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Red-tail cats surveyed — our big colour feature starts on page 80.

Practical Fishkeeping is on sale the 30th of every month preceding the issue date.

COVER: *Miclabrichtys bicolor*, the Hawaiian Bicoloured Anthis, courtesy of Bruce Carlson, Waikiki Aquarium. Flag Basslets are delicate but highly desirable occupants of insect systems and, like Clownfish, change sex in adulthood. They start off as females and undergo the transition only when they have spawned.

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TALK BACK



Write to: Talkback
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I'm not sure if Star Letter winner F. Poizer is pulling my leg or not, but his 'Glass Fish' reminiscences secure him a free year's subscription to Practical Fishkeeping.

Do you have a point to make, information to pass on or even (heaven forbid) a moan about the magazine? This is YOUR forum. Write to: Talkback, Practical Fishkeeping, Bretton Court, Bretton, Peterborough PE3 4DZ.

That's service!

AS I am known for my occasionally scathing outbursts on various aspects of fishkeeping, the following might come as a bit of a surprise. I was so 'jobsmacked' by the exemplary service extended to me by Wildwoods, of Enfield in Middlesex, that I have to put it on record.

Back in the summer, I bought a preformed concrete pool from them, for the top of my waterfall. They are not cheap but, in my opinion, far more realistic when weathered than fibreglass. It was transported home and handled with the utmost care but alas, while I was balancing on top of the rockery and trying to set the thing into place it got dropped. Naturally, according to Murphy's Law, it broke.

I should make it clear that these things are by no means fragile — it was pure bad luck and bad handling on our part. I rang Wildwoods, explained exactly what had happened, and was told 'bring it back and have another one'.

I was trying to explain that the housekeeping wouldn't stretch that far when the man on the other end of the phone explained there would be no charge. In fact, he didn't even really want to see the broken one. I went along and he was true to his word, although I think he was amazed that at five foot nothing and barely eight stone I had managed to break a concrete pond.

Wildwoods didn't know I was going to write and had nothing to gain from their actions, so I thought mention should be made of their caring attitude to customers. I shall certainly continue to patronise them. — **Daphne Layley, Thorpe, Egham, Surrey.**

Another Krib tale of woe

I WRITE in reply to John Collins' January letter about Kribensis. I, too, have had problems with these fish, with four mystery deaths over the past six months. They seem sporadic and isolated, not affecting other tank occupants. Symptoms are similar to those described by John — swollen bodies and gaping mouths. I, too, have tried remedies, but without success.

None of the casualties were involved in fights and the usual aquarium maintenance was regularly carried out. After the first death, I thought the fish might have picked up an infection from the supplier, so I replaced it from another source — but the same thing happened. In fact, it doesn't matter where I buy my Kribis, they become swollen and die. As many of these fish are now bred in the UK, could in-breeding be to blame? — **D. Chandler, Wiltinton, Surrey.**

Minnow takes a vacation

THOUGH I am a wily snail fly in the fishkeeping league, the following tale may amuse your readers. We have kept coldwater fish for several years — bitterling and mountain minnows — in a tank on the kitchen window sill, which presides over the washing-up ritual and other culinary activities. The water is kept fresh by a small airpump and an outside green-lined plastic filter tank that recirculates the water through centimetre diameter plastic syphon and splash pipes.

The fish had stabilised for most of this time at three mountain minnows and a bitterling pair. The smallest of the minnows disappeared about a month ago and we assumed it had fallen prey to some ill or accident or had

been devoured by its companions. Then one of the bitterling died suddenly, with what looked like a tumour in the region of the pectoral fins.

A tank-cleaning was called for, so I detached the side-mounted filter unit and had removed its home-made charcoal cartridge and debris-trapping wool when I noticed a quick movement. There, sure enough, was the missing minnow! It must have seum into the syphon pipe and been sucked upwards. None the worse for its ordeal, it was returned to its pair, where it is doing well and feeding heartily.

I now make sure there is a baffle over the main tank intake for the syphon! — **Alex Marwood, Driffield, E. Yorks.**

Spring feeds pay dividends

I READ with interest the article in January's PFK on feeding fish. When I took up the hobby some 14 years ago I read everything I could lay my hands on, but advice on feeding was very conflicting. 'Little and Often' was the commonest suggestion, and for a few months I was feeding twice daily and experiencing all sorts of problems.

I experimented and reached the conclusion that feeding once every other day works well. I rarely lose a fish, other than to old age, and my sixteen tanks are trouble-free.

Feeding like this, the fish spend a lot of time searching in the gravel and therefore little is left to pollute the tank. It also has the advantage that I can go away and leave the fish for a few days, and they won't even notice I've gone. — **Helen Allen, Watchet, Somerset.**

'GLASS' LEG-PULL

THE letter from L. Collins of Shipley, West Yorks (Glass fish) made me smile. It reminded me of a memorable date, September 1st, 1939, when I was evacuated 52 miles from my home in Salford to Newton Estate in Lancaster. I was eleven at the time, my brother Derek was seven. We shuffled from door to door, with our labels on our coats, arriving at 80 Langdale Road — who were down for 'Boy' — one

"I've got to look after this kid," he said so they took us both in.

— Inside, on the sideboard, was the most glorious sight — a shining, three-gallon bowl of golden-brown glass and inside, glass fish of all shapes and colours all hanging on glass bubbles. Every week it was emptied and polished.

On another topic, there's an impolite aquarium magazine that offers real dried prawns beautifully mounted in

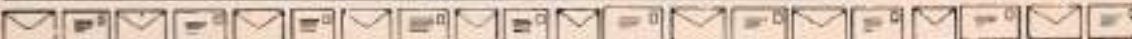
exchange for a subscription gift to a friend for Christmas. If I sent one to any friend of mine, they would never speak to me again!

Finally, I would like to praise 'Classic Aquatics' featured in 'Shopping Around'. Quite a place! — **F. Poizer, Nottingham.**

• I trust you realised that the 'Glass Fish' referred to in the original letter were living creatures... course you did. As to those dried prawns, they offend my sense of good taste almost as much as my conservation conscience — **Ed.**

Double value

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Aquatic Queries

WELCOME to Aquatic Queries, our FREE reader service designed to help YOU get more from your hobby. Our panel of experts will answer any questions you care to put to them.

Answering general queries is Dr. David Ford, of Aquarian Laboratories, and Dr. Chris Andrews, in charge of London Zoo Aquarium. Cichlid fans deal with Mary Bailey, technical editor to the British Cichlid Association, while David Sands is the man to write on Catfish.

Marines are in the capable hands of Dave Keeley, who runs Snowcrest in Loughborough.

Just tick the expert you are writing to in the box below and attach the coupon to the front of your letter.

Send with SAE to: Aquatic Queries, Practical Fishkeeping, Bretton Court, Bretton, Peterborough PE3 8DZ.

Green diet

Q I have purchased a Suckermouth Catfish (*Hypostomus pleurostomus*) and would like to know what and how much it should eat.

— Karen Goodchild, Saltburn, Cleveland.

A *Hypostomus* are very misunderstood. In nature they live in the rich algae gardens of shallow forest streams, eating continually grazing on greenery and possibly on any invertebrate that they can find within the algae. In aquaria you can offer them spirachpeas, lettuce, fine shrimp and bloodworm. D.S.

Companions for Clarias

Q I have a 12" *Clarias* catfish kept in a 4ft tank. What other fish can I add to keep it company? — G. Camp, Lengwith, Mansfield.

A Few fish can survive with *Clarias* in the

'arena' of a four foot tank but I can recommend Tilapia, African cichlids. They can hold up their own quite nicely in the aggressive, enclosed world of a *Clarias* dominated fish tank. D.S.

Well done — it's a rarity

Q I have been trying to identify and gather information on a recently purchased fish which I understand is a *Lithoxus* Pleco. It measures 125mm and seems darker in colour

than that shown in your book. Could you give me any details? — Colin Mears, Sidcup, Kent.

A I have seen a couple of the catfish you mention and I do not think that they are *Lithoxus*... if you look at the photos in my book you will see a different bodied, smaller catfish pictured as *Lithoxus lithoides*. Your fish is

A cool cat

Q I recently purchased a coldwater catfish, but cannot find any information on it. It is black on top and has a white belly. It kept in my community tank and measures about 4 1/2 inches. Can you give me any details of its history? — Terry Trevor, Lowestoft, Suffolk.

A Your catfish is an *Actinurus*, one of the many Bullhead catfishes that range from the Canadian lakes down through North America and into Central America (Mexico).

They live in a wide range of waters, from small woodland creeks to large rivers and lakes. Imagine our own country streams, the type that slowly wind through the local woods, and you will not be far out. Bullheads are territorial and feed on crustaceans, fish and worms in nature. D.S.

actually akin to Peckoltia pulcher although I would not think this species will remain in the genus for too long as it has distinct features (flat head, broad ventrals) that suggest it belongs elsewhere. Nonetheless, this is a nice, rare species that may attain six inches or more that should be fed on lots of greens and be given very clean water. D.S.

Pricy extra

Q After keeping a 3ft community tank I wish to move to something larger. I intend to keep a pair of Discus, a pair of Angels and a shoal of large tetras. Can you add something else for me? — N. Bedford, Hitchin.

A If you have the budget, I would recommend some of the large cichlids, especially *Brochis britski* which I have kept successfully in a Discus aquarium. They seemed to prefer the warmer conditions, although I would add that it takes a few days for them to adapt to warmer conditions if they have been held in cooler waters. D.S.

Aquatic Queries

DR. C. ANDREWS

DR. D. FORD

DAVE KEELEY

DAVID SANDS

MARY BAILEY

Please attach to the first page of your letter.



Brochis britski are an ideal cichlids for mixing with Discus — but still pricy.

A tale of two lakes

Q I have a tank measuring 36" x 12" x 12" and recently bought a pair of *Aulonocara nyassae*, measuring about two inches. I believe they come from Lake Malawi. Can I add a pair of Goby Cichlids (from Lake

Tanganyika)? If not, can you please advise of any other cichlids to include in my tank? — P. Vials, Newquay, Cornwall.

A *Aulonocara nyassae* does indeed originate from Lake Malawi, and the

genus is endemic to the lake.

Although I do not normally recommend mixing fishes from Lakes Tanganyika and Malawi unless you really know what you're doing, I think the combination you contemplate would probably work. So I would give it a try.

You could keep other *Aulonocaras* with the *nyassae*, or some of the

smaller "Haplochromis" from Lake Malawi. You could, if you like, keep a pair or two of Mbuna, but in this case I would forget the Goby Cichlids. If you do mix Mbuna with *Aulonocaras* then avoid outnumbering the latter, as they are shy and tend not to thrive in a rough tank where Mbuna are in the majority.

M.B.



Aulonocara nyassae — one of the few Tanganyikans that could mix with cichlids from Lake Malawi.

Be careful how you dose

Q I am keen to try breeding Discus and read of a chemical called Sodium Dihydrogen Sulphate which, when used in the daily/weekly water changes, will help to lower the pH of the water. I have not been able to obtain this, and wonder if it is known by another name. Can you also tell me where this can be obtained? — C. Tomie, Bishopbriggs, Glasgow.

A This substance is sometimes used in pH adjusters sold by aquatic retailers. I cannot stress too heavily, however, the dangers of dosing with this type of chemical, as the process can easily go wrong.

Given that you live in Glasgow, where the water is very soft indeed and therefore easily acidified (as there is no hardness to act as a buffer) I suggest that instead you simply use peat filtration, which has the added advantage of usually stimulating the fish as peat contains hormones. Garden Peat (moss, not sedge) is perfectly OK as long as it contains no additives. M.B.

For gigantic cichlids you need gigantic tanks

Q My tank measures 36" x 15" x 12" and I am interested in keeping either Jack Dempseys or Yellow Guapotes. Are the Guapotes suitable for this size tank? Any information would be useful to me; also would you recommend a catfish that I can keep with it? — Richard Garman, Marlborough, Wilts.

A The Yellow Guapote is a member of the *Nandopsis* section of 'Cichlasoma', and is thought to be closely related to

'*C. motaguense* and '*C. managuense*. It may, in fact, be a form of the former. As such it is a large predatory fish which is really not suitable for your tank, which is too small for a large aggressive fish. So I think you would be far better off with Jack Dempseys.

I'm afraid that I know very little about catfish and would hesitate to make any recommendation in your case, if you go to a reputable dealer for your Dempseys then he will probably be better able to advise on this point that I am!

M.B.

How to join

Q I have a tank of African cichlids and I am interested in joining the British Cichlid Association. Joanna Mulley, Abbotsdale, Gloucester.

A To obtain a membership application form then please write to our membership secretary: Howard Barnfather, 309 Keighley Road, Sipton, N. Yorks, BD23 2RA.

If you prefer, simply send him a cheque for £9.50 and ask to join.

For the record, there is always an ad for the Association in the back of PFK (small ads).

M.B.

Stunted? No!

Q I recently obtained a female Tilapia *T. buttikoferi* measuring 10". I am worried, as I was told she has stunted growth and wonder if this will later affect her. I feed her with snails, plus lettuce and peas as well as food sticks. Can you give me any information on this fish, as I am unable to find any books on this type of Tilapia. — Dave Vloe, Cornwall.

A A 10-inch female *T. buttikoferi* is certainly not stunted, so have no worries on that score!

This species derives from Liberia; we know very little about it in its native habitat. I have heard that they do eat snails, but have no scientific confirmation. If yours is doing so, then it is probably true! Most Tilapias are omnivorous, with a taste for vegetation — in captivity they will eat most things and thrive. They will live and breed in tap water of a variety of chemistries. *T. buttikoferi* is noted for

being very attractive in appearance, and downright repugnant in behaviour — adult males are particularly nasty, and it is usually necessary to use one of the divided tank methods to breed them, else the female ends up dead in short order. They can be kept in very large tanks with other large nasty cichlids, or as 'singles' as show fish/pets. If bred they produce a large brood (500+) which, now that the fishes' behavioral characteristics are widely known, are not easy to sell — so one wonders if it is worth the aggro!

M.B.

Shrimps need separate homes

Q I have an 18 x 12 x 12" coldwater tank containing goldfish and bitterling. I would like to add some freshwater shrimps if this is possible, as I find their behaviour fascinating. — Alex Gerard, Hampton, Middlesex.

A You cannot add freshwater shrimps to your aquarium — they will merely feed the fish.

The animals are crustaceans of the order Amphipoda, the most common being *Gammarus* sp., found in most European waters. They are scavengers, eating mainly decaying organic matter, but they will eat living creatures and even each other.

The most common is *Gammarus pulex*. Other species, such as *G. tigrinus* or *G. lacustris*, are brackish water shrimps but have been seen in freshwater near industrial sites, probably because of pollution.

The shrimps can be housed in a small aquarium and fed flake food. The females will carry eggs in a pouch under the thorax, and these hatch out as tiny replicas of the parents, i.e. no larval stage. They do form family units until the young are adult.

A variant is the Blue-green shrimp from the USA, *Crangonyx pseudogracilis*, now also widespread in the UK. There is even a colourless species found in underground waters, *Niphargus* sp. D.F.



Freshwater shrimps (*Gammarus*) need a separate aquarium for their fascinating behaviour to be observed.

No caviare from these!

Q My local aquatic centre has started selling Sterlets and I am interested in keeping these, but am unable to find any information. Can you give me any suggestions on feeding and general care? — Daniel Padley, Wokinghampton.

A Sterlets are quite hardy fish but do require an unheated tank that is well aerated and well filtered. They feed on live foods like tubifex, and chopped earthworms or lean, scraped raw meat. They grow quite slowly, but can reach two or three feet in length. C.A.

No fast rules

Q With reference to the letter from J. F. Lobb in the December issue of *Practical Fishkeeping*, his tank is 36" x 12" x 15" and he has 38 fish totalling 76". I always thought it should be 36" of fish. Can you enlighten me? — H. Mullan, Gloucester.

A Stocking levels are always quoted as the safe limits for beginners. Experienced hobbyists can double the levels, because they understand about ammonia and nitrite problems and take steps to avoid the crisis via powerful filtration and frequent water changes.

If you visit zoo aquaria you will find very crowded tanks to maximise interest for the viewing public. However, these tanks are connected to large volumes of stored water and it is the total water volume that determines stocking density, not the aquarium size.

You will also see crowded tanks at the national fish shows, but these are temporary set-ups for one or two days, with little or no feeding. Dealers' tanks are often densely packed, but behind the scenes are central filter systems with controlled flows of clean water flushing the show tanks continuously.

Remember that a new tank should start with only a few fish, building to the safe maximum as the filter system matures. D.F.

Plants in mind

Q Being a newcomer to the world of aquaria, I started a year ago with a 2ft tank. I have now acquired a 48" x 15" x 12" tank, which I intend to run as a community tank, concentrating on variety rather than size. Which filter system would you advise me to use, bearing in mind I'd like my plants to flourish? — M.L. Melton, Stevenage, Herts.

A I suggest you utilise under gravel filtration with a powerhead either end of the tank. Plant your plants in pots containing a mixture of aquarium peat and garden loam — or use an internal/external power filter and place a layer of peat and garden loam beneath the gravel for healthy plant growth. There is never one guaranteed way to achieve a healthy aquarium, so read plenty of books on the subject from your local aquarium shop. C.A.

Not for tyros

Q I am thinking of keeping Elephant-nosed fish. I hardly know a thing about them, so could you please tell me the best conditions for them and what they feed on? — B. Sharples, Preston, Lancs.

A My first reaction to those who say they would like to keep these fish is to say — Don't! But if you are prepared to set up the correct aquarium for these fascinating mormyrids, then by all means have a go.

The problem is that Elephant-noses *Gnathonemus petersi* (and related *G. elephas*, *moori*, *schiffmaniae* and *macrocephalus*) are found in muddy waters in Africa, where

Super spots

Q I have a tank of community fish but sadly have lost a few fish to White Spot. I have treated the water but how often should I do this? One shop told me they apply a small dose every month to every tank.

Also, when I have applied the solution twice, is it necessary to change some of the water within a few days or weeks? White Spot is under control at the moment, but it is the aftercare that concerns me. — A. Laserick, Sunderland.

A No, do not use any treatment continuously... it stresses the fish, and stressed fish get diseases.

A single treatment with White Spot cure should be sufficient. If not, you have one of the new strains of 'stubborn White Spot' that has developed resistance to the chemicals used in the traditional cures (such as Methylene Blue or Malachite Green).

In this case use the more powerful copper treatment (such as Aquarion No.9 CopperSafe) but again only one treatment. In severe cases, a second dose is permissible but only after a 50% water change.

Also ask yourself why the fish are not naturally resistant to the parasite. Poor water quality? Overcrowding? Pollutants? Temperature too low? Get the conditions right, especially water quality, and the fish will not get White Spot. D.F.

MISCELLANEOUS • MISCELLANEOUS • MISCELLANEOUS

they use their long 'nooses' to find their way around and locate food (small worms and larvae). Hence the brightly lit, gravel-based, community tank will stress the fish.

Have a muddy base such as loam and sand, with lots of roots and petrified wood for refuges. Red lighting is useful if plastic plants are used. Feed on small earthworms, bloodworms, cultured whiteworms etc. There are no reports of successful breeding in the home aquarium. The sexes appear identical. D.F.

DID YOU KNOW?

The skin of the dogfish was used by cabinet-makers to smooth down wood before sandpaper was invented. It was known as 'shagreen.'



An Elephantnose fish probing in a sandy substrate for minute food particles.

Pseudo sharks

Q I recently bought a Silver Diamond Shark which is kept with Zebra Danos, Cherry Barb, and one Red Tailed Black Shark. Can you give me some information about it? — Jonathan Milnes, Sheffield, Yorkshire.

A These attractive and very active fish are ideally suited to a fairly large aquarium, where they can grow to several inches. They do best in a shoal of at least five or six individuals.

They are fairly tolerant of a range of water conditions and will feed readily on a selection of prepared and fresh foods. As your fish grow I would be wary of the smaller occupants, which could be eaten by the larger, so-called shark. C.A.

Algal plague

Q I have just bought my first aquarium, 36 x 18 x 12", with a built-in hood containing a 30" 25 W fluorescent tube. I've bought several Simlwood decorations and Prantastic plants. Filtration and aeration is by two Rena R225 internal filters. The lights are on for 12 hours a day. Fish include catfish, gouramis, swordtails and a number of barbs.

The problem is a fine brown-tinger coloured algae which coats my plants and decor. I've tried chemicals, and stripped the tank down completely once, but still the algae persists. How do I get rid of it once and for all? — D. Clayton, York, North Yorkshire.

A The reason your tank is plagued with brown algae is you have an insufficient amount of light and your tank is stocked only with plastic plants. You should add a second 30" white fluorescent tube, and also 50 - 100 small to medium sized, real plants. These plants will then use up the light energy falling on them, and thus compete with and help control the algae.

Simply increasing the number of tubes will result in green, rather than brown, algae.

If you prefer not to have live plants, turn the light on for only one or two hours per day. A healthy aquarium relies on a balance between the light entering the tank and the number of real plants. Achieving this balance is the secret in avoiding algal problems. C.A.

Real 'Honeys' to keep and breed

Q About a year ago I bought two fish under the name of 'Honey Dwarf Gourami'. They are 2 1/2 inches long and a pale white colour. They have very distinct scales and occasionally display a black stripe running from eye to caudal fin. Do you know what these fish are, and whether they can be bred? — W. Duke, Emsworth, Hants.

A There is a Honey Gourami, *Colisa chuna*, and a Dwarf Gourami, *Colisa lalia*, but I have never heard of a Honey Dwarf, nor of any hybrids. Your description fits *Colisa chuna*, which has a line from the eye to the tail, which can fade and return. Perhaps you have a collection of females... they are pale.

If you want to breed the fish you need some males, which will be darker, even orange-red when in breeding condition. Mosquito larvae bring the fish into breeding condition. When a female is fat with eggs, isolate the most vigorous looking male in a breeding tank half full of clean water at 24°C. Supply some floating plants to help nest building, but the Honey builds a poor nest compared with other Gouramis.

Remove the female after she is spent and the male a day later when the eggs should be hatched. Feed on prepared infusoria, then cooked egg yolk and then freshly hatched Brine Shrimp. Do lots of partial water changes, because this fine food for the tiny fry can soon

cause pollution problems.

As with all these species, be careful at four weeks when the labyrinth organ develops. Cool air over the low water will chill the fish and they will just die off. Use a filament bulb to heat the surface and do not lift the lid at the critical time. After six weeks the tank can be filled up and normal commercial foods given. D.F.

DID YOU KNOW?

Some varieties of Koi grow larger and larger than others. If you want a really pet fish, try a Cha-Goi (a brown Nishikigoi).

Returning to a favourite hobby

Q I am returning to fishkeeping after a five year break and wish to set up a tropical tank. The main priority will be to grow a variety of plants. I am disabled, so the set-up will need to be as maintenance-free as possible. My tank will be 48" x 18" x 15" with an under-tank heater and external thermostat. What size of gravel is best, and should peat be added under the gravel? Should I use additives for plant growth?

Could you suggest a filtration system, and would this need an airpump? Also,

what lighting do I need for a community tank? A major problem I need to overcome is that our tapwater is extremely hard, and I understand most plants/fish require medium to soft water. — J. Beddingfield, Wymondham, Norfolk.

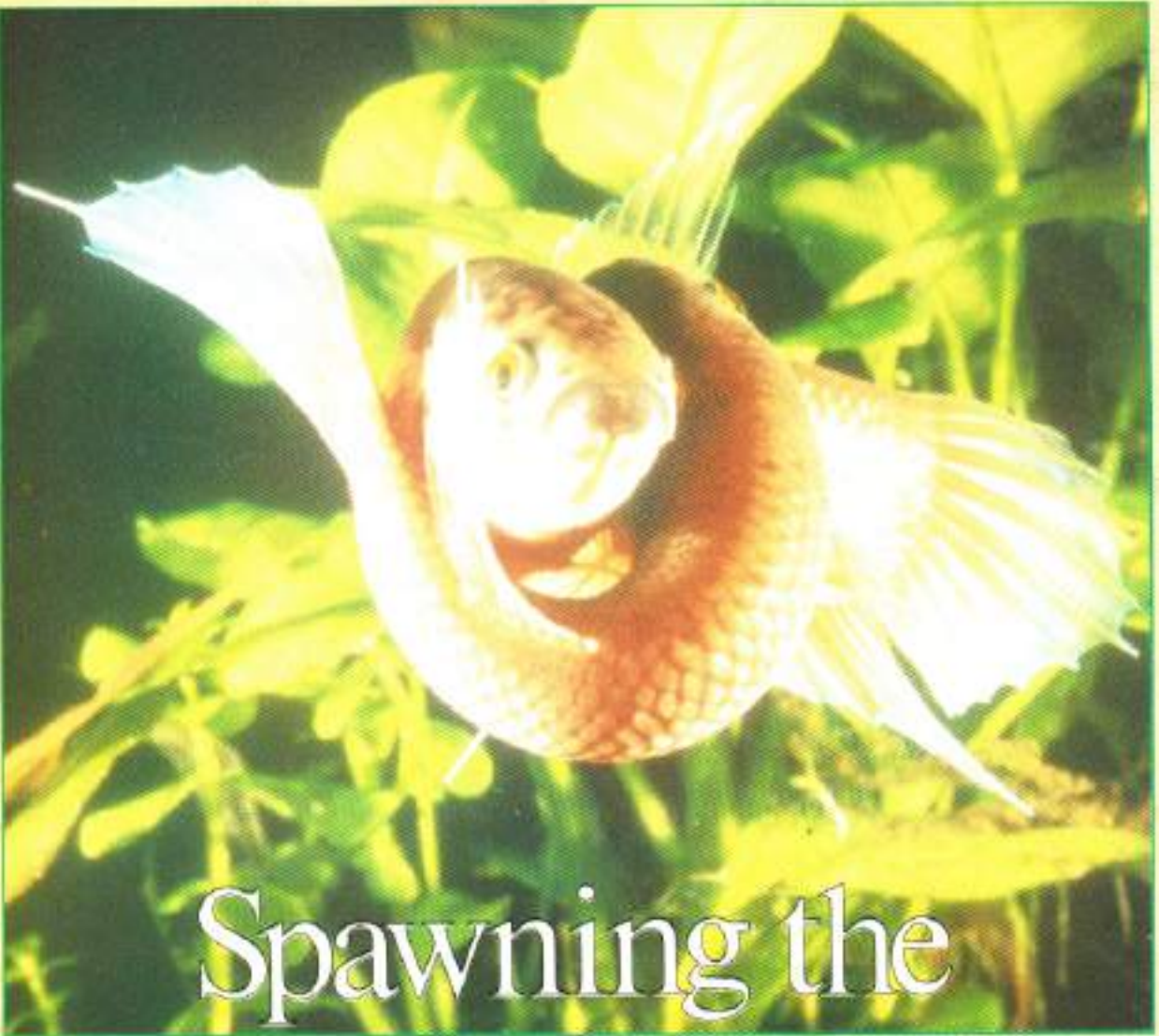
A I suggest you use normal aquarium gravel with a particle size of 2 to 3mm with undergravel filtration. This should be fairly maintenance-free. Simply disturb the top half inch of gravel with a planting stick and syphon out any debris when doing your normal water

changes. Hydro Clean gravel washers, available from aquatic shops, make this quite easy.

Plant your plants in shallow pots buried in the gravel, using aquarium peat and garden loam. Your lighting should be 3 x 38" fluorescent tubes. Use two white Northlights and a single Grolux.

Your community tanks could hold the small South American schooling tetras and catfish, with some peaceful Dwarf Cichlids. Dilute hard tapwater with clean rainwater. C.A.

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Spawning the

GIANT FIGHTER





Betta macrophthalma 'Sumatra'. Picture: Dr. W. Foerck.

Over the last few years, the range of *Betta* species has widened considerably with the import of several new Giant Fighting Fish. Aside from their size, which makes *Betta splendens* insignificant by comparison, these anabantoids are unusual in that they do not build a bubble nest, but are mouthbrooders.

I have been lucky enough to observe the spawning behaviour of these fish, including two regional varieties of *Betta macrophthalma* or Wasser's Giant Fighter. One was from a commercial import, the other wild-caught in Pekan Nenas by a fishkeeping friend of mine.

The common name already suggests that *Betta macrophthalma* is a rather large creature. Examinations made by Krummenacher in the natural habitat of one population, wrongly described as a new species (*Betta wasser*) revealed a maximum length of nearly 15cm. This makes *Betta macrophthalma* the largest Fighter discovered to date, and well worthy of the 'Giant' tag.

Both sexes of Wasser's variety show a loamy yellow basic colour under normal conditions, with three blackish-brown horizontal stripes on the flanks. The dorsal region is pale, and the iris of the eye coloured reddish-brown.

Betta macrophthalma is not easy to keep. It needs a tank holding at least 100 litres, water of very low hardness (under 3°dH) and a pH between 5.5 and 6.0. Plants are unnecessary but will be tolerated, and add to the decor. Each week, at least a quarter of the water should be

Opposite: *Betta macrophthalma* 'Pekan Nenas', spawning. Photo by J. Schmidt, Geobios. Lower picture: *Betta macrophthalma* 'Penang' by G. Teuwen, Geobios.

First-hand observations of the breeding behaviour of an unusual mouthbrooding Anabantid *Betta macrophthalma*, by German aquarist Jurgen Schmidt. Translated by Harro Hieronimus

changed and the tank topped up with water of the same temperature and chemical constituency.

A diet of frozen food and beefheart seems the least likely to bring about digestive problems.

There are several differences between the spawning behaviour of *B. macrophthalma* and the closely related *Betta pugnax*. The former species is very rare, so it is worth going into some detail.

My observations relate to the Pekan Nenas variety, for although the commercially obtained fish spawned, they subsequently died. This species is even more susceptible to bacterial infections than *Betta pugnax*, and reacts almost as badly to proprietary cures as to the ailments.

I find a good preventative is to add some dried beach leaf to the aquarium water.

During mating, the dorsal surface of the female's body turns dark, until the upper lateral stripe is no longer visible. The ventral region goes paler and the scale edges become more defined. It is easy to tell when a female is ripe, because the eggs may be clearly seen through the pale skin of the swollen belly. If a male is now introduced, the female will take the initiative. She swims around her potential mate in typical *Betta* fashion, going through the motions of spitting eggs.

To understand what is going on, one must realise that in mouthbrooding Bettas the eggs are laid on to the anal

fin of the male, where they are fertilised, then picked up by the female and spat back towards the male. It is he who incubates them.

Spitting of phantom eggs has been observed in both *Betta* editoes (where oddly enough, both sexes do it) and *Betta pugnax*. It appears to operate as a stimulus to the male, for initially he is not an interested party.

The pre-mating behaviour of the female *Betta macrophthalma* (circling and 'spitting') may last from three hours anything up to three days. Next, the female swims above and below the male and presents her pale, full belly to him. Gradually, the male will take a greater part in the proceedings, swimming alongside the female, but several more hours will elapse before the pair begin to circle one another closely.

Even now, there will be a pseudo-spawning before the real event. At this time, the male turns a uniform ochre yellow, with the scale borders a little darker than the centres. This species does not possess any brilliantly coloured or reflective scales. Immediately after a pseudo or actual spawning, the lateral stripes of the male reappear.

The egg spitting, circling one another and swimming to the borders of the spawning territory end when the female swims to her partner's flank and he embraces her in an open 'U' shape, with his caudal fin cambered outwards. The female turns slightly on her side as the pair unite in the middle level of the water and drive towards the

surface.

The spawning embrace is very short, compared with that of all other *Betta* species, and of about the same duration as the *Trieopopsia* species of Goswami. As soon as she has released her eggs, the female separates, only to turn and snap at the small number of very large eggs (3mm diameter) lying on the male's anal fin.

At this time, the male is still very torpid, and only slowly does he begin to straighten his body. Only rarely do eggs fall to the bottom of the tank — the female is generally most adept at collecting them in mid descent.

She now turns to face her mate head-on, and spits the eggs directly towards him. The male is quick to take them into his mouth, which is just as well, as once the female has released them she attempts to snap them back — whether to eat them or to repeat the exchange is not clear. She seems to recognise eggs very well, and never confuses them with particles of gravel, as sometimes happens with *Betta unimaculata*.

Betta macrophthalma is the only spitting *Betta* species I have seen which completes the entire egg transfer just 40 minutes after pseudo-spawning has given way to the real thing.

According to my fishkeeping friend Mr Brown (who gave me my own Bettas), the incubation period lasts about three weeks. At the time of writing, my own male had not released the fry.

I hope this rare species will be bred in numbers in captivity, but difficulties cannot be ignored. Another aquarist who has tried reports that his male carries the eggs for only seven days, and then spits them out undeveloped — but perhaps this fish is a novice to the game and will improve with practice.



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Orton Southgate, Peterborough, PE2 0UF. Every correct entry will go into a hat and the first one drawn out will be declared the winner. Entries close 21st March, 1989.

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Courting death

Q My tank is at present housing a Domino Damsel and a Dwarf Lionfish. The Damsel's behaviour is intriguing. It swims up to the Lionfish, turns its back and fans its dorsal and tail fins. The Lionfish is not effected by this. In fact it displays itself to the Damsel. Could you please explain this behaviour? Also, I plan to obtain a Chieftain Butterfly and a hermit crab. My conditions show nitrate less than 0.1, SG 1.023. — A. Smith, Old Colwyn, Clwyd.

A You should first take steps to lower your SG to 1.020, and more importantly, get your nitrate readings to zero — if not, you may not have much success with your Butterfly.

Have you introduced an air diffuser in your system? If not, this is the cause of your high nitrate level. It could also be that you are over-feeding to achieve the levels. These are the areas to check.

A Lionfish's natural diet is crabs — so if you intend to add a crab to your tank, make sure it is larger than your fish's mouth! In a small tank a Domino will not leave a Butterfly alone — it could eventually harm it to death. Please seek help when obtaining further fish, for compatibility.

The hard bit

Q I am writing to let you know of a successful spawning by my Fire Clowns, resulting in some 70-100 bright orange eggs. Can you now, however, give me any information on rearing the fry and sexing the fish? — T. Bowles, Chesterfield.

A Congratulations on your achievement. But as you will find, getting the fish to lay eggs is the easy bit, raising the resultant fry is far more complicated. I have sent you a leaflet which describes how to raise rotifers, which is the first step, but you will not only have to set up a separate tank for the fry, you will also incur quite a lot of other expenses, as well as time, and only you can decide if you can afford this.

There are no external sexual differences between clown fish (they can change their sex anyway) so you can only tell their current sexual leaning by their behaviour.

Marine Forum

Dave Keeley is your expert on the saltwater scene



Toxic suspect

Q My marine aquarium has been set up after reading endless books, but every fish I have introduced has died. The longest lived 1 1/2 weeks, one only lasted eight hours. I have followed all the instructions, re-checking several times, and all nitrate tests were clear. My tank was allowed to mature for a month. I have now had to dismantle the aquarium. Can you tell me what has gone wrong — I do not want to give up on keeping a marine aquarium — Garry Grierson, Lumphinnans, Fife.

A You seem to have followed instructions to every detail, but something is wrong somewhere. Since all tests have proved correct, you must look to other areas for your disaster.

I would guess that you have inadvertently introduced something into the tank that should not be there. Ask yourself the following questions — was your local water authority treating the water when you set up? Is there any chance that you used buckets, cloths etc which had had detergent, or weed killer, or anything poisonous, in them? Were the corals and shells thoroughly bleached, and more importantly, was the binach thoroughly washed off afterwards? Are you sure that your hydrometer was accurate?

Though I am the first to urge everyone to read and read, that does not mean that books alone can give you all the answers — try and make contact with other marine keepers, whether hobbyists or traders, and learn off them.

PRACTICAL FISHKEEPING

'Wilting violet' Anemones



Low nitrate readings and correct pH should help keep both corals and anemones fighting fit

Q I own a 21-inch cube tank with no ammonia and nitrite readings and what I consider good lighting and filtration, but while most of my inverts are doing well, I cannot keep anemones alive. My last *Radienthus malu* shrimp and died within four months. It failed to take solids, and was continually being knocked about by two clowns. An earlier *Storobaccis* anemone failed the same way. — A. Bernard, Nottingham.

A Anemones and corals are closely related. Normally, if conditions are right for one, they are right for the other. It is most unusual

for clowns to actually harm an anemone, so I can only ask you some general questions.

What about your nitrate and pH? These factors are by far the most critical, once a tank is established.

I have no idea what your invert food 'Complexall C' is, but eight drops a day sounds an awful lot. Send me the empty bottle, I'll check it out. Ensure your power filter is turning over the water three times per hour, and that you have good aeration — vital, this.

Though you have stacks of fluorescent tubes, one spotlight on for three or four hours a days would work wonders.

... and more shrink problems

Q Could you please advise whether the lighting is adequate in my marine tank? Every anemone I have bought over a period of months gradually gets smaller and smaller. I have a mixture of 'inverts' also, and occasionally these get choked up with green algae. — Thomas Sibald, Kibbernie, Ayrshire.

A If it were me, I would add a different type of light, a spot light preferably, even if only for a few hours daily. I would swap the Grolux for a 'proper' light, and I would add nutrients such as SeaGarden. And try adding a long spined urchin or two — they are excellent for algae cropping.

Red ruination

Q I have recently encountered severe algal problems in my marine tank. The front glass needs scraping almost daily, and a reddish-brown algal slime spreads over the rockwork and substrate. I have tried reducing the amount and length of lighting but this made no difference. Adding algal fertilizer to rob the slime of nutrients has been a worthless exercise. Can you say what causes the slime and how can I remove it and avoid it in the future? — **W.M. Faust, Saltont.**

A Red algae is a nuisance and upsetting. It can arrive without any apparent reason and without any lack of efficiency on the mariner's part. Incandescent lighting can get rid of it, but this is not always practical. Nutrient additive can remove it, but if lighting is added it will speed up the growth.

You need patience in this case — red algae can disappear as quickly as it arrived — but be prepared for it to hang around for six to 12 months!

Ideal system

Q I am at present converting my tank to a marine set-up and have taken advice from my local dealer, who was mentioned in PFK some time ago (Loveloy of Radford Rd, Nottingham). Cost is an important factor so I am obtaining a powerhead undergravel filter, outside canister filter and a protein skimmer.

What is the correct lighting for my tank and where should I position the protein skimmer? This is a Sander and was obtained from a friend recently in Germany — therefore all instruction are in German. Could you give advice on installation? — **J.R. Rymes, Nottingham.**

A Your local dealer has given you sound advice. The set-up you have described should present no problems. I have sent a lighting chart to answer your lighting query. Sander protein skimmers are widely available here, and any local dealer should be able to quickly show you how to set it up. If you have problems, you can write to the UK agent: TMC, Maxwell Road, Borham Wood, Herts.

PRACTICAL FISHKEEPING

Lowdown on hairy crabs

Q I recently set-up an invert aquarium with about 430lb of living rock with anemones and two clownfish. After a few days I noticed the appearance of four Hairy Crabs (*Pilumnus hirtellus*) ranging between 1-5cm. They are not very active and do not stray far. I have been unable to find any information on the crabs. Are they compatible with shrimps, corals, etc? If not, what could I add to my aquarium? — **M. Ostern, Brossdal, Norway.**

A According to 'Marine Life' by David & Jennifer George, *Pilumnus hirtellus*

comes from the North-east Atlantic and the Mediterranean. Since your living rock was probably from neither of these areas, I think you have a different species of crab. But that is as much as I can tell you.

There are dozens of 'hairy' crabs, ranging between 2cm-20cm across. Most are predators (will attack weaker species, like shrimp and tube worms). But they are fairly shy and attack only for food or if threatened. You should be able to keep crabs without risk, especially if you feed them two or three times a week, but only you can decide whether to take the risk.

Living rock doesn't count!



Change tubes and spots every year and 18 months respectively or their efficiency will be seriously reduced.

Q I intend setting up a 48 x 15 x 18" marine aquarium for inverts. How many living rock would this support?

My lighting will be via two 40-watt actinic blue tubes and 120-watt mercury vapour lamps. How many of these would I need to give adequate lighting and avoid 'dark' areas?

Working on a volume of 30 gallons, what would be the minimum recommended turnover period per hour through my intended external filter system?

Finally, can you recommend a good selection of invertebrates in the South Wales area? — **G. James, Cardiff.**

A Living rock does not require space, as it

neither consumes oxygen in any measurable quantity, nor adds to pollution. In other words, treat it like any filter-feeding invert and exclude it from your stocking rules. Buy as much as you can afford (about a cupful at today's prices!).

I would use only two lamps for your size tank. You may find keeping the lights on for 14 hours would be best. I change my actinics every twelve months, mercury vapours every 18 months.

The water volume of your tank will depend on how much living rock you buy. You should use a power filter capable of turning over the water volume three times per hour.

A good shop is Kerrison's Animal Health, Leckworth Road, Cardiff.

Green is best

Q I have a 48 x 15 x 12" aquarium. My problem is algae. Originally, it was green — I was advised to add Aquarian Copper Safe and switch off the lighting, and this worked. Now I have red-brown algae, which is worse! Could you advise on how to remove this? — **C. Hulme, Lasswade, Mid Lothian.**

A I am sure your green algae must have been caused by outside light and it is virtually impossible to run a marine tank without the presence of algae. Compared to the unsightly red, brown or blue-green, you were ill-advised to get rid of the green algae. I would suggest you buy a proper light (articles on lighting can be found in PFK), remove the Coppersafe Polyfilter and let nature take its course.

Aladdin's cave

Q My current three-foot system doesn't really let me keep fish adequately. It's run on reverse flow with a Marathon power filter (I'm one of your disciples in this respect, although when I copied it but it was virtually the same outlay as powerhead, thanks to the savings in substrate).

I was recently very lucky in answering an ad in my local paper. The seller had a sack of bits and pieces of marine equipment which I bought for a song, and I would like to know (in the polite sense) what I can do with them.

The list comprises Eheim 2015, Lison System canister filter, two Sagem 12000 powerheads, 16" Sander protein skimmer, Sander Ozoniser, three 150w starter units and a Hoffman Silent Air pump. Various pipes and tubes came with the bargain, and I myself have a 20w and a 25w starter unit on my current tank, with a 30" GroLux 25w and a 24" Northlight 20w tube.

How large a system would all this equipment support, and if I opted for an aquarium smaller than the maximum size you recommend, is it possible to have too high a water turnover? — **G. Fairbairn, Reading, Berks.**

A A good few questions! Since you have three x 40w choker/starter units, which operate 48" fluorescent tubes, your tank needs to be four or five feet long. Since you have a 16" protein skimmer, you need a water depth of 15" to 18", depending on how you take the measurement of the skimmer. Since you are not going to rely on the Liso except as a back-up, and since you like reverse-flow, you have two power filters with a combined litres per hour throughput of 960, so a tank of 320 litres is well within your grasp.

Possibilities therefore include 60 x 18 x 18" or 48 x 24 x 18" or of course anything a little smaller. It does not matter if the water flow is greater than the minimum suggested, if you choose the five-foot tank you should definitely buy a second hand protein skimmer. Use the powerheads elsewhere.

• Dave Keeley appears again on page 44 to conclude his 'custom-ordereq' marine aquarium series. The topic — Invertebrates.

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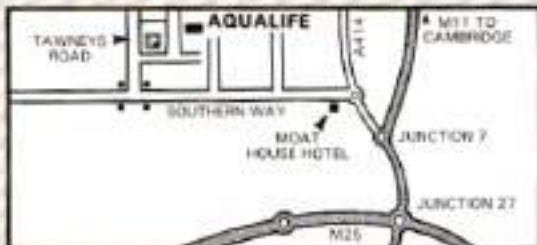
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LABOUR OF LOVE

To hear some people talk about their computers, you'd think they were budding Clive Simclairs — when all they are capable of is loading in a game cassette.

The same sort of self-deception operates among goldfish keepers. "I have spawned my fish," they boast, when all that has happened is that their Comets or Fantails have reproduced without any human agency. This is all very well if you are happy with chance crossings, but to line-breed and get the best results you need to control spawning.

The following article describes the method I have adopted over many years and which has always proved successful. Other breeders have their own techniques which can be just as rewarding — there are no hard and fast rules.

One must start thinking about breeding as early as July or August. It is at this time you must decide what varieties to select. For beginners, I suggest you start with a single-tailed goldfish and restrict yourselves to just a couple of varieties (eg. Comet, Shubunkin).

At that time of year — midsummer — breeders are selling off their surplus stock. These fish may not themselves be show winners, but they carry the potential in their genes for progeny that excel. One can buy six or more youngsters and grow them on. The more you buy, the better the chance of obtaining what I consider to be the minimum number of adults in the correct sex ratio. Two females and three males should be your goal, since it is very easy to lose fish, and for a number of reasons not connected with neglect or poor stock — when applying heat after the winter, for example, when your fish are at their least resistant to disease. There is very little chance of replacing adult goldfish in February or March.

The next stage is to feed the fish up, so that they have enough fat to see them through the cold months and to wean them strong enough to prepare for a spawning in the



Controlled breeding of goldfish is light years away from letting them spawn indiscriminately, says Bill Ramsden of the Northern Goldfish and Pondkeepers Society ...

early spring. For those of you who keep their fish outside, or in a fish house, you will notice that at the end of October and through into November they are beginning to slow down and do not require the usual amount of food. Now is the time to clean your fish and separate the females from the males.

My own formula cleaning solution is one measure of Terramycin, eighty drops of formaldehyde and six drops of copper sulphate in four gallons of water, brought to the same temperature as the tank. Do not forget to use strong aeration.

After the fish have been in this solution for twenty minutes, they are transferred into another container of clean water. In the meantime, your tanks must be given a thorough cleansing with bleach or Milton sterilising

fluid. It goes without saying that every trace must be rinsed away afterwards.

For the next two and a half months, the fish receive practically no food — perhaps a little daphnia if the weather has been so mild as this winter, but definitely no flake or pellets. Keep an eye open for the effects of cold. If your fish appear to be suffering, apply a little heat, but gradually and not more than is absolutely necessary.

If you decide that April the first will be the date you put your fish together for spawning, you must start six weeks earlier, raising the water temperature by two degrees F each day until it reaches 65°F. During this time, the fish will start looking for food. Start them off with small quantities of live food and high protein preparations, increasing

quantities in line with growing appetites. Good aeration is required, and any excess food must be removed regularly.

A three to four-foot tank is quite suitable for breeding, and this must be prepared at least a week before the fish are put together. If possible, leave the tank empty for seven days to kill any disease organisms, otherwise thoroughly clean it with bleach, Dettol or Milton fluid. No smell should remain after rinsing.

You can now fill the tank to a depth of six inches, treating yourself to a new airstone for aeration. In the meantime, prepare your chosen spawning medium. This can be bunches of nylon wool, unravelled nylon pan scrubs, natural plants or (my favourite) onion bags cut into strips and weighted down with glass marbles. These bags can be obtained free from any greengrocer. Boil them first to sterilise them, and add four or five bunches per tank.

Now the big day has arrived, when the fish can be selected and put together in the breeding tank. Your female should be heavy at the rear, with the left hand side of the body more prominent than the right (this is the developed ovary). The body should feel very soft when gentle pressure is applied near the anal fin.

Now it is the turn of the males — using two to one female increases the chances of a fertile spawning. They should be chosen for their chasing ability, and a good indication is the breeding tubercles on the gill plates and pectoral fins, which look like tiny white pimples and should not be confused, as they sometimes are, with White Spot parasites.

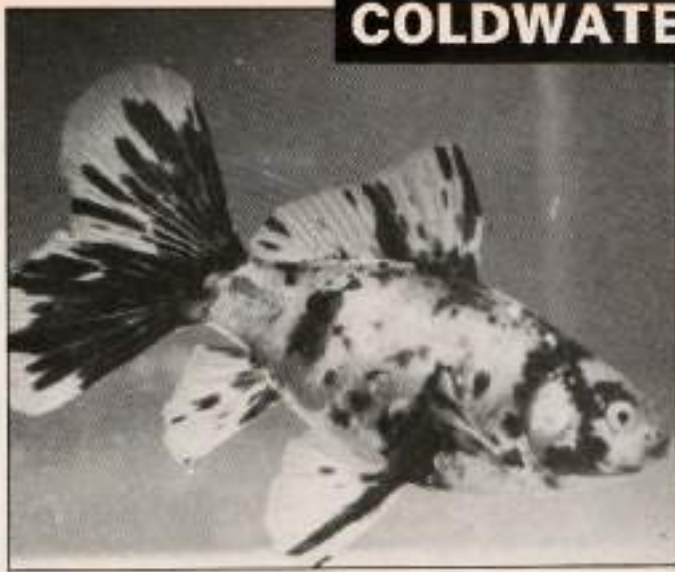
All potential breeding stock must be put through the same medication regime as was used when bedding them down for the winter. This is to ensure they do not pass on diseases or parasites to the fry.

Temperature at transfer should be 65°F. Early evening is the best time for this, and



Some of the Veiltails bred by the author. To grow on successfully, early culling is essential.

PRACTICAL FISHKEEPING



A ripe female's body should feel soft. Be careful not to apply too much pressure or eggs may be expelled. For the beginner, single-tailed varieties like the Bristol Shubunkin are recommended.

you should now raise your heater/stat setting to 70°F. Sometimes the fish may start chasing the first night and spawn the following day, but more often than not it takes longer. The added stimulus may be provided by holding in fresh tapwater under pressure, just before you go to bed.

Spawning starts in the early hours and continues on anything up to midday. Do not be in a hurry to separate the fish if they stop chasing, because they take rest periods. On the other hand, watch for fish that eat the eggs as soon as they appear. These must be removed without delay.

Once spawning is complete, transfer the parent

fish to another tank of the same water temperature. You can now gradually lower the setting on your heater.

Fertile eggs, which are adhesive, are pinhead-sized and amber-coloured. On the second day you may notice that some have a funny appearance — these are infertile and can be ignored. The rest will be showing two little black eyes with a curved black line, the developing body structure.

These eggs are very hard to see, but do not despair if you find only a few. You'll miss dozens for every one spotted, and it won't be long before the fry have hatched — at 70°F this takes only four days. At first, many will lie on the bottom, others will hang

from the spawning medium. They carry a food sac that will support them for two days, but after this they will become free-swimming and begin the search for food.

The best first diet is brine shrimp nauplii. You can buy commercial hatchers, but I use a large toffee jar holding two quarts of water, into which are dissolved two large tablespoonfuls of common salt (without additives). Add two teaspoonfuls of brine shrimp eggs, aerate strongly, and keep the jar at between 75°F and 80°F.

It will take 36-40 hours for the brine shrimp to hatch. Remove the airstone and leave all to stand for ten minutes. The young shrimps will settle at the bottom of the jar and can be removed by

siphoning up through a fine tube and filtering through a fine-meshed piece of nylon.

After the first week you can remove the spawning medium, turning and shaking it slowly to make sure no fry are still attached.

It is very important to start culling the young fish as soon as their bad points become apparent, not wasting good food on poor fish and giving the remainder more room to grow.

That's the basis of my breeding technique. As you grow more skilled, you may well work out your own refinements, but whatever happens you will have that element of control over that most obdurate of creatures, the goldfish.



Five-day-old Moor fry, with daphnia.



Fertile (clear) and infertile (cloudy) goldfish eggs. For every one visible, probably ten have been laid.



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Ask a non-fishkeeper to name a tropical species, and chances are he or she will come up with the Neon Tetra. This is not surprising, as both Neons and the closely-related Cardinals are brightly coloured, constantly on the move and simple to keep.

Both fish are characins, a fact given away by the presence of a small adipose fin behind the dorsal. Other features of this family include the numerous teeth.

The Neon (*Paracheirodon innesi*) and the Cardinal (*Cherododon axelrodi*) differ not only in coloration, as shown in the illustrations, but also in the structure of the teeth and skull. The Neon has small plates on its underside, just anterior to the tail.

Where are they from?

The Neon Tetra was first collected by the Frenchman A. Rabaut in 1935. The exact location was kept a secret, but it has subsequently been found in small streams and pools throughout the upper reaches of the Amazon. Here it tends to live in slow flowing, shallow areas where the water is soft (often less than 1°dH hardness) and acidic. The Cardinal Tetra was collected from tributaries of the Rio Negro and Orinoco, where it preferred the same habitat as the Neon. It was described by Dr. L. Shultz and named *Cherododon axelrodi* after his friend, Dr. H. Axelrod.

How to keep them

Neons and Cardinals will tolerate a wide range of water conditions, soft to moderately hard, acidic, neutral or even slightly alkaline. They are happy as individuals or in shoals, and take almost any food.

However, to keep them at their best they require more precise conditions.

Aquarium size is not important, but the water should be soft and slightly acidic to neutral (General Hardness 0 to 5°dH, pH 5.5 to 7.0). A temperature of 20-22°C (lower than the usual community tank) suits them well.

Regular partial water changes should be carried out with dechlorinated water. If you are using a power filter, position the outflow so as not to cause strong currents, perhaps by directing it against a wall of the tank. Many fishkeepers use peat as a medium to encourage acidic water — this should be contained in a mesh bag, but never added to an undergravel filter bed.

Blackwater extracts can also be added to simulate Amazonian conditions.

Neons and Cardinals show their best colours when

The Neon Tetra was voted Britain's most popular tropical fish in a PFK poll last year. Dr. David Pool, of the Tetra Information Centre, shows how to keep and breed the Neon and its close cousin the Cardinal.

subjected to subdued lighting and when swimming over a dark substrate. Areas of the aquarium should be shaded, using tall plants like Amazon Swords and Myriophyllum, or floating species such as Indian Fern or Fliccia. Create thickets, but allow free-swimming areas for viewing.

Neither species looks anything on its own, so create shoals of at least ten fish. The interactions and group behaviour occurring within such shoals add greatly to their interest. In larger aquaria, the fish will stay closely together, especially when danger threatens.

Feeding is no problem, as Neons and Cardinals readily take quality flake foods. The basic staple diet should, however, be supplemented with freeze-dried or live foods.

Given such conditions, both species will reach 4cm (1½ in) although 2.5 to 3cm is more common. Such small fishes are obviously susceptible to predation by larger tankmates.

Breeding

Until relatively recently, both species were thought difficult to spawn. Consequently, the hobby relied heavily on wild-caught specimens.

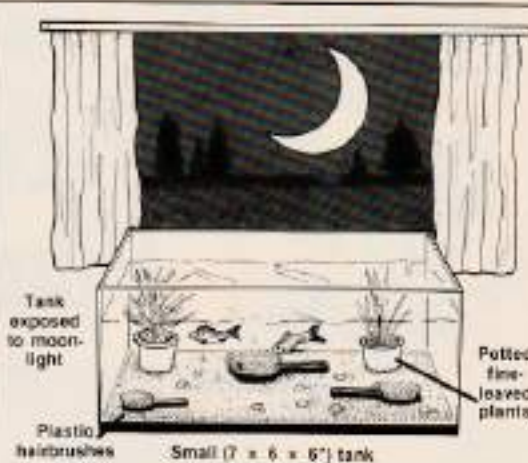
Now that the precise conditions required are better known, they can be bred both commercially and by the careful hobbyist.

The first step is to obtain healthy parents, so keep a shoal under ideal conditions until the sexes can be distinguished. The females will be slightly larger and have rounded abdomens, compared to the much slimmer males.

Before selecting parent fish, the shoal should be fed live or freeze-dried foods for a couple of weeks, and at this stage the sexes should be segregated to prevent unscheduled spawnings.

The breeding aquarium need be only 15 x 10 x 15cm (7 x 6 x 6 in) for a single pair. It should contain a spawning grid and a small bunch of filamentous plants (eg Myriophyllum and Java Moss) or also an artificial spawning mat. Suitable grids can be made from optumed plastic hairbrushes with nylon or plastic bristles. The more of the tank base covered, the better.

Water quality is the trigger to success. The tank should be filled with water that has a hardness of less than 2°dH and a pH of 5.5 to 6.5 for



Suggested breeding set-up. Moonlight plays a mysterious part in the success story.

Neons; for Cardinals, the parameters are slightly different, a hardness of 2-3°dH and a pH of 5.5 to 6.0. Such water can be obtained from rainwater butts, or from springs in peaty areas. The temperature should be 25-28°C, in other words two or three degrees warmer than in the main aquarium.

After two or three weeks' conditioning, one male and a ripe female go into the breeding tank during the evening. The room containing the aquarium should then be left with the curtains open.

The fish will often spawn the following morning at dawn, or even during the night if there is sufficient moonlight.

Cardinal Tetras, in particular, are renowned for this nocturnal behaviour and will even spawn in complete darkness.

If the parents fail to breed, several tricks are worth a try. These include placing the aquarium where it will receive early morning sunlight; reducing the temperature by 3°C by changing half the water, followed by a gradual increase to 28°C; adding more acidic water, and changing one or both parent fish.

The courtship display is most impressive, with the neon stripe of the male turning an intense blue or violet. The male swims around the female with fins outstretched, flexing his body. If the female responds, this behaviour intensifies and the male swims alongside the female, nudging her flanks and abdomen. A chase now develops, with the female being driven into plants where

eggs are released. Some will stick there, but most fall to the bottom of the tank. Both species are avid egg eaters, hence the need for some sort of spawning mat.

Once spawning is complete, the parents should be removed to recover their vigour.

The eggs must be protected from strong light. If your room lighting is too bright, cover the aquarium with a black polythene sheet until the eggs hatch. This should happen within 24 to 48 hours after spawning, and the tiny fry are free-swimming five days later. They should first be fed infusoria or hatching rotifers (kits for these are now available). After about four days they can graduate to finely powdered fry foods.

Rearing

Young Neons and Cardinals are very sensitive to pollutants, so filter the water through foam and perform 25% water changes every four to five days. After approximately one month, modify the hardness of the replacement water to gradually acclimatise the fry to normal aquarium conditions.

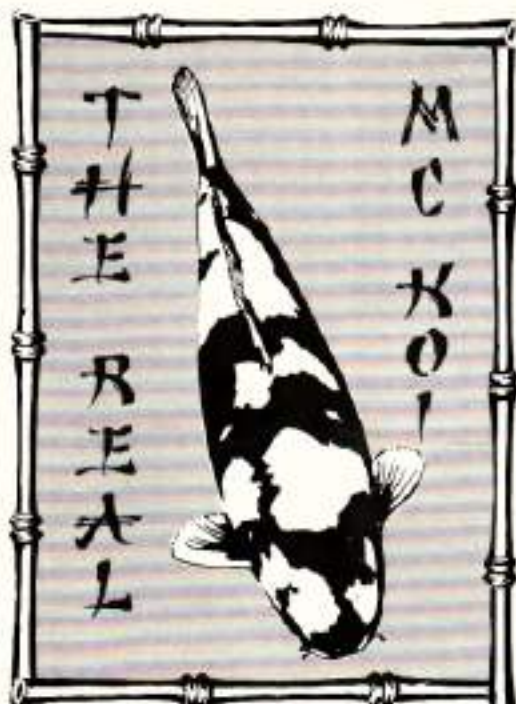
Neon fry grow faster than those of Cardinals, and will be mature after only six months. The Cardinals are three months behind them. As they grow, thin them out to avoid stunting, and check for rising water hardness, which has the same effect.

Opposite: Cardinal Tetra (top) by Mike Suddford, and the slightly less colourful Neon, by Peter Gothercole.



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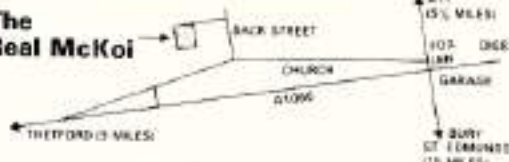
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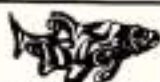
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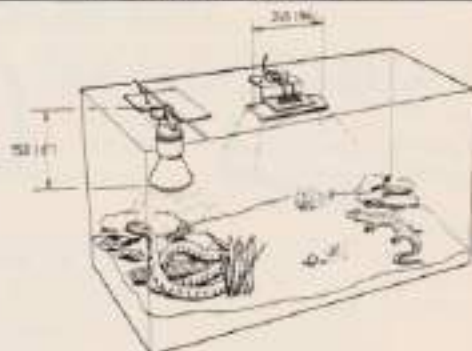


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YOUNG FISHKEEPER

Have you got what

it takes?

Keeping reptiles and amphibians is a responsible task, and not one to take lightly. Herpetologist Marc Staniszewski advises 'look before you leap'.

Do you have what it takes?

I am frequently asked by the many people who contact me: "How do I look after this particular herp?" If it is a species I keep or have kept in my collection, then I am able to give a definite answer on the procedure of maintenance (or husbandry). But if the creature in question is one I have not formerly kept, then all I can suggest is homework and steady... research the species in as much detail as possible.

Today there are so many good books, pieces of literature, university papers, clubs and associations, herpetologists and fellow hobbyists that one really cannot go wrong in this department.

One must always be wary of the reptile shop, though. Many (but not all) of these places are intent only on making profits from dealing in huge numbers of half dead creatures destined for an early grave.

A good reptile dealer will give friendly advice along with healthy, clean animals and will not try to sell a 'difficult' or 'sicky' reptile to an unsuspecting customer.

Believe me when I say there are too many of the former type of dealer about.

Unfortunately in a day and age where wild animals are becoming scarcer, it is no longer a question of 'Practice makes perfect' but more 'Do you have what it takes to look after this species?'

Reptiles and amphibians are not just pets or 'toys' with which one can 'play' every so often — they are living creatures which possess certain degrees (of varying of intellect and senses including pain). Therefore it cannot be stressed too strongly that they need regular care and attention.



The author's own Garter Snake (*Thamnophis sirtalis*). This is one of the very easiest 'starter' herps.

The main objective in the husbandry of any wild animal in captivity is to provide a set-up which is both comfortable and hygienic. As the animal has been (in most cases) taken from its ideal habitat in the wild, then one must aim to reproduce this situation in captivity. The type of set-up chosen is entirely up to the keeper, but consideration must be given to the size, not only of the vivarium but of the herp.

Don't buy a baby python for yourself or a child which at the time will fit nicely into that old tropical fish tank. Think of the consequences... one minute it's 30cm, the next

thing it's grown to 12ft and suddenly the aquarium isn't quite so useful. Would it not be better to start with an attractive pair of harmless garter snakes? — so much easier to maintain, but equally as interesting.

The secret of success is to build up the size gradually, along with experience. Jumping straight to the top of the tree by acquiring something like a Rhinoceros Iguana won't be of any benefit to you, your pocket or the dead iguana. Experience of such herps comes with time, and time means patience, plenty of research and understanding.

Once you have gained this, then go ahead and purchase

Araucaria or Japanese Giant Salamanders galore. Even then, consider closely the space and money required for such animals — expensive creatures are in the main expensive to maintain.

Also remember that herps can suffer from stress just as much as humans. Small enclosures, all-glass vivariums, overcrowding or over-handling can all create an unpleasant environment, particularly with the more secretive species.

The two main areas of cost involved in husbandry are heating and feeding. It makes sense not to acquire a herp unless you can afford to keep it warm. Species such as Jacksons Chameleon or Giant Zonase which hail from warmer climes require both Tri-light fluorescence and a 14 hour photo-period with either a pad or central heating during the rest of the time... all this can add up to a higher electricity bill. It is no good switching the lights off for a few hours to cut costs, because you are defeating the object. If a herp requires a certain photo-period 265 days a year then this must be strictly adhered to. Surely by cutting the costs you can't really afford to keep the herp at all, so aim for a herp from a more temperate, cooler climate which requires less heat.

Feeding can present similar difficulties. Costs increase with the size of the animal. In the long term a large snake or lizard will be relatively expensive to feed, especially when essential vitamin and mineral supplements are taken into account.

Some reptiles require a specialised diet, feeding on one particular or difficult-to-obtain food type. A good



Lizards are more difficult than snakes for beginners, requiring agile insect food and UV light in order to synthesise Vitamin D. This is the Greek Snake-eyed Skink, *Ablepharus kribellii*.

example is the Thorny Devil or Moloch from the Australian deserts, which lives only on ants/beetles. Try obtaining those in the middle of January! Before purchasing any reptile or amphibian, thoroughly research its feeding habits.

The question of humanity also arises where feeding is concerned. For instance, a relative, friend or neighbour may object to the use of mice, rats and rabbits, whether live or frozen. If the problem does arise there are plenty of herptiles which consume anything from insects to fresh vegetable matter, whitebait to raw red meat ... again, research is the operative word.

HYGIENE is a very important aspect of herptile husbandry because failure to

understand this often results in loss of a specimen.

Various diseases and viruses can develop, some of which can be transmitted from herptile to owner (or anyone in the vicinity), but recognising the need for hygiene results in a healthier environment all round. With regular cleaning of the vivarium and its constituents, the risks are minimal.

Aim to disinfect the set-up at least once a week with a 4% sodium hypochlorite solution (only 1% solution for amphibians), making sure all water bowls, decor and bedding are given similar treatment. Anything disinfected should be thoroughly rinsed afterwards.

Both overcrowding and overfeeding increase the risk of disease, and any uneaten

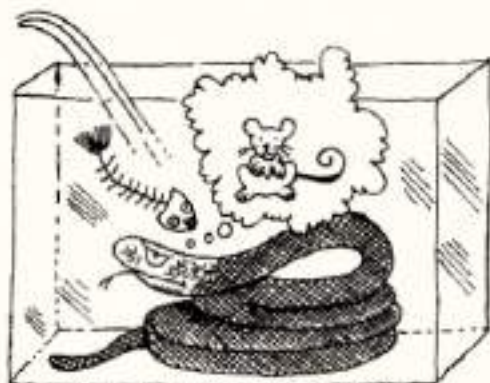
or regurgitated food should be removed immediately, likewise with faeces. A good way to understand both hygiene and associated diseases is to purchase a book describing all aspects, something which I myself regard as of utmost importance. Fortunately reptiles and amphibians are highly resistant to diseases.

A conclusion to be drawn from this article, especially with regard to beginners, is to start off with herptiles that are considered 'easy' and then to gradually build up the experience. I can recommend idea 'starters' as garter snakes and most European N. American herptiles, along with a few Asian species such as Fire-bellied newts, Asian Bullfrogs and various water snakes (*Natrix* spp.) found in that area.

JANUARY'S contest to win either a large or a junior model of the ingenious Telex HydroClean proved very popular.

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Junior HydroCleans are on their way to: L. McDonald (13), Dublin; Michelle Birrell (12), Winchester, Hants; Miss N. Seattle (12), Birkenshead, Merseyside; Daniel Hewson (10), Goolbs, N. Humberdale and Swinton Xavier (10), Balsall Heath, Birmingham.



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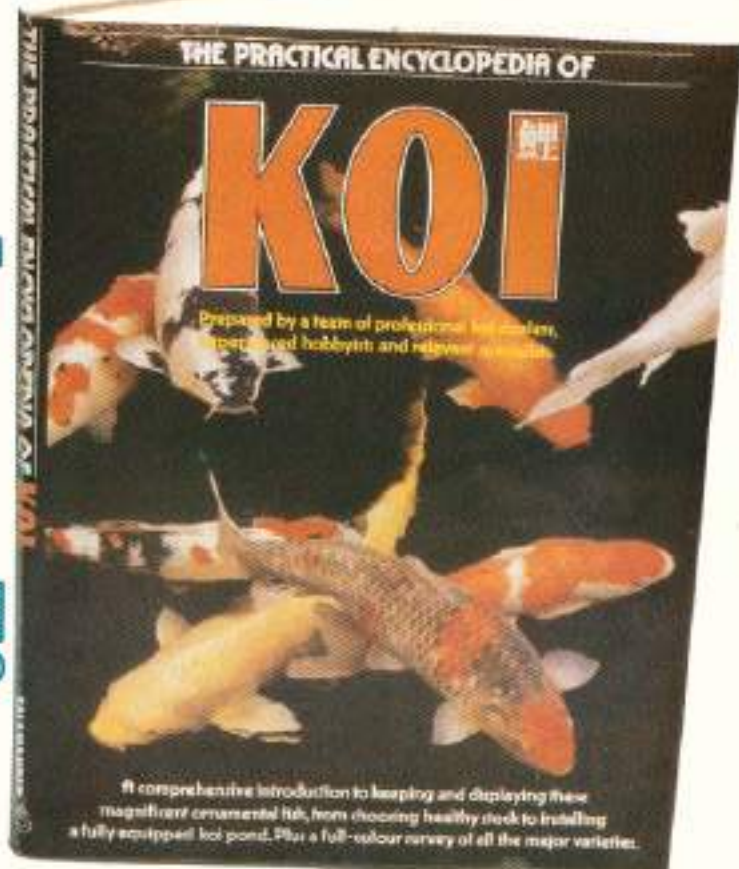
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KOI EVENT OF THE YEAR!



The Practical Encyclopedia of Koi
edited by Anne McDowell
(Salamander Books, £19.95)
ISBN 0 86101 405 7

On these pages we offer you a sneak preview of the Koi Event of 1989 — for not until April 20th will this magnificent book be available in the shops.

The beautiful artwork depicting non-metallic Koi is typical of the high standards achieved throughout. But this is not just another glossy identification guide. The Encyclopedia is the first book with the resources to combine the best

'coffee table Koi' with all the information needed to buy healthy stock and keep them that way.

If you're a beginner, the extensive practical section blows away all the mysteries surrounding pond and filter construction, disease and treatment and Koi identification.

If you're more advanced into the hobby, the book is a mine of information on Koi history and anatomy, breeding, and even what goes into staging and judging a major show.

Included in this 208-page hardback are over 200 colour photographs and 180 artwork illustrations, all of the highest quality. The list of contributors boasts the sort of pedigree an All-Japan Nishikigoi

Show winner would be pushed to beat: Bernice Brewster, Nicky Chapple, John Currier, Mark Davies, Glyn and Den Evans, Keith Phipps, Yvonne Rees and Peter Scott.

It's high time a book appeared with the prestige befitting this rapidly growing sector of the fishkeeping hobby. Here it is!

And the good news is that Practical Fishkeeping will be carrying selected extracts throughout the spring and summer months. All you ever wanted to know about Koi but were afraid to ask is here, and more besides — so take the first opportunity to buy your copy of 'The Practical Encyclopedia of Koi'.

Nick Fletcher

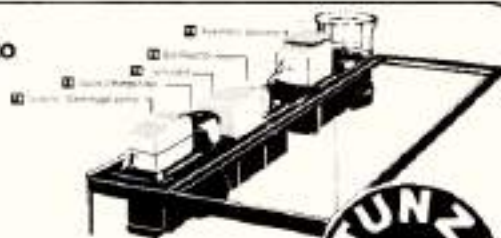
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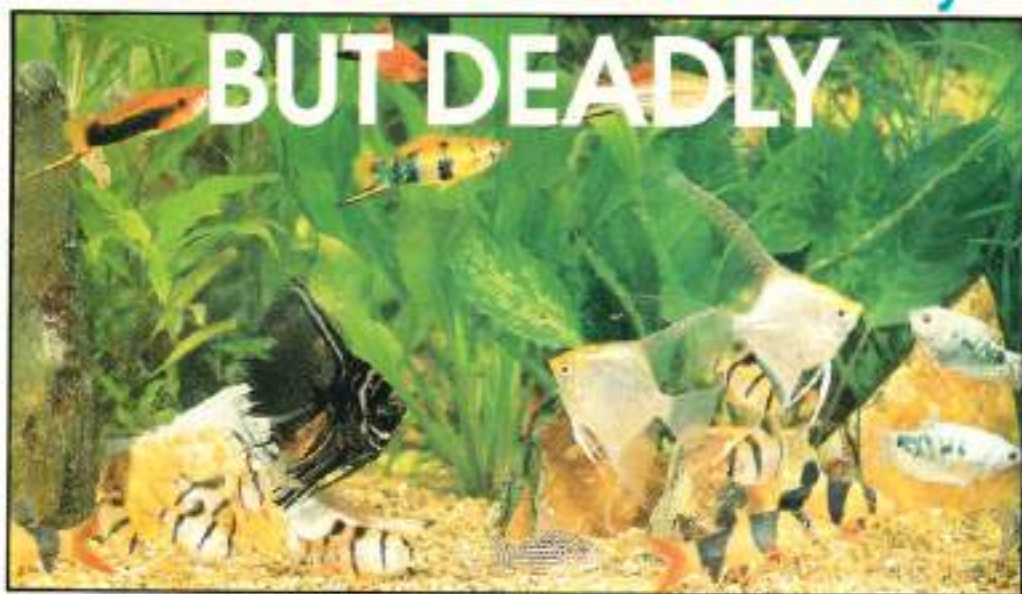
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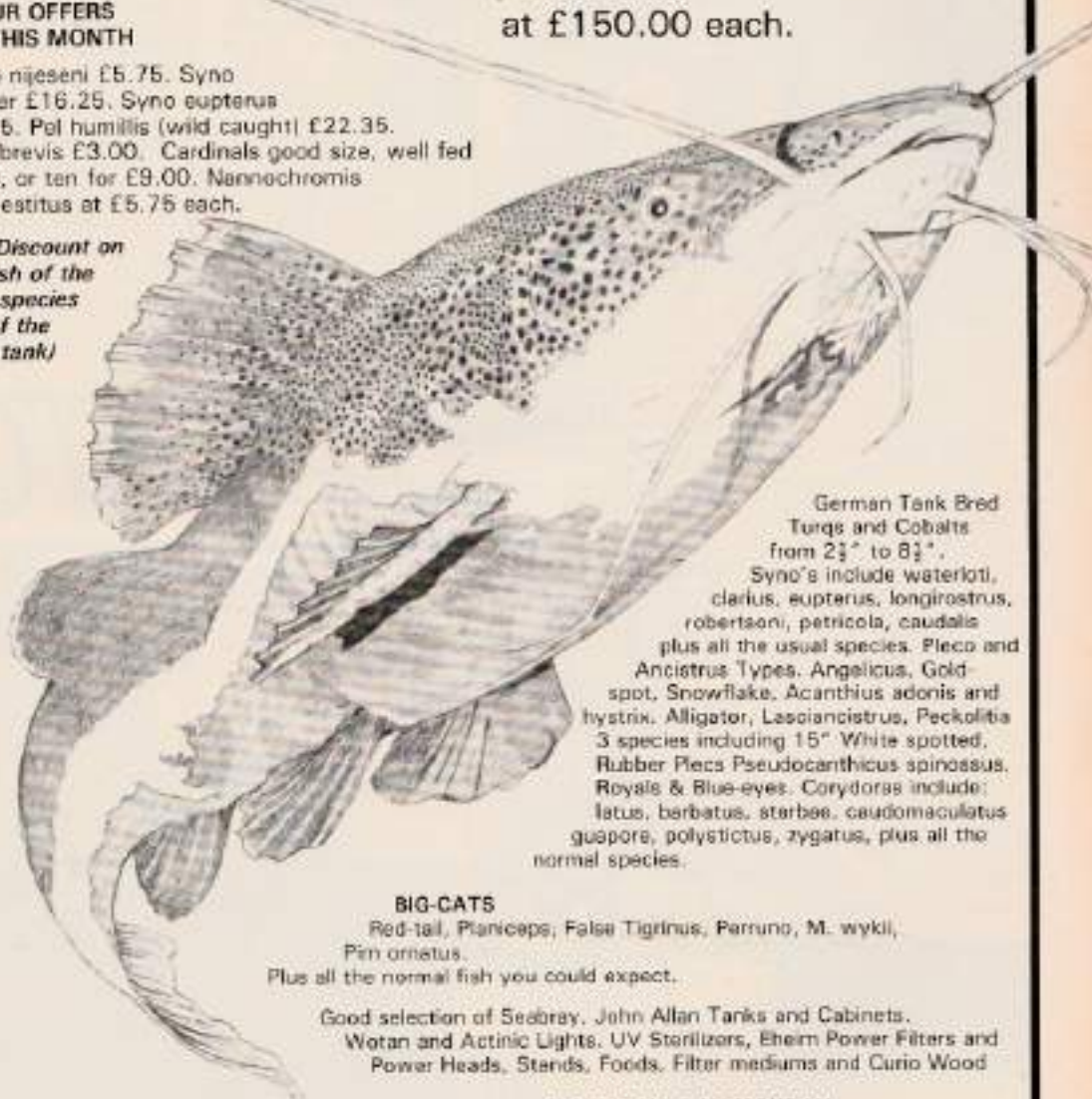
MONKFIELD AQUATICS

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Dave Keeley hits the trail to try and complete the stocking of his mixed marine aquarium — with mixed success



• DAVE KEELEY

Today

This is the fourth and final article describing my purchasing and setting up of two different marine tanks. Regular readers, please forgive my quick repetition of the story so far, included for the benefit of newcomers.

Last October I went down to my local shop, The Underworld, and bought two marine tanks and all the relevant necessary equipment. This was photographed and described in October's and November's issues of PFK. Tank number one was a 48" x 15" x 12" fish-only tank; we set the tank up, and in December's PFK I described how the only fish on my list which was currently available was a Long Nosed Hawkfish. So, he was duly purchased, and for the last six weeks he has been happily swimming around on his own — let us hope that he has not grown too used to the solitary life, and that my next purchases will not be harassed too much by him for her.

I went away for Christmas. I was not in too much of a hurry to make the next livestock purchase, since I had to leave the tank in the hands of one of my warehouse operatives — a keen but inexperienced

freshwater aquarist. I am writing this article as the others — i.e. putting my thoughts down on paper before going downtown to make my purchases, and then afterwards reporting on my findings. So my initial intention tomorrow is to find another two fish to add to the Hawkfish, preferably from my original list as described in December.

Buying the fish should hopefully only take a few minutes and a few pounds, but larger commitments of both will be needed to start stocking my 48" x 18" x 15" invertebrate set-up. I have already described how I have spent £150 on 35lb of living rock, which has also been left on its own in the tank. This larger tank is now fully matured. I have done a 50% water change, and it's now about time that I added some movement and colour. Non-aquatic visitors do not really appreciate that the tiny polyps and worms coming from the living rock are really very interesting — they think the tank is a waste of time and

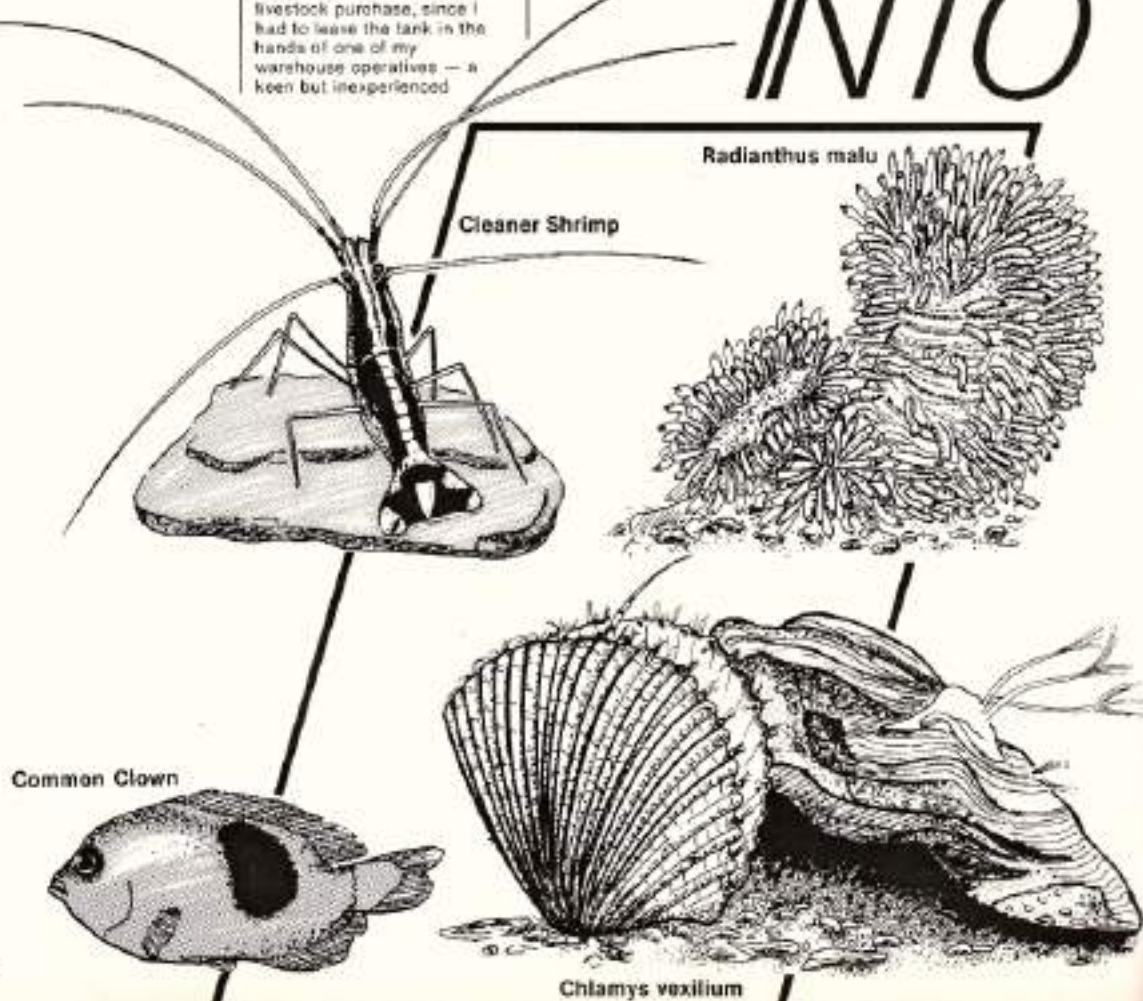
effort at the moment. So, tomorrow I hope to once again shock my bank manager by depleting The Underworld's new invert section, as yet unseen.

Tomorrow

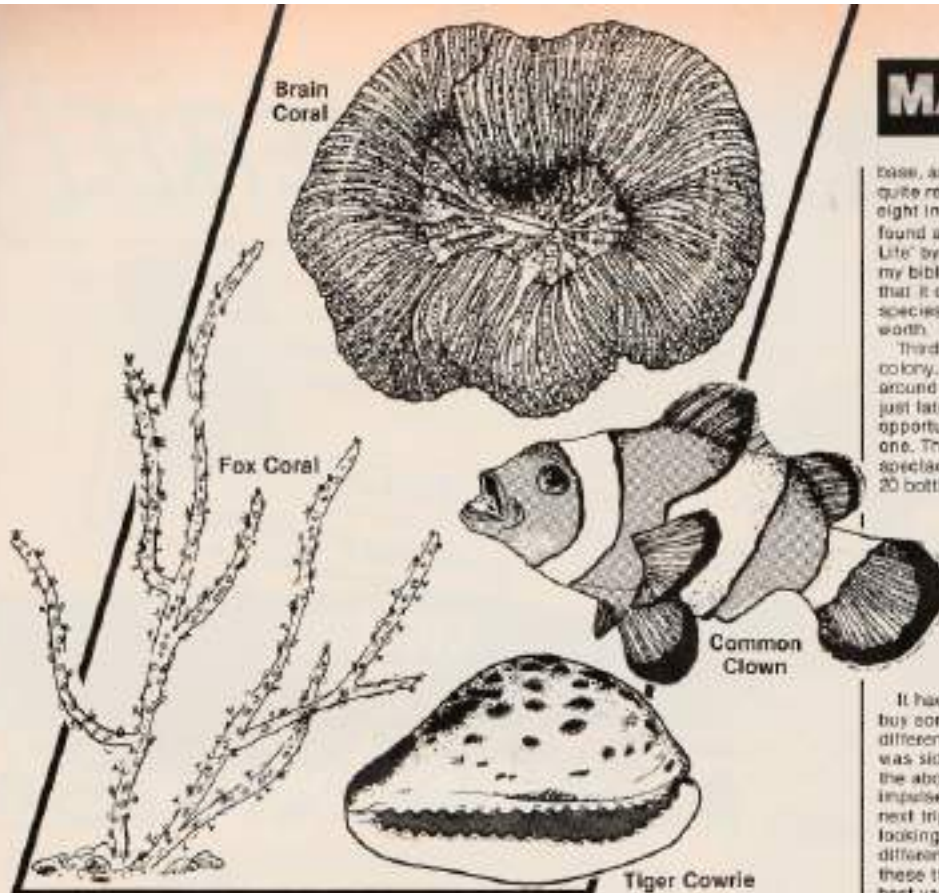
At last my invertebrate tank is up and moving! But first to the fish system. As hoped for, they had a pair of Common Clowns (£7.95 each), and so they were duly purchased. I had rather hoped that the Dwarf Angel on my list would also be available, but I had left it too late and all the angels on show had been reserved.

As I mentioned, I was a little concerned that my Hawkfish would be too aggressive towards any newcomers, and my inclination was to put in two different varieties in order to split his attention. But my fears were unfounded. The new inhabitants have settled without mishap. There were for sale some largish Regal Tangs and some smallish Yellow Spotted Tangs, both on my 'wants' list, but I do not

INTO



MARINES



base, and so stands upright quite readily, and is about eight inches high. I have found a picture in 'Marine Life' by the Georges (one of my bibles) which indicates that it could be *Plexaurid* species, for whatever that is worth.

Thirdly, I bought a mussel colony. I have seen these around a few times in shops just lately, but this is the first opportunity I have had to try one. They are quite spectacular — there are about 20 bottle green mussels in this particular clump. Apparently, the secret of maintaining them is to feed them directly with liquid food on a daily basis. Out comes the jumbo bottle of Lizard!

It had been my intention to buy some Anemone Stones of different types, but somehow I was side-tracked into buying the above. Talk about an impulse shopper! But on my next trip I will definitely be looking out for two or three different clumps — I find these the hardest and the best value of all the types of coral.

The shop had a reasonable choice of anemones — nothing spectacular, but some quite nice varieties, some brown *Radianthus malu* about six inches across as well as a number of *Ceratactis*. Whatever happened to the spectacular green Carpet Anemones that we used to see? There are certainly none around nowadays. I have never been impressed with the Caribbean *Ceratactis*, so I settled for the *Radianthus*.

My last two purchases were a largish Tiger Cowrie — there is plenty of algae on which he can graze — and a pair of cleaner shrimps. The prices were as follows:

Brain Coral	£17.95
Fox Coral	£19.95
Mussel Colony	£27.00
Tiger Cowrie	£16.95
2 Cleaner Shrimps	£23.00
<i>Radianthus Malu</i>	£17.25
TOTAL	£121.40

Both tanks still look quite bare. It is obvious that they both need quite a bit more stock, and the invertebrate tank in particular is going to drain my finances quite a lot. I reckon that I need at least another seven or eight major pieces, plus more shrimps, maybe an urchin, some tubeworms etc. This is the last of the current series, but I will write a follow-up on my progress towards the end of the year.

INVERTS

think that the tank is yet ready for Tangas — the algae growth is not yet sufficiently developed.

So to the invertebrates. The new Underworld invertebrate system has not yet

materialised — this was in fact wishful thinking on my informant's part. But they have installed a 48" Mini-reef, which is full of invertebrates. It would be difficult to design a tank from which it is more

awkward to sell — in fact, it is nearly as awkward as that sentence. What I am trying to say is, that the Mini-reef has a large, heavy, unmanageable lid, below which are a number of fluorescent tubes lying on the cover glasses, and removing the stock from the tank was a major undertaking. But in many ways it was a good thing that my choice was limited — I still managed to spend far too much, and I have not finished yet.

My main intention was to buy a few largish stationary pieces, to fill purposely-left gaps in the living rock, plus one anemone, and maybe one or two mobile animals which could be augmented on my next trip. I more or less achieved my plan. I ended up with three quite large decor pieces, which look magnificent, if a little lost.

First I bought a large piece of Brain Coral (*Techyphyllia* species), about six inches across, brown with a slight green tint. I have done well with these in the past — as long as you can get them home undamaged, they seem to last for a reasonable period of time with little trouble.

I then bought a soft coral, which they called a Fox Coral — it looks like a piece of Staghorn, but it is soft, not boney. It is on a nice firm



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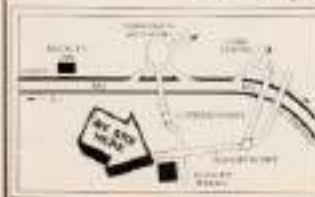
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"A BUNCH OF THOSE..."

Barry James review the aquatic plants unkindly referred to as 'pondweed' ... which have many uses other than putting oxygen into the water

Submerged aquatic vegetation is an essential component of any well planted and balanced garden pool.

The term 'Oxygenator' is an old one, based on the fact that, like all plants, submerged vegetation releases oxygen as part of the photosynthetic cycle. This oxygen was thought to dissolve in the water, which was subsequently breathed in by the fish.

However, it was realised some time ago that very little oxygen is gained by the water in this fashion, most being obtained by simple gaseous exchange at the surface. If you want only to increase the oxygen content of pools, the most effective method is to create turbulent conditions which increase the total surface area of the water. These days, inexpensive electric pumps producing either fountains or waterfalls will do this very effectively.

This realisation has not diminished the role that submerged plants play in the ecology of the pool — quite the contrary. Present thinking

acknowledges the importance of the functions that these plants perform.

Submerged plants grow extremely fast. In so doing, they absorb large quantities of minerals, such as nitrates and phosphates. These are known to be essential for the growth of algal organisms. Their other important role is to provide shelter for both adult and immature fish and to act as repositories for the eggs. Many species of submerged plants are also consumed in small quantities by fish, and provide an important source of vitamins.

One of the most frequent errors made by beginners is to underestimate the number of plants needed in the initial planting. The result of this is a rapid proliferation of one or more species of algae, with the result that the submerged plants become suffocated and perish.

Most pool plants are now offered as 'pot grown' specimens. However, this method of presentation is seldom used with oxygenators. They are generally sold as bunches of

4-5 cuttings held together by lead strip. The reason for this is that only the most vigorous part of the plant is sold — the old rootstocks are discarded. Unlike cuttings of terrestrial plants, oxygenators cannot wilt when submerged so the cuttings root quickly. One should buy one bunch for every two square feet of surface area, in other words a pond 12 feet by four would require 24 bunches.

Special planting containers are manufactured for aquatics. These are in three sizes — small, medium and large. Small ones are generally employed for the submerged plants. All these containers are of 'mesh like' construction, to allow for unrestricted growth of the roots.

Your container should first be lined with hessian — obtainable from your dealer — and then filled with a proprietary aquatic compost to within 1" of the top. Six bunches should be used for a small container. Simply drill holes about two inches deep with your finger and insert a bunch into each hole. The soil should then be firmed and covered with coarse gravel to the top of the container. Surplus hessian is then trimmed with a pair of scissors and the container is ready for placing in the pool.

With pools up to five feet wide it is normally possible to simply lean over and gently place the containers on the bottom. With larger pools, a stout pole may be needed to position the containers in the middle. Although submerged plants will grow in water up to five feet in depth, it is better to start them in shallow water and gradually move them to deeper water as growth increases.

After two or three years, these plants will have to be repotted, as the growth will weaken and the plants will become untidy if allowed to grow unrestricted. Simply take fresh top cuttings and make up your own new bunches — lead weights are readily obtainable at any good aquatic dealer.

Although there is a large number of different varieties of submerged plants available, you will find only one or two in the average garden centre. To obtain rarer and choicer species you will have to visit a specialist water plant grower or obtain their catalogue.

SPECIES *Elodea canadensis* (Canadian Pondweed)

Although this is the plant most asked for of aquatic dealers, it is seldom on offer these days. This is because it has been superseded by the ubiquitous Giant Curly Pondweed. In any case because of its very brittle stems it is not favoured by commercial suppliers because of the difficulty in bunching it. However, it is a pretty if somewhat invasive plant. Although suitable for smaller pools it should never be introduced into larger pools or natural ponds and lakes.



Giant Curly Pondweed (*Lagarosiphon major*). There are several plants in this genus and confusion is rampant — for example, the correct name for Canadian Pondweed is *Egeria canadensis*, but people persist in calling it *Elodea*.



Nottalia peltata (left) with *Fontinalis antipyretica*. The latter is best introduced along with the stone to which it attaches itself.

***Hottonia palustris* (Water Violet)**

Probably the most spectacular submerged aquatic, Water Violet has huge whorls of feathery bright-green leaves. The flowers are pale-lilac and are borne in clusters above the water surface. Although extremely popular, supply of this delightful plant is always exceeded by demand.

***Potamogeton crispus* (Wavy Pondweed)**

This plant closely resembles the known seaweed seen on our coasts. It is an attractive plant, equally at home in still or running water.

Tilapia recurva

This pretty plant from the Antipodes is of too recent origin to have acquired a folk name. A versatile plant, it may be planted submerged or alternatively can be used to cloak the baskets of marginal plants. Light-green foliage with the bonus of small white

foliage in the emergent form characterise this species.

***Fontinalis antipyretica* (Willow Moss)**

A very adaptable plant, this aquatic moss will colonise the torrents of fast flowing rivers or will be equally at home in the garden pool. It attaches itself to stones or the sides of the pool and sends out dense masses of dark-green fronds. This plant does not produce roots, so is simply placed in the pool, not planted in containers.

***Ceratophyllum demersum* (Hornwort)**

Another plant which does not produce roots, this species forms dense floating masses just below the surface, where it acts as an ideal refuge for goldfish fry. In winter it forms tiny buds which sink to the bottom and rest in the mud until the rising temperature of the water in spring activates it into growth once more.



Wavy Pondweed harbours plenty of natural food items amidst its glossy, rather brittle leaves.



Hornwort is one of the best oxygenators and spawning media, but can run rampant, only to pollute the water when it 'breaks up' in autumn.



Spiked Water Milfoil *Myriophyllum spicatum*, also known as 'Parrot's Feather,' grows equally well emerse or submersed.

***Lagarosiphon major* (Giant Curly Pondweed)**

Often referred to as *Elodee crispae*, this species was originally imported from South Africa but is now widely distributed throughout the world. An excellent choice for any pool, it is a robust species, with stout stems crowded with whorls of light to dark-green narrow, recurved leaves.

In winter the foliage becomes covered with a deposit of lime in hard water areas, and so becomes dowdy. New spring growth, however, returns the plant to its former glory.

***Myriophyllum spicatum* (Spiked Water Milfoil)**

One of five resident species of Milfoil, this species is the one most likely to be met with. The fine hair-like leaves are arranged in whorls around a thin, but pliable stem. Colour of the foliage varies from dark-green to reddish-brown. The insignificant flowers are borne above the surface in mid-summer. An excellent aquatic, and highly recommended.



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This month the subject is Carbon Dioxide, and its use as a plant fertiliser and controlling agent for pH.

Dupla CO₂ diffusion equipment is capable of providing the optimum supply of CO₂ in both freshwater and reel-type marine aquariums, and the fully automatic control of pH values in freshwater systems of any size.

Tropical waters, especially flowing waters, have a surprising degree of stability independent of the season, water level and light conditions. Factors such as the pH value, the CO₂ content, degree of hardness etc. have only a slight fluctuation range.

Several functions are also dealt with simultaneously by the Dupla CO₂ system, which assure stability in the aquarium:

1. constant pH value;
2. stable carbonate hardness;
3. optimized carbon supply of the aquarium plants.

1. Constant pH value

In the optimized community aquarium in which tropical fish from geographically and chemically differing waters can be cared for, a neutral pH value setting is recommended (see CO₂ table). Both fish from weakly acidic waters (e.g. neon fish) and also those from slightly alkaline waters (e.g. Lake Malawi or Lake Tanganyika) find an optimized tolerance range here.

The CO₂ system also offers great advantages for specialized aquariums in which special fish species, e.g. discus fish, can be cared for or bred: due to the precisely determined CO₂ dosage (by means of permanent pH controller) both acid and alkaline pH ranges are able to be programmed and set so as to be stable.

2. Stable carbonate hardness

If an aquarium suffers from CO₂ deficiency, the following sequence will occur:

Carbon is chemically bound in the carbonates. Now the plants need this carbon, since a different source is not available. In this process, so-called biogenic decalcification, carbonates are destroyed. As a consequence the carbonate hardness drops to dangerously low values and the pH value becomes extremely unstable; however, with sufficient CO₂ supply the plants utilize the carbon contained in the carbon dioxide. Biogenic decalcification no longer occurs and the stability of the water is assured.

3. Optimized carbon supply . . .

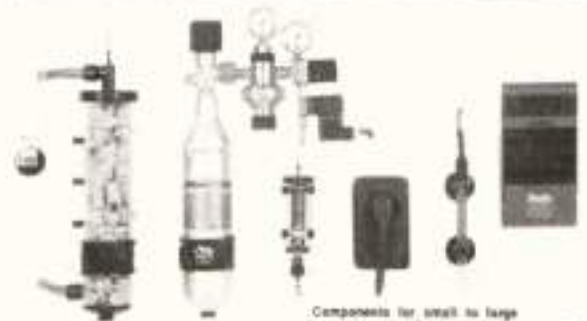
Submerged water plants meet their carbon requirements preferably from gaseous, solute carbon dioxide in the water. The supply from carbonates, which is also possible, leads as described above, to greater problems. Optimized carbon supply is assured by Dupla CO₂ fertilization.

The CO₂ table

The table will assist in determining the exact requirements of any given aquarium, particularly in respect of CO₂ fertilization. It confirms the rule that optimum pH regulation by means of CO₂ diffusion leads to the optimum availability of carbon for the plants. It also highlights the exceptions to this rule, however, in that water containing a carbonate hardness of less than 3 to 4 degrees can suffer a shortage of CO₂ very quickly. In fact at neutral pH levels the CO₂ content is already very low. Under these conditions even the Dupla CO₂ test can show misleading results due to the presence of humic acids, high nitrate values, and other substances that "fool" the test into thinking that CO₂ is present.

Dupla CO₂ System Reference Table, General Table for pH, carbonate

Aquarium Type	pH	Carbonate Hardness (°dH)	CO ₂ (ppm)	Temperature (°C)												
				15	20	25	30	35	40	45	50	55	60			
Community	7.0	3-4	10-15	15	12	10	8	6	4	3	2	1.5	1	0.5	0.2	0.1
Discus	5.5-6.5	3-4	10-15	15	12	10	8	6	4	3	2	1.5	1	0.5	0.2	0.1
Specialized	5.0-6.0	3-4	10-15	15	12	10	8	6	4	3	2	1.5	1	0.5	0.2	0.1
Plant	6.5-7.5	3-4	10-15	15	12	10	8	6	4	3	2	1.5	1	0.5	0.2	0.1
Marine	8.0-8.5	3-4	10-15	15	12	10	8	6	4	3	2	1.5	1	0.5	0.2	0.1



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SICK-LIDS!



Mary Bailey, of the British Cichlid Association, begins a NEW series on the ills and ailments that can affect everything from a Ram to a Guapote . . . kicking off with a few words of caution about jumping to conclusions . . .

Readers who regularly follow the *Queues* pages will (I hope) have noted that, when it comes to illness in cichlids, I am not a great believer in "little bottles". I was, once — it is a stage that every fishkeeper must pass through, the belief that every problem can be solved by tipping something into the tank.

As time passes, the realisation may creep in that you are spending a lot of money and achieving very little in the way of cures. If you are lucky, you may stumble across the first major rule of coping with illness in fishes:

IT IS NECESSARY TO KNOW EXACTLY WHAT THE ILLNESS IS

This may be stating the obvious, but regrettably most people apply the treatment for what they think the illness might be, rather than what they know it to be. Often the visible signs of illness — eg increased respiratory rate, resting on the bottom, gaping mouth — merely indicate that the fish is ill, and give no clues as to the cause. All too frequently, no further clues appear and the fish is logged as a "mystery death".

In this sort of case there is a terrible temptation to start trying pills and potions in the hope of effecting a cure. This is pointless and dangerous. At best the fish may recover, but you then won't know if it was cured by the remedy, or simply recovered spontaneously. If you then make the assumption that the same remedy will work on future, similar cases, you are likely to be disappointed.

If the first treatment fails, then panic may set in. A whole variety of remedies may then be tried, sometimes within a short period of one other, and usually without any attempt to remove the residues of one (by filtration/water changing) before adding the next. This is downright foolhardy. By turning the tank into a



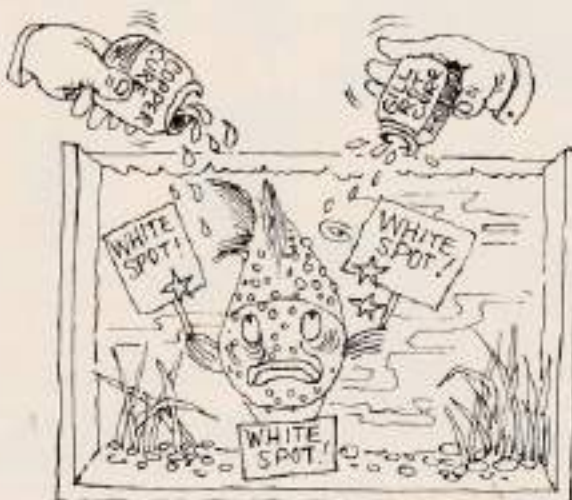
chemical brew you risk a) causing additional harm to the sick fish, b) poisoning the other occupants. Or you may

kill off the bacteria in your filter system and instigate a nice case of nitrite poisoning. There is another, if anything

Looking at a healthy fish is often the best way of ascertaining whether your cichlids are on or below par. Check out this Uaru: intact, erect finnage, bright eyes, rounded belly (but not bloated), confident position in the water, well-coloured, free from cuts, abrasions, raised scales, fungal or bacterial infections. And Uaru are supposed to be "difficult"! even more bitter pill for the fishkeeper to swallow in the shape of the second major rule:

APPROXIMATELY 95% OF AQUARIUM ILLNESS IS CAUSED BY POOR ENVIRONMENT

A lot of fishkeepers think I'm talking rubbish when I say that, but please bear in mind that I have reached that conclusion not only from my own experience, but from comparing notes with other hobbyists and after more than a decade of trying to sort out other peoples' tragedies for them.



Make sure you are treating the right ailment. Suppositories are no good for sore heads . . .

PRACTICAL FISHKEEPING

There are two major barriers to acceptance of these two rules: first, it is easy to blame the problem on a disease vector (bacterium, virus, etc) and to apply the contents of the "appropriate" bottle. If the fish still dies then the remedy must have been useless, never the diagnosis wrong. And second, it is very difficult for anyone to face up to the fact that they have, through (undoubtedly unintentional) neglect, caused their pets to suffer and perhaps die. Remember, I have myself been through this traumatic and humbling realisation, and it hurts. But is it not better to accept you were wrong and to take steps to avoid any repetition, than to blame it on someone/something else and blithely make the same mistake again?

So far, this article has been something of a lecture, but it is useless if I'm even trying to explain how to handle illness unless these two major rules are understood and accepted.

So, now I have got that off my chest, let us look at how



Is your tank hygiene good, or do you let things slide? Poor environment can be a killer.

Time to start worrying is if more than one fish is affected, either simultaneously, or over a period of time, by the same ailment. In such an eventuality proceed as follows:

a) Check water quality and

water correct it, either by water changes in the case of pollution, again as under d) below, or by adjusting the chemistry if that is the problem.

b) Examine the fish to see if there are any definitive signs of a specific disease. In many cases there will be only indefinite signs such as scratching. These could mean anything.

c) If you are sure of a diagnosis then treat with the appropriate medication.

d) Otherwise assume environmental problems, and change 30% for three days. It may take several days for any improvement to become obvious.

Also, ask your vet if he can do a post-mortem, and what preservation procedure to follow. A post-mortem will cost you money, but so would all the medications you might otherwise try at random, and so would the fish you are likely to lose through lack of correct diagnosis/treatment.

You may not need to have a

If most of your fish are suffering from the same complaint, at least you know the trouble isn't in your imagination...

to proceed if a fish does become ill. We will assume that there are no obvious signs such as growths or inflammation, just a general malaise. The first thing to do is to look at the other inhabitants of the tank. Examine these carefully to see if they are showing any minor signs of distress/discomfort. It is helpful to continually observe your fish in good health, so that any slight abnormality is immediately obvious.

If all the other fish seem AOK, then the next step is to do something! The hobbyist must learn to accept that fish do die, and that there is nothing that can be done if a single fish suffers failure of an internal organ. If you really must do something, then change 30% of the water in case you have an environmental problem. But in many cases the afflicted fish will either die or recover, and the rest of the occupants of the tank are never affected.

PRACTICAL FISHKEEPING

chemistry, and even if all is apparently okay do a water change unless the fish shows signs of poisoning and no new items have been added to the tank. If this is the case, then the Water Authority may have dosed your water with something (they sometimes do this to eradicate creepy-crawlies) and you should phone them politely to enquire — it will be helpful if you can get their cooperation in warning you the next time, so don't be aggressive! If this is the problem then you will need to get uncontaminated water (rainwater, water from outside the treated area) and change as much as possible of the tank water over the next 2-3 days as under d) below.

If you have added any item(s) to the tank then suspect poisoning — remove the suspect item(s) and change water as under d) below.

If you find something otherwise amiss with your

post-mortem done, but it may be that the only way to find out what the problem is, and it is as well to know the procedure before the next corpse becomes available. The wise fishkeeper will talk to his vet long before he has any need of his services, so as to be able to be prepared. The wise hobbyist will, in any case, make a friend of his vet, as there are likely to be other occasions when his help is required — eg in obtaining drugs not available as patent remedies.

Finally, a word on the special problems of newly-purchased fish falling ill and dying, something that is usually blamed on the retailer, but is generally your fault. Usually such deaths are the result of —

a) Too drastic a change in water chemistry. Death usually occurs within three days of introduction.

b) High levels of metabolic wastes — this is the classic case where the resident fish are fine, but the newcomers die. The resident fish have got used to increasing concentration gradually, while the new fish suddenly find themselves immersed in a strong concentration.

c) Stress/damage due to poor packing/transportation. In this situation, prevention is the only cure!

Having covered the basics of procedure in the event of illness, in the second part of this article I will be listing the various conditions cichlids are prone to, how to identify them, and how to treat them.



Poor handling of fish isn't confined to airports. Even at so-called 'specialist' shows, cichlids can have a rough ride in buckets, inadequate bags etc.

INSIDE...

Editor Nick Fletcher visits a Koi keeper whose pond doesn't stop at the garden. An imaginative project has left Dave Albon enjoying the best of both worlds!

Dave Albon didn't like the idea of all his beloved Koi skulking in the depths throughout the winter months. So he gave them the option of coming in from the cold.

Now his 'indoors-outdoors' pool is a year-round delight. And even in the hardest weather, he and wife Elaine can sit snug in their conservatory and enjoy their fish as they rise for pellets.

This happy state of affairs came about when the couple bought a piece of land in the Reading area and designed their house and garden from scratch.

"It was a wrench, leaving the old place," confesses Dave, 18 years a Koi keeper. By that, he clearly means his old pond and perhaps also the 'sea house' construction that disguised the filter. In those days he got close to his fish only in the summer, when he would don flippers and mask to swim among them.

The new house lies in beautiful countryside in the Kennet valley, almost on an island between the river and the Kennet and Avon Canal. Some of the local wildlife, like the otters Dave has spotted, is welcome. He's less happy about the herons and feral mink, but hopes they will find pickings easier on a neighbouring trout farm.

While the house was being built, Dave concentrated on the new pond — getting his priorities right. He had already decided that part of it would run inside a hexagonal, Victorian-style conservatory, but first the ground had to be cleared. A seven-ton tree stump was just one of the unwelcome attractions.

Luckily, a JCB was on site for the house footings, and Dave borrowed it to roughly dig out the hole that was to hold 50 tons of water. Later, when it was time to excavate the filters and install pipework, he had the luxury of his boss and next-door-neighbour Pat Harrison mucking in. When he's not engrossed in his Koi, Dave works just minutes from home

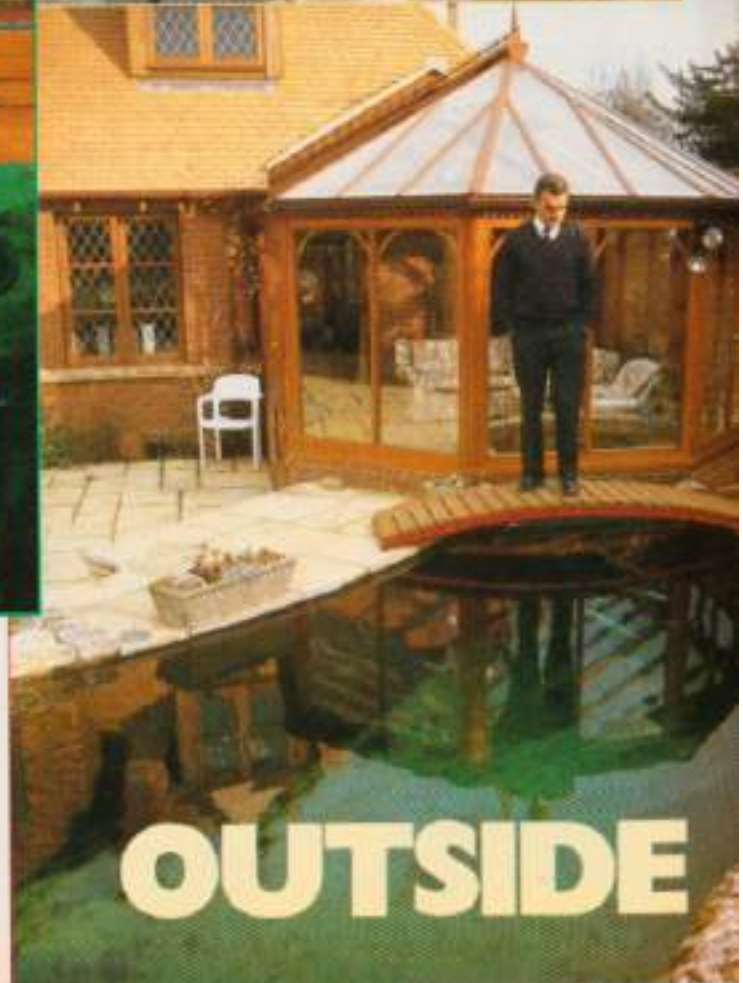


Above: House and pond were built simultaneously, a luxury few Koi keepers could imagine.

Left: Dave and neighbour fitting filter pipework and bottom drains. The pond has six in all.

Below: The pond takes shape. Gravity intake to the filter (wing built top left) is visible.





as a security guard! This may explain why closed circuit TV has been installed to survey his pond and deter the light-fingered.

One of the pleasures of Koi keeping is learning from past mistakes. Dave's first Koi pool was Butyl-lined, and he found that filamentous algae on the sides was a plague during sunny weather. So this time he opted for concrete-block construction, rendered with two layers of glassfibre mat

and resin and finished off with a smooth gel coat.

Six bottom drains service the pool. They are only 1½" diameter piping, but the waste water is powered out by a 5,000 gph swimming pool pump. All the necessary valves are housed undercover, next to a sand filter that polishes water returning from the filter. Gravity fed, this contains settlement brushes, Floor and Hottag.

The depth over most of the pool is a generous 7 ft, shallowing up to 5' 6" at the narrow end where this remarkable water feature dips under a Japanese-style bridge and into the conservatory. The cost of the pond and filter, with an 18" retaining wall, was just £3,000. But Dave then had to set about landscaping his fishes' new home, adding to the bill.

The rocky ground and behind the pool took 18 tons of Westmorland stone, with individual pieces weighing up to a quarter of a ton. That was when boss/worker relations were at their most strained, as all the rocks had to be positioned by hand and Dave was not satisfied until they lay just so.

The overall effect is to give a Japanese touch, aided by stone lanterns and Bonsai, rather than to aim for an authentic Zen water garden.

The fish which set off this most unusual of pools were bought from a number of sources, mainly at between six and twelve inches apiece. They have grown on well, and some have been with the Albons for well over a decade. Three larger Koi — a Hajiro, a Kohaku and a Shiro Utsuri — were purchased from a private collection, and in 1985 Dave went on the Living Jewels tour to Japan, organised by Bernard Channing of Japanese Water Gardens fame. There he stretched his bank balance to a Taisho Sanke, a Hi Showe and a



No job for seven-stone weaslings! Westmorland rock in large chunks is manoeuvred into position by the sweat of honest brows.

Goshiki

The latest purchase was a small Sumi Geromo, bought from Peter Waddington at Koi '88. There are forty fish in all, ranging from six to 26 inches and including a few home-bred happy accidents. All have pet names, like Ghips (for a fish that was bought with a scar on its head).

Dave enthuses about his membership of the BKKS. He was chairman of the Swindon and District section, which unfortunately disbanded. Last May he was one of the prime movers behind the formation of the new Kennet Valley section, which now boasts

around 50 members — including many who have transferred over from Swindon.

"I like to keep away from the politics and enjoy the social side," says Dave. "The moment you join, you can benefit from the pooled experience of thousands of dedicated Koi keepers. It would take a lifetime to gain all that knowledge first-hand."

The conservatory definitely extends the Koi keeping year, for even when the weather is mild, the fish will come inside by choice. Last Christmas they had a festive 'dinner' of pellets, bread, peas,

sweetcorn and worms. Dave gets these at night from a nearby playing field.

"They seem to feel secure with a roof over their heads," he says. "Inside, the wind does not ruffle the surface of the pool, and of course, they are safe from predators."

A modest man, Dave Albion does not think his novel Koi pond is all that special. We leave you to judge for yourselves!

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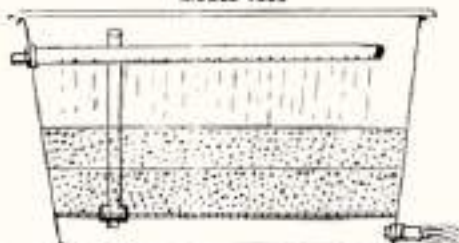
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KOI CORNER



SHOW BUSINESS

For this month, Greg Peck and Peter Waddington, of In-filtration Ltd, join forces to give you the lowdown on Koi home and abroad.

Ojiya City in Niigata Prefecture straddles Japan's largest river, the Shinano. In some parts it is over 600 yards wide, flowing over rocks and pebbles and home to salmon, trout and many small native fish. On a sunny day, the water appears blue and has

thankfully remained unpolluted for centuries. But there's another species of fish in the Shinano. Feeder streams from surrounding mountains, from Yusawa to Yamakoshi, flow directly past hundreds of Koi breeding establishments, and when culling takes place all



The Sanke that took the supreme championship, and that Keith Edwards had in his expert sights...



The weather in Ojiya excelled itself for sheer nastiness...

valueless fish are discarded to take their chances.

Around late October, Koi can be seen in these streams making their way towards the main river. But forget flying to Japan with a fishing rod to make your fortune... the breeders know their stuff!

Koi of a different calibre are exhibited in late October outside Ojiya town hall in the 'Noh-gyo-sai' or agricultural festival. These are the best fish produced by over 600 breeders in the surrounding area. The 1989 event will be on October 29th - 30th and I will be making, I think, my ninth visit. I rate it the most interesting show anywhere in the world, and the competition is intense. Big-name breeders like Dainichi, Matsunosake, Tarazo, Miyata and Isumiya are there to be (hopefully) knocked off their perches by up-and-coming youngsters.

At the 1987 Noh-gyo-sai the Dainichi Company took first place with a Showa, second with a Sanke and third with a Kohaku. That took some doing! But what was to happen this time round?

I was in Ojiya for ten days before the show, looking for newly harvested Koi for In-filtration Ltd. Breeders had been harvesting their stocks from field ponds to display and sell on their premises. But the very best fish were held back for the Ojiya show, as the way to reach the top is by reputation.

Every hotel in the city was jammed with dealers and hobbyists from all over Japan, plus enthusiasts from Indonesia, Singapore, Hawaii, South Africa and Thailand.

The cost of staging the show is split between the dealers and the Ojiya department of agriculture. The outside venue is inexpensive, but to that has to be added the tab for show ponds, aeration, advertising, Polaroid

photos, judges and a massive array of trophies.

On the big day the weather let us right down. Skies were grey, there were showers interspersed with hailstones, and the locals were predicting the first snow of winter — six metres are not uncommon, apparently. I waited in the hotel foyer with Keith Edwards, a Koi enthusiast from Essex, for 'Davy' Takanashi, who was to be our show host, and a doctor and his wife who were arriving from Mauritius.

On the way to the show, the doctor asked me if I had spotted any special Koi in the ten days or so I had been in Japan. I told him the best I had seen in my travels was a Sanke owned by a breeder called Hiroi from near Uragami. The doctor vowed to call in again and see it, but we had to wait outside Mr Hiroi's house for the hall to abate. Once in the fish house we noticed several notable 'gaps' in his stocks, including that Sanke, which his wife told us was already at the show!

A bleak scenario greeted us there — rows of windswept umbrellas, TV cameras protected by polythene bags, and at times so much wind ripple on the vats that the fish were indistinguishable by variety, let alone pattern and shape.

The judges were obviously having problems. At this show there are nine size groups, and the first decision is for the best three Koi selected from eight and nine. Two Koi were so neck and neck that it took a couple of hours to decide between them — shades of Britain, hee!

I tried to hop between the hailstones and take a few photos of the showground when I heard cheering from the judging area. Sure enough, Mr Hiroi's Sanke had taken the Supreme

PRACTICAL FISHKEEPING

Championship, with a Kohaku we had seen harvested by Mr Kawakami of Torazo in second.

Mr Hiroi was very, very pleased with himself, and rightly so. The Koi is around 73cm long and still 'Tatsui', so further improvements will take place as the fish is still only six years old.

The next day (Sunday) we returned to the show, only to be greeted by still colder weather. The restaurants and coffee shops were doing a roaring trade, but conditions prevented us from seeing all the Koi we would have liked. The fish — and there was a superb selection in all colours and varieties — didn't seem to mind one bit!

Third in the Supreme Championship was a Kohaku belonging to Mr Mana of the Daiichi Company. I was sorry to hear that his 1987 Supreme Champion, a Showa, had developed a stomach deformity in one of his mud ponds. That meant it was now useful only for breeding.

NHK Television interviewed me on the first day and the presenters found it hard to believe that many people in the UK kept Nishikigoi. They were astounded that I had visited the Nihon-goi-sai so many times, and I got the impression that the crew had never before witnessed a Koi show, let alone were able to understand why enthusiasts from all over the world were crowding into a small town in Niigata just to look at fish.

From what I heard later, Mr Hiroi threw a huge party the night of his triumph and I guess he was not open for business the following morning. Who put the 'N' in Sanke, indeed.



Why is Hiroi San rubbing his hands together? Because one prize Sanke buys an awful lot of Sake, that's why...

PRACTICAL FISHKEEPING.

Seasonal care

COLDWATER

Spring is the season which causes us Koi keepers most concern. At this time our fish are at their weakest, and trying to get them out of their semi-hibernation can be difficult. Here are a few suggestions which should help!

Once the temperature of our pond water rises to above 48°F our Koi start to look for food. At this stage I prefer to feed easily digestible items, such as brown bread or sinking whelkgerm. I will start by feeding perhaps twice a week, at the same time keeping a careful eye on water quality — checking pH, nitrite and ammonia levels daily.

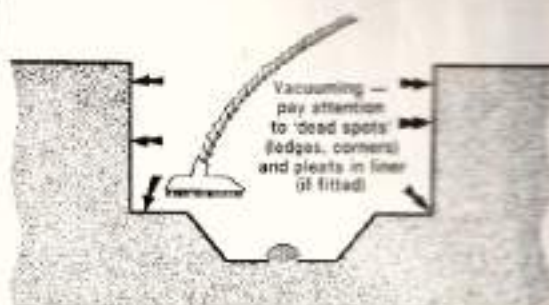
The problem at this time of year is that the filters are at a low ebb, and with our Koi being in a similar state, it is beneficial that our water quality be at its best. Once the fish start feeding they produce waste, and the filter suddenly has to work overtime to cope.

The solids can be adequately taken care of via settlement, but the real problem is that at low temperatures the bacteria in the biological filter are almost dormant, and too much waste will see the water quality drastically affected.

Some pondkeepers turn off their external filters over the winter months (as an ardent Koi keeper I leave mine running). I would recommend before switching them back on to completely clean them out, not forgetting to clean and overhaul the pump.

Even if your external filtration system has been in operation over the winter, I suggest a bit of a spring clean is a must.

The type of external filtration determines what maintenance can be carried



A vacuum is a good idea if you have bottom drains, essential if you haven't. Pay attention to the potential 'dead spots' as here.

out. My own is four-chambered, the first of these being a discharge box and pre-settling chamber. This I empty, purge via the bottom drains, and completely hose down before back-flushing the other chambers to waste. My second filter chamber is my main settling chamber and consists of two rows of brushes which are removed and thoroughly cleaned. This chamber is then completely vacuumed out, removing all the solids.

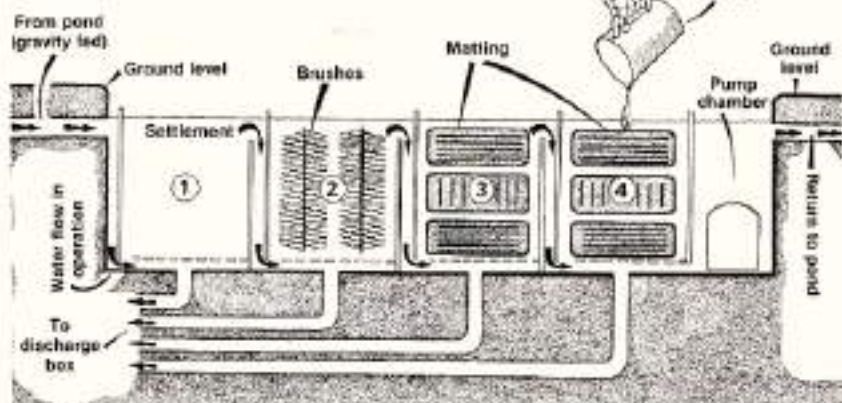
I am now left with two chambers of matting cartridges. I remove and clean only one, leaving what few aerobic bacteria remain in the other to multiply.

If airstones are used in the filter, it is a good time to check them over, replacing any that are worn. Should you have no aeration in your biological filter it is perhaps time to rethink, for without it, it is virtually impossible to have a biological population. There are two main types of bacteria in our filters — anaerobic, the 'villains', and aerobic, the ones that turn ammonia and nitrite into

harmless nitrate. Without good aeration you are cultivating the baddies!

After cleaning out the filter, do not forget the pond itself. Check that there are no leaves or mulm. It's not a bad idea, either, to remove any frogs found in or around the pond. Place them in a box and take them down the meadows, far enough for them not to return. The reason is that frogs are not too particular as to what they mate with, and horrific damage has occasionally been caused to Koi.

Now that the filter and pond have had their 'spring clean', the next thing to consider is assisting the filter to cope with the fish waste. I can recommend two ideas in this direction — first a 10% daily water change (a steady trickle is ideal) assuming an overflow/skimmer is fitted. The alternative is to pull your bottom drains and refill on a daily basis.



This simplified filter system shows spring tasks to be undertaken: 1) Drain and hose down settlement chamber 2) Remove brushes, vacuum out solids 3) Remove and clean matting in the first biological chamber 4) Seed the final chamber with Polybac or similar.

KOI CORNER



Seasonal care

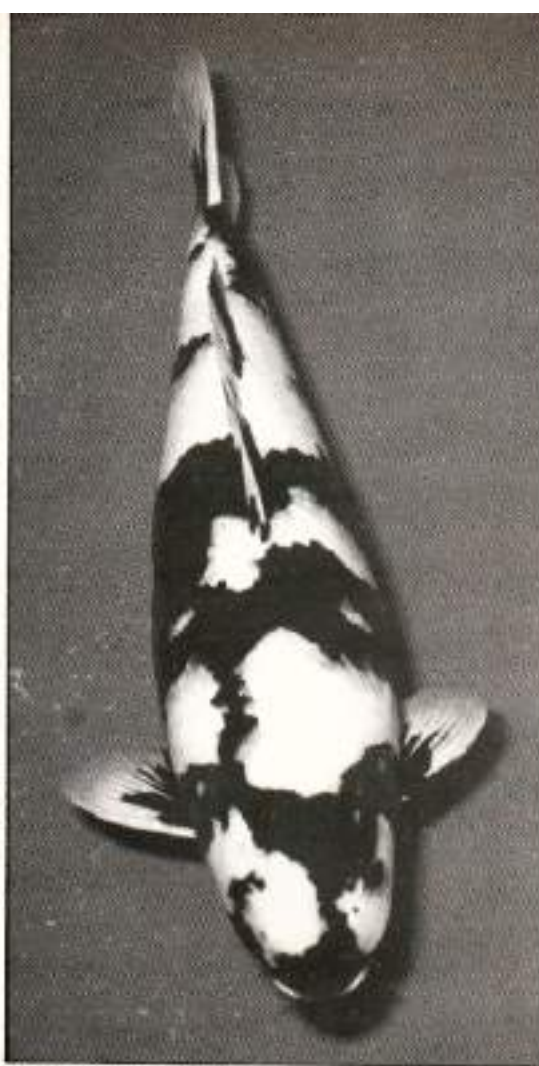
Unfortunately, tap water cannot always be depended upon, because of the chlorine and other additives. You can always check with your local Water Authority or, if you feel like splashing out £300, there is a device on the market called **Aquapure** which simply connects between your water supply and your pond. Aquapure will remove all additives from tap water and, depending on what you think of your koi or how much they cost, could be a good investment!

The other thing I do is to use a filter additive to help to get the biological filter on song. There are a couple of different products on the market, but one I have personally used with excellent results is **Polybac**.

This is a product consisting of several micro-organisms, freeze dried. When added to

the filter, they boost the biological filtration capability. I personally feel that for the cost of a few pounds it's a must at this time of year, or for anyone setting up a new pond. Tests carried out by koi dealers in the UK have shown that Polybac can reduce ammonia and nitrite levels within 10 days, and maintain a virtually ammonia-free environment for months.

Finally, what about our koi? What I normally do, as soon as they start feeding properly, is to give them all a saline (salt) bath. The dose I prefer to use is one kilo of salt to 11 gallons of pond water, leaving them in this solution for up to ten minutes before returning them to the pond. This helps clear out the gill plates, just in case small particles of dirt have become trapped while they have been in a semi-dormant state over winter.



A classic Shiro Utsuri with the characteristic 'Y' shaped head sumi and bold wrappings. Just as a Bekko is a Sanke without the Hi, so a good Shiro Utsuri should resemble a Showa without the same red markings.

KNOW YOUR KOI

THE Utsuri Mori is generally known as just 'Utsuri' (meaning champel), the reason being that it is not uncommon for the black background colour to change as the koi grows.

The Utsuri is a black koi with a single coloured pattern — either white (known as Shiro Utsuri); yellow (Ki Utsuri); or red (Hi Utsuri).

The Shiro Utsuri, along with the Kohaku, Sanke and Showa, falls into the category known as 'Go Sanke'. These four varieties are the koi which generally win the major awards at shows.

SHIRO UTSURI

Shiro (meaning white) Utsuri are by far the most popular of the three Utsuri varieties. They are koi with a black base colour and a white pattern. Excellent Shiro Utsuri with lots of white skin can give the impression that the koi has a

white base colour with a black pattern, and it is not uncommon for beginners to the hobby to mistake them for Shiro Bekko.

The main characteristics of the Shiro Utsuri are those of the Showa (see last month's issue), except that the Shiro Utsuri has no Hi (red).

The quality of the Sumi (black) is most important in this variety and should be homogeneous, stable and glossy, with clear sharp edges. It is said that the Sumi of the Utsuri does not settle till the koi is at least four years old. The contrast of deep ebony Sumi against a snow-white pattern is what makes this variety so impressive.

The head of the Shiro Utsuri should have plenty of white on it, with the Sumi pattern dividing the head into two, or as a 'Y' shaped pattern from the shoulders to the nose. As far as the sumi on the body is

concerned, large markings are preferred, but they tend to look gloomy. Modern Utsuri tend to have much more white and a lot less Sumi — these look less impressive, but graceful and more refined.

The pectoral fins should have Sumi markings at their base (Motoguro).

Should the Shiro Utsuri have any Hi (red) on it, in principle it would be a Showa. The Shiro Utsuri should have no Hi at all. But slight Hi around the eyes, on the abdominal region, or overlapping the Sumi on the back is permissible, if unobtrusive. Hi on the pectoral fins is not allowed. It should always be remembered that a koi with many charming points and perhaps a small defect is still regarded as a good one.

Finally, you should always look carefully when purchasing Utsuri. The Sumi pattern can quite easily hide

defects, such as a missing eye or head deformity.

KI UTSURI (Yellow)

The Ki Utsuri is basically the same as the Shiro Utsuri except that the coloured pattern is yellow, not white. Due to the popularity of the Shiro Utsuri, Ki Utsuri are seldom seen.

HI UTSURI (Red)

The Hi Utsuri is once again fundamentally the same as a Shiro Utsuri, except the pattern is red. Hi Utsuri are quite popular koi among beginners, attracted by the contrast of red on a black background. But the Sumi tends to be uneven.

SPRING SICKNESS

At this time of year it is not uncommon to have the unfortunate experience of losing a koi. I lost two of my favourites in the spring last year, one due to a deformed egg sac, the other to heart



Ki Kii Utsuri — a precious yellow and gold Koi not often seen.

COLDWATER

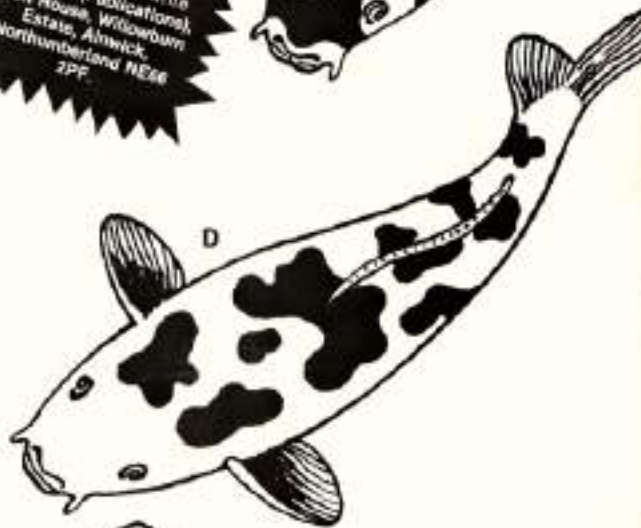


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failure. This was the first time I had lost a koi for several years. Do spend that little extra time observing your koi, as early detection of many problems can make the difference.

Empty cries of 'BVC' have been heard from all koi corners over the past year, although I have yet to have it confirmed that it has been found in koi. I am sure the less experienced may panic, should he or she lose any koi this spring. **DON'T!** If you should lose a koi and are not sure of the reason, find out! Ask your local vet, dealer, koi society, or contact MAFF who may be able to help.

Shiro Utsuri patterning. A and B viewed from above, C showing how the pattern should envelop the body. D is a Shiro Bekko, for comparison.



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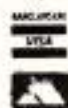
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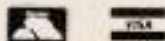
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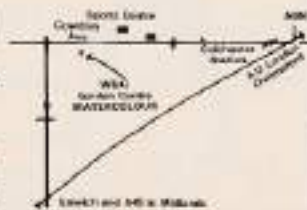
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Geyser fountains are ideal for the smaller pond, as spray will not flow from them. This is a split-level patio with pond, at the 1988 Chelsea Flower Show.



PATIO PIECE

Let water bring life to otherwise dull expanses of paving, says James Allison — coldwater specialist at The Aquatic Habitat, Brockworth.



A spring-fed sunken patio pool at Snowhill House, Gloucester. The four corners emphasise the former shape.

This piece is for those of you whose houses back on to seemingly vast expanses of dull, gray paving slabs. Perhaps the practical and labour-saving advantages of your patio are being overshadowed by the fact that it is very drab and boring to look at.

Have you considered that a small pond could be built into the patio for very little effort, perhaps over a weekend? The reflective water surface, fish and aquatic plants would soon add a focal point of interest. With a small pump you could also have the benefits of moving water; a small fountain or spouting ornament. A pond pump could

also be used to power a filter, which would ensure clear and healthy pond water.

If you wanted a big patio pond, then it would obviously involve more work, but then you would have an impressive addition to your garden.

SITING

Water features close to the house have a number of advantages. The pond can be seen and enjoyed, even when the weather keeps you in. Sources of electricity for pumps and lighting are also close to hand. The house itself will provide valuable shelter from wind, and the garden hose is nearby for top-ups.

The positioning of a pond has a major influence on how successful a feature it will be. Plants and fish benefit from a fair amount of sunshine, which helps to warm up the pond water. All-day exposure to sunshine is not necessary — in fact, it can result in problems with green algae. If full day sunshine is unavoidable, then plants grown around the South side of the pond (in or out of the water) will provide beneficial partial shade.

Try to avoid sites overhung by trees, as blossoms and leaves can pollute the pond. If necessary, a pond cover net can be used in the autumn to keep out leaf falls.

SIZE

The pond should ideally be in proportion to the rest of the garden and patio if it is to blend in well. Try chalking some possible outlines on to the patio, stand back and see how they look from a distance.

Even small ponds can look deceptively large when empty. By the time they are filled and stocked with plants and fish, they will seem to have shrunk. It is far more common for pondbuilders to wish that they had built their pond larger rather than smaller!

For those of you with very little space, then a small pond 3' x 3' or 4' x 4' will fit neatly into the layout of paving slabs. Don't expect such a small pond to hold more than a few plants and goldfish. The smallest ponds are often the most difficult to maintain in natural balance. The plants will need trimming back to prevent them from swamping the pond, and a pond filter may be necessary to keep the water clear.

If you want to keep a reasonable selection of plants and fish, then I would recommend a pond with a surface area of at least 40-50 square feet, i.e. a pond 6' x 8'.

Ponds of around 100 sq. ft and over (i.e. 12' x 8') are better suited to larger fish such as koi and orfe. Such

large ponds could alternatively house a really bold display of water plants or one of the taller fountain ornaments. There are few practical limits to the upper size of pools, as liners are available in virtually any size. It depends upon how much space and money you have to spare.

DESIGN

The simplest designs are plain squares and oblongs which should fit in well with standard patio slabs. L-shapes and staggered oblongs are other interesting possibilities. For the more adventurous, hexagonal and round ponds should provide a challenge.

Many patios have differing levels, and these can be used to excellent effect with ponds. A pool can be built out from the upper patio to form a raised section in the lower area. (See diagram.) A series of pools on different levels can be linked by waterfalls.

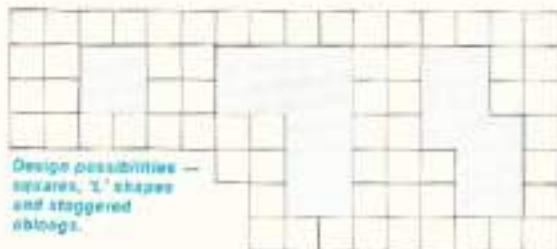
Raised ponds have a number of advantages. They bring the water, fish and plants closer to eye level. They also help overcome problems with leaves or blowing dust, and reduce the risk of young children and pets falling in.

I know of a number of people who have ponds in their conservatories. Conservatories seem to be a very popular way of extending the home, and there is no reason why a pond cannot be built fully or partially into them (see 'Indoors, Outdoors'). The shelter afforded makes these ponds more suited to exotic water plants, the more delicate fancy goldfish and the koi keeper who wants to enjoy his koi all year round.

If space is really pushed,



Design possibilities — a raised pond on a split-level patio.



Design possibilities — squares, L-shapes and staggered oblongs.

then don't forget that tily tube, cobble and bubble fountains and self-contained fountain ornaments provide a big impact in a small area.

CONSTRUCTION

The two most popular methods of construction are liners and preformed pools. Concrete still has a place in the construction of reinforcing shells for complex or sheer-sided pool designs, but modern materials are easier to handle and install, and more reliably waterproof.

Liners are available in many

sizes — some are available off the shelf from water garden centres. They are easy to transport and install and their flexibility makes them suitable for nearly all designs. Good quality butyl rubber is the best material with a proven long-life expectancy.

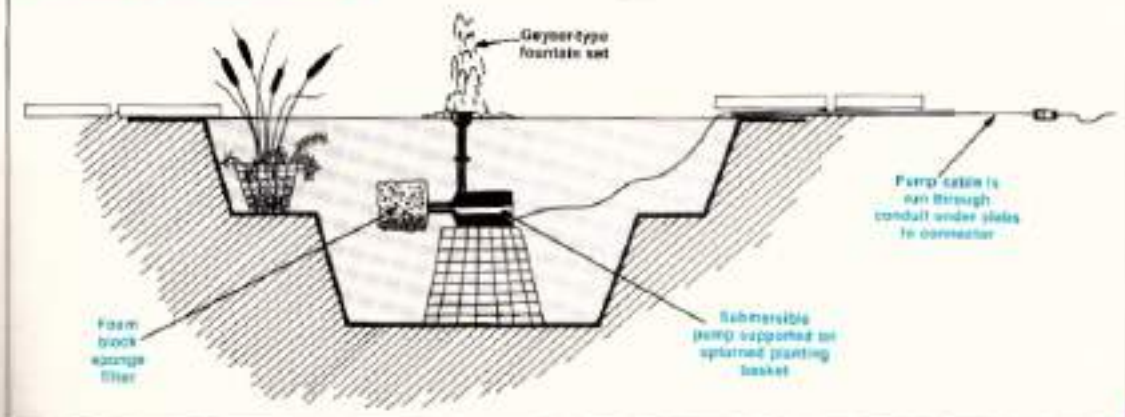
Preformed pools come in a range of sizes and designs. Some of the more formal shapes are ideal for patios and, if a supporting wall is built around them, they can also be used in fully and partly raised situations. I have even seen hexagonal designs

offered by some continental producers, with optional built-in waterfall lips.

Glassfibre is the most rigid and strongest material for such pools. Quality glassfibre pools also have a good life expectancy. More economically priced plastic pools are widely available. Preformed pools have the advantages of smooth internal surfaces and planting shelves built into the design. However, they are more difficult to transport, are generally too shallow for koi, and tend to be more expensive than liners.

Whether you choose a liner or preformed pool, do follow the installation instructions carefully to obtain the maximum life from the materials. Remove stones from the excavation and make sure that the top edge is level

More of a water feature than a viable fishpond, this small formal patio design adds movement to an otherwise large expanse of slabbing.



EDGING

Slabs are the most obvious form of edging. If they overlap the edge slightly, this will help disguise the pond construction material. Make sure that slabs are large enough and well enough anchored so as not to topple into the pond (see diagrams).

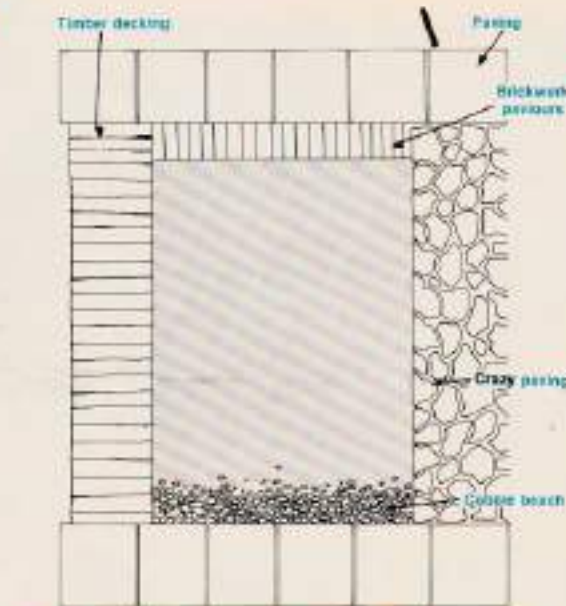
Do treat all new slabs and cementwork with a proprietary lime neutralizing agent. If cement falls in, the pond should ideally be drained and all cement fragments removed before refilling. Lime from untreated cement can build up to dangerous levels in the pond, stunting plants and killing fish. Ideally, slabs should slope gently away from the pond edge. This helps prevent dirt and dust from washing into the pond.

A pipe laid below the slabs at the construction stage will make it easy to wire in a water pump at a later date. Don't cement around the cable attached to the pump itself, as it may be necessary to remove the pump at times.

More unusual types of edging include crazy paving, brickwork (use bricks suited to contact with water) and wooden decking. Cobble beaches can be created on shallow shelves around the edge of liner ponds.

PLANTS AND FISH

The stocking level of pools is usually related to the surface area of the pond. This is more easy to calculate for regular oblong than informal pools. Plants should go in first. These are available from most stockists from late March onwards. Oxygenating plants help to create balanced conditions and, in general, one bunch should be planted



Edging possibilities — sometimes, mixing two materials helps reduce strict formality.

later additions.

FOUNTAINS AND WATERFALLS

It takes some skill to incorporate waterfalls successfully into patio ponds, and these are best considered at the design stage.

Preformed waterfall units are relatively easy to install, but their informal designs don't always suit formal patios. However, it is very easy to install fountains and spouting ornaments. Submersible pumps can be fitted and running in less than an hour. A wide range of fountain jets and ornaments is available to suit all tastes.

Avoid high fountains in small pools, as the wind will soon blow the water away. Wide-nozzled jets give bolder sprays more visible from a distance (see diagram). Spouting frogs and similar ornaments require only small to medium-sized pumps.

FILTERS

Sponge block filters are a neat and unobtrusive way of filtering small pools of up to 100 gallons or so. They

PATIO PIECE

for every two square feet of surface area. These should be spread around the pond at different levels and planted in the appropriate shallow baskets.

Marginal plants and water lilies should be placed in the depth of water recommended for each specific variety. Choose plants whose eventual sizes are in keeping with the

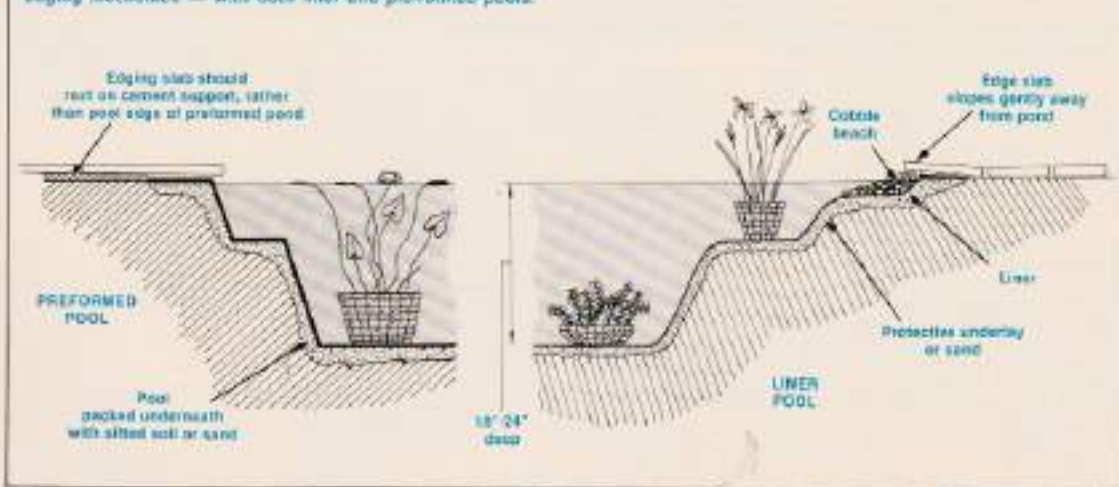
size of pool.

Fish should wait until the plants are established, usually at least 3-4 weeks. Build up stocks gradually, and don't buy fish too big for the pond. The recommended maximum stock for the first season is one inch of fish length for each square foot of surface area. This allows for fish growth and leaves room for

usually fit directly on to the pump inlet. If run for 24 hours a day they will function biologically and help to keep the pond crystal clear.

In larger pools with more fish, bigger filters will be needed. If too small a filter is used it will not function as well, and will need frequent cleaning. Larger in-pool filters are available, but they can

Edging mechanics — with both liner and pre-formed ponds.



take up a fair amount of space, are bulky to handle and sometimes tricky to clean.

External filters are the only alternative. Appropriately sized filters are excellent at keeping pools clear, but they are bulky. For patio pools this poses a problem. The filter could be set in the ground beside the pool and covered with decking. Make provisions for draining of the filter in such a position. Another possibility is to have the filter positioned remotely, i.e. in a garage or shed or next to a wall. Pipes can run under the paving to and from the pond.

Do consider space for a filter at the design stage. Their effectiveness has made them an increasingly popular addition to garden ponds.

Once completed, the pond will greatly enhance the patio. If you use the patio frequently in the summer months, consider some form of lighting. You can then use the patio for evening barbecues and look at the pond — rather than stumble into it in the dark.



Split-level patio pond with various edgings and wooden walkway over.

COSTS — Preformed pond 4' square, 18" deep	
Item	Price
Pond shell	£30-£35
Lily, marginals, oxygenators, containers	£20
Medium goldfish (3-4)	£5
Small pool pump	£35-£40

COSTS — 12' x 8' x 2' deep lined pond	
Item	Price
Butyl liner 16' x 12'	£100-£120
Fish and plants	Dependent on quality
Filter to service 1000 gallons	£100-£400
Pump to power filter and fountain	£70-£100



A patio pool in the Chinese/Japanese style, with ornamental Acan.



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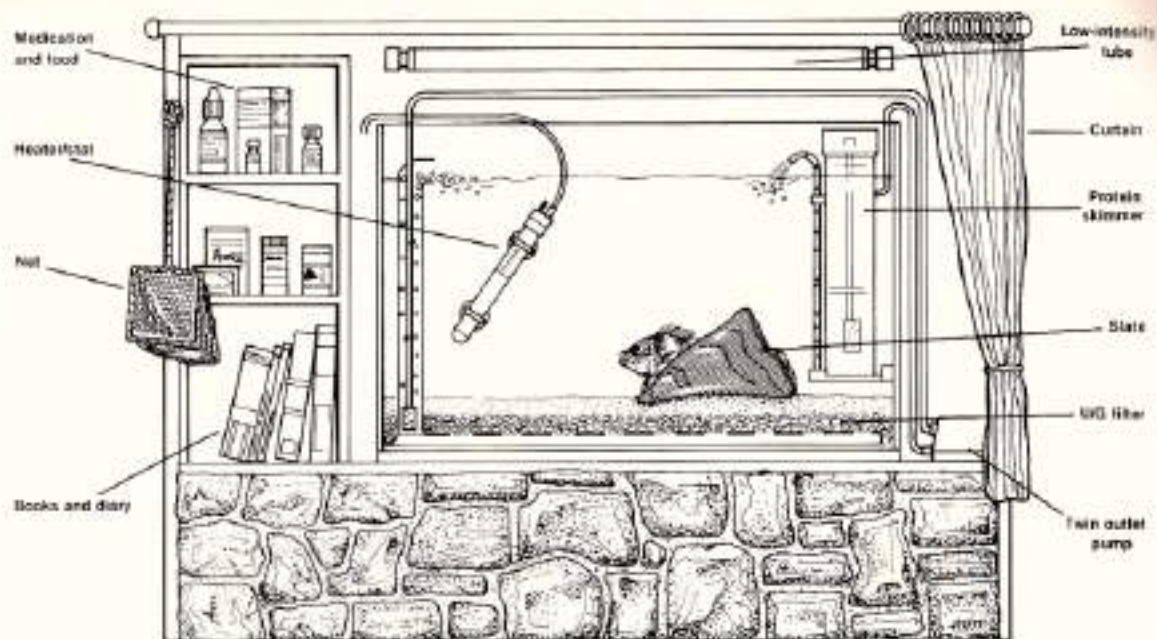
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If we all had the space and resources, our ideal quarantine/hospital tank might look something like this. A place for everything, everything in its place.

QUARANTINE

Almost as essential as salt water, if you're a serious mariner, is a quarantine/hospital tank. Nick Dakin explains the whys and wherefores . . .

Picture the scene. You return home from the aquatic dealer, pleased as punch because — at last — you've been able to buy that special fish you were dreaming of owning. It's straight to the show tank: lights out, float the bag, mix the water and release. Everything looks great, and it's time to sit back and admire the new acquisition. It certainly is a great feeling.

But what's this? Only a week and the thing is scratching against every available surface. Not only that, but so are some of its tankmates. The smile of satisfaction has been short-lived, to be replaced by a pale-faced mixture of disbelief and horror!

Anyone recognise the story? Yes, I thought so, for it's a common one that I've heard and seen many times.

The question is, could it have been avoided? I believe to a very great extent, yes, it could.

Most of us know that when we are stressed, our resistance to disease is lowered and our body can be open to all manner of infections. These range from the common cold to more serious ailments. Fish are no different, and when we consider the vast amount of stress they have to undergo just to make it into our living room aquarium, then the amazing thing is that any survive.

That is why I believe all marine fishkeepers should have at least two tanks — a show tank and a quarantine tank, doubling as a hospital. The careful use of one tank for the two purposes is usually quite in order, as anyone with diseased stock should not be buying new fish. If a fish needs treatment while a new purchase is still in quarantine then I can only suggest that you discuss the matter with your retailer and ask if you can return the new fish temporarily until all is well again.

It's in the bag . . . but will it stay in the tank? That depends on your quarantine procedure says Nick Dakin.





REASONS FOR QUARANTINING

The case for quarantining a new fish is a strong one, and can be justified by the following reasons:

- (1) It enables the fish to adjust to the stress of captivity and to aquarium life.
- (2) The owner can watch for early signs of disease and treat accordingly in a controlled environment, without interfering with any other stock.
- (3) The fish can be seen to be eating properly. If experiments are to be made, then this is the best place to do it.
- (4) Any undesirable or unusual habits can be noted. These may or may not present a problem in your show tank but at least you will be aware of the situation in advance.
- (5) After quarantining, a new purchase will be in the best condition for final introduction into the show tank, especially if it is to join the rough and tumble of other, more boisterous tankmates.

THE QUARANTINE TANK

This should be as large as you can accommodate comfortably, and certainly no less than ten gallons for smaller fish. Larger fish will obviously need an appropriately larger tank, always bearing in mind the one inch of fish to every two gallons of water guideline.

High water quality should be a priority at all times. Undergravel filtration and protein skimmer, coupled with regular water changes, is one satisfactory option.

While fish occupy the tank, then tests for ammonia, nitrite, pH and levels of copper (if any copper treatments are being used) should be made every few days.

Try to sight the tank in a quiet area, but a place where observations can be made easily. Lighting is not that important at this stage, and one or two tubes should be quite sufficient.

Some cover is appreciated by most fish and can be supplied by a few slates. Avoid building rock 'castles' as this is fraught with problems:

- (a) Fish will tend to hide most of the time, thus making observation very difficult.
 - (b) It displaces valuable water.
 - (c) It traps uneaten food.
 - (d) Fish that panic easily can damage themselves in their mad dashes and can even bring the whole lot crashing down.
- As Tufa rock can interfere with the efficacy of some medications.

MEDICATION

I must admit that I do favour administering prophylactic doses of copper-based medication to all new arrivals, rather than the 'wait and see' what occurs approach. The philosophy behind this is simple; any stress caused by this sort of medication is going to be infinitely less than letting a disease develop and subsequently trying to cure it.

Obviously, manufacturers' instructions should be followed carefully (one very good reason for knowing the exact amount of water contained in your tank) and do bear in mind that many medications cannot be used within the same time period. Therefore, if you do suspect disease, be sure you are certain of your diagnosis. Some diseases do show outward signs, but many physiological problems such as liver or heart failure are well beyond the scope of all but the well-equipped specialist (I am, of course, referring to fish that require a post-mortem!).

Applications of any medication, as well as the results of tests made, should be logged in a daily diary. This can prove invaluable in preventing double doses due to a memory lapse (always supposing the memory is good enough to remember to fill in the log in the first place!).

Test kits enable the marine hobbyist to monitor water quality, especially important in the confined space of the quarantine tank (picture courtesy Jerzy Gawor, J.G. Associates).

HOW LONG?

How long is a piece of string? Only you can be the ultimate judge here. There are no hard and fast rules in this area. I can, however, make some sensible and informed suggestions.

If a fish shows no signs of disease, is eating and behaving as expected, and you are sure so you can be that it is the right choice for your show tank, then about three weeks should be adequate.

If you have had to treat for diseases and a cure is effective, then allow about four weeks from the last observed signs of infection.

Reluctant feeders will require patience and not a little skill. Once feeding well, a further two or three weeks should be all that is necessary.

If you are planning to introduce your new purchase into a mixed invertebrate/fish aquarium then this is where a quarantine tank really becomes invaluable. Once fish are in this type of set-up they are virtually impossible to catch without creating a scene resembling a battlefield. Therefore, to be as sure as possible, a quarantine period of up to two months is recommended. This has the added advantage of giving the owner an extra period of time to decide whether the choice was a good one or not. If not, then there has been no harm done.

FEEDING

Find out what the fish have been feeding on when purchasing, and don't be afraid to ask to see it feeding if at all unsure. A reputable dealer will be only too pleased to comply with this sort of request, as it safeguards both him and you. After all, you can't very well ask to return a specimen because it's not feeding if you were shown it feeding in the shop tank.

If a fish refuses food, don't buy it — it's as simple as that! If you are satisfied the specimen is okay, then continue to feed the same in the quarantine tank as was used in the shop.

If you find that a new purchase stops feeding when first placed into the quarantine tank, don't panic. A short period of starvation, say a day or two, then an offering of live brine shrimp usually does the trick. Try to encourage acceptance of a variety of foods to avoid it

MARINES

getting 'hooked' on one type of food only. As this is rarely enough to satisfy all the nutritional needs of most fish.

Uneaten food is a good sign of overfeeding, so adjust your regime so that none is left. Of course, small traces of uneaten food are almost impossible to see, let alone remove, and this is where our friendly Hermit Crab comes in. These virtually

indestructible creatures do a good scavenging job and help to keep the tank mature when not in use. For years I have kept many in copper-medicated tanks, and have yet to lose one!

Some caution is needed, and they should not be kept with very small fish they might catch, or indeed with very large fish that might catch them! As with most things, 100% success is never guaranteed but I do think the resilient nature of this fascinating invertebrate is well worth exploring.

AND FINALLY...

On NO account let your quarantine tank become a second show tank, however little used it is and however tempting it may seem. If a second show tank is desired, then by all means set one up — you'll enjoy it. What you won't enjoy, though, is the time you desperately need your quarantine tank to treat a sick fish, only to find it has ceased to exist!

There is a law that says once a temporarily unused quarantine tank has become a permanent home for a cute little grouper that was just crying out to be bought, then it will suddenly be needed for the purpose it was originally intended. I'm not sure, but I think the law begins with an S!

Many people have 'got by' without the use of quarantine; many people have lost countless fish unnecessarily! Don't be caught out. If you intend to take fishkeeping seriously then get a quarantine tank. If you already possess one (and use it), give yourself a slap on the back!



What to feed the 'patients'? DenoMarin is a good choice since it sinks, and any uneaten morsels will be mopped up by your friendly hermit crab.

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FOR STOCK TO BE RECEIVED FROM ABROAD. IT
WOULD TAKE MORE PAGES THAN ARE IN THIS
MAGAZINE TO LIST ALL THE FISH WE HAVE IN
STOCK SO HERE ARE JUST A FEW:

Geophagus tondei
Geophagus brasiliensis
Var. *Pike Cichlid*
Claudioo laticeps
Anadoras gryllus
Ragnus doctus
Dooptatatus malinwa
Myxus nemus
Black Lancer
Syno membranaceus
Pseudopimelodus sp.
Tetraodon mbi
P. S. zuzanae boltonis
Tetraodon mullius
Megalodon irvini
Acanthodoras spinosissimus
Megalodon sp.
Micodontodus tigrinus
Tiger Shoelnose
Alligator plec
Arowana
Royal Parakee
Blue-Eyed plec
Stenopoma barbatum
Rheokricaria lanceolata

Pterygoplichthys gibbiceps
Red peacock
Pezoma
Braconplatystoma jamaense
Polypterus ornatus
Pseudodoras variatus
Electric catfish
Calliphysus macropterus
Perruichthys peruviana
Wabago loon
Cichlasoma altum
Cichlasoma citrinellum
Cichlasoma milkyii
Cichlasoma maculicauda
Cichlasoma bifasciatum
Cichlasoma melanostrum
Cichlasoma managuense
Cichlasoma dovi
Cichlasoma symplekum
Cichlasoma makracanthus
Cichlasoma robertsoni
Cichlasoma friedrichstahli
Cichlasoma tetraodon
Cichlasoma pinnace

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'TC' hails from Basilides, Essex, and is pictured here with his owner, Sue. TC is one of the Red-tails surveyed.

fish at that time). My pet-sized import from Peru grew to three foot in as many years.

The distinctive colour pattern, black body and white mid-lateral stripe, coupled with the striking blood-red tail, makes the Red-Tail one of the most popular giant aquarium fishes available today. It is interesting to note that Interpet use a picture of this catfish in their colour advertising. One aquatic establishment uses the Red-Tail Catfish as an emblem, and several more advertise individuals as display specimens.

I learned a great deal about keeping large catfishes (much of it relative to keeping other large specimens) during the years 'Bertie' was a popular attraction in my aquarium shop from which I have been 'retired' since 1987. Long after his television appearance in 1982 — which came about because of the record price paid (his untimely death followed shortly after) — people asked me about the huge catfish.

In the early years of my aquarium shop I published details about keeping *Pyractocephalus*. Several fishkeepers contacted me through PFK (Bertie appeared on the PFK front cover and in articles in June 1983 and June 1985 with problems relating to sustaining Red-Tail Catfishes in the first months of captivity. The same problems and related subjects reoccurred, and from that time I began to keep a record and offered fishkeepers the opportunity to complete a questionnaire.

EMPEROR OF THE AMAZON

In keeping 'Bertie', my display *Pyractocephalus*, I recognised the need for the employment of a different tropical fishkeeping psychology. Large fishes obviously do not need crumbed lake fish of the 30 lbs per day, like birds of prey, they are 'edged' and become clever if confined to small aquarium systems.

Pyractocephalus are scarily, heavy-boned, streamlined predators equipped with a strong tail to fight for an existence in the enormous, fast flowing South American waterways. Home to a *Pyractocephalus* is within the huge torrents spilling from the Peruvian Andes and the Guyanan highlands down into the Amazon Basin. Massive rivers, they are more like freshwater seas, miles across and rafting by of a million gallons a minute.

Bertie was housed in an eight by two by two foot aquarium, and even such a grand home seems small by comparison.

In nature, Pirarara pursue a predatory existence alongside other catfishes from the *Firmelodidae* family. These

range from the smaller aquarium-sized species such as *Pimelodus* to the large tiger shovelnose *Pira-pira*, *Piraraca* group which have been known to weigh in at over 340 lb (150 kilos) and grow to a foot six inches.

As they swim through the fishing cataraacts, Red-Tail Catfishes are captured in great numbers by food-catching native fishermen. The same nets and baited gill lines reveal strange catfish catfishes, the catopoids (which are capable of ripping into the flesh of host fishes), large characins, *Brycon*, *Cerosoma* and *Pacus*.

An educated guess suggests that about 250-500 Red-Tail Catfish are exported from South America in a normal year for the aquarium trade. The majority are shipped from Iquitos, the export centre for Peru. Manaus (the export centre in Brazil) and more recently Belém, in Brazil.

The ornamental fish demand probably represents less than 1% of the total Redtail specimens captured. The rest go to the factory refrigeration ships and local fish markets for food! God

forbid that the Japanese become aware of the great taste of Pirarara, as they are already the world's number-one fish consumer!

Of the aquarium trade total, about 40% are flown to North America and the balance to Asia, Japan and Europe. Some of the American imports are then transhipped to Europe from Miami, Florida. It seems that in the UK we have the main aquarium 'appetite' for the Emperor catfishes. Some might be transhipped from the UK to Japan, because of the higher prices tropical fish can attract in the Land of The Rising Sun. In the last decade up to 3,500 have found their way into importers' holding tanks before being sold to retailers.

Heiko Bleher, West Germany's most famous tropical fish collector and expedition writer, provided information on the export of *Pyractocephalus*. He informed me that over 2,000 Pirarara have been shipped since the early part of 1985-1987, the highest number in the history of the ornamental fish industry. Two factors were instrumental in this extraordinary total:

One — the upsurge in interest in tropical fish in Japan and Asia, because of media peopled ~~at~~ altitude towards keeping big fish; Two — South America had suffered a prolonged dry season.

The latter factor meant easier catching for the native fish collectors working in low-water rivers, and in particular on the cataraacts or large rapids, where fishes congregate to migrate.

No-one knows what effect excessive collecting of these catfishes during migration could have on this and other species. It is documented that older *Pyractocephalus*, 'giant' metre-long specimens and probably female, have long since gone into the factory food-ship holds. If these large females are migrating to spawn, then a much greater and more significant damage to the species will have been caused over the last ten to twenty years.

Fortunately many other major rivers are home to the Red-Tail. Waters in Guyana (Essequibo and tributaries), Venezuela (Orinoco and tribs.) French Guyana (Oyapock) and

Surinam (Coppename, Conarlin and Surinam) are not so vigorously fished, and hardly ever for the aquarium trade. Thanks to this, the Emperor Catfish is not yet a threatened species!

(Note: I would be happy to have the two collected species 'total numbers' monitored by the species could be included under the useful protection of the World Wide Fund for Nature Organisation.)

The statistics of what happens following the commercial collection of tropical fishes in South America would probably truly frighten caring fishkeepers, and even most animal conservationists!

Ten years ago few, if indeed any, aquarium retailers knew how to keep and feed the large catfishes. Today very little has changed, I know, because half my telephone and written queries come from retailers!

One terrible example of unacceptable mortalities (which I detailed in my earlier published research, but I believe should be repeated here) relates to an import into Manchester airport which was transhipped from Miami, Florida. This consignment of tropical fish had its origins in Manaus, Brazil, and included at least eight Red-Tail Catfish specimens cleared alive through the height and custom ways of the airport. Within the week, half were dead and one or two more looked to be dying or badly shipping shocked.

The Miami aquarium fish importers are not known to be the best 'handlers of fishes' and they appear to be unaware that the system of allowing young fish to starve before shipment (commonplace in South America and Florida — so that fishes cannot produce wastes and pollute the very small amount of water in the shipping bags) has disastrous results. A young *Piracetoccephalus* which has a dried-out stomach may never eat again, and starves to death over several months.

Few importers/retailers have the knowledge or experience necessary to treat infections and diseases caused by bad handling and shipment shock.

A high percentage of shipping losses can be directly attributed to the million-dollar wild tropical fish trade which demands high turnover of livestock and does not allow for the animals to be rested, properly fed and treated. A major percentage of the problems also stems

from poor holding facilities by exporters in South America. Most appear to be unregulated, and they operate a system where they buy fish in large quantities outside of the wet season when fishes are in plentiful supply.

Inadequate conditions and lack of space results in severe livestock overcrowding.

This, combined with a general lack of training in relevant aquatic subjects and basic animal husbandry, means the longer fish are held before export, the greater the chance they will die.

The final balance of the blame can be placed directly on the shoulders of ignorant retailers. They make fundamental mistakes at the critical import time when fish are susceptible to infection. More than one retailer has placed two *Piracetoccephalus* into the same tank, because of a lack of aquarium space. The Red-Tail Catfish is naturally an extremely territorial species, and two specimens confined together in a small space can only spell disaster.

Combine this simple mistake with the wrong water conditions and it is not surprising, and also extremely saddening, that these regal beasts give up life.

Once an imported specimen has settled in, and begins to feed properly it can be long-lived, especially if kept in public aquaria. Indeed, *Piracetoccephalus domesticus* easily and soon hand-feed.

But if retailers find looking after Red-Tail Catfishes difficult, what hope is there for the hobbyist? Surprisingly enough, the fishkeeper stands a better chance, because a specimen that has survived to be sold is undoubtedly one that has fought hard and is strong.

The fishkeeper's problems are often long-term, and I have brought most of them together for analysis in the table. These repetitive problems are listed in the table below:

KEEPING	FEEDING	AILMENTS
Low or fluctuating pH.	Refusal.	Shedding mucus.
Poor water quality.	Excessive feeding of prawns.	Itching.
Growing.	Regurgitation.	Surface gasping.
Territorial disputes.	Glu-tionous over-feeding.	Bacterial infections (red blemishes), ulcers.
Nocturnal behaviour.	Excess waste.	Fish-lice (Argulus).
Lack of daytime activity.	High ammonia and low pH.	
	Consuming non-edibles!	

The initial problems relate to many factors, often the trauma and stress of bad handling and shipment. From collection by the Indians, who fish simply to feed the hungry mouths of their families, to the delay by customs clearance staff anxious to placate the paperwork mountain, the stress builds up.

Feeding is the least priority. Water quality should be as good as possible and this requires that undergravel and external power filter must be organically mature in the fishkeeping sense. They must have operated over six weeks in an established aquarium. If this is not possible, then the retailer must provide mature

gravel and power filter media: new and sterile will not do!

Once water conditions are acceptable and the catfish appears to be settled, small amounts of food can be offered. It is essential not to upset the water balance while the animal is still relating to its new surroundings. An imbalance could kill!

Long-term filter media such as ceramic pieces, por-scume and gravel topped with a layer of filter wool (that should never be washed out too thoroughly) are ideal for power filters operating on large aquariums. Carbon, unpredictable in its usefulness, has to be removed when treatments are added to the aquarium water.



Top: 'Claude' was bought in the summer of 1986, even smaller than most imported Redtails.

Above: 'Alexis the Magnificent' pictured in his prime at his Cambridge home.

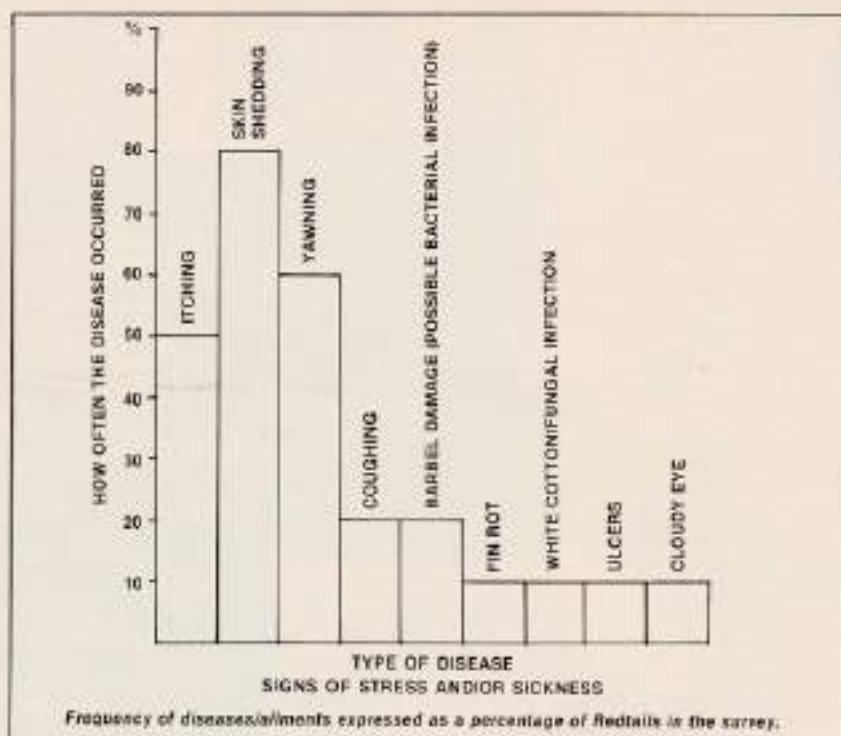
It should only be used if it is replaced monthly or if more than one power filter is operated on the system. It is impossible to have too much filtration, but it is possible to over-wash the filter media and thus defeat the nitrification filter bed that is necessary for purification of fish wastes in an enclosed system.

Many surveyed fishkeepers washed power filter media under tapwater without realising that chlorine kills nitrification bacteria. This can result in poisonous ammonia and nitrite waves appearing in the aquarium after water changes. The effects can be severe enough to kill an already stressed catfish. A container of aquarium water should be drawn off and the contents of the power filter emptied into it and rinsed out.

Regular, small partial weekly water changes seem to be the ideal maintenance and probably create the least stress for catfishes.

Another major problem is health care.

Captive *Phraetoccephalus* shed mucus — a lacina like skin — when water conditions are imbalanced or the catfish is suffering from an infection.



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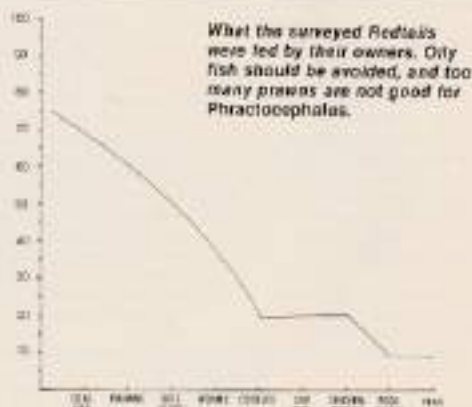
UVAQ 30 w U V Steriliser <i>(For ponds up to 5,000 gall)</i>	£119.95
UVAQ 15w U V Steriliser <i>(For ponds up to 2,000 gall)</i>	£79.95
30w Replacement Tubes	£12.95
15w Replacement Tubes <i>(As fitted to original UVAQ units)</i>	£10.95

These are genuine UVAQ units and not to be confused with potentially dangerous inefficient units that do not incorporate a quartz sleeve in their design.



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I believe this occurs when the fish wants to shake off the effects of high or changing pH and possibly parasitic infection.

Few fishkeepers would look for white spot on large fishes unless the white cysts covered the fish. Even fewer hobbyists are aware of freshwater *Godinium*. This parasitic infestation attacks the gills of the host and the extreme seems to be asphyxiation. Infested specimens may appear to "cough" or hang at the water surface. Sometimes they itch, scrape and shed skin in an attempt to throw off its effects.

Aquarium marine salt, added to the partial water change, and standard parasite treatment added in the aquarium from day one will soon solve those problems.

Common parasites such as fish lice can be picked off the fish with tweezers, and a general copper-based treatment can be applied to the system if various parasitic infestations seem to have overrun a newly introduced fish.

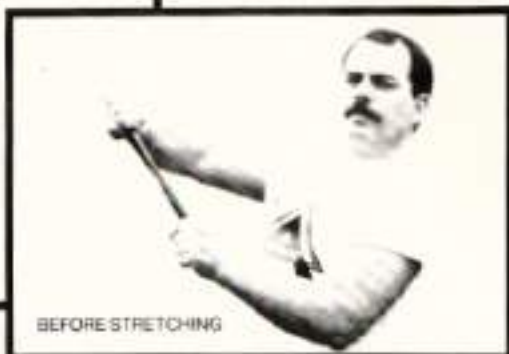
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pond application as the liner will conform to small subsidences which can often take place with new pond installations however well planned. Should this happen, the liner is not left with any stress points as its molecular qualities settle to the new configuration. Other manufacturers' guarantees do not allow for this eventuality. Guaranteed for 20 years but it's nearly eternal! Available in full colour packs and off the roll. If you haven't seen it yet send for a sample and prove it for yourself 39p a sq. ft. (RRP) Made in the UK.

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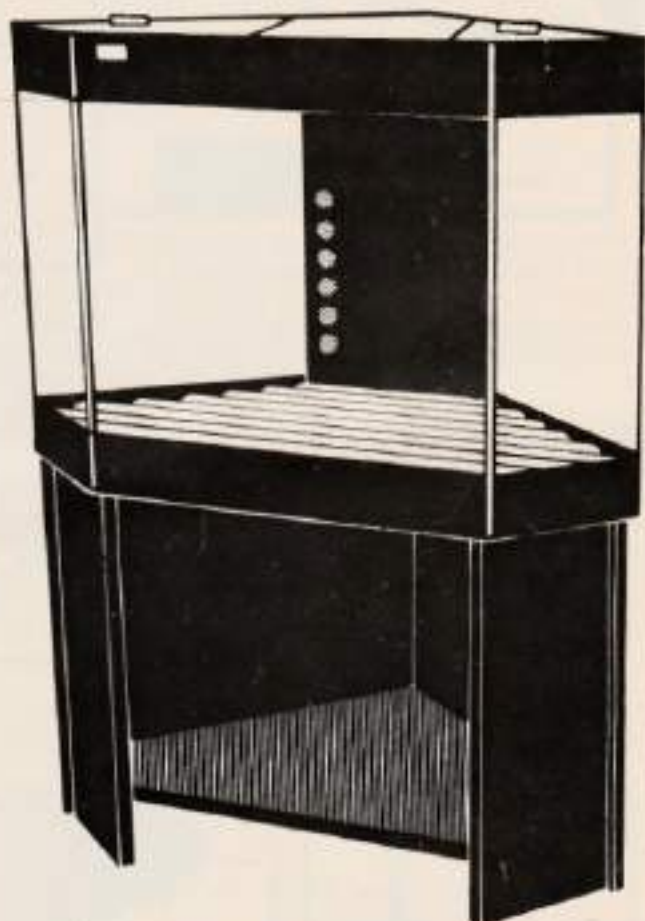
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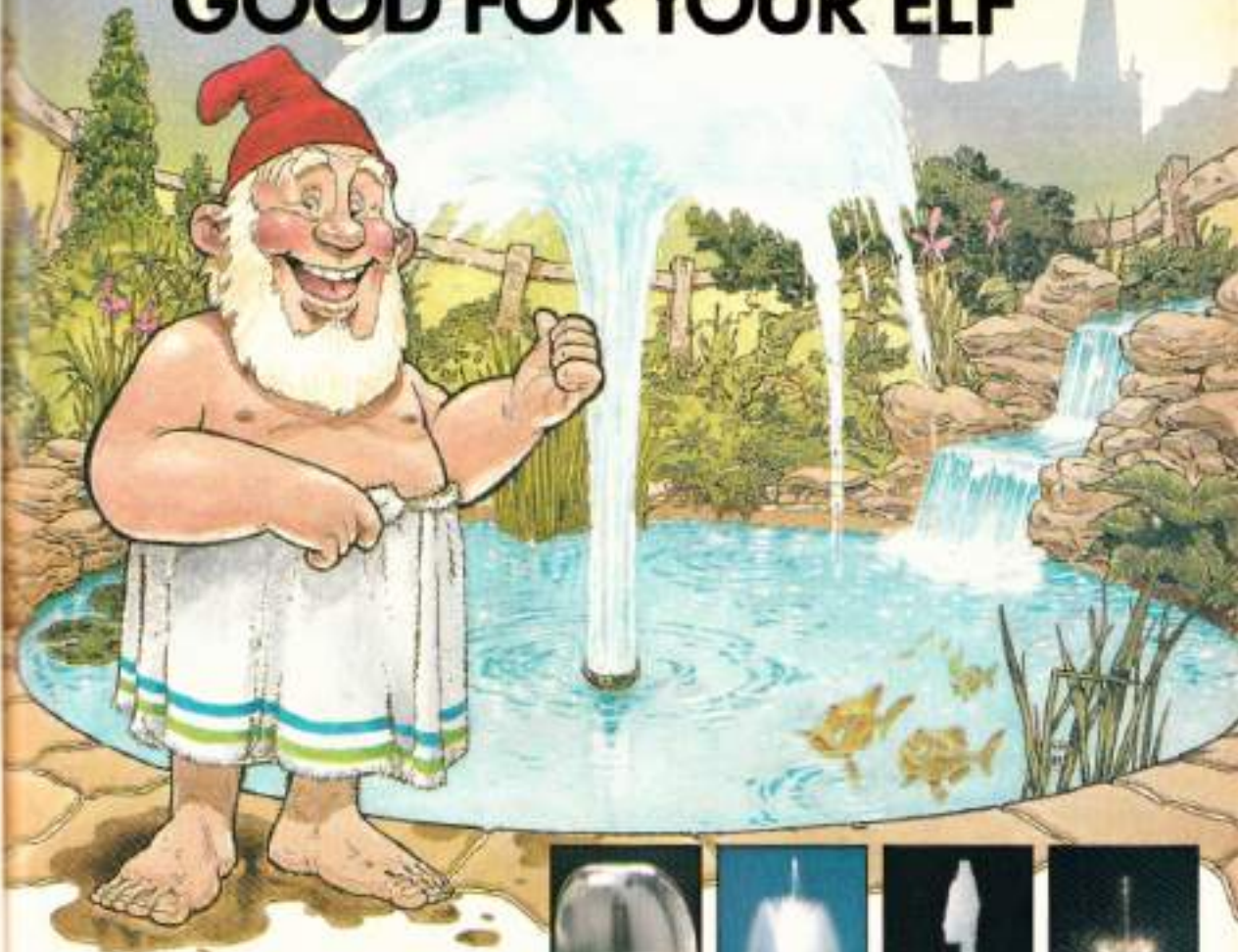
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SÖCHTING OXYDATOR

A device which puts pure oxygen into the water of your aquarium or pond, without any moving parts and independent of your electricity supply, sounds too good to be true. But these are precisely the claims of the German-made Söchting Oxydators.

I have had the opportunity of examining the Oxydator W, for pond use, and confess to being somewhat baffled, both by the design and means of operation. That it releases pure oxygen is not in dispute. What I would question is whether the amount produced can have any significant effect on water quality or the well-being of fish.

Let's briefly list the manufacturer's claims:

- Activated oxygen filters to every corner of the pond, including 'dead pockets' which the current cannot reach. It even penetrates the substrate, making it an ideal biological filter.

- Activated oxygen encourages aerobic micro-organisms which convert fish waste into harmless by-products. It puts an end to stale, foul odours from the pond bottom.

- Activated oxygen rids water of organic products such as carbohydrates and nitrite by converting them into safe, simple substances like water, carbon dioxide and nitrate.

- Activated oxygen improves redox potential, killing unwanted algae and bacteria which cloud water.

So how do these scientific miracles occur? By means of a catalyst acting on Hydrogen Peroxide (yes, the same stuff that gives Madonna bleached roots).

A small catalyst rod breaks down some of the peroxide inside a plexiglass container, and the resulting oxygen is expelled through a small hole



Unscrewing the cover to the pouring hole in the base of the plexiglass inner container. The air hole for the gas generated is visible to the left.

88

Nick Fletcher looks at two totally different pond products in depth in this occasional equipment review series. Manufacturers — if you'd like your aquatic goods featured in a later issue, give the editor a ring.

THE ENGINE ROOM



The Söchting Oxydator W with the necessary 27 per cent Hydrogen Peroxide solution.



Filling the inner container. We would recommend rubber gloves for this potentially hazardous task.



The inner container is inserted and placed into the ceramic outer.

in the base. So far, so good.

But now, to quote the leaflet, the specially developed ceramic of the Oxydator releases the pure oxygen your fish need. Only our unique ceramic can do this — ordinary ceramic has no effect at all!

Sounds like a certain lager ad, doesn't it? And what I cannot fathom is how the ceramic, in the Model W at least, can have any effect on the oxygen generated. If you look at the design, you will see that the gas does not need to pass through the outer ceramic container at all!

My main worry about the Oxydator is not its efficacy, so much as the potential danger to fishkeepers. The Pond model uses a litre of 27% Hydrogen Peroxide, and at this concentration the chemical can burn skin. The inner container aperture through which it must be poured is only narrow, and at the very least a small funnel should be provided to minimise the risk of spillage.

Cost must also be taken into account. The unit itself is pricey (£89) for what it is — namely a cylindrical ceramic outer, a plastic handle reminding me of a horticultural tree tie, an inner plastic container with the 'catalyst' that's little bigger than a lighter flint, and a container of peroxide.

That, in itself, costs over a tenner for a litre, and in warm weather (oxygen release is in direct ratio to temperature) you may need to replenish the solution each month.

These sort of statistics begin to make an airpump look cheap.

My conclusion is that the aquarium models A and D are likely to be of real benefit — some Discus keepers swear by them. But in a pond of any size, the amount of oxygen released will be so small in relation to water volume that the beneficial effects will be slight.

The Model W is certainly



The Oxydator in operation. The oxygen emerges as a fine mist, easily absorbed into the water, but what difference the gas would make in a large pond is open to debate.

PRACTICAL FISHKEEPING

not a replacement for a conventional pond filter, and I suspect that a clamp of Hornwort would rival it for oxygen production, during daylight at any rate.

But Koi keepers could find it an unlikely boon. It is recognised that aerobic bacteria present in filter beds need a high oxygen content in the water to work at their best. A Söchting Oxydator, strategically placed within the filter chamber, could be a lot more convenient than an airpump (which of course delivers carbon dioxide as well).

Verdict: I suspect that claims for the Pond Model W are optimistic. I shall keep my sample for warm weather, when sensitive fish like orfe suffer from low levels of dissolved oxygen, and use it instead of the traditional hose pipe played on the surface. Major UK stockists of the Oxydator range are Tropicals and Marinas, 71 Lower Richmond Road, Mortlake, London SW14 7JH. Tel: 01-878 5480 who have working examples in their aquaria. They will be happy to answer reader enquiries and may prove me wrong in my assessment of the product.

CYPRIO PREMIUM RANGE PUMPS

Purchase of a submersible pond pump can make a substantial dent in the wallet — but many of us justify the expense by believing that this vital piece of equipment is going to last as long as that other costly outlay, the Butyl liner.

The traditional 'circulator' pump for goldfish ponds, designed to lift a modest head of water and power a fountain or small waterfall, is purpose-built for its job but cannot be expected to cope with larger pools and their attendant filters. Their

obvious drawback is that the strainer, designed to prevent solids from jamming the impeller, needs frequent cleaning.

Those of us needing a more powerful and trouble-free workhorse will turn to the vertical spindle centrifugal type of pump. These move round thousands, rather than hundreds of gallons every hour and can cope with higher heads of water. Running costs vary tremendously from model to model, so that an apparent 'bargain' buy can add substantially to your electricity bills.

And even if you choose an economical model, you cannot expect it to last

indefinitely. The problem can be traced back to the fact that most of these pumps were not originally designed for continuous running. For draining flooded cellars or pumping out the bilges of boats, on an intermittent basis, they could truly be expected to give years of service.

However, a biological filter has to be run 24 hours a day. Under this workload, traditional vertical spindle pumps suffer wear on motor bearings and seals. Because the motor is sealed, servicing is difficult, if not impossible. When your pump breaks down outside its guarantee period, you throw it away.



A submersible pump from the Cyprio 'Premium Range' — like a car, it comes with a service guarantee.

Now, this seems strange. If your telly goes on the blink, you call in the service engineer. If your car, be it a Lada or a Rolls, breaks down you don't leave it by the roadside to rot. Regular maintenance every 12 to 15 months will extend the life of a pond pump to five years or more, and now you can buy a range that offers just that.

Cyprio 'Premium Range' are designed so that all parts are accessible and replaceable, and the UK distributors will give your pump an annual overhaul for around £25. It is not recommended that you carry out such work yourselves, for Cyprio carry the full range of spares and labour charges, thanks to the simple assembly of components, are minimal.

For those of you worried about the safety aspects, I have taken one of the 'Premium' pumps to pieces and can assure you that the seals are fail-safe and robust. I would always recommend, though, that mains voltage pumps are run through an ELCB (earth-leakage circuit breaker) in case the cable is accidentally severed.

Inevitably, the price of the 'Premium Range' is higher than for comparable factory-sealed units, but you are investing in a product that is going to last the course.

Five manual models are presently available, starting at £125 for the 1000 gph version. Float switch options will appear later. All the pumps are guaranteed for 12 months and built to take a range of accessories including base plate adaptors (horizontal or vertical), pond vacuum conversion kits, venturis, fountain/waterfall attachments and a range of hose packs. For further details, contact:

Cyprio Ltd at 133 Eastgate, Deeping St James, Peterborough. Tel: 0775 344302.

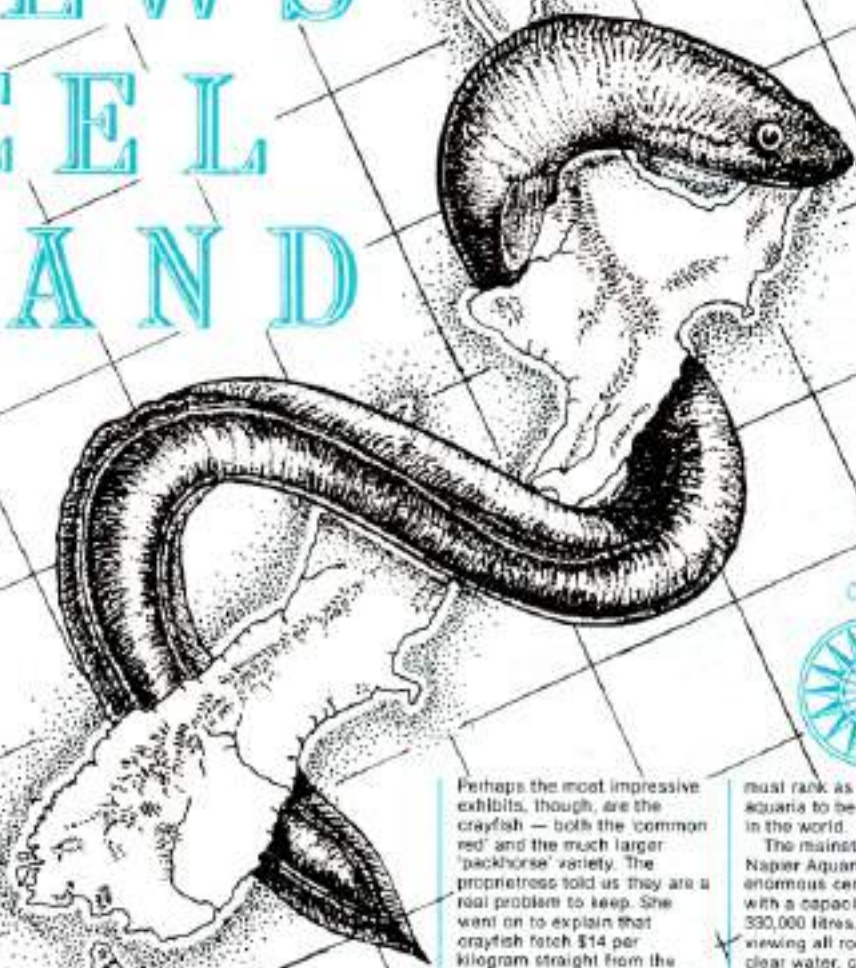


A Premium pump (foreground) showing how easily accessible the motor is, compared to a traditional vertical spindle centrifugal pump with sealed unit.



The wear casing of the pump is a push-fit, incorporating a sealing ring (not shown).

NEWS EEL LAND



Mike Furness continues his New Zealand aquatic travelogue and invites us to meet the most obliging fish in the world

I first began to dawn on me just how good a destination for the fishkeeper New Zealand might be when I visited friends in Whangerei. Sightseeing a few miles out of town, we came across a small settlement with nothing unusual about it — except for a large sign painted on a tin roof announcing "Aquarium and Post Office". As it was Sunday, the post office was closed and with it the aquarium, but it did serve to whet our appetite for the

remainder of our travels.

There are a surprising number of small public aquaria in New Zealand but as most are run by enthusiasts, they are well worth visiting. Take, for example, the Mangonui Marine Aquarium in Northland. Outwardly it is just a small shed on the end of a wharf, but within it is packed with 15 lovingly cared for tanks stocked with Black-spotted Grouper, Blue Mutton, Snapper, Yellow-tail, Trevally, Grey Moray Eel and Seahorse, to name but a few.

Perhaps the most impressive exhibits, though, are the crayfish — both the 'common red' and the much larger 'packhorse' variety. The proprietress told us they are a real problem to keep. She went on to explain that crayfish fetch \$14 per kilogram straight from the boat and much more at the shops. At up to 10 kilos in weight, the packhorse crays are often worth over \$100 each, and so are regularly pinched!

The small aquaria often put those in the city zoos to shame. For example, Auckland Zoo had only about a dozen four-foot tanks, all unimaginatively presented. Its saving grace was a ten-foot koi tank, made all the more special for being one of the very few places in New Zealand with a licence to keep these fish.

Wellington Zoo aquarium was very poor, consisting of a small brick shed half filled by a horse-drawn carriage and with only a few sparsely stocked tanks.

To be fair, the negative impressions of Wellington were to some extent accentuated by a visit just a couple of days earlier to what

must rank as one of the best aquaria to be found anywhere in the world.

The mainstay of the superb Napier Aquarium is its enormous central marine tank with a capacity of about 330,000 litres, fish-level viewing all round and crystal clear water, courtesy of a filtration system which pumps through over 6,000,000 litres per day. The tank was extensively decorated to form a realistic rock-scape, and well stocked with a variety of very good sized fish, including five-foot sharks, large dogfish and skate. Additional interest, not that any was needed, was provided at the 3.15 pm feeding time, when the fish, including the sharks, are hand-fed by a diver.

There are other tanks on the same level which, on their own, would seem large and impressively set out. As it is, they struggle to hold their own in such proximity to that huge central tank.

The first floor houses mainly freshwater tropicals, along with several marine aquaria and a tidal tank. All are beautifully maintained and presented.

This collection was

PRACTICAL FISHKEEPING



Nobody believed that this picture hadn't been 'set up' when the editor showed it around the office. The tame eels of Motueka are not to be missed!

undoubtedly the best to be found anywhere in New Zealand and included many banned fish which are found nowhere else in the country, e.g. piranha. If ever you see in Napier, look it up!

The Kiwis pride themselves on their ingenuity and imagination, and nowhere is this better illustrated than by the variety of fish shows on offer. Besides the public aquaria mentioned above, one can find semi- or totally submerged viewing chambers, underground walkways, underground aquaria and even attractions offering hands-on experience with wild fish!

Kelly Tarlton's Underwater World might be the first of the more unusual attractions the fishkeeper will visit, especially as it is situated in Auckland, the first port of call for most visitors. This large marine aquarium is different inasmuch as you don't look at it, you walk through it. An arched acrylic tube has been constructed round the inside of the tank, about 15ft underwater. With a wall thickness of nearly three inches, there is no danger of getting wet, but the sensation of being in among the fishes is very similar to donning wet

suit and aqualung and jumping in. It's quite an experience to watch skate, with seven-foot 'wingspans', glide overhead, just inches away, while shoals of pelagic fish swim past on both sides.

A moving walkway is provided for people who wish to be transported through this magical world, but I suspect that most fish-lovers would follow our example and step to one side to stand and stare. The only thing that might curb the urge to stand and stare all day is the inescapable 'underwater music'.

High on most peoples' agenda when travelling in New Zealand are the thermal springs, pools of boiling mud and erupting 'geysers' of Rotorua. If you can put up with the town's volcanic, sulphurous smell for an extra couple of hours, Rainbow and Fairy Spring Trout Sanctuary is worth a visit. It is very much a tourist trap, but it is in a beautiful setting — and who can resist the chance to see fish?

The trout are free to come and go but, as they are well-fed, they tend to stay. The springs supplying the 'sanctuary' put out up to five

TRAVEL



British aquarists could learn from this stream observation chamber at the Turangi Trout Hatchery. Even if fish don't happen to be in view, there's plenty of interest on the illuminated display above.



Packhorse Crayfish at Manganui Marine Aquarium. They are a gourmet commodity and often get swiped from their tanks.

million gallons per day of clear gin-blue water, so the trout can live in very crowded conditions with no problems of oxygen deficiency or pollution. The only limiting factor appears to be space.

Their numbers, however, lead to great competition for the food which tourists (including fishkeepers) throw in. Many of the fish sustain knocks while feeding, consequently fungal skin diseases are common. Many of the larger fish also suffer from jaw deformities, which interpretation boards suggest is due to the previous practice of feeding the fish from a wooden spoon!

Besides the trout, Rainbow Springs boasts one of the few native freshwater sections to be found anywhere in the country, offering a rare chance to glimpse some of the very elusive Galaxias.

A town which surpasses even Rotorua as a tourist resort is Queenstown, the home of 'Queenstown Waterworld, New Zealand's Natural Underwater Observatory'. I'm not too sure what is natural about a perspex-fronted bunker sitting on the bottom of Lake Wakatipu, but it does make

for an interesting show.

As at Rainbow Springs, all the fish are entirely free to come and go, but they are attracted to the viewing chamber by feeding pots hung in front of the window. During our visit about 30 fish were continually around the feeders. These were mainly rainbow trout of 5-10kg, but there were also a few brown trout and several long-finned eels which were more than four feet long and 18" in girth. All would be prized specimens for anglers, so it is not surprising to find plenty of notices warning of the \$500 'no fishing' ban.

From Queenstown's underwater observatory it is only a relatively short journey down the road (and often there is only one road) to Te Anau with its 'Underground Aquarium'. This consists of one 6' x 6' x 15' long tank, which may better be described as a glass-fronted pool with a stream running through. Again, it is well stocked with large trout and, for a 50 cent entry fee, worth a quick look. And while you are in Te Anau, why not drop in at the 'Bird Park'? This houses the local Acclimatisation Society's

NEWS EEL LAND

hatchery, with the growing-on tanks open to the public.

So far, all but the last of the attractions discussed have had one thing in common — an entrance fee. But while you never have to dig deep to enjoy these shows, there are several available that are absolutely free.

Friends in Rotorua told us that the Ministry of Agriculture and Fisheries Research Institute were carrying out grass-carb rearing experiments at a place with the lovely name of 'Whakarewarewa'. We stopped by to learn a bit more about it, and found ourselves being treated to a three-hour guided tour of the establishment by the very obliging staff.

A few miles further south is the Turangi Trout Hatchery. This is open to the public and has an excellent stream observation chamber giving a trout's eye view of life in a river. An added bonus here is the chance to emulate the trout in the Tokona thermal

baths, just a little way downstream.

Another unusual "freebie" is the artificial spawning stream below Lake Aviemore Dam. The stream is a reasonably successful solution to the problem of the loss of spawning streams faced by migratory fish trying to pass the dam. The dam was considered too high for a fish ladder to be practical, so a 1km long haipis stream was created with gradient and base material suited to the spawning of Salmonids.

The number of redds in evidence in the gravel bed indicated that the stream is at least partially successful. Unfortunately, the spawning stream is of no use to the migratory fish marooned upstream of the dam.

No account of New Zealand's aquatic attractions could be completed without a mention of the 'Tame Eels' of Moleua. Not to be found in any guide book we possessed, we stumbled across the reference to the beasties in the Shell Book of Maps! It sounded worth a detour and eventually we tracked down a small house at the end of a long dirt track lane with a sign outside stating, "Feeding times 10-12 and 2-4 daily. Adults \$1".

We were led to the eels!



The artificial spawning stream below Lake Aviemore Dam.

stream, a couple of hundred metres away, by an old farmer clutching a tin plate and a pair of sharpened sticks. As he got into his stride he became more and more excited about his eels, telling us how they recognised his footsteps and would be waiting at the 'beach'. Sure enough, about 20 Long-finned eels were there, jostling for position, about a third of their bodies already out of the water. More eels were arriving all the time we were there, and the old man seemed to know them all individually.

The tin plate carried about 8oz of finely chopped bacon. Pieces were pressed on to the end of a stick and offered to the eels, which had no hesitation in coming forwards for them. As well as stick feeding, we were encouraged to stroke them. After initial attempts to go for your fingers, the eels soon accepted it and seemed totally unconcerned about the

messaging digits.

The relationship with the eels started about 25 years ago, when a son started trying to catch the eels with a piece of meat on a stick. He caught none and the eels quickly got used to being fed!

As a show, the 'Tame Eels' were very informal, great fun and very typically Kiwi.

I hope I've shown that there is plenty of interest for the fish enthusiast in New Zealand and that the lack of variety of fish species available is more than made up for by the variety and quality of the shows. Of course, if you are prepared to get wet and put your head beneath the waves, this is only the beginning of the 'fish experiences' to be had.

However, we were travelling in the winter and the warmer waters of the Coral Sea seemed worth waiting for. Time to head for that island off the coast of New Zealand called Australia.



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P31	Green Cabomba	£0.88	£3.32
P36	Red Diptera	£3.70	£18.83
P35	Indian Fern	£0.88	£4.43
P38	Cryptocoryne Affinis	£1.03	£5.17
P41	Cryptocoryne Balansai	£1.85	£9.28
P44	Cryptocoryne Cordata	£0.81	£4.06
P45	Cryptocoryne Griffithii	£0.81	£4.06
P46	Cryptocoryne Lingua	£1.55	£7.77
P47	Cryptocoryne Neuhoffii	£1.25	£6.29
P49	Cryptocoryne Pontedericifolia	£1.70	£8.52
P50	Cryptocoryne Wendtii	£1.32	£6.66
P51	Cryptocoryne Beckarii	£1.32	£6.66
P5	Cryptocoryne Retrospiralis	£1.82	£9.03
P58	Hairgrass (Viviparal)	£0.88	£3.32
P64	Amazon Sword (Large)	£1.55	£7.77
P66	Pygmy Chain Sword	£0.73	£3.69
P69	Echinodorus Tennebus	£0.73	£3.69
P75	Elodea Densa	£0.88	£3.32
P82	Red Hedge Plant	£0.95	£4.80
P83	Green Hedge Plant	£0.88	£3.32
P80	Red Ludwigia	£0.88	£3.32
P91	Green Ludwigia	£0.88	£3.32
P94	Creeping Jimmy	£0.73	£3.69
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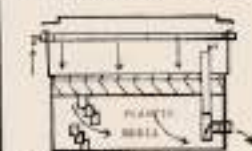
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2009*	ø 84 x 232	210 - 480	0,28	10 W	70 - 300
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2013	ø 150 x 345	380	1,15	8 W	250
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50916 Eheim up plates - set of 56	£12.90
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50208 Eheim-Filter (general carbon)	£2.49
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50205 Aquaclear Zeolite	£3.45
50206 Purifier	£1.99
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Equipment reviews by technical editor Cliff Harrison



FOODS

If you have any pond food left over from last year, I suggest you discard it unless it has been kept in an airtight container in a cool, dry place: being exposed to the atmosphere, and the dampness it contains, will quickly reduce the nutritional value of even the best of foods.

If you do decide to buy fresh, then you might like to know about a pair of new Koi foods from Omega, a company hitherto better known for its range of cat and dog foods.

Omega Koi Foods are available in two formulae — Regular, also referred to as the

"Summer" variety, and Wheatgerm. Both contain spirulina to enhance the colours of the fish, and are manufactured as complete balanced diets to build your fish up to maximum condition during the spring and summer months.

The "Summer" variety contains a blend of cereal, fish and meat, the wheatgerm variety is exclusively vegetable based: both also contain the necessary minerals, oils and fats, and are free of artificial colours and preservatives. Each is available in three pellet sizes, and retails at £3.95 (summer) and £4.25 (wheatgerm) for a 1 kilo bag. Packs carry a "use by" date at the top, which helps guarantee the level of vitamins in the food.

Available from local aquatic stores, Koi specialists and selected garden centres: further information from Omega Foods, Cornard Mills, Sudbury, Suffolk CO10 0JA (Tel: 0787 72353).

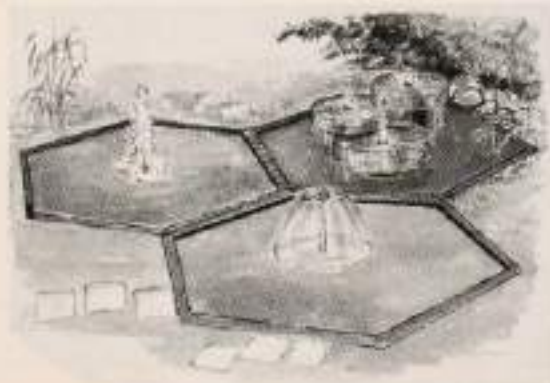


PONDS

If you prefer the advantages of glass fibre pools, but find that those commonly available aren't really large or deep enough to suit your needs, then do hunt out a **Plasticall** stockist. These are the real giants among pre-



Two applications for the Plasticall "Windermere" hexagonal pool — teaming units in-ground, and as an individual, raised water feature.



formed pools, with the largest measuring over five metres in length — but their advantages don't end there.

First, they come in a variety of styles not found elsewhere, including informal "kidney" shapes and walled ovals. For a more formal setting, oblongs, L-shapes, circles and even a hexagon can be incorporated into a paved area. Either alone or adjacent to each other, they can form, for example, a moat surrounding a central island. For even greater flexibility, the **Aquametic** range units are specifically designed to be linked together to create a large area of water garden (more of that later).

Second, there are a number of accessories available that help to create a permanent and well-ordered display, including marsh plant containers and a hedgehog safety ledge. Finally, **Plasticall** ponds are generally deeper than ordinary fibreglass pools, most being 66cm deep, and some of the **Aquametic** units a full 100cm deep: these are regarded by most serious hobbyists as being far better for the fish, and provide an additional measure of protection in really harsh winters.

The standard **Plasticall** range comprises 21 models, in capacities from 340 to over 4,700 litres. The smaller models are fine for a few small fish in very sheltered conditions, but the larger models are the ones that really deserve the attention — so I'll start with those. The **Ocean's** capacity is 4,720 litres, and its kidney shape measures 550cm long by 260cm at the widest point — so don't think you'll get it home on the roofrack.

When you first see the **Ocean** in a display of **Plasticall** ponds, you'll probably be horrified at its sheer size (or at least at the size of the hole you'll have to dig in your garden). But of course, like all ponds, it looks much smaller once it is installed and planted.

Next come the **Pacific** and **Atlantic** (both informal shapes), the circular **Huron** (260cm diameter), the L-shaped **Superior**, and the oblong **Ontario** — all of these holding around 2,500 litres of water. Next down in size, at about 2,000 litres, are the oblong **Adriatic** and the attractive hexagonal **Windermere**.

For the hobbyist with deep pockets and a strong creative urge, the **Aquametic** range offers the versatility to link together a number of units to create exactly the design you want. The central pools are square or triangular, and sections can be removed from any (or all) of their sides to bolt on long swimming areas, or a curved extension section.

Finally the accessories. Marsh plant containers provide ideal conditions for marginals and bogplants, while square or circular hollow island units are versatile enough to accommodate a fountain pump, support a statue or house a further display of marsh plants.

Your **Plasticall** approved stockist will be able to give you details of the full range of products, and show you just how solidly constructed these large pools are. For information on local stockists contact **Plasticall**, **Uplands Court, Stowpland Road, Stowmarket, Suffolk IP14 5AN** (Tel: 0449 674999).

Omega Koi Foods had a limited launch last year and are now more freely available. The editor test-fed his fish in 1988 and can recommend them as economical, quality pellets.



BOOKS

THERE are so many books available on pond and water gardens that it really does pay to sift through the options — that way, you are sure to find a title that really does please. However, I'll mention just a few that I think are particularly worth hurrying out.

The *Interpet Guide* series is one of the most attractive of the budget-priced ranges, with four titles of interest to coldwater enthusiasts: *Koi* by Barry James, *Garden Ponds* by David Papworth, *Coldwater Fishes* by Dick Mills, and *Fancy Goldfish* by Dr Christopher Andrews. The authors are highly regarded in their respective fields, and the



A couple of TPN titles pertinent to the pondkeeper.



LOW VOLTAGE EQUIPMENT

HAGEN'S Laguna system of pond products offers all the accessories needed for the small-to-medium sized pond, combining the security of low-voltage operation with moderate cost to appeal, particularly, to novice pondkeepers.

There are three fountain pumps to choose from (so finding the best one for your size of pond won't be difficult), plus an excellent compact-sized filter unit, and a submersible light to create underwater effects either alone or combined with the fountain spray.

The three pumps are coded models 100, 200 and 300, and offer outputs of 180, 300 and 450 gallons/hour respectively. Each is supplied with a rather modest 'standard' nozzle, but a set of four different (and more interesting) nozzles is



The Laguna Fountain Head accessory set gives your pump some versatility.

available at reasonable cost as an optional extra — the fifth nozzle in the set being an additional standard one.

Do take care not to damage the nozzles, though, as they are made from a rather brittle



Whether or not you attach the Laguna Pond Light, as here, note the weighted ballast unit.

grade of translucent plastic. You can also run a small waterfall from the two larger pumps by using a T-adaptor to divert part of the output, though the performance of the fountain will be somewhat

reduced.

The pumps are supplied with a baseplate and a reasonably efficient prefilter element to remove larger particles from the water. But to help keep the pond in pristine condition you really need a proper filter: the Laguna Pool Filter is of modest dimensions (and so best for the smaller sizes of pond), but is otherwise a remarkably well thought-out design. The pump can be switched directly (and securely) on to one end, or alternately connected to it with a short piece of flexible tube to improve accessibility for cleaning.

A solid handle to lift it out of the pond, a large area of inlet grids for optimum performance, and added ballast weight to keep it securely positioned in the



The Laguna 300 is rated with a throughput of 450 gallons per hour, ideal for the smaller goldfish pool when teamed with the Pond Filter.



Within its modest limitations, the Laguna Pond Filter is convenient to handle and well-designed.

ON FILE

information



BOOKS

whole presentation of the books is carefully thought out, with excellent colour photographs and drawings. I particularly recommend the **Garden Ponds** title, though the specialities of the others will doubtless attract much interest from more experienced enthusiasts.

TFH continue to offer the widest range of pet interest titles, their special strength being in the middle price ranges. One of their best coldwater titles is the **Goldfish Guide** by Dr Yoshitichi Matsui, running to

over 250 pages. This encompasses just about every facet of interest — genetics, breeding, history, environment, diseases, feeding, pools and goldfish varieties (to mention some of them), plus a brief section on the hobby in the UK. Unlike some TFH titles, whose content majors on extravagant colour photographs, this one is predominantly text, but with enough illustrations to make it interesting. Retail price is £12.50.

Water Gardens for Plants and Fish by Charles B. Thomas was introduced just

last year, and is one of the very few titles to major on the pond plants — particularly lilies. Most of the photographs are quite excellent, though the quality of the few fish actually depicted is rather poor — more of an encouragement for readers to keep the plants and forget about the fish! However, the short sections on pond design and construction are a useful inclusion, and overall the book could do a lot to encourage hobbyists to be more aware of the variety and the beauty of water plants available. Excellent value at £7.50.

Just to pick up on that theme of books with extravagant colour photographs, one of the titles most clearly in this category is **Koi of the World**, by Dr Herbert Aeshrod. You'll find it packed with large, detailed photographs of the many colour varieties to be found, plus a selection of photographs of Japanese ponds, but don't think you will actually learn much about the needs of the fish — that's just not what the book is about.

I'm sure most coldwater enthusiasts would love to own this book, not least because of the excellence of the fish depicted on its pages, but at around £30 it isn't cheap. How about dropping a few hints about an early, but timely, birthday present?

This quartet of Interpet Guides will soon be joined by an Encyclopedia of Koi — see page 20 for exciting details.



LOW VOLTAGE EQUIPMENT

pond — all these combine to make it one of the best filters in its class.

Now the light, again, a well-designed unit with a ballast weight for stability, and supplied with a clear lens over which further coloured lenses can be clipped to create attractive underwater effects. If placed directly beneath the fountain, then the water spray itself will be lit up.

All the electrical equipment operates from transformers that must be housed in some suitable spot, and each is supplied with a generous 15ft of low-voltage cable fitted as standard.

For further details on model performance, applications and prices contact your local Hagen stockist.

It seems that the trend towards low-voltage equipment outdoors is gathering pace, with Interpet being the latest major company to re-examine its range of pond pumps. "Safety" is the major claimed advantage

of low-voltage operation, but I should choose "peace of mind" instead, since I don't know of any serious incident involving a conventional pump from a well-known manufacturer.

Children and animals are both at risk from inadvertently interfering with a mains cable or connector, and even responsible adults, using a spade, shears or hedge-trimmer, can slice through a live lead whose location is poorly marked. Of course, if you find that a 240 volt-operated pump or light is the one that best suits your particular requirements, then you must use a circuit-breaker plug or adaptor for safety. If you decide you really do prefer the 12 or 24 volt models, then, in 1988, you'll find a wider choice of models than has ever been available before.

Interpet launched their first Powerstream low-voltage fountain pump at the end of last year, and this has now been joined by a further three models, the largest having a flow rate of a massive 2700

litres/hour. Those three new models have an impeller that runs in just one direction (unlike most small pumps, where it can start and run either way), and this has allowed the impeller chamber to be designed to work more efficiently.

The smallest model measures 11 cm long overall (half of which is the prefilter section) by 6 cm wide and 7 cm tall, excluding outlet nozzle; the other three models share a common casing some 20 cm long overall (including the excellent prefilter section), by 6 cm by 9 cm.

Between them, the four models in the Powerstream range cover just about every fountain requirement, and do so with very economical use of electricity, as the following table illustrates:

Model 600:	600 litres/hour,
	10 watts
1200:	1200 litres/hour,
	30 watts
1800:	1800 litres/hour,
	35 watts
2700:	2700 litres/hour,
	45 watts

The two smaller models feature adjustable fountain sprays, while the 1800 has a large mushroom head and the 2700 an unusual geyser head. They also all have flow diverters to reduce output to the fountain head, so that even the largest can be accommodated in a pond of quite modest dimensions, and the excess output (with the three larger models at least) can be diverted to a small waterfall or cascade, or even a biological filter.

Dismantling is straightforward, either for routine cleaning of the prefilter foam, or for access to the impeller area. Incidentally, the foam is an ideal texture — fine enough to strain out most of the sediment, yet coarse enough not to get blocked up too quickly — and the grids protecting the prefilter section are well-designed to prevent injury to fish or other creatures.

Overall, these Powerstream low-voltage fountain pumps are a creditable extension to



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The **Interpet** range, and long-term trials will doubtless confirm their reliability. Retail prices of the four models are £29.95, £54.95, £69.95 and £75.00, inclusive of the 24-volt transformer. The transformer must, of course, be housed in a dry and ventilated space (such as a shed), and the low-voltage cable can be extended considerably if necessary to reach the pond.

Hozelock was one of the innovators of low voltage water garden equipment, though with the emphasis more on lighting than pumps. There are two pumps in the range, the **Mini-Cascade** for fountain operation, the **Super Cascade** for fountain or waterfall, or even both combined, where only moderate performance of each is required. These pumps operate from 24 volt transformers, and both have a flow rate adjuster to ensure the height of the spray suits the area of the pond — and the prevailing conditions, since a strong wind can quickly lower the pond's water level by several inches as the spray falls on the surrounding garden. The larger model features a fountain nozzle with individually adjustable jets for versatility.

Hozelock offer four styles of lighting for the water garden. **Moonglow** features lights set on short spikes for insertion in the ground (or they can be used with wall-mounted brackets), and

provide a directional beam to highlight the pond and other features around it; lenses are coloured amber, green, blue or clear.

Nightglow Garden and Patio Lights provide a soft all-round light from modern-styled mushroom-topped lamps set on top of short columns that can be sited in areas where a more general lighting is required. Large spikes ensure a stable fixing even in soft or sandy soil and, like all **Hozelock** lights, there are no corroding parts, almost everything is manufactured of a tough and resilient grade of plastic, with brass used for electrical components.

Moonglow and Nightglow Lights are available in two or four lamp sets, and are supplied complete with transformer and a generous



You may have seen these **Hozelock** pumps operating in their special clear plastic display units at aquatic retailers.

length of low voltage cable: the lamps can be quickly attached or disconnected at any point on this cable without cutting it, giving the greatest versatility in their use in the garden. All the **Hozelock** lamps use ordinary 12-volt car bulbs, readily and inexpensively available from motor accessory shops.

Hozelock Hi-Lights are their latest model, wide black plastic columns with a translucent section at the top to give an upward illumination for paths and patio areas. Their simple, modern styling will appeal to many people — but for my money, the other models look more in keeping with the pond itself.

Finally there is **Aquaglow Pool Lighting**, water-resistant lighting units that will float at the surface of the pond to attract attention, or anchored beneath the surface will illuminate the inhabitants and create beautiful coloured effects. The two-lamp set includes one blue and one amber lens, with the wiring permanently connected and sealed.

SUNDRIES

The **Söchting Oxydator** is an crucial device that slowly releases oxygen into the pond to help aerobic micro-organisms purify the water naturally, and put an end to the bad smells that often indicate unhealthy and stagnant conditions. It works

by releasing the oxygen at a strictly controlled rate from an inner chamber that has been filled with hydrogen peroxide, at a concentration dependent on the size of the pond.

The outer chamber is a ceramic shell, with a plastic strap across the top which serves as a carrying handle and to keep the inner plastic container in place. When the charge of hydrogen peroxide has been exhausted, the **Oxydator** automatically floats to the surface to warn you it needs attention.

The UK distributors of this German-made product make a number of claims regarding the improvement in fish health and general condition of the pond, and, along with its smaller brothers intended for aquarium use, it seems to be creating considerable interest.

Clearly it won't work miracles on a long-neglected pond, but it may be worth serious consideration as an alternative to a pond filter, considerably less expensive than many, certainly far less trouble to keep working efficiently, and of course it doesn't need a pump to power it.

The **Söchting Oxydator** model W is the one designed for ponds. It retails at around £80, and further details can be obtained from your local dealer or direct from the UK distributors: **Tropicals & Marines**, 71 Lower Richmond Road, London SW14. Tel: 01-876 5463.



FOODS

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Aquarian 3 in 1 fish food	£20.95	
Aquarian Coldwater 180 g	£4.50	
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FREE with the bumper April issue of Practical Fishkeeping is a most original gift worth OVER £1.

We have always said that aquatics is a growing hobby, and to prove it we are giving away a 'Garden Pond-Edge' wild flower mixture. Now you can create your own mini habitat, made up of wild plants such as you find growing in marshland or by the side of streams.

The specially selected mixture has been chosen exclusively for Practical Fishkeeping by

botanist/seedman John Chambers, of Kettering. The 19 species range from 1 ft to 5 ft tall and the packet — which comes with full sowing and cultivation instructions — is sufficient to cover two square metres.

Don't worry if you haven't a pond. A damp border will suffice. Wherever you use your FREE seeds, they will attract butterflies and birds, as well as providing food and shelter for amphibians.

We shall be carrying a feature on bog gardens by John Chambers himself, as well as a host of other seasonal goodies for pond and aquarium keeper.

LONGER-standing readers of this magazine may well remember Don Reid, who was our herpetology writer until he decided to up his roots from the Golswood Wildlife Park and head for Madagascar.

It's been two years since we heard from him, and we were wondering whether Don had been eaten by a crocodile or succumbed to an unknown tropical disease. But no — he has finally broken radio silence to let us know all is well.

"I've recently had a wonderful time discovering snakes and lizards new to the area in which I live, and a few unidentified mysteries as well," says Don.

"I still can't get used to sitting shaving in the local lake, surrounded by literally hundreds of small and medium-sized cichlids which, back home, would no doubt fetch a five apeece minimum.

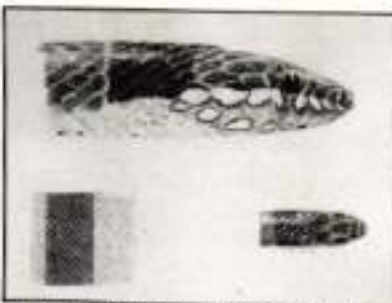
"They are so plentiful here — the locals catch hundreds every day, but the population never seems to dwindle. I wish I knew what species they were; there seems to have been very little work done on Madagascar fishes, certainly nothing is in progress now."

Out guest about the crocodile wasn't too wide of the mark... Don did have one scrape with a ten-footer while he was watching the

ospreys, egrets and kingfishers. But luckily the big saurian was more afraid of him than he of it.

Nor were we very wrong about the possibility of Don's succumbing to a tropical disease. He wrote to us from a hospital bed, where a leg infection has been causing him persistent trouble.

But good to hear from you again, Don. We'll try and persuade you to write some more articles for PFK!



One of Don's intricately detailed scientific drawings of the herpetiles of Madagascar.

THE RSPCA is organising a national children's competition to design a poster on the theme of responsible pet ownership. There are many terrific prizes on offer and the winning poster will be used to promote National Pet Week in May. All entries must be received by 31st March.

The competition is open to all young people in Britain aged from 6 to 17 years. The

poster must be done on an A4 size piece of paper in colour. Paints, felt tips or crayons can be used. The message to be put across is how important it is to care for pets properly. The judges include Winney Willis of 'Treasure Hunt' fame, Michael Strachan, the presenter for 'Owl TV', and well known artist Tony Hart.

The competition is organised into three age

categories: 6 - 11 years old; 12 - 14; and 14 - 17 years old. There are colour television sets, pocket televisions and other prizes on offer for the winners and runners-up in each of the three age categories. The overall winner will get an individual prize, plus computer for their school.

The competition is being sponsored by BP Nutrition, the producers of Duo pet food

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THE Institute of Fisheries Management is organising a workshop on April 12th, the theme of which will be 'The Dangers Associated with the Importation of Ornamental Fish'.

The workshop, to be held at Reading University, has been prompted by a new outbreak of SVC (Spring Viraemia of Carp) in coarse fisheries in the south of England.

The organisers fear that the lifting of trading restrictions in the EEC after 1992 will allow non-ornamental fish from Europe, the USA and Asia to be imported into Britain as 'coldwater ornamentals' unless the loopholes are closed.

At the workshop, invited speakers will review the current situation, representatives of interested bodies will present their views, and there will be an open debate towards the end of the day.

Booking forms and further details are available from Dr J. Domaradzki, Department of Aquaculture, University of Reading, Reading RG6 2AT.

which raises funds for the RSPCA. The Charity received a penny for every can sold.

Entries, which are non-refundable, should be sent to: RSPCA National Pet Week Competition, RSPCA, Causeway, Horsham, West Sussex, RH12 1HG. There is a limit of one entry per person. Entrants must put their name, address and age on the back of the design plus their school's name and address.

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52183. Eheim Substrat Carbon Bag 2215.....	£10.90
52184. Eheim Substrat Carbon Bag 2217.....	£13.99
52172. Eheim Carbon.....	£3.95
52174. Eheim Biofilm, Fine.....	£1.30
52175. Eheim Biofilm, Coarse.....	£1.30
52142. Eheim Biofoam, Fine.....	£2.95
52141. Eheim Biofoam, Coarse.....	£2.95
52143. Eheim Biofilm.....	£1.95
52220. Eheim Biofoam Pad.....	£1.35
52204. Aktivskil Remover 500gms.....	£2.95
52203. Aktivskil Remover 100gms.....	£4.50
52224. Peel Film.....	£1.19
52222. Hobby Densair Pad.....	£2.95
52248. Bio Marine Polyfilter.....	£7.75
52248. Nitro.....	£7.25
52241. Nitro Box.....	£3.95
● New Mega Media Available	

TROPICAL FOODS

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50013. Aquapon Tropical 500gms.....	£13.80
50003. Aquapon Tropical Fibra.....	£55.55
50004. Aquapon Growth Food 244gms.....	£9.75
50034. Aquapon Condition Food 100gms.....	£9.20
50084. Aquapon Colour Food 100gms.....	£9.75
50006. Aquapon Fry Food 100gms.....	£9.20
50070. Aquapon Guppy Food 100gms.....	£9.10
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50003. TetraMin 1000g.....	£9.20
50004. TetraMin 1000g.....	£7.50
50005. TetraMin 25 800g.....	£75.55
51104. King British Tropical Flake 200g.....	£9.75
51105. King British Tropical Flake 200g.....	£7.80
51106. King British Tropical Flake 200g.....	£47.50
50095. King British Arctic Ki-Ril 40g.....	£2.90
50087. King British Red Tablets 175g.....	£4.50
51101. Nutrafin Tropical Flake 100g.....	£2.50
51002. Nutrafin Tropical Flake 700g.....	£4.90
51003. Nutrafin Stable Flake 2.0 kilo 500g.....	£22.90
51145. Waterlife Universal Flake 50gms.....	£2.25
51144. Waterlife Universal Flake 100gms.....	£3.50
51104. Philips Ultimate Tropical Flake 300g.....	£3.25
51104. Philips Ultimate Tropical Flake 400gms.....	£7.50
51104. Philips Tropical Flake 500gms.....	£9.50
51044. Sea View Basic 5000g.....	£4.10
51047. Sea View Basic 10000g.....	£7.25
51048. Sea View Colour 2500g.....	£2.99
51049. Sea View Colour 10000g.....	£6.50

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50082. Medium or Coarse 100g.....	£3.50
50080. Medium or Coarse 250g.....	£5.85
50084. Medium or Coarse 500g.....	£11.85
50085. Medium or Coarse 1kg.....	£19.85

51250. Sea View H Protein 150ml.....	£2.85
51253. Sea View Vegetable 250ml.....	£2.55
51254. Sea View Vegetable 500ml.....	£2.15
50034. Tetra Conditioning Flake 200gms.....	£9.90
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50041. Tetra Growth Food 100gms.....	£5.60
50011. TetraMin 500 Tablets.....	£4.35
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50013. TetraMin 4000 Tablets.....	£11.90
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50071. Aquapon tablet Food 100 Tab.....	£1.40
51071A. Aquapon tablet Food 500 Tab.....	£4.40
51051. Sera O Nio Tablet 64 Tab.....	£2.90
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51112. Waterlife Corfish Food 200gms.....	£1.90
51124. Waterlife Corfish Food 120gms.....	£6.90
51036. SeraMin 340gms.....	£6.45
51017. SeraMin 101gms.....	£13.50
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51083. Ligar for Larvae 50ml.....	£1.45
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50026. Tetra Min 80gms.....	£3.95
50046. Tetra Granular 225gms.....	£5.25
51090. Ligar Invert Food 50ml.....	£2.35
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50012. Aquapon Marine Flake 200gms.....	£9.90
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52012. Broad Spectrum Bactericidal - 100ml.....	£1.00
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52017. Broad Spectrum Bactericidal - 100ml.....	£1.00
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52019. Broad Spectrum Bactericidal - 100ml.....	£1.00
52020. Broad Spectrum Bactericidal - 100ml.....	£1.00
52021. Broad Spectrum Bactericidal - 100ml.....	£1.00
52022. Broad Spectrum Bactericidal - 100ml.....	£1.00
52023. Broad Spectrum Bactericidal - 100ml.....	£1.00
52024. Broad Spectrum Bactericidal - 100ml.....	£1.00
52025. Broad Spectrum Bactericidal - 100ml.....	£1.00
52026. Broad Spectrum Bactericidal - 100ml.....	£1.00
52027. Broad Spectrum Bactericidal - 100ml.....	£1.00
52028. Broad Spectrum Bactericidal - 100ml.....	£1.00
52029. Broad Spectrum Bactericidal - 100ml.....	£1.00
52030. Broad Spectrum Bactericidal - 100ml.....	£1.00
52031. Broad Spectrum Bactericidal - 100ml.....	£1.00
52032. Broad Spectrum Bactericidal - 100ml.....	£1.00
52033. Broad Spectrum Bactericidal - 100ml.....	£1.00
52034. Broad Spectrum Bactericidal - 100ml.....	£1.00
52035. Broad Spectrum Bactericidal - 100ml.....	£1.00
52036. Broad Spectrum Bactericidal - 100ml.....	£1.00
52037. Broad Spectrum Bactericidal - 100ml.....	£1.00
52038. Broad Spectrum Bactericidal - 100ml.....	£1.00
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52027. Tetra Marine Vit.....	£2.25
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52128. Tetra Medico - Coarse.....	£1.85
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52180. Waterlife Buffer 0.5 100gms.....	each £2.95
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52182. Waterlife Buffer 0.5 500gms.....	each £2.95
52183. Waterlife Buffer 0.5 1000gms.....	each £2.95
52184. Waterlife Buffer 0.5 2000gms.....	each £2.95
52185. Waterlife Buffer 0.5 5000gms.....	each £2.95
52186. Waterlife Buffer 0.5 10000gms.....	each £2.95
52187. Waterlife Buffer 0.5 20000gms.....	each £2.95
52188. Waterlife Buffer 0.5 50000gms.....	each £2.95
52189. Waterlife Buffer 0.5 100000gms.....	each £2.95
52190. Waterlife Buffer 0.5 200000gms.....	each £2.95
52191. Waterlife Buffer 0.5 500000gms.....	each £2.95
52192. Waterlife Buffer 0.5 1000000gms.....	each £2.95
52193. Waterlife Buffer 0.5 2000000gms.....	each £2.95
52194. Waterlife Buffer 0.5 5000000gms.....	each £2.95
52195. Waterlife Buffer 0.5 10000000gms.....	each £2.95
52196. Waterlife Buffer 0.5 20000000gms.....	each £2.95
52197. Waterlife Buffer 0.5 50000000gms.....	each £2.95
52198. Waterlife Buffer 0.5 100000000gms.....	each £2.95
52199. Waterlife Buffer 0.5 200000000gms.....	each £2.95
52200. Waterlife Buffer 0.5 500000000gms.....	each £2.95
52201. Waterlife Buffer 0.5 1000000000gms.....	each £2.95
52202. Waterlife Buffer 0.5 2000000000gms.....	each £2.95
52203. Waterlife Buffer 0.5 5000000000gms.....	each £2.95
52204. Waterlife Buffer 0.5 10000000000gms.....	each £2.95
52205. Waterlife Buffer 0.5 20000000000gms.....	each £2.95
52206. Waterlife Buffer 0.5 50000000000gms.....	each £2.95
52207. Waterlife Buffer 0.5 100000000000gms.....	each £2.95
52208. Waterlife Buffer 0.5 200000000000gms.....	each £2.95
52209. Waterlife Buffer 0.5 500000000000gms.....	each £2.95
52210. Waterlife Buffer 0.5 1000000000000gms.....	each £2.95
52211. Waterlife Buffer 0.5 2000000000000gms.....	each £2.95
52212. Waterlife Buffer 0.5 5000000000000gms.....	each £2.95
52213. Waterlife Buffer 0.5 10000000000000gms.....	each £2.95
52214. Waterlife Buffer 0.5 20000000000000gms.....	each £2.95
52215. Waterlife Buffer 0.5 50000000000000gms.....	each £2.95
52216. Waterlife Buffer 0.5 100000000000000gms.....	each £2.95
52217. Waterlife Buffer 0.5 200000000000000gms.....	each £2.95
52218. Waterlife Buffer 0.5 500000000000000gms.....	each £2.95
52219. Waterlife Buffer 0.5 1000000000000000gms.....	each £2.95
52220. Waterlife Buffer 0.5 2000000000000000gms.....	each £2.95
52221. Waterlife Buffer 0.5 5000000000000000gms.....	each £2.95
52222. Waterlife Buffer 0.5 10000000000000000gms.....	each £2.95
52223. Waterlife Buffer 0.5 20000000000000000gms.....	each £2.95
52224. Waterlife Buffer 0.5 50000000000000000gms.....	each £2.95
52225. Waterlife Buffer 0.5 100000000000000000gms.....	each £2.95
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52227. Waterlife Buffer 0.5 500000000000000000gms.....	each £2.95
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52230. Waterlife Buffer 0.5 5000000000000000000gms.....	each £2.95
52231. Waterlife Buffer 0.5 10000000000000000000gms.....	each £2.95
52232. Waterlife Buffer 0.5 20000000000000000000gms.....	each £2.95
52233. Waterlife Buffer 0.5 50000000000000000000gms.....	each £2.95
52234. Waterlife Buffer 0.5 100000000000000000000gms.....	each £2.95
52235. Waterlife Buffer 0.5 200000000000000000000gms.....	each £2.95
52236. Waterlife Buffer 0.5 500000000000000000000gms.....	each £2.95
52237. Waterlife Buffer 0.5 1000000000000000000000gms.....	each £2.95
52238. Waterlife Buffer 0.5 20000000	

A TROUBLE-FREE POND SEASON



.....with **Waterlife**®

- HALOEX** Neutralises chlorine, fluorine and other fish poisons in raw tapwater. Treat tapwater when setting up new pond and for part-changes - 300/1200 gal.
- ALGIZIN**® Broad spectrum protozoacide, fungicide and algicide. Treats white-spot, velvet, costiasis; all fungal diseases and blanket weed - 2000 and 8000 gallons.
- SEA VITA** Multiple vitamin liquid food additive. Soak flakes and pellets before feeding. Greatly enhances colour, disease resistance and sexual vigour.
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- PONDFLORA** A tableted pond plant fertilizer. Bury one tablet in amongst the plant's roots - marginals and submerge plants. 30 tablets per pack.
- PARAGON** A parasiticide similar to Sterazin® but totally harmless to Orfe and Rudd. Use each Spring and Autumn when parasites threaten - 700/1400 gals.
- PONDSAL** An electrolytic general tonic for all pondfishes. Should be used in conjunction with Sterazin® to control horse leeches - 150 gals.
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- BROAD RANGE pH** A test kit covering the pH range 4 to 10 with a totally different colour at each point on the scale. Includes buffer packs.
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RESEARCH LIMITED

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TOP QUALITY EQUIPMENT—TOP QUALITY SERVICE

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Whisper 1600	32.25		
Whisper 1800	33.75		
Whisper 2000	35.25		
Whisper 2200	36.75		
Whisper 2400	38.25		
Whisper 2600	39.75		
Whisper 2800	41.25		
Whisper 3000	42.75		
Whisper 3200	44.25		
Whisper 3400	45.75		
Whisper 3600	47.25		
Whisper 3800	48.75		
Whisper 4000	50.25		
Whisper 4200	51.75		
Whisper 4400	53.25		
Whisper 4600	54.75		
Whisper 4800	56.25		
Whisper 5000	57.75		
Whisper 5200	59.25		
Whisper 5400	60.75		
Whisper 5600	62.25		
Whisper 5800	63.75		
Whisper 6000	65.25		
Whisper 6200	66.75		
Whisper 6400	68.25		
Whisper 6600	69.75		
Whisper 6800	71.25		
Whisper 7000	72.75		
Whisper 7200	74.25		
Whisper 7400	75.75		
Whisper 7600	77.25		
Whisper 7800	78.75		
Whisper 8000	80.25		
Whisper 8200	81.75		
Whisper 8400	83.25		
Whisper 8600	84.75		
Whisper 8800	86.25		
Whisper 9000	87.75		
Whisper 9200	89.25		
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Whisper 9600	92.25		
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Whisper 10000	95.25		
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Whisper 16400	143.25		
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Whisper 17600	152.25		
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Whisper 18000	155.25		
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Whisper 18400	158.25		
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Whisper 19600	167.25		
Whisper 19800	168.75		
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Whisper 20800	176.25		
Whisper 21000	177.75		
Whisper 21200	179.25		
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Whisper 24200	201.75		
Whisper 24400	203.25		
Whisper 24600	204.75		
Whisper 24800	206.25		
Whisper 25000	207.75		
Whisper 25200	209.25		
Whisper 25400	210.75		
Whisper 25600	212.25		
Whisper 25800	213.75		
Whisper 26000	215.25		
Whisper 26200	216.75		
Whisper 26400	218.25		
Whisper 26600	219.75		
Whisper 26800	221.25		
Whisper 27000	222.75		
Whisper 27200	224.25		
Whisper 27400	225.75		
Whisper 27600	227.25		
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Whisper 28000	230.25		
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Whisper 28400	233.25		
Whisper 28600	234.75		
Whisper 28800	236.25		
Whisper 29000	237.75		
Whisper 29200	239.25		
Whisper 29400	240.75		
Whisper 29600	242.25		
Whisper 29800	243.75		
Whisper 30000	245.25		
Whisper 30200	246.75		
Whisper 30400	248.25		
Whisper 30600	249.75		
Whisper 30800	251.25		
Whisper 31000	252.75		
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Whisper 31600	257.25		
Whisper 31800	258.75		
Whisper 32000	260.25		
Whisper 32200	261.75		
Whisper 32400	263.25		
Whisper 32600	264.75		
Whisper 32800	266.25		
Whisper 33000	267.75		
Whisper 33200	269.25		
Whisper 33400	270.75		
Whisper 33600	272.25		
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Whisper 34200	276.75		
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Whisper 36400	293.25		
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Whisper 36800	296.25		
Whisper 37000	297.75		
Whisper 37200	299.25		
Whisper 37400	300.75		
Whisper 37600	302.25		
Whisper 37800	303.75		
Whisper 38000	305.25		
Whisper 38200	306.75		
Whisper 38400	308.25		
Whisper 38600	309.75		
Whisper 38800	311.25		
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Whisper 39200	314.25		
Whisper 39400	315.75		
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Whisper 40200	321.75		
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Whisper 40800	326.25		
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Whisper 41200	329.25		
Whisper 41400	330.75		
Whisper 41600	332.25		
Whisper 41800	333.75		
Whisper 42000	335.25		
Whisper 42200	336.75		
Whisper 42400	338.25		
Whisper 42600	339.75		
Whisper 42800	341.25		
Whisper 43000	342.75		
Whisper 43200	344.25		
Whisper 43400	345.75		
Whisper 43600	347.25		
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Whisper 45200	359.25		
Whisper 45400	360.75		
Whisper 45600	362.25		
Whisper 45800	363.75		
Whisper 46000	365.25		
Whisper 46200	366.75		
Whisper 46400	368.25		
Whisper 46600	369.75		
Whisper 46800	371.25		
Whisper 47000	372.75		
Whisper 47200	374.25		
Whisper 47400	375.75		
Whisper 47600	377.25		
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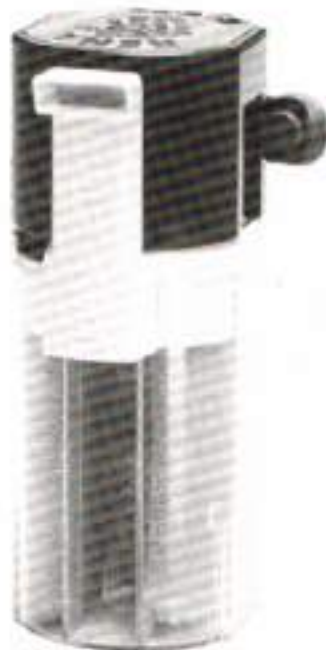
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