idea with the latest series of pond pumps. This puts a 200, 250, or 450 pond pump actually inside a pre-filter module (or modules)

where it is surrounded by a flying saucer-like structure, with a foam pre-filter inside a mesh grille. The pump flex passes out through a slot in the module.

The unit also has a neat fold-

down handle which is not necessary because the set-up is heavy (it's not), but will aid in lowering it into your pond. It's mainly there to help in removing the "lid" of the module, which screws on with a bayonet fitting.

Good features of the unit are the way the system can be enlarged by adding extra modules, and the way the sponge can be removed and easily cleaned. I suspect the fact that these sponges are thin will not mean that they clog any more quickly than the average strainer, but they will be easier to clean.

Weaker point is the inevitability that grit will get jammed in the bayonet-type lid fitting. You could also argue that some pond pump pre-filters offer an amount of biological filtration which this thin sliver of foam won't.

But all-in-all a unit worth considering in the smaller pond. There are three sizes at £56.99; £69.99, and £89.99. SW

•More details from Remanoid Ltd., Unit 44, Number One Industrial Estate, Medomsley Rd., Consett, Co Durham, telephone 0207 591089.

Star rating

Quality	★★★★
Practicality	★★★★
Price	★★★

Boost your potted pond plants

Aqua Boost is a new slow-release fertiliser (resembling an exotic breakfast cereal) which consists of small blobs of fertiliser bonded together with a dissolving coating. You pop the whole pod into the soil near the roots of your plant, in the Spring, and it should be going strong in the Autumn. The combination of rising temperature, and moisture starts the pod working, and it is claimed you can re-pot in the Autumn and the fertiliser will start working in the spring. SW

•Boxes of 20 pods cost £3.95 from aquatic and gardening outlets. More details from Aqua-Soil Products Ltd., Blue



Looks like a crunchy snack - but it's your plants that will be fed

Waters Estate, Bovey Tracey, Devon, TQ13 9YF telephone 0626 835135

Star rating

Quality	★★★★
Practicality	★★★★
Price	★★★★



Starting with a rush

Filter Start is a solution which claims to contain billions of live filter bacteria and will, the manufacturers say supply, "the one ingredient missing in all newly set-up biological filters i.e. sufficient numbers of live and actively nitrifying bacteria."

Dr Sundaram S Manjan is the director of Esarem Ltd the company that has developed the bacteria. "With this product", he claims, "we proved that a tropical/freshwater aquarium can be set-up and fully stocked all in one go. Now with Marine Filter Start we are proving that a marine system can be matured in days."

It's certainly easy to use - you just dump it in your tank or sprinkle it over your filter media.

Filter start has a use-by date, and requires refrigeration (which is worrying because as yet it's only available by mail order). It's also very expensive, as the prices below show.

In fact there's a problem here - we're testing the freshwater Filter Start on a new tank that we've had to set up quickly. This type of situation is ideal for Filter Start - an emergency which requires a mature filter quickly.

The sample bottle we used came to us in January and is date-marked "Use by 30. 04. 1992". This very honest touch of date-marking highlights the problem. Keeping a bottle of Filter Start handy on the off-chance of a disaster could be expensive as it will quickly deteriorate, and using it to start a new set-up is going to require some forward planning.

But I can see it being a brilliant aid to the organised Koi keeper, looking to boost his filter in the early spring.

The company (Esarem Laboratories) also offers an advice line on 0795 475319. We'll let you know next month how we got on with the test tank. SW

PRICES:

Freshwater:	
16 gallon tank	£5.99
33 gallon tank	£10.99
Marine:	
33 gallon tank	£12.99
Pond:	
150 gallons	£11.99
2000 gallons	£39.99
All plus £2.05 postage & packing.	

Star rating next month

•Available from Garner Marketing, 118 West Street, Faversham, Kent ME13 7JB.

It was simple good fortune that led to World of Koi at Bromley, Kent having the oriental initials WOK. The name was not chosen with that in mind. It was chosen to sum up the obsession felt by the two partners in the business - Rod Gilbert and Steven Hickling with the fish of their corporate dreams.

Disappointment and disillusionment with the Koi trade which was then just beginning to take shape, brought them together. And five years ago, they took the only sensible route to ensuring high standards for themselves and others - they set up their own business. They've been developing the site steadily ever since, the latest measure being some (very welcome on the day we called) extensive roof insulation. The result was their own world of Koi.

Showponds

Highlight now is a 10,000 gallon pond which in natural light from extensive skylights looks just like an immaculately-landscaped natural pond.

This pool contains some magnificent Koi, massive Common Carp and a couple of Sterlets. It's heated to ensure lively and hungry fish all year round. Other ponds and several sale vats hold a wide selection of fish from March onwards.

The dry goods section is exceptionally thorough, including everything for the construction and running of a pond.

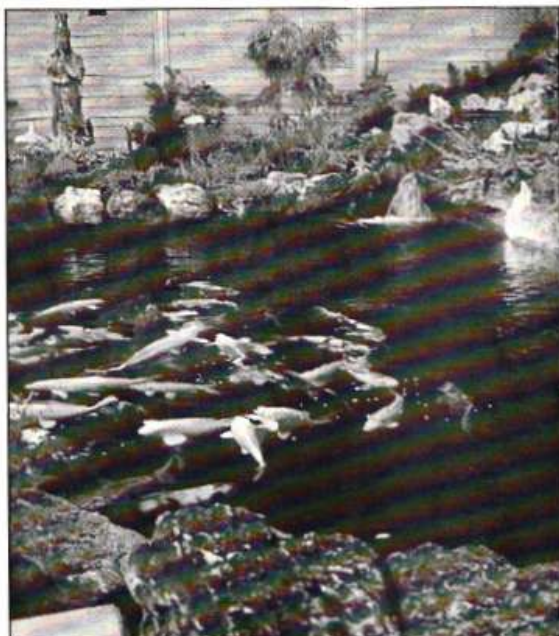
Tanks

Other coldwater fish better-suited to tanks are held in a separate area. WOK caters unusually well for this branch of the hobby with a wide selection of equipment including the full range of Clearseal tanks.



Large, airy, warm and well-stocked - that's WOK.

Practical Fishkeeping/March 1992



Big Koi in the heated show pond.

World of Koi

Two men had a mission to create their own world of Koi - Shopcall visited to assess the results

Filters

If filters are just so many black boxes to you, a visit to WOK will offer a refreshing change. WOK's own range WOK 380 filters are built in octagonal units. These are not separate units - the octagonal

tanks are manufactured custom-made to the needs of a pond. They can be factory-joined in a wide variety of ways to form various shapes, straight or staggered lines or even squares for instance. They are equally adaptable in that though they're gravity-fed, they can be adapted to be pump fed. Lots of emphasis is placed on a filter large enough to do the job - they will filter up to 20,000 gallons and can be designed to go still larger. WOK also manufactures a vast range of pond-building equipment.

...and the unusual

WOK are not unusual in that they offer a pond building service. But few other companies can match

their computer design service. They measure your garden, note existing features, choice of equipment and filtration, and feed the information into a computer which will offer various possible designs. The measure of the success of their pond-building business is that they're solidly booked with work for their four full-time staff Tim, Paul, Matt and Justin.

A large range of Brunel microscopes is on sale. They pay tribute to WOK's proactive approach to fish health - customers are encouraged to take smears from their fish to identify problems.

Another unusual feature is the WOK Gold Card which costs £15, and gets you a 10% reduction on many purchases and a quarterly newsletter.

Tip from World of Koi

If you have blanket weed problems, never stock Sterlets into a pond. They are designed to hug the bottom, and will get trapped in blanketweed and smothered to death.

The fish

WOK import Japanese Koi from 4 to 36" in a variety of grades to suit all pockets. The main shipments arrive this month, with an auction on April 20 (Easter Monday). They also sell Golden Orfe, tench, comet Koi, and some high-quality fancy goldfish, with a varying range of coldwater fish for the tank side.

Treating fish is a speciality of WOK's. Their fish pond call-out service is constantly on the road, while they will take-in, quarantine and treat sick fish in their own carefully-monitored unit.

Rod and Steve (along with full-time staff Bill and Donna) have succeeded in creating their own world of Koi - and even if they don't think it's Utopia every Koi fan will find a visit an interesting and enjoyable experience.

• World of Koi, Bencewell Farm, Oakley Road., Bromley, Kent. Tel: 081 462 9479 (Fax) 7883. Open seven days a week 10am to 6pm.

Tip from World of Koi

Most of the "disease" problems WOK's call-out service encounter can be traced back to the filter.

Everything you want KOI

We continue our series for lovers of Koi - and newcomers to the hobby - destined to cover every aspect of the most popular pond fish. This month, Koi varieties with NITA BUTCHER.

Unlucky it may be, but the Japanese recognise thirteen varieties of Koi for judging purposes. All are, of course, colour variations of a single species, *Cyprinus carpio* - but that's only the first complication of many.

For one of these categories - **Kawarimono** - is the 'catch-all' into which all Koi fall that cannot fit into the round dozen. Sometimes such fish are genuine, beautiful 'one-offs', but they can equally be hybrids between two recognised varieties, or fish that exhibit peculiarities of patterning and scalation that preclude them from being judged in a class for which they might otherwise seem obvious candidates.

Just one example is the **Kanoko Showa** - dappled like a young fawn, but still basically a black fish with red and white markings in the classic pattern.

There's an obsession among some Koi keepers to own the 'perfect' fish, but such a beast has never existed. The closer a Koi aspires to perfection, the higher the price - which is fortunate for most, relatively impoverished fishkeepers whose main aim is to have colourful, healthy pond occupants.

Colour, of course, is not the only consideration. Body shape and finnage can make or mar a fish, and you have only to look at a vat of cheap and cheerful Koi to spot at a glance the misshapen products of intensive breeding. Male Koi are always slimmer than females, but don't confuse slimmish with emaciation, or robust good health with obesity. I believe that introducing **Doitsu** (German-scaled) carp into Koi bloodlines was a mixed blessing, for these fish were originally bred for the table and shaped like little porkers.

Another horror story is the prospect of genetically engineered Koi finding their way

on to the market. There is, in the USA, a fish-farm developing table carp and catfish which grow, on average, 30 per cent larger than normal, and this is achieved by the incorporation of a human growth hormone into their genetic make-up.

show', both here and abroad.

Taisho and **Showa Sanke** (red, white and black fish) were named after the Japanese eras in which they were developed, but modern examples can differ greatly from the fish originally regarded as 'right'.

Utsurimono - predominantly black fish with one contrasting body colour, usually white (**Shiro Utsuri**). The black patterns are as for a **Showa**

Asagi/shusui - blue, or blue/grey reticulated back, red and white in varying degrees, according to sub-variety (a **Hi Asagi** has much red). A **Shusui** is the **Doitsu** version of the **Asagi**. **Koromo** - literally, 'robed'. The fish are crossbreeds between **Asagi** and (usually) **Kohaku**, resulting in blue-bordered scales (**Ai-goromo**) or black-bordered scales (**Sumi-goromo**)

Kawarimono - hybrids, **Karasugoi** (black fish), **Matsuba**, **Goshiki** (**Asagi/Bekko** or **Taisho** crosses), and many other fish that are now recognised and prized as varieties in their own right. An example is the **Ochiba-shigure**, a grey and green Koi with **Matsuba** scalation that now appears in **Doitsu** and **Ginrin** forms. **Kawarimono** are the truly unique Koi that give every hobbyist the opportunity to own something special

Ogon - single coloured fish with a dull, metallic lustre. Very popular with beginners, and breed truer than multi-coloured Koi varieties

Hikari moyomono - fish with two or more coloured patterns, one of which is metallic, OR Koi in two metallic colours.

Examples: **Yamabuki**, **Hariwake**, **Platinum Kohaku**, **Kujaku Ogon Hikari**, **Utsurimono** - crosses between **Ogon** and **Utsurimono**
Kinginrin - fish with sparkling scales. Hence **Kinginrin Shiro Utsuri**, **Kinginrin Showa**.

Note: such fish are judged in the **Kinginrin** class although of otherwise well-recognised varieties
Tancho - the red head spot transforms an otherwise valueless white Koi (**Shiromuji**) into a **Tancho Kohaku**. A **Tancho Showa** or **Tancho Sanke** likewise has the red confined to the head

Cheat's guide to Japanese terminology

Koi nomenclature can be daunting, but a few words will get you by. Here are the ones that are most useful:

Koi - simply, 'carp'. The word becomes 'Go!' in some cases, i.e.

Nishikigoi (brocaded carp) and **Higo!** (red carp).

Gin (with a hard 'G') - silver.

Kin - gold. If you have trouble remembering which is which, gin (the drink) is a silvery colour.

Hi (pronounced 'hee') - red.

Sumi - black.

Doitsu - mirror-scaled.

Ginrin - literally, 'silver and gold', but applied to scales with a pearly lustre.

Matsuba - like a pine-cone. It refers to reticulated scalation.

Kujaku - peacock.

Tancho - Japanese red-headed crane. Applies to any Koi with a red (ideally circular) head spot.

Kage (car-gay) - dappled.

Nidan, **Sandan**, **Yondan** - refers to numbers of red areas in the patterning of **Kohaku**...two, three and four respectively.

Many of these terms can be combined to give a good word-picture of an individual fish: for example, **Sumi Tancho Gin Matsuba** is a fish with a reticulated, silver body colour and a black headspot.

In other words, these patented fish are (albeit minutely) related to us! Security around the farm is high, because of the ecological time-bomb that could be set off by escapes into the wild. But everything has its price - including, perhaps, a jumbo Koi of mammoth proportions? (And no, this is not the April issue of PFK).

The big three

Perhaps because they have a simple, classic beauty, or perhaps because perfection is hardest to achieve in these varieties, the Japanese value three types of Koi above all others - the **Kohaku**, the **Taisho Sanke** and the **Showa**. Certainly, these fish usually win 'best in

The modern **Sanke** can have very small areas of black in relation to red and white, while a type of **Showa** known as a **Kindai** has so much white in relation to black that at first glance it can be mistaken for a **Sanke**.

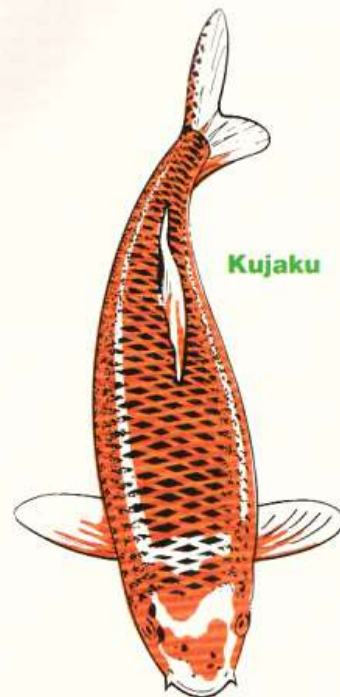
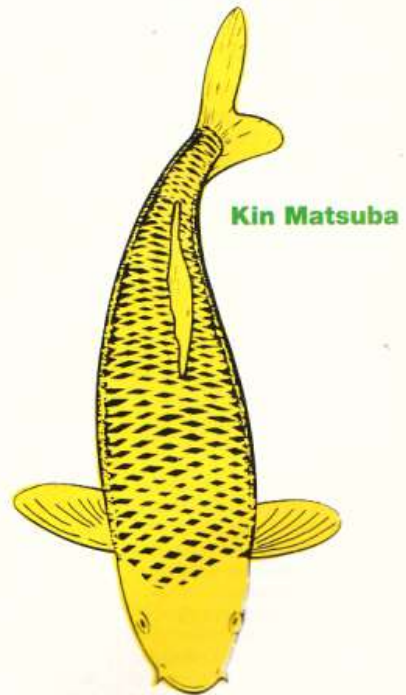
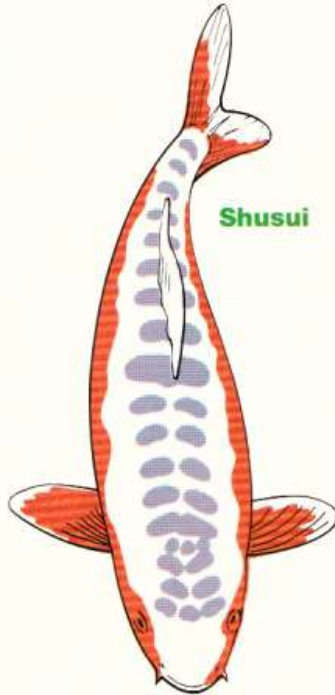
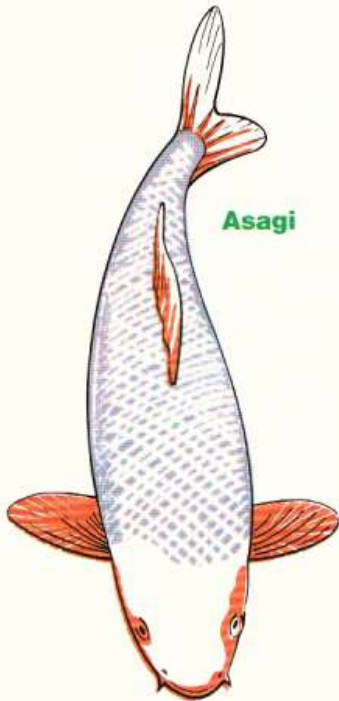
The thirteen varieties of Koi

Kohaku - red and white
Taisho sanshoko (or **sanke**) - white fish with red and black markings

Showa sanshoko (or **sanke**) - black fish with red and white markings

Bekko - fish of solid colour, usually white or red, with black markings

ted to know about...



COLDWATER INFORMATION ■

◀ THE ten fish illustrated in this article, you will already appreciate, are by no means the whole story, but they are either universally popular, or have qualities that appeal to me personally.

■ The **Asagi** was one of the first Koi varieties, and unlike the others, it was developed throughout Japan, rather than exclusively in the Niigata prefecture. The original **Asagi** was probably a mutation of the **Magoi**, and arose in the early Nineteenth Century.

A good **Asagi** should have a clear blue back with white or pale blue reticulation and an unblemished blue or white head. Red is permissible and desirable on the cheeks and belly and in the fins, but should ideally not go above the lateral line.

Common faults in the **Asagi** are a blackish/brown back rather than the desired blue, a stocky body shape and a head that tapers too much towards the mouth.

Asagi are important, not only as a variety in their own right, but as brood stock in establishing bloodlines of other varieties.

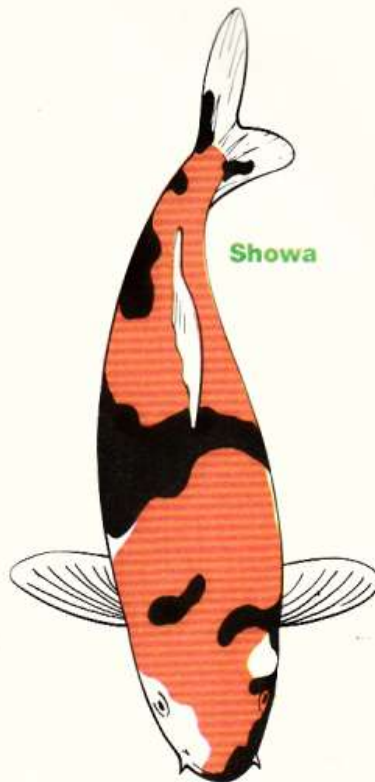
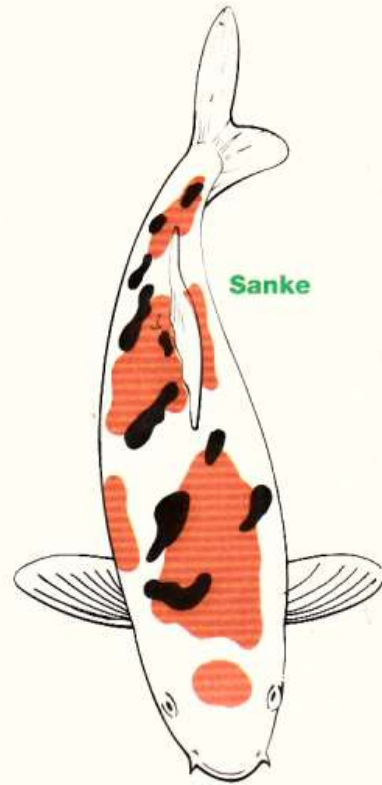
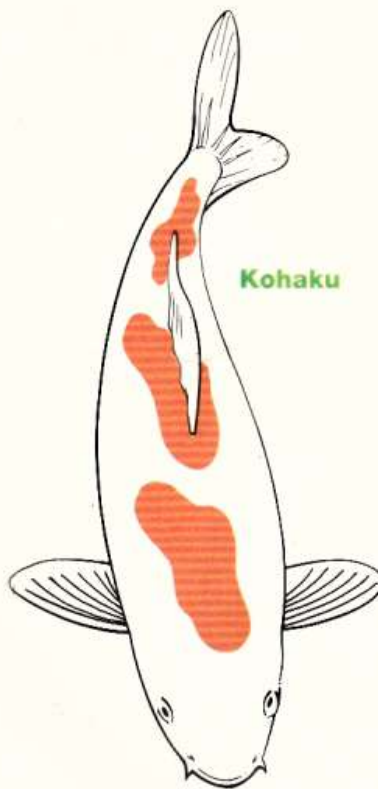
■ The **Doitsu** equivalent of the **Asagi**, the **Shusui**, is a glorious fish at its best - but unfortunately, really good examples are rare.

The mirror carp ancestry should give us a fish with an even row of bright blue scales either side of the dorsal fin, but too often they are neither even nor blue. Even good young fish can develop a blackish tinge to these scales as they mature.

Red should appear in the same areas as with the **Asagi**, but nowadays the **Hi Shusui** (where it extends over the back as well as into the fins and around the belly) is an acceptable fish.

■ A more sophisticated Ogon-type Koi is the **Kin matsuba**, another fairly recent development - the first fish produced as late as 1960. The reticulated scale pattern on the back serves only to emphasise the clear, yellow head and fan-like pectoral fins, but really good examples are rare. The **Gin matsuba** is the silver equivalent.

■ The **Kin ki utsuri** is included as a representative of the **Hikari Utsurimono** group of



Koi. A black and yellow, metallic fish, its patterning is similar to that of a **Shiro Utsuri**, which in turn can fairly be described as a **Showa** without the red.

This Koi exemplifies the sense in using Japanese terminology for the various varieties, for the three words are shorthand for what it's all about.

Good examples are rare - the yellow is often suffused with black flecks (known as 'shimis'), while the balance between the two colours is difficult to achieve.

■ The **Ogon** is a deceptively simple fish to appreciate, not that it is all that popular in Japan. It is a single-coloured **Hikarimono**, or metallic, Koi variety that first arose in 1946 from a wild, golden-striped mutant whose progeny had been selectively bred for a quarter of a century. Typical **Ogon** are golden fish with a clear head and lustrous pectoral fins: platinum, orange, yellowish gold and grey are other recognised colours.

Ogons, more than any other Koi, are prone to misshapen, often fat, bodies and fins out of proportion to the fish as a whole. In Japan they tend to be entered in shows only in the jumbo class they are very fast-growing.

■ The **Kujaku**, or 'peacock' Koi, is yet another type of **Ogon**, this time the result of a spawning between a female **Matsuba Ogon** and male **Matsuba Ogon** and **Hariwake**.

The basic body colours of this variety are metallic red and silver, over which runs characteristic pine-cone reticulation. Good red markings on the head contrast with the silver to accentuate a Koi that is both bright and beautiful, like its namesake.

■ Proving that perfection is hardest to achieve in the simplest



This Koi which is coloured like an old leather football was bought at 2" and shows what can happen when the genes get out of control...

Practical Fishkeeping/March 1992



A Kumonryu from the author's pond shows the doitsu scaling and has tinges of red on the belly.

guise, the **Kohaku** has inspired the Japanese since the first red-cheeked mutation arose from a wild carp in the early Nineteenth Century.

We all know them as red and white Koi, and because of their popularity, several distinct bloodlines are known... **Tomoin**, **Buketa**, **Yagozen**. A top-rank **Kohaku** needs impeccable quality of colour - the white like snow, the red bright as arterial blood. But it also needs these to be in harmony with one another, to form a pleasing, overall pattern. I have already mentioned the 'step' patterning, but it goes a lot further than that. The degree to which the red covers the head, the percentage of red to white, whether the red spreads below the lateral line, all are taken into account. But some **Kohaku** that break one or more rules are still impressive fish. The word that best sums up a good example is, perhaps, 'presence'.

■ Imagine a good **Kohaku** with the addition of black over the red and/or white markings, and you have the **Taisho sanke**, a fish that first appeared spontaneously in a **Kohaku** spawning in 1915 and was later improved by **Bekko** blood.

The idea of what makes a good **Sanke** has changed radically in only 15 years or so, from a rather flowery fish with equal amounts of **hi** and **sumi** to one where the **sumi** is almost incidental, serving only to accentuate the red and the white. A distinction is also made between **Tsubo Sumi** (black over white) and **Kasane Sumi** (black over red). The main faults with run-of-the-mill **Sanke** are imbalance between the markings, poor or non-existent head **hi** and insufficient contrast between colours, often merging into nondescript blurs.

■ Everyone has their favourite variety, and mine is the **Showa**. This Koi first appeared in 1927, the result of a cross between a **Ki** (yellow) **Utsuri** and a **Kohaku**. The beauty of such fish lies in the sharp contrast between three primary colours, although having said that, the **Boke Showa**, where the black is dappled, has a quiet elegance.

As a general rule, you can distinguish a **Showa** from a **Taisho Sanke** by the **sumi** extending into the head, a black base (**Motoguro**) to the pectoral fins and the black blocks of base body colour.

However, the dividing lines are meeting somewhere in the middle

with the development of **Kindai Showa**, which have just as much white in the body as a typical **Sanke**. **Showa** can be **Doitsu**, **Kinginrin** or what is known as '**Hi Showa**', in which red is the predominant colour. Common faults with the variety are an unbalanced pattern, uneven distribution of **sumi** in the pectoral fins, and muddy head markings.

And for some reason, a really large **Showa Sanshuko** is indeed a rarity.

■ Finally, in this top ten list, **Karasugoi** are not everyone's kettle of fish. In their purest form, they are merely matt black Koi: but the black is like the back of a raven, from which the Japanese name derives, unlike the rather muddy hue of a **Magoi**.

Contrast white on the head and fins with the predominant black, and you have the very elegant **Yotsujiro**, Dragon-patterned black and white **Doitsu** Koi are known as **Kumonryu** and command a high price. Superficially similar is the **Matsukawa-bake**, but this fish is odd in that the distribution of the respective colours changes according to water temperature.

A **Sumi Nagashi** is yet another **Karasugoi** variant, with **Matsuba**-patterned scales. **Karasugoi** and their derivatives form a very important sector of the **Kawarimono** class of Koi and are becoming increasingly popular among Koi-keepers looking for something a bit different. ■