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AQUARIST

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COLLECTING FISH IN
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Special features on...

GOLDFISH



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FISH PEOPLE

(Produced by Maurice Metzak)

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COVER STORY

(Photograph: Jane Burton/
Bruce Coleman Ltd.)

Over the years, the Angelfish (*Pterophyllum scalare*) has received a great deal of attention from commercial breeders worldwide. This has resulted in an extremely wide range of fin and body configurations, some of which are so far removed from the basic wild type, that the fish exhibiting them would stand no chance of survival in the native Amazonian waters where their ancestors originated from. There is no doubt that this trend will continue, either, with ever-more-spectacular varieties appearing on a regular basis. Despite this, the most popular Angel of all is still the basic, short-finned, graceful — and relatively tough — form.

GUEST EDITORIAL



An Open Letter To All Members Of The Aquatic Industry From OFI (UK)

Sometimes the truth hurts. In most cases it's human nature not to upset a friend, colleague or customer. So here goes. Isn't it about time you actually got off your backside, put your hand in your pocket and got involved in deciding your future within our industry, rather than leaving it to someone else?

Did it hurt? Well, we hope so, because up until now, there have been just a few people actually working on your behalf to save, yes, *SAVE*, our industry for the future. The few are not asking for recognition for the hundreds of hours spent away from their businesses, or for the thousands of pounds in financial support. What they are looking for is basically two things:

- 1 Financial backing in the way of membership to OFI (UK) in order that funds are available to use in the fight to save our industry;
- 2 Your personal involvement.

Oh yes, we can hear it now: "I haven't got time to get involved with that lot" — "They can sort it out" — "It will all come out in the wash".

Yes, we can sort it out; it will all come out in the wash, but it may not be either to your liking, or of benefit to your business.

Without boring you with too many details, OFI (UK) will actually be involved with The Ministry of Agriculture, Fisheries & Food in formulating the guidelines for the importation of live tropical and coldwater ornamental fish into Europe. Yes us, not some unknown wholesaler, retailer or manufacturer in far-off Germany or France determining your future, but US.

Do you still want to sit on the sidelines leaving, what can only be described as a mammoth undertaking, to someone else? No? Well, good, we are halfway there, then. So, the next thing to do is complete an application form, write out a cheque and post it and actually get involved in the next general meeting. If you don't, you will never be able to blame those who did make the effort, put their hands in their pockets and worked for their future in our industry.

Peter Golding

Application forms are available from: OFI (UK), 59 Stubble Lane, Dronfield, Sheffield S18 6PG. Fax: 0246 290 486. The next OFI (UK) meeting will be on WEDNESDAY, 2 MAY, at THE CREST HOTEL, HINCKLEY ROAD, WALSGRAVE, COVENTRY (M6 - JUNCTION 2) Time: 10.00 for 10.30 am. Open to members only, but membership application and fees accepted prior to, or at, the meeting.

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Tomorrow's Aquarist



By David Sands

First Top Ten replies

In March's *Tomorrow's Aquarist* I asked what your favourite fishes are. The first two letters came from opposite coasts. R. A. Holt's letter came from Rossall Beach, near Blackpool and Darius Tehrani's letter came from Hove, in Sussex! 'Blackpool' voted for the Koi first — Hove for the Glassfish. In Hove, the Koi was eighth, whereas the Glassfish didn't get anywhere in the Top Ten in Blackpool.

From Chichester, Peter Grunert sent me two lists, one which he thought would be the most popular, and the other, his own favourite fish list. He thought the humble Goldfish would walk in at first place, although he preferred the Red Tail Catfish to sit at number one. His own preferences made interesting reading in that he

liked the Tiger Shovel-nosed Catfish, *Polypterus* (the Birchir) and so on... His estimate of the most popular fishes is very accurate:

1) Common Goldfish, 2) Guppy, 3) Platy, 4) Neon Tetra, 5) Angelfish, 6) Swordtail, 7) Zebra, 8) Cardinal Tetra, 9) *Corydoras* (albino), 10) Molly.

Diane Hughes, a former MSc Fisheries Biology student at Plymouth Polytechnic (who I met at the Polytechnic while giving a lecture to her class a while ago) wrote to me saying she had conducted a 'national' survey into fish buying, distribution and selling habits of Britain's fishkeepers through retail and wholesale outlets as part of her final year project.

Diane forwarded questionnaires to 200 retail outlets and 50 UK wholesalers and was able to build up a complete



The Common Goldfish is already beginning to emerge as the most popular coldwater fish kept by hobbyists.

picture of fish prices and lots of other statistical information.

In the popularity polls, the top tropicals were as follows:

- 1) Neon Tetra
- 2) Guppy
- 3) Platy
- 4) Angelfish
- 5) Zebra
- Joint 6/7/8) Swordtail/Black Molly
- 9) Cardinal

The top marine was the Clownfish and the top coldwater fish was the Common Goldfish! Incidentally, Diane was kind

assuming which fishes are most popular with young fishkeepers today.

Relative beginner

Jonathan Richard Sands, (yes, he's a close relative — he's my son) set up a small coldwater aquarium on his birthday, purchased out of his own birthday money... with special discounts, of course! I wasn't too sure just how he was intending to set it up, though. He wanted White Cloud Mountain Minnows, Red Fantails and Calico Fantails, which he got. The only problem was that his bedroom sometimes became cold when the family stayed away so he found the fish very inactive.

This gave me an idea. I



Jonathan admiring a Giant Puffer. Keeping such fish is still some way off, but he's — at least made a start.

enough to inform me which were her favourites... The Dwarf Gourami, the Dwarf Shovel-nosed Catfish and the Neon Tetra took the top three spots in freshwater tropicals; the Lionfish was her top marine, with the Comet Goldfish as her number one coldwater form.

Diane wrote me a smashing letter and even informed me that she had used my Plymouth lecture on collecting fishes in Brazil and Guyana in her project... and I even got an acknowledgement!!

Good Luck, Diane in your work. I hope we shall publish more from you in the future.

I await further letters before

organised him a small Interpet heater-thermostat (now he has to clean my car for the next thirty years!) and he found the difference amazing. Of course, anyone with a coldwater tank can do the same, and then, a greater range of fishes are available. The fish are more active, filters work more efficiently because there are more bacteria, and the fish look better.

So, from the youngest fishkeeper I know, I can give you food for thought — the only difference between a coldwater tank and a tropical tank — is a heater. Both tanks need lighting filters and fish...

Happy fishkeeping!

Herpetology matters



By Julian Sims

Neoteny

The life cycle of the majority of amphibians starts with a larval phase, with the larvae growing and, eventually, developing into small versions of the adults. This change of body shape from larval form to miniature adult is known as METAMORPHOSIS.

If amphibians keep their external characteristics for longer than expected, then this is called NEOTENY. This extension of the time spent in the larval form is of two types:

(i) Total Neoteny.

This is where the larvae continue to live in water but also develop sex organs and reproduce. The olm (*Proteus anguinus*), which inhabits caves in south-eastern Europe, and the Texas Blind Salamander (*Typhlomolge rathbuni*), found in similar subterranean conditions in the southern United States of America, are two examples of total neoteny. In these two species, the amphibians remain in their larval form throughout their entire life.

The Axolotl (*Ambystoma mexicanum*) from Mexico is another example of total neoteny where the amphibians become sexually mature in the larval state. However, unlike the previous two examples, Axolotls can metamorphose if environmental conditions change.

(ii) Partial Neoteny.

This is where metamorphosis is delayed or stopped. Larval amphibians affected in this way don't develop functional sex organs and therefore cannot reproduce in the immature condition.

Total neoteny has only been observed among the group of amphibians called the Urodeles — the newts and salamanders.

Partial neoteny is more widespread. This condition is not only found among the Urodeles, but also among the Anura — the frogs and toads. Partial neoteny in the larvae of the Anura is frequently associated with rapid growth. This can result in the development of 'giant' frog or toad tadpoles.

Many of the species of amphibian found in Britain demonstrate partial neoteny. This has been recorded in the tadpoles of the Common Frog (*Rana temporaria*), Edible Frog (*R. esculenta*), Common Toad (*Bufo bufo*), Common Newt (*Triturus vulgaris*), Great Crested Newt (*T. cristatus*) and Palmate Newt (*T. helveticus*).

Partially neotenus frog tadpoles can grow to a very large size. For example, the total body length may exceed 11.5cm (approximately 4½ inches) of which the tail occupies at least 8cm (approximately 3¼ inches). The head and body appear to become 'swollen' or 'bloated'. Hind limbs reach the budding stage and then cease to grow. Front legs don't develop. These 'giant' tadpoles are relatively inactive and can survive for about two years before they die. They don't undergo metamorphosis. (See **Your Questions Answered** in the February '90 issue of *A&P*).

Partially neotenus newt larvae are frequently much lighter in colour than their 'normal' aquatic counterparts. Neotenus newt larvae vary from pale yellow to cream in coloration, hence they are sometimes, but inaccurately, described as 'albinos'.

The external gills, which are retained throughout their 3 to 4 year lifespan, are coloured pink. These gills remain functional respiratory surfaces because internal lungs, necessary for life on land, do not develop. Par-

tially neotenus newt larvae don't grow to the 'giant' proportions achieved by neotenus frog tadpoles.

Causative factors

There are several interacting factors which cause neoteny.

Metamorphosis is controlled by hormones, and, in particular, those released by the thyroid gland. In order to make the necessary hormones, this gland requires the mineral iodine, which is normally absorbed in water, either from the environment or obtained from the food. However, if iodine is not available (for example, the melt water from snow which collects in mountain lakes can be very pure), then amphibian larvae which live in these conditions might not metamorphose. This is the case with Axolotls which live in high altitude lakes near Mexico City.

A second cause of neoteny is the malfunction of the thyroid gland in individual tadpoles. This is a common cause of partial neoteny in frog tadpoles and accounts for the occurrence of one or more 'giant' tadpoles in the same pond as tadpoles which are growing and developing normally. A defective thyroid gland can also account for the swollen appearance of giant tadpoles. A similar build-up of semi-fluid material — called MYXOEDEMA — occurs in humans with thyroid deficiency.

Temperature also influences the rate of metamorphosis. Tadpoles of the Natterjack Toad (*Bufo calamita*) develop in shallow pools called slacks which

form in sand dunes. These pools rapidly warm up in sunlight, and the tadpoles complete their metamorphosis comparatively quickly in six to eight weeks. Conversely, the lower the temperature, the slower the rate of development.

This accounts for the fact that Common Frog and Common Toad tadpoles which develop during a cool summer, or inhabit cold mountain tarns, might overwinter in the larval form. These tadpoles continue to grow and, eventually, complete their metamorphosis in the following spring. Being slightly larger than normal juveniles, these young colonists of the land have a better chance of survival than if they had left the water as small amphibians in the previous autumn.

A combination of low environmental temperatures and very limited availability of iodine have promoted the neotenus way of life with Axolotls.

A fourth factor which can influence the duration of neoteny is the presence or absence of fish in the lake inhabited by the tadpoles. Without the predatory effect of fish, tadpoles can persist in the water. This aquatic environment is often much more stable than life on land.

Neoteny is a fascinating variation in the life cycle of some amphibians and prolonged existence in the larval form can have advantages for survival. Finally, as metamorphosis is, to some extent, controlled by the prevailing environmental conditions, partial neoteny is more common in some years than in others.



This giant frog tadpole (owned by A&P reader, Mrs Freda Perry) was 18 months old when this photograph was taken. It measured 3in (7.6cm) in length the last time it was seen in the 75-gallon (c340-litre) cistern that formed its home.

Letters

A query fit for Sherlock Holmes?

Every now and then, you get one of those letters that seems simple to deal with and yet every answer offered seems to have its own immediate contradiction. Try this one on for size, and then turn to our **Diary Dates**, page 38, to see if you have come up with any other deliberations of your own!

The query, from **Mr Rattle** of Norfolk, concerns his goldfish which persist in occupying only one small end area of his brand new 4ft tank. No more information was given (except that they are fed several times a day), so can you offer explanations why the fish behave like this?

The answer to the query (on the **Diary Dates**, page 38, may well be found within this collection of ponderables, but we give no guarantees!

- 1 They may be attracted by light: is that end of the tank nearer to a window? Is any light falling on the tank brighter at that end? Is the tank only partially covered with an external background?
- 2 Alternatively, maybe the fish are confining themselves to the darker end of the tank. Has the tank got enough plants to offer the fish enough shade (or other hiding places) in which to seek refuge in the remainder of the tank?
- 3 A further theory is that they might be attracted by their own reflections in the end glass; again, this is another 'light-based' idea and further shading could be the answer.
- 4 A rather more easily-arrived-at theory might be that this is the end at which the fish are fed. To verify this, the tank would need to be observed from outside the room, to see if the fish only congregated at one end when their keeper was in the room. If this is the case, then maybe not enough food is given at each feeding.
- 5 Very often, fish are attracted by air bubbles; these could be from an undergravel fil-

ter's airlifts or, simply, an airstone. Just to be contrary, excessive water movement caused by such bubbles (or the returning water current from a power filter not equipped with a spraybar) might make the fish keep away from one end of the tank.

- 6 As the aquarium in question is a coldwater one, there is probably little difference in water temperature from one end to the other. In the absence of circulating water from any filters or airstones, there is a remote chance that one end gets warmer than the other, either by direct sunlight or by the proximity of a radiator. To balance out this argument, maybe one end is getting cooled by an open door and the fish, prefer the other, 'warmer' end.
- 7 Vibrations may be driving the fish away from one end of the tank: is this end near to a vibrating air-pump or power filter? You might even consider a nearby hi-fi loudspeaker, for that matter!

Dick Mills

Safe pump installation

Since writing to you (Letters — March '90) it has occurred to me that some readers may appreciate some guidance on installing the pump referred to in my earlier letter in a safe manner.

Twin cable, not three core, of five amp capacity and PVC sheathed, would be entirely satisfactory. I would suggest that the pump should be placed in a two-litre ice cream carton, or similar plastic carton. Two holes should be drilled in the lid, one at either end, but about one inch in from each end. They should be about $\frac{1}{16}$ in (10mm) in diameter.

The lid should be placed upside down on a house brick or block of wood, in such a way as to leave it overhanging the brick or block. The cable from the pump would drop out through one hole and the air tube out through the other. The body of the carton would be placed on to its lid so that it will,

in fact, be inverted. Another brick or weight of some kind should then be placed upon the bottom of the inverted carton to hold it in place and, finally, a plastic bucket, or similar, should be placed over the whole arrangement and well weighted down against high winds, and heavy rain.

It is very important not to place insulating material around the pump casing as I have found that sufficient heat can be generated to soften the pump casing and base.

S. A. Singleton,
Falmouth,
Cornwall.

'Painted' Glassfish

As a novice to fishkeeping, may I first congratulate you, and one or two local shops in my area, for the help and advice I have received during my first, and somewhat naive, six months in the hobby? Special thanks must go to Wholesale Tropicals in Bethnal Green as, without their help and advice, I know I would have spent a lot more, only to achieve a lot less than I have so far.

However, I have one criticism. I went out the other day and bought two Painted Glassfish (from another shop, I hasten to add!). It is since then that I have been told that these fish are actually injected with

paint not, as I had thought, fed in a similar way to coloured birds, i.e. on colour food. I also hear that it is now becoming a fashion to inject Tinfoil Barbs.

I must say that I think this practice is disgusting. Not only does it change my view of the hobby, but it also tells me that not everyone involved in the keeping of fish does it for the love of the fish. How can people expect the government to allow us to import a wider range of fish for study and conservation when some of the fish we are now keeping are treated so badly?

As a novice, I don't suppose many people will take what I say very seriously, but I implore those who stock this fish not to do so. While their sale may bring in a fast profit, in the long run, it will do neither the hobby, nor the shopkeeper, any good, as the world is waking up to conservation issues, and will eventually raise awareness of this cruel method of treatment of what has to be one of nature's greatest gifts — the fish.

I have, of course, now returned my fish to the shop from where they came.

M. O'Brien
London E9 7BW

Editor's Note:

For further discussion of this topic, see our editorial (page 3) in the March '89 issue of A & P

John Dawes



'Painted' Glassfish generate strong feelings among both hobbyists and members of the aquatic trade.

Seaview

by Gordon Kay



Specific water changes

Following on loosely from last month, I am often taken to task on two of the things which I advocate when talking to audiences around the country. These are Specific Gravity and frequency and volume of water changes.

Regular readers will remember that I have been keeping my aquarium at a SG of 1.018 for around 18 months now and that, far from being disturbed in any way by this lower salinity, my fish actually benefit. I have, in fact, now reduced the SG another point to 1.017.

I firmly believe that we have a responsibility for the wellbeing of our fishes, and that anything we can do to make their life better is OK with me. It is well proven that lower salinities reduce the metabolic workload on the fishes and, as I have said before, any fish I have introduced into water of a lower SG, has settled in much better than I have previously experienced. It has also been shown that parasites find life tough in lower salinities. I have also proved this point for myself.

As for water changes, I said last month that — within reason — you can never do too many, and I stand by that 100%. Despite what anyone says, water is being changed all the time on the reef (at the Tetra seminar in Liverpool, one gentleman was adamant that it isn't!!)

Water changes are about far more than just nitrates. There is so much being added and so

much taken away which we can't monitor, that I am convinced that, even with all the hi-tech gear in the world, nothing will ever be better than water changes. I do 10% every week (which isn't too arduous once you've sussed it all out), and my fish positively 'glow' afterwards.

I trust that I can now rest my case, but just in case anyone still thinks I'm a nutter, let me tell you that I have a pair of Bicolour Angels (*C. bicolor*) which are 5 years old, a Wimple fish (*H. acuminatus*) which is 10 years old and several Butterflies in their third and fourth years.

SNIPPETS

- 1 Every year, evaporation takes more than 80,000 cubic miles of water from the surface of the world's oceans and some 24,000 cubic miles are carried inland in the form of clouds and precipitated onto the land as rain and snow.
- 2 The salinity of saltwater may vary regionally and with depth, but the ratio of its constituents always remains constant.
- 3 In a restricted gulf, sea-water enters a narrow opening and spreads out owing to surface currents, evaporating as it does so. Thus, the most concentrated solutions occur here, and vast thicknesses of evaporites may form. As concentrations increase, calcium/magnesium salts form first, followed by sulphates, sodium chloride and, lastly, potassium and boron — both of which are quite rare.
- 4 Semi-diurnal tides occur twice every day (diurnal tides occur once daily). These are rare and are due to local coastal conditions. Mixed tides are an amalgam of the above types — there are two tides per day, but one is very much stronger than the other.
- 5 The island of Mont-St-Michel is surrounded by sands which stretch into the English Channel for 10 miles. When the tide rises,

it rushes in at a rate of 210 feet per minute. The tides in the bay of Mont-St-Michel are the highest in Europe at 41 feet.

- 6 The deepest trench in the ocean is the Marianas Trench, in the Pacific ocean, which is 11,033 metres deep. This is pretty deep when you consider that Mount Everest is a mere 8,848 metres high!
- 7 Krill is not confined to the Antarctic. There are about 90 species of *Euphausia* distributed widely throughout the world, but greatest commercial interest centres on the Antarctic *Euphausia superba*, which occurs in vast concentrations. Baleen Whales congregate to feed on Krill in the Southern Ocean during the Austral summer, before moving north to warmer waters for breeding. 2-3 tonnes of Krill are taken in a single feeding. However, the reduction in whale populations has led to less pressure on the 200 plankton populations in the Antarctic and an 'excess' of Krill has resulted. This

excess was soon pounced on by Russia and Japan in the early 60's; so much so that the Russians diverted part of their fleet of factory ships to the area to make the most of this source of protein.

- 8 Fish such as the Common Skate (*Raja batis*) have disappeared totally from the Irish Sea during the past 20 years. This is a slow-growing species, taking up to 11 years to reach sexual maturity. Only a few large eggs are produced each year. On hatching, the young are already large enough to become trapped in the meshes of a standard trawl. This and other slow-growing elasmobranchs (in contrast to bony teleost species, which are faster-growing and often produce vast quantities of eggs) are therefore in danger of extinction. Ironically, this is not a direct result of fishing specifically for those species, but rather a tragic result of trawlers hunting for other food fishes.

Until the next time...



Butterflies, and many other tropical marines, appear to do better under low Specific Gravity conditions.

BRAZIL

Part I — Rio in Janeiro

There's a lot more to Rio de Janeiro than its world-famous carnival. *A&P* editor John Dawes went there in January to take a look at some of the aquatic life in and around this bustling, highly-charged, spectacular mugger's paradise.

(Photographs by the author)

When the first Portuguese explorers came across the imposing islands and peninsulas protecting the vast inlet in which Rio de Janeiro nestles today, they thought they were entering the mouth of a huge river. The month was January . . . I think. 'River' in Portuguese is 'Rio' and 'January' is 'Janeiro' . . . so we ended up with Rio de Janeiro. Original, isn't it?

Quite a few hundred years later, three rather pale-skinned, winter-weary European 'explorers' (I use the term as loosely as it is humanly possible to do!) also found themselves in Rio in January (Janeiro) — overflowing with expectations, armed to the teeth with cameras and fish nets, and pumped full of injections to protect them against all manner of nasty eventualities, from Fin Rot to Exophthalmia and Dropsy . . . or so it felt!

My 'partners in crime' on this trip, were two old friends — John Scarll from Belton Fish Farm near Doncaster, and Roy Scott from The Water Zoo in Peterborough.

Trop Rio

Rio was our first port of call. We wanted to meet up with John's suppliers, Mario Pinheiro and Marco Tulio Cortes Lacerda, the proprietors of Trop Rio, who had offered to take us to a few choice collecting sites in and around Rio. We also wanted to visit their premises to see how they looked after their fish and what sort of exotic selection they had in stock.

Their approach, I have to say, was first-rate. Everything — but *everything* — that comes in is quarantined. No fish is allowed to be shipped until they are certain that it is in a fit state to travel.

As to the selection . . . well, to say that it was impressive would be a gross understatement. It even included at least three, as yet undescribed, species, among which was a super *Aequidens* which is currently being referred to as *Aequidens 'Araguaia'* — in recognition of the region of Brazil in which it is found.

Add to this Marco's encyclopaedic knowledge of fish, Mario's intimate acquaintanceship with collecting sites, and both their boundless enthusiasm and sound business sense, and you have an exceptionally efficient — and successful — outfit.

Lake of the Rotting Fish

Both John Scarll and I are livebearer 'freaks'. As it turned out, Roy wasn't too far

behind us either! We were therefore particularly keen to have a go at collecting one of Rio's most famous viviparous species — the incredible One-sided Livebearer, *Jenynsia lineata*.

"No problem", Marco said. In fact, nothing ever seemed to pose a problem for our hosts. "We can collect as many *Jenynsias* as you want within Rio itself. We'll also find *Poecilia vivipara* and, with a little luck, *Phallopterychus janaenae*."

As it turned out, the *Phallopterychus* proved elusive, but the *Jenynsias* and 'viviparas' appeared to be just itching to jump into our nets. Mind you, if I were to live in Lago Rodrigo de Freitas, under the shadow of that famous towering Rio landmark, mount Corcovado, with its giant statue of Christ the Redemmer looking down on me, I, too, would be looking for an opportunity — any opportunity — to jump out!

The fact is that Lago Rodrigo de Freitas receives a liberal and constant supply of sewage and household refuse, is brackish, smells (and how!) and overheats regularly. In fact, the temperature of the water — at least on the day when we were there — was . . . wait for it . . . a 'gill-boiling' 36°C (97°F)! Would you want to live in a place like that?

What amazed us was that, despite the thousands of dead fish floating in the water and washed up, rotting, on the shore, the *Jenynsias* and 'viviparas' were in the rudest of rude health. And we have the cheek to think that these are delicate fish? Who are we kidding?

What also struck us was that, with one exception, all the dead fish were marine. Yet another surprise was waiting for us as we made our smelly, squelchy way back to the car. A local angler was fishing out fantastically coloured, healthy *Geophagus brasiliensis* from the rich, pea-green, polluted, overheated soup that constitutes Lago Rodrigo de Freitas.

Since pollution is one of the less laudable trademarks of the modern world, we, not unnaturally, assumed that the problems at Lago Rodrigo de Freitas were of recent origin. "Not a bit", Marco assured us. "The site has been known as the Lake of Rotting Fish since before the first European settlers arrived!"

One final, possible, bonus to come out of the lake is that the *Jenynsia* we collected may not be *J. lineata*, but a new species. At the moment, hundreds of specimens are awaiting shipment from Trop Rio, so it may not be too long before we know.



TOP

Lago Rodrigo de Freitas — the Lake of Rotting Fish. Despite its local name, and the numerous piles of refuse that 'adorned' its shores, this location yielded excellent One-sided Livebearers and *Poecilia vivipara*.

TOP RIGHT

Rio Paraiso, in the foothills of Serra do Mar, is a collector's paradise.

ABOVE MIDDLE

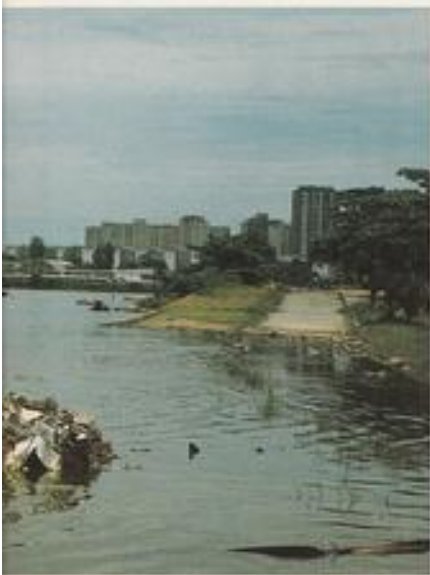
Several specimens of this 'probably-new' *Rhinoloricaria* were collected, both in Rio Paraiso, and in Rio Agualdo.

ABOVE

The new *Aequidens 'Araguaia'* — still awaiting description.

RIGHT MIDDLE

A superb male *Corydoras barbatus* — one of numerous equally gorgeous specimens collected at Rio Agualdo near Xerem.



This attractively marked *Characidium guakuensis* thrives in the coolish, crystal-clear oxygen-rich, fast-flowing waters of Rio Paraiso.



This large *Jenynsia* female from Lago Rodrigo de Freitas may well turn out to belong to a new species.

Collecting in Paradise

About 80 kilometres (50 miles) north of Rio stand the green-draped mountains of the Serra do Mar, source of countless, crystal-clear, fast-flowing streams. One of these is Rio Paraíso, our next stop.

While — as on the day we visited Lago Rodrigo de Freitas — the air temperature was 38–40°C (100–104°F), the water in these mountain streams was cool; around 25.5°C (78°F), in fact.

Not surprisingly, the fish fauna — with one notable exception — was completely different. Gone were the marine fish (dead or alive!) and the typically brackish *Jenynsia* and *Poecilia vivipara*, but not *Geophagus brasiliensis*. We didn't catch any adults, just a few juveniles, but enough to prove just what a remarkably adaptable species this is.

The sole livebearer representative at this location was an old favourite of mine, the One-spot Livebearer, *Phalloceros caudimaculatus*, which, up to that point, I had only ever seen as variegated, golden aquarium specimens. Fine though these fish are, they can't compare, in my book, at least, with the unadulterated wild form... especially when a swoop of the net can yield close on 100 writhing, perfect specimens.

Our haul was varied and rich, consisting largely of various Sucker-mouth Catfishes like *Ancistrus*, *Schizolepis guntheri*, *Neoplestocostus granulatus*, *Parotocinclus Maculicauda* and two species of *Rhinoloricaria*, one of which is probably (yet again) a new species. Blue Tetras (*Mimagonistus microlepis*),

Rhamdia sp. and *Characidium guakwenis* were also caught, though in small numbers.

With a surface flow-rate of about ½ metre/second, a pH of 6.2, and located just 3 or 4 metres from the road, this location is pretty close to being the ideal collecting site.

Rio Paraíso was, as its name implies, almost like Paradise. Fish everywhere, excitement at every turn, a brilliant sky and sun above, and a gurgling, deliciously refreshing and rejuvenating gush of pristine-pure water around. If I were a fish, that's where I'd like to live... a million light years removed from the sweltering, sewer-like conditions of Lago Rodrigo de Freitas. What a place!

Special Catfish Finds

Not far from Rio Paraíso, near the town of Xerem, is Rio Aguinaldo. Where it flows through human habitation, the water is, obviously, not particularly good. But, travel a kilometre or so upstream, and a whole new world opens up.

The water, once more, becomes crystal clear and is home to as impressive a selection of fish species as that found in Rio Paraíso, with one or two welcome 'extras'.

Geophagus brasiliensis, *Phalloceros caudimaculatus* and most of the others, including the probably-not-yet-described *Rhinoloricaria*, are all there. So are two other very special catfish.

One is an unusual, hyperactive *Trichomycterus* species, a member of the *Trichomycteridae* (the Parasitic Catfishes) which does not exhibit the parasitic lifestyle of

many of the members of its family. The other is the subject of many a catfish hobbyist's dreams — *Corydoras barbatus*. Thousands of them!

I had often wondered why this member of the *Corydoras* genus was so different to so many of its nearest relatives. *Corydoras barbatus* has a long gently-sloping forehead, a head that is somewhat narrower than in most *Corys* and a long, and very slim, body.

Just a moment or two in Rio Aguinaldo provided the answer. The surface water flow over the sandy areas where we collected *C. barbatus* was about 1 metre/second. Stumpy, 'double-decker' body shapes would be quite inappropriate in such an environment. However, long slim bodies, gently sloping foreheads and long narrow heads are ideal — just the features that this most beautiful of the *Corys* possesses.

Closing Remarks

Collecting in and around Rio de Janeiro proved to be a richly rewarding experience. It also helped to break us in gently, preparing us in small easy steps for the next stage in our Brazilian adventure — collecting in the Rio Negro and its tributaries.

I would like to extend a most sincere vote of thanks to Mario Pinheiro and Marco Tulio Cortes Lacerda of Trop Rio for their tremendous hospitality and enthusiastic efforts to show us some of the delightful fish within their patch, and proving to us in the best way possible that there is more to Rio than its carnival... much more!

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CLOSED THURSDAYS

DISCUS DALLIANCE?

The joys and frustrations of the aspiring Discus breeder,
as experienced by Jo Field
(Photograph by the author)



Healthy-looking fish ... and (some!) healthy-looking eggs. But, alas, no resulting healthy-looking fry!

What that tank needs is a couple of Discus", said my friend. I looked. She was right; it certainly did need a centrepiece. The tank (38 x 20 x 16in) was specially made for an alcove in the living room. Something to watch when there's nothing on the telly (often!).

It was well-planted and sparsely stocked with a busy shoal of Harlequins, a bossy crowd of Blue Tetras, a male-dominated quartet of Honey Gouramis (because they masqueraded as females in the shop), a group of Sparkling Gouramis and a suicide squad of Chocolate Gouramis. Lurking in the bottom were two rarely seen Clown Plecs. Finally, two Clown Loaches had been installed to keep the small population down

to manageable proportions. Not a bad little community, but I agreed, it did lack a focal point. Besides, imagine the joy of actually being told that you NEED a couple of Discus!

Manager-blanching fish!

Out I rushed to find my suitable centrepiece. Goodness, they're not cheap are they? Certainly, the ones that stole my heart that day were guaranteed to make the bank manager blanch (do you ever imagine your cheques being examined to see what you spend the overdraft on...? I sometimes wish that aquatic stores and Off Licences had names like chemists or charities!)

I located my Discus in Cambridgeshire — Cambridge Blue every one of them, a group of about ten, shimmering and gliding in their tank. So beautiful as to take your breath

away, and each one perfect. They were around about 70/80mm (2.75-3.2in) — plenty of room for growth, but big enough to spawn. The idea of breeding Discus appealed to me enormously.

Remembering what I'd read about sexing these fish (i.e. they can, but you can't!) I hunkered down in front of the tank and watched them. After about half an hour of being stumbled over by other admirers, I thought I had singled out a likely pair. Attracting the attention of the shop assistant with one eye, while keeping the other fixed on my selection, was not the easiest of tasks. I think quite a few people thought I was having some kind of fit and averted their gaze!

At last I succeeded, and over came the girl with a net. Smelling a rat, my 'pair' parted and joined separate groups in opposite corners of the tank. Now, one beautiful Discus looks much like another, and after a few minutes of "Is it this one? ... No, I think it might be that one ...", I gave up the pairing idea and left it to chance.

Torville and Dean

Soon bagged up (separately) and boxed, they were carried gently home and duly installed. Conscious, perhaps, of their importance as the centrepiece, they rewarded us with their dazzling blue display, dancing together in perfect harmony and total contempt of their new inmates. We called them 'Torville and Dean'.

I shot off to the library and grabbed all the books that were on offer, bought test kits, etc. — a bit late you might think, but, in my defence, I'd already ascertained that the Discus would like the conditions I had for the Chocolate Gouramis, i.e. hot/soft/acid. (Not that I can ever get my Chocolates to survive for long. I handle them with kid gloves, yet they die. A mate of mine bungs his in untreated tapwater and keeps them in the garage. Occasionally, he shows them, a rarity indeed. They not only survive, but they breed!)

Still, back to the Discus. Were they a pair? Various admirers laid bets on their gender, accompanied by hopeful comments like "... that one's got a bumpier nose ... the other one's got a bulgy-er belly ...". I waited for a sign, fingers crossed.

Oblivious to this close observation, the Discus spent the first week alternately bickering over who owned which plant and sulking in opposite corners of the tank. At the end of the first week I dutifully changed 10% of their water and added Black Water Extract, while ensuring that the pH ('acidity') remained at around 6.5 and the GH (hardness) at 3. The temperature remained steady at 82°F — 28°C (you could see the Clown Plecs mopping their brows!).

Over the next couple of weeks, Torville and Dean settled down to hand-feeding on assorted frozen food — nothing but the best of course. Their relationship began subtly to change: a lot of fin flapping went on, and close swimming through narrow gaps. They started to engage in long passionate kisses ('mouthing', I was told).

Things looked even more hopeful when Torville began a spring-cleaning campaign. I looked to no avail for signs of breeding tubes (there were graphic illustrations in my library book), but perhaps they were coy — or hadn't read the book!

Another week went by — and another water change. The pH had increased over the week to 7.2; panic — too high. I added some buffer and a well-matured piece of bogwood. This particular piece seemed very much to T & D's liking; painstakingly they cleaned it, nibbling away at the top edge of the wood and smooching together behind it.

The big event

I missed the serious business — it happened one night. There, along the bogwood, were the neatest rows of eggs you have ever seen.

Within minutes I was on the 'phone — like an expectant parent with joyful news . . . "It's happened . . . they've done it . . ." "Congratulations". (My friends humoured me!). What joy . . . they WERE a pair!

"Not necessarily . . ." said one expert, "two females will often induce each other to spawn." (Really?) Within six hours the eggs had gone — completely disappeared. Who

were the culprits? Surely not the proud parents-to-be who had spent so long fussing, cleaning and fanning their brood. It had to be the Blue Tetras . . . greedy things, they'd have to go. I emptied the tank of all but the Clown Plecs (can never find them without turning everything upside down).

Torville's caudal peduncle had gone a dark shade of navy blue. I was assured this was a good sign and that more spawning activities should follow. Exactly one week later, more neat rows of eggs decorated the bogwood. I took some photographs — I was sure that THIS time all would be well; obviously, the first time had just been a trial run.

I bought Brine Shrimp eggs in readiness, and a magnifying glass to watch hatching progress. Should I leave the lights on or off? I compromised and dimmed them, settling down to wait. Within 12 hours the eggs had gone white — next morning they had vanished.

Regular performances

To cut a long story short, Torville and Dean performed with amazing regularity every seven to ten days — and every following morning had eggs for breakfast. I became resigned to it after a while, though never really believed that my two beauties were in fact Torville and Torville.

On one occasion I even witnessed the event and was fascinated to see how slowly it is done. The female glides along her chosen well-cleaned surface like a ballet dancer, depositing neat strings of pearls as she goes.

I have to admit that Dean appeared to be

relatively clueless and, although he attempted to follow his mate's straight lines, he wandered all over the place and released no milt that I could see. When the spawning was over, women's lib reigned: it was Dean who had to protect, clean and fan, and Torville who went 'swimabout' to get away from it all.

The regular spawning went on for a period of three months. Thinking that perhaps Dean lacked a certain something, I bought vitamins for him, but nothing made any difference. In early August they stopped and life in the tank continued fairly peaceably, though Torville's low opinion of her mate led to quite a lot of hen-pecking (and who can blame her!). Ah well — I had really only wanted a centrepiece anyway.

Fading dream

Now, a year has passed and my dreams of breeding Discus have faded. Conditions in the tank remain static — perhaps that's the problem. Maybe I should start collecting rainwater; it's certainly acid enough round here!

Dean has grown much bigger than Torville, who spends most of her time seeing him off when he, flushed with breeding colours, ventures to suggest a reinstatement of conjugal rights.

This week, though, she has at last deigned to dance with him again and is making the odd prim overture. Fins are slapping a bit, but no mouthing yet. I'll keep my fingers crossed — who knows, maybe this year I shall witness those baby Discus clinging to their parents' sides. Hope so — I can't wait.

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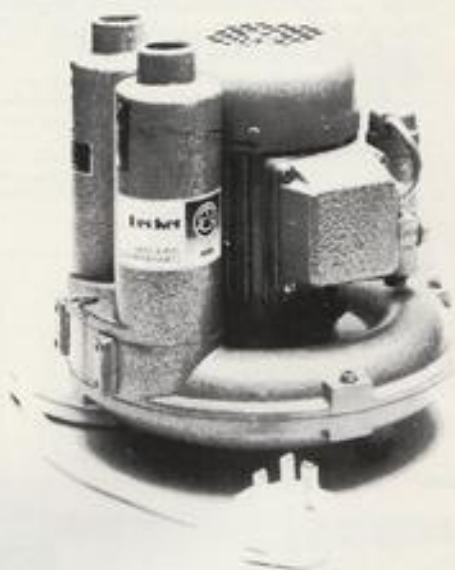
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**Herpetology, Julian Sims. Koi, Roger Cleaver.
Tropical, Dr. David Ford. Coldwater, Pauline
Hodgkinson. Plants, Barry James. Discus,
Eberhard Schulze. Marine, Graham Cox.**

COLDWATER



In a Lionhead (this is a young specimen) the back profile is only curved. In Ranchus, the curvature is much more pronounced.

Ranchu or Lionhead?

I have heard people refer to Lionheads as Ranchus and vice-versa. Are there any differences between them, or are they one and the same fish?

The most obvious difference

between a Lionhead and a Ranchu is in the shape of the back. In the Lionhead the back is only slightly curved, rising gently from behind the head and sloping gradually to the tail. In the Ranchu, the back 'falls off' rather sharply towards the caudal peduncle.

KOI

Koi on the ropes

I am hoping to breed my Koi this season. What spawning medium should I use?

The ideal spawning medium for use in artificial spawning ponds is one of the commercially available spawning ropes or spawning mops. Although they are not cheap, they are very effective.

As an alternative, spawning ropes can be made from bailing twine or rope, long enough to span your spawning pool. Shorter lengths can be knotted onto this length. The fibres of these short lengths can then be frayed or combed out to make a mass of fine strands on which the eggs can be deposited.



Japanese-style spawning ropes are about the best of the available Koi-spawning media.

TROPICAL

Fiery Pair

I have recently bought what, I hope, are a pair of Firemouths. One — which I take to be the male — is about 10cm (4in) long. It has a slightly longer and more pointed dorsal fin than its companion, which is about 1.3cm (c.0.5in) shorter in overall length.

Would you please tell me if I do have a pair, as I suspect, and, if so, how I should go about breeding them?

The Firemouth, *Cichlasoma (Heros) macki*, comes from Central America and is a very prolific species; therefore it is being mass produced in Far East fish farms. In the wild, the fish can reach 15cm (6in), but tank fish are much smaller. Their natural habitat has soft water (6°DH) and is slightly acid (pH 6.9), at 28°C (82°F). They lay eggs on smooth stones or bogwood, so

these conditions should be offered.

Females are slightly smaller, have more rounded dorsal and anal fins, and are less colourful than males. From your description, it sounds as if you have a male and female, but you cannot be certain until she is fat with eggs, when the belly often turns pale — almost white.

The fact that you have not described the female as fat or pale, indicates that she is not yet ready to breed. Perhaps she is still too young — breeding fish need to be a year old. These fish do not take kindly to being moved to a breeding tank; they prefer familiar surroundings. If a pair forms, it is better to move the other fish.

Once they breed, the fish will carry on giving regular broods, and the fry are easily raised on freshly-hatched Brine Shrimp, then crushed flake.



A magnificent male Firemouth. Females are smaller and less colourful than males. They also have more rounded fins.

MARINE

Spot-on choice

I have recently set up a 60 x 24 x 24in (150 x 60 x 60cm) marine aquarium containing the following equipment:

1 Aquaclear 800 powerhead operating a 30 watt UV unit.

1 Aquaclear 400 powerhead creating a surface current. (Both these powerheads operate undergravel filters covering approximately half the tank's floor area).

1 Rena 224 internal power filter.

1 Rena 301 air pump running a protein skimmer.

2 x 300 watt heater/thermostats.

2 x WOTAN mercury vapour FLORASET spotlights.

Is this equipment adequate? I am slowly stocking the tank with invertebrates and quiet fish.

The present equipment which you have should prove

sufficient to create an extremely attractive and successful invertebrate/fish community aquarium.

The only other piece of equipment which I would have recommended is an external powerfilter which permits the usage of charcoal as a filtrant medium.

Safe Fluoride levels

As a marine aquarist, I am very concerned at the North-west Water Authority's avowed intention, despite a recent poll in which 8:2 people were against it, to introduce fluoride into our drinking water. Can you tell me if this is going to affect any of the various forms of sea-life we keep in our aquaria adversely? Distilled water in the

quantities that would be required does not seem a satisfactory answer.

The amount of fluoride which is added to tapwater by those Waterboards who use it is less than 1 part per million, ie less than one thousandth of a gram of fluoride in each litre of tapwater.

As such, this minute trace of fluoride would have no harmful effects whatsoever on any forms of marine life, whether fishes, invertebrates or algae, and is significantly less than the amount of fluoride which my company adds to ULTRAMARINE sea salts in order to match naturally-occurring amounts of fluoride in oceanic seawater.

Fluorine is a vitally essential trace element for all forms of marine life and is, therefore, also an important component of SEATRACE and other trace element boosters.

PLANTS

Basic Essentials

I would be very grateful for your assistance as I am very, very frustrated with my plants. All the fish in my tank are fine, but the plants are pale, almost yellow in colour, and do not grow. I have tried various bulbs and tubes, but to no avail. The same goes for additives.

The details you give are too sketchy for me to give you an informed opinion. Perhaps the details below will be of some help.

There are four requirements to be considered in the successful cultivation of aquatic plants, namely:- Light, Water, Substrate and Fertilisation, plus, of course, the preparation of the plants themselves. In addition, to present an aesthetically pleasing scene, the arrangement of the 'hard' furnishings, such as Simlwood, bogwood, natural rocks and gravel, must also be given consideration.



Luxuriant growth like this can be achieved, provided all the basic essentials are adequately catered for.

Lighting

The intensity and quality of the light source is very important. Fluorescent lights are generally the first choice for today's aquarist. 20 watts per square foot of surface area will be sufficient for tanks up to 15in (38cm) in depth. This will mean two tubes will be necessary. Truelight or Triton lamps will both prove satisfactory for plant growth. The photoperiod

DISCUS

Ideal Discus Aquarium

Would you please advise me on setting up a Discus fish tank as shown in your book, *Discus Fish, The King of all Aquarium Fish*?

My local water has a pH of 6.9 and the hardness cannot be measured with a drop tester. I was told that the water is too soft. As I wish to keep the tank free from

hanging lights, can I use the new Triton tubes?

Also, what would you recommend for the first four filtering chambers? Further, what type of pump (flow rate) can I use with this system? Do I need to treat the water with any resins, etc.?

There are not too many Discus keepers who can obtain large quantities of 'perfect' water. Yours comes pretty close, so your experience with these fish should (almost) be trouble-free.

The biggest problem with Discus is, and has always been, the quality of the water. You will therefore have one thing less to worry about.

In a 50cm (c 20in) high aquarium, measuring 60cm (24in) front to back, you will either need three fluorescent tubes covering the length of the tank, or five tubes, two over each of the planted parts and one over the 'fish' part. I suggest that you use two Triton tubes over each of the planted sections and one GroLux covering the length of the aquarium.

For the first four chambers of the built-in trickle filter I suggest that you use the following: in the first chamber, a fine filtering medium like wool or sponge; the second and third chambers filled with a biological material like Eheim Substrate or similar; the fourth chamber with either Optima Carbon, or a suitable peat, and, uppermost, a thin layer of a fine sponge to protect the 'trickle' part of the system from any suspended matter.

The pump most suitable for this system would be something like an Atlantis or Rena 20. The flow rates of both of these pumps are sufficient.

There is no need to use any resins at all, but a water conditioner like AquaCondit must be used to give 'life' to the water.



Plants and Discus can co-exist quite happily as long as the lighting arrangement is designed to meet their differing needs.

PLANTS

Continued

should be 10 hours per day and should be continuous.

Water

The best source of water is probably the rainwater butt. Mix this with a little tapwater so that the pH is around neutral and the hardness from 3-6° for preference, although most plants will still succeed up to 12°DH. Water clarity is important, as fine debris will not only clog up the pores of fine-leaved plants, but will also absorb a great deal of light. An efficient filter is therefore essential to take care of this problem. Most aquatic plants thrive at temperatures between 75-82°F (24-28°C). Undertank or sub-gravel heating will help plant growth by keeping the roots warm and by circulating the fertiliser elements throughout the aquarium.

Substrate and Fertilisation

The nutrient requirements of aquatic plants are better understood today, following extensive research by leading aquatic companies.

Old techniques, such as the use of Sphagnum Moss peat under the gravel, gave very variable results and, in many cases, led to an anaerobic situation developing in the substrate, with harmful effects on both plants and fish.

I would recommend using one of the excellent tropical clay products on the market (such as Everite No 1).

These clays are rich in iron, and, as the natural soil of the rainforest, will ensure that the plants will not have to adapt to alien conditions. Coupled with complimentary products which contain a full range of chelated trace elements, plants should not suffer any nutrient deficiency.

Boosting the carbon content by carbon dioxide infusion, while a somewhat advanced technique for many British aquarists at the moment, will bring undoubted benefits, as continental aquarists who have used this process for many years will testify.

Great Crested ambition

I have just constructed a pond and would like to stock it with a colony of Great Crested Newts. I grew up with a pond full of these lovely creatures and would like to finish my days in similar fashion. Can you help?

The Great Crested or Warty Newt (*Triturus cristatus*) is fully protected by the Wildlife and Countryside Act, 1981. This important legislation is not only designed to protect the remaining ponds in which these newts naturally occur, but also means that they cannot be legally collected from the wild or sold, exchanged, or bartered without the appropriate licence from the Department of the Environment. Further details can be obtained from:

**The Wildlife Conservation Licensing Section,
Department of the Environment,
Tollgate House,
Houlton Street,
Bristol BS2 9DJ.**

However, the British Herpetological Society is involved

nationally in establishing Great Crested Newt colonies to conserve the species. They produce an information pamphlet *Crested Newts in Garden Ponds*. A copy of this pamphlet can be obtained by sending a stamped addressed envelope to:

**The Conservation Committee,
The British Herpetological Society,
c/o Zoological Society of London,
Regent's Park,
London NW1 4RY.**

White's Tree Frog revisited

For a long time, I've been wanting to keep White's Tree Frogs. I would therefore welcome any advice you may be able to provide me with. I would also be grateful for details of suitable suppliers.

A White's Tree-Frog (*Litoria caerulea*) was featured on the front cover and **Your Questions Answered** in the January 1990 edition of *Aquarist & Pondkeeper*.

Adult White's Tree Frogs grow to the relatively large size of 7 to 10cm (2.8-4in).

HERPETOLOGY

Members of this species of amphibian are not particularly active, but they do like to climb up plants, resting on branches or in the axils of their leaves. Thus, a fairly tall vivarium is recommended — as described in **Spotlight, TROPICAL AMERICAN TREE FROG**, (*A&P* October 1988).

Plants should be rooted in soil held in terracotta flower pots. Suitable plants include vascular ferns, ivy (supported on a framework of canes) and long-leaved monocotyledonous plants such as irises and lilies.

Pieces of bark on the floor, not only look pleasing, but also provide additional hiding places. Bark also helps to conceal one of the best base coverings for vivaria used for housing amphibians — foam rubber. This has two advantages:

- it is easy to clean regularly, and
- it holds water, helping to maintain humidity.

Unfortunately, it does not look very attractive.

The vivarium should contain a 'pond'. A thermostatically controlled submersible aquarium heater (75 Watts or lower) can be used to maintain an environmental temperature of 82°F (28°C).

The vivarium must be well ventilated to reduce the amount of condensation forming on the glass. This makes the

amphibians difficult to view. Humid conditions also promote the growth of fungi.

White's Tree Frogs feed on a variety of invertebrates, including mealworms, crickets, spiders, flies and moths. The vivarium must, therefore, have an insect escape-proof lid.

The vivarium can be illuminated by day using a TRUE-LITE fluorescent tube. Further details of these tubes can be obtained from:

**General Acoustics Ltd,
Salter Road,
Cayton Low Road Industrial Estate,
Scarborough,
North Yorkshire YO11 3UZ**
With regard to suppliers of amphibians in general and White's Tree Frog in particular, you might try:
**Blades Biological,
Scarletts Oast,
Furnace Lane,
Cowden,
Edenbridge,
Kent.**

Tel: (0342) 850242
If this specialist biological supplier cannot help you, several other suppliers of amphibians and reptiles now regularly advertise in *Aquarist & Pondkeeper*. Another source of potential suppliers of amphibians and reptiles can be found in the Animals section of *Exchange and Mart* — published weekly.



The almost human face of Whites Tree Frog

IN PRAISE OF THE GUDGEON

More unusual and entertaining than a catfish — that's the Gudgeon, according to Richard Lloyd Roberts

Isn't it often the way, when you visit an aquarist shop, that you come away with something totally different from that which you intended to buy?

Last summer I was scouring the shops, local and distant, in search of a particular species, but fate brought me before a tank containing a beautiful little coldwater fish which begged me to buy it. Knowing my aquarium was fast approaching saturation point, with only enough room for the fish which I had for so long been searching, I had to make a tough decision, and thus I came home with *Gobio gobio*, the Gudgeon.

Once home, this new acquisition soon joined my coldwater community tank, after the four weeks in quarantine which I subject all newly purchased fish to. It fitted perfectly with the other species in the aquarium, as, although being very active, the Gudgeon is by no means an aggressive fish. I felt certain that my new find was bound to raise some eyebrows among other aquarists, since these fish are very hard to find on sale in Britain.

Aquarium requirements

The Gudgeon is a coldwater fish requiring well-oxygenated water which must be kept clear, as it is used to fast-moving water of rivers and streams. It has been claimed that it can withstand lower tropical temperatures for short periods of time, but, despite this, it is best kept in conditions more akin to those found in its natural coldwater habitat.

As with many coldwater fish, the pH value of the water is not an important criterion, the same applying to hardness.

A good depth of gravel is, however, necessary in the aquarium, as, being a bottom-dwelling fish, the Gudgeon has intense burrowing tendencies. Plants must therefore be well bedded into the gravel in order to prevent them from being uprooted. Good filtration is also needed, to compensate for the stirring up of the gravel which results from the activities of this charming bottom dweller.

Origins

Gudgeons are not often found in aquatic shops in the UK. On the continent, though, especially in Germany and the Netherlands where the keeping of coldwater fish appears to be far more popular than it is here (where it is considered a phase you go through before 'graduating' to tropicals), the Gudgeon is relatively easy to obtain.

This species originates from almost all of Europe, except for extreme northern areas and some regions around the Adriatic, and is better known in the UK as a catch for anglers, rather than for aquarists.



The long, slim body features of the Gudgeon make it ideally suited to a bottom-dwelling existence.

Diet

I was originally told that the Gudgeon eats only livefoods, but experience has proven this claim to be wrong. All our fish are fed on a varied diet of flake food and freeze-dried foods, and they all seem perfectly happy with this combination, including *Gobio gobio*.

Being a scavenger, the Gudgeon also supplements this diet with any edible scraps which may be found among the debris in the gravel.



In close-up, the slender mouth barbels of the Gudgeon can be clearly seen.

Characteristics

As has already been mentioned, the Gudgeon is a bottom-dwelling fish. Unlike many of the commonly called bottom-dwellers however, such as loaches or catfish, which often make forays into the upper reaches of the aquarium, the Gudgeon sticks almost

exclusively to the bottom of the tank. It can move with little apparent effort, gliding from one end of a tank to the other with barely a flick of the fins. It can also remain still for long periods of time, watching.

It also has an unusual shape, the body tapering from a very large, boulder like head, down to an extremely narrow caudal fin. A neat row of diamond-shaped dark patches flank the body, and a regular pattern of dots adorn its almost transparent fins. The head is the largest part of this fish (except in large females), and has a downturned mouth which is characteristic of bottom feeders. The mouth has two barbels hanging from the corners.

The Gudgeon can grow up to 8 inches (20 cm) but, in an aquarium, it will usually only grow up to 2 or 3 inches (5-7.6cm) — unless given roomy accommodation.

Male and female Gudgeon are very similar, although the males are slimmer. This is an egg scattering fish, but there have been no reports of an aquarium spawning as yet.

Summary

The Gudgeon is a beautiful fish for the freshwater, unheated aquarium. It displays many of the characteristics of a catfish, but has the added quality, in my opinion, of being more unusual than catfish, and (arguably) more entertaining to observe. It is easy to keep, and is far more attractive in an aquarium than, (as the French use it) as a gastronomic delicacy, or (as physicians in the last century preferred) swallowed live, as a cure for consumption!

BLUE AND PINK

Robert and Valerie Davies provide an expert guide to the care and breeding of three attractive, interesting and tameable species of skink.
(Photographs by the authors)



Male Pink-tongued Skink (*Tiliqua gerrardii*). Note the extremely long tail.

There is nothing sexist about the title. It merely refers to the common names by which skinks of the genus *Tiliqua* are known.

The genus *Tiliqua* contains about ten species but, since they are found mainly in Australia, very few of them are likely to be available in this country. Three species which are occasionally bred and, therefore, available in England, are *T. gigas* (New Guinea, the Moluccas and some Indonesian islands), *T. scincoides* (SE Queensland, Eastern New South Wales and Victoria), and *T. gerrardii* (New South Wales to Cape York Peninsula).

Specimens of these species which become available should be captive-bred, since their importation is banned. We have been fortunate enough to have all three species in our collection. We therefore hope that would-be keepers may find our experiences interesting and useful.

DESCRIPTION

Pink-tongued Skink (*T. gerrardii*)

The maximum length attainable by this species is reputed to be 45cm (17.7in), but captive-bred specimens do not always attain this length. Our adult male, classed as large, is 41cm (16in), of which 22cm (8.7in) consists of tail.

Coloration is variable. Some specimens may be strongly banded, while others may have no markings at all. The bands can also vary in thickness and may be dark brown, edged with white, as in our adults, or, as in the case of our babies, a light golden brown. The basic colour can also vary, but, generally, is a greyish brown. The ventral surface varies from almost white to pale pink.

The body is slender, to some, seemingly snakelike, tapering into a long semi-prehensile tail. The claws are quite sharp and, together with the tail, are used for climbing.

The common name for this species is based on the adults' pink tongue. However, the babies' tongues are dark blue and, as they mature, gradually lighten to become pink, but a faint blue rim remains round the inside of the mouth throughout life.

Blue-tongued Skinks (*T. gigas* and *T. scincoides*)

As their common name implies, these species possess a blue tongue which they display as a threat, since it contrasts with the pinky-lilac coloured inside of the mouth. As well as displaying the tongue, a threatening hiss is produced, although threat behaviour towards the keeper is seldom seen, as these skinks soon become tame.

Our adult male *T. gigas* has a snout to vent length (SVL) of 50cm (12in) with a 22cm (8.7in) tail. The limbs are comparatively small for such a heavily-built lizard, but this is common to many skinks. (Some skinks may have vestigial limbs only, two limbs only, or no limbs at all.)

The female *T. gigas* has a relatively shorter body, which is broader than the head. She also possesses heavy jowls, a feature which may occur in obese males.

The coloration is a rich, reddish-brown, almost tan. There are usually eight to ten narrow, dark brown crossbands on the back, with others on the tail. The ventral surface is paler.

T. scincoides is often called the Common Blue-tongued Skink. An adult male reaches about 60cm (24in) in length. The dorsal

surface is light brown, almost fawn in colour. The head and neck are unmarked. The rest of the body and tail have broad cross-bands which start off brown, almost orange in colour, and gradually darken towards the tail. The ventral surface is light. There is also a dark stripe extending from just behind the eye to the second or third dorsal band. In some specimens, the dark colour can take on a slate-blue hue. As with *T. gigas*, the limbs are comparatively small.

HOUSING

- Blue-tongues, including sexed pairs, must be housed separately, otherwise they will fight and inflict severe damage on each other. Pairs are only placed together in the breeding season (see breeding notes below).
- Pink-tongues, being more gregarious, can be housed as small groups, but squabbling, especially over food, can occur, so the keeper has to ensure that no specimens are intimidated and prevented from feeding.

The minimum-sized cage for an adult Blue-tongue is 60 x 60 x 30cm (24 x 24 x 12in). Obviously, a larger cage is beneficial. Height is not really crucial since these lizards are not climbers.

Pink-tongues require more height than Blue-tongues. For example, for a small colony of four to five creatures, a minimum cage size should be 60 x 60 x 60cm (24 x 24 x 24in).

The ideal heating system is a thermostatically controlled heater pad (well protected against claws) as these skinks like to absorb heat from underneath. It also enables the creatures to move between warm and cool spots as required. Our cages are lit by Tru-lite tubes which have proved beneficial.

In Blue-tongue cages, any furnishings must be heavy and robust. A 15cm (6in) diameter, half-round, earthenware pipe makes a good shelter. Calcareous gravel makes an ideal medium, as it is absorbent and assists in the sloughing process, especially of the feet, which sometimes retain the old scales to the detriment of the skink.

The only moisture required by Blue-tongues is a light spray with tepid water in



T. gigas, showing why this species is known as the Blue-tongued Skink.



Baby Pink-tongued Skink (one month old) resting on a branch.

the morning. Pink-tongues, however, need a slightly moist vivarium. This can be provided by clumps of Sphagnum Moss sprayed regularly. Being semi-arboreal, they need branches, cork bark, etc. for climbing. Plenty of hiding places can also be provided by the use of cork bark and stone. The appearance of the vivarium can be enhanced with the use of real and artificial plants.

Calcareous gravel is also used as a substrate for this species. Heating and lighting is as for the Blue-tongues. Vivaria, must of course, be fitted with a ventilation panel. The temperature for all the skinks is maintained at 28°C (82°F) during the day, dropping to about 20°C (68°F) at night. During winter, the skinks receive about 10 hours of light, this being increased to 16 hours in summer.

FEEDING

Pink-tongued skinks are specialist molluscivores and will, therefore, thrive on a diet of snails. Since snails larger than 4mm do not occur in our area, we rely on friends to provide a supply and tend to use quite a lot of slugs — whitish-grey and brown ones (*Agriolimax*). Keepers should try to ensure that slugs and snails come from uncontaminated sources, of course.

In addition, we have always found that it is possible to wean Pink-tongues, when young, onto cat food (ours do not like the fish-flavoured variety). From birth, all our baby Pink-tongues are fed from forceps to ensure an adequate share and avoid fights. This means that, within a very short time, the sight of a pair of forceps brings them running and, as a result, they tame very quickly.

The Blue-tongues are absolute 'dustbins', so one must guard against overfeeding of adults. These skinks will accept all the usual insect foods, earthworms (*Lumbricus*), cat food, raw beef heart, and bean sprouts. They are partial to slugs and particularly fond of snails.

In addition, they will devour a wide range of chopped fruit and vegetables. They are especially fond of banana and mustard/cress. The fibre in the fruit and vegetables seems to make the faeces firmer, and so, easy to remove. The food is occasionally sprinkled with multi-vitamin powder and scraped turtlebone.

Obviously, the wider the variety of food one can provide, the more nourishment the skinks will receive. Relying on just one or two foods can cause nutritional deficiencies

and often causes the animals to refuse food. Drinking water in all skink vivaria is changed daily. Adult skinks are fed about two to three times a week.

BREEDING

All members of the genus *Tiliqua* are ovoviviparous (livebearers), so there isn't the usual trouble of having to hatch the eggs. With practice, it is relatively easy to sex *Tiliqua* species. When comparing a male and a female, the female will have a shorter, broader body, which is wider than the head.

Tiliqua gigas (one of the Blue-tongues) will usually mate between March and April. The gestation period can be anything from 130 to 170 days. The other species mate from, roughly, September to October, the resultant young being born between December and March. Gestation for these species can be somewhat shorter; from 95 to about 150

attempts occur. As with some other lizards, mating can be quite violent and the females receive severe bites which heal quickly, but leave scars. The pair must be separated and reintroduced the following evening and on several consecutive evenings as, although a single mating may result in pregnancy, even several matings may not have the desired effect. During the gestation period, females tend to eat less than normal, so it is advisable to administer vitamin and calcium supplements during this time.

Babies are born live, sometimes in a membrane, at other times having already broken out of it before emerging. The young usually eat their own yolk sac; if not, it will be eaten by the mother. Many youngsters will feed soon after birth.

A Pink-tongued skink may give birth to as many as 25 young which are about 10cm (4in) in length, a little over half being tail. *Tiliqua gigas* may have up to 10-12 young which are about 15cm (6in) long. *Tiliqua scincoides* may have up to 25 young, and these are somewhat smaller than in *T. gigas*. By contrast, Blue-tongued babies have a body length of two-thirds of the total length.

Young specimens are better housed separately to avoid trouble. Even the Pink-tongues, which are more sociable than the Blue-tongues, may squabble at mealtimes, unless, as mentioned, time and care is taken to ensure that each one receives its share (a time-consuming problem if you get a large clutch). If housed separately, the young skinks develop rapidly and could be sexually mature in under two years.



The Common Blue-tongued Skink (*T. scincoides*) has very attractive body markings.

days.

Obviously, because they are kept in colonies, the Pink-tongues will mate when ready, but with the Blue-tongues, pairs must be introduced to each other at the right time. The best time for pairing is in the evening, since that is usually the period of most activity.

The approach of mating time is often marked by fasting and increased activity on the part of the males. It is also a time when they can be very aggressive. The female should be introduced into the male's vivarium, as a male introduced into the female's vivarium may be attacked and lose interest in mating. If conditions are right, the female will be chased, grabbed by the shoulder and then mated. Often, numerous

CONCLUSION

Blue-tongued and Pink-tongued Skinks make interesting vivarium subjects, provided one has adequate space to house them. They are slow-moving, relatively easy to feed, become extremely tame and, given suitable conditions, will breed and live for more than 10, and possibly, up to 20 years.

Because of import restrictions, it is vital to perpetuate these species (as with all herpetiles) in captivity. A cautionary note, however: it is very tempting to obtain a pair of *Tiliqua* from the same parents, but this is not advisable, since in-breeding can cause deformities, weak progeny and, ultimately, cessation of breeding. Therefore, any males and females used as breeding stock, should be unrelated to each other.

A TANK WITH A DIFFERENCE

David Sands (consultant to Aquarian) loves a challenge. Therefore, when someone suggested a 'lawn-based' aquarium, what else could he do, other than take the plunge?

(Photographs by the author)



Prototype 1 (in fact, this was the only prototype), showing the luxuriant underwater lawn in its early days, plus the thriving — at least, initially — community consisting of Congo Tetras, Elephant-nosed Fishes and Variegated Shark virtually hidden from view on the bottom right corner of the piece of bogwood.

I guarantee the reader that this is one article that has never appeared anywhere in the world!

Experienced fishkeepers often say that there is nothing really new in the fish hobby, but I offer what I think is one of the most original pieces I have ever written.

Fish myths

Fishkeeping is steeped in myths. Some years ago, a 'serious' fishkeeper from Blackburn, Lancashire, repeated an idea to me, for the fourth or fifth time. He said (as always before), "Dig out a lump of your front lawn and lay it down on top of an under-gravel filter plate, top it up with water and you will have the most 'instantly-mature' aquarium and a wonderful substrate for fishes. . . ."

This idea truly fascinated me. In all the times he mentioned this concept, I didn't once ask if he had ever tried it for himself. I had always considered this particular fishkeeper to be a thought provoking, if not very slightly on the wild imaginative side, aquarist.

Recently, another fishkeeper made another 'wild' claim about a completely different idea and I was prompted to resurrect my story of the Grass Tank.

I am a man of action! If someone sows a seed of a good idea to me, I simply have to see it through. Maybe the Blackburn fishkeeper had only ever talked about the grass tank idea. . . but the challenge was irresistible and I wanted to try it.

Beginning at the beginning

In 1985 I began the first stages of what could only be described as the most interesting aquarium system I have ever established, but have sat on the results since that year. I photographed the system only three times in as many months and, for a strange reason, unknown even to myself, I have not written about the results until now. (I have the strangest feeling I am now Robert Louis Stevenson about to retell a horrifying ghost story!)

Gardening for fishkeepers

After selecting the experimental tank from a row of four 24x18x12in (60x45x30cm) aquaria which received direct sunlight from a top window (the only naturally lit area in the room), I began to plan the grass tank. The chosen aquarium was already well estab-



Elephant-nosed Fish, experience showed, should be kept either singly or in a large shoal.

lished, with an undergravel filter, gravel, heater/thermostat and GroLux lighting.

I removed the gravel and water and saved about 50% of the original clean water, using the balance to wash the gravel before removing it.

My fishkeeping friend had always argued that grass still grows, even when submerged and, as my front lawn seemed to be in a permanent state of flood, I had no reason to discredit his theory.

Stepping gingerly onto the lawn, I chose a particularly lush patch of grass where a lake forms even at the first sign of rain. (I remember those years as especially wet for some reason.)

I cut out a piece exactly 23 x 11in (58.5 x 28cm) and carefully slid the spade underneath the sod and rolled the grass forward with each slice of the spade. My first attempt saw the piece split into two so I persevered until I had the one complete chunk that would be the vital part of my experiment.

Shaking off the excess soil illustrated how many worms and grubs make their home in a lawn, but the numbers I saw then could never compare with the fantastic numbers I saw at a later stage. At the finish, I had a near soil-less sod and I can remember thinking at the time that, if my aquarium business ever folded, I would be able to find work as a turf cutter!

I'm not sure if the piece had stretched during my efforts to rid it of soil, but when it came to placing the grass into the aquarium, it required a severe trim to enable me to install it perfectly into place on top of the undergravel filter plate.

I ran the 50% saved water back and topped the tank up to about 12 inches (30cm) so that the light could penetrate to the grass and the powerhead would splash water back onto the surface. An air stone charged the water with oxygen and the tank now looked to be the near-perfect 'uncontrolled' experiment.

I sealed the edges of the sod where it touched the glass with a thin layer of washed aquarium gravel, more or less to make the experiment appear as neat as possible.

The most beautiful tank in the world

The tank looked stunningly beautiful. The lush green substrate rippled as sunlight came through the window down onto the grass tank. In that moment, I planned the conversion of another 30 aquaria as I visualised the most stunning aquarium shop on the planet!

Few aquariums look right without fishes. I had to add the finishing touch, even though I

knew that it was better to leave the aquarium overnight to settle. The water began to cloud slightly but I was confident that this small detail would be ironed out by the filter overnight.

The grass tank begged for Mormyrids.... Everyone knows that the Elephant-nosed Fishes wish for a soft, grassy substrate. Those fine extended snouts only want for a muddy, vegetated world to root around in.

In a twinkling, I had added a trio of the slightly rarer *Gnathonemus zanzibaricus* that Neil Hardy Aquatica had kindly shipped to me, and all was well. (*Gnathonemus petersii* the 'Common' Elephant-nose was to be added at a later stage).

Morning came and the grass tank was the first to be inspected. The water was crystal clear. But alas, on closer inspection, the surface appeared to be covered with black blobs; blades of lost grass and a great amount of assorted debris.

On even closer inspection, the surface revealed itself to be a floating graveyard for every kind of creepy crawly. I had murdered at least fifty worms, an equal number of grubs, spiders, centipedes and heaven knows what else.

Plenty of livefood for the Elephant-nosed Fishes, I thought, even though I had already begun to net out the debris. The truth is that a two-foot by one-foot sod of turf is more overcrowded than Oxford Street on Christmas Eve!

Once I had recovered from this fishkeeping equivalent of a coronary, the grass tank didn't seem so bad. The grass seemed as lush as ever and the Elephant-nosed Fishes were what can only be described as in their element.

Prototype 1

The grass tank, Prototype 1, was now my 'special' African tank. I added a small group of Congo Tetras — I have always loved Congo Tetras, *Phenacogrammus interruptus* — at two to three inches long (5-7.6cm); the males rival any other tropical fish for sheer beauty. The next to go in was an African Variegated Shark, *Labeo variegatus*. These sharks can be a bit nippy as they grow but, what the heck, it looked so brash! Then it was merely a question of sitting back to admire my handywork. Someone else's idea had now become a reality.

The great shame is that my Blackburn friend never saw the aquarium in this



Congo Tetras were the first occupants of the 'Grass Tank'.

moment of glory. Had he done so, he would have beamed a self-satisfied smile at the wonder of it. The tank appeared to be the most natural display I had ever aquascaped, and the finishing touch of a small piece of bogwood was the signal to show the tank to all and sundry.

The comments came thick and fast. "A bob's worth of Fallis in that tank", "The broad-leaved plant looks smart", "Nice green growth." and so on. Someone even asked to buy a bunch of the 'plants' ie the grass!

How green is my grass

The next day I witnessed slightly fewer creepy crawlies than the day before, but it still amazed me how many creatures had found refuge in my front lawn. The tannic colouring from the bogwood stained the water and prevented the sunlight/daylight from penetrating the water in quite the same stunning way as before. (Mistake number one).



This Variegated Shark proved 'nippy' but was, otherwise, fine in the 'Grass Tank'... until things began to go wrong.

The fish seemed fairly happy, accepting frozen bloodworm and flake, although I began to notice a very strong pecking order developing in the trio. (Mistake number two). I would now recommend that Elephant-nosed Fishes be kept singly or in large groups.

The grass still glowed green, but I wasn't entirely sure at all if it was still growing. I dropped the water level a little more without leaving the powerhead totally exposed so that more daylight could penetrate to the bottom. (Most powerheads are water-cooled, and so, will burn out if allowed to run above the water level for any great length of time.)

After two weeks, even a glance showed that the grass had obviously lost some of its green and, much worse, some of its tufts. I believed balding grass meant a receding experiment.

I removed the bogwood and partially changed the water in an effort to regain the clean, clear, crystal water that had graced the start of the experiment.

At some stage in the third week, I felt unhappy about the fish... just a feeling, but the Elephant-nosed Fishes didn't seem too happy and the Variegated Shark looked very

sad. I removed all the fish and tried a complete water change. At the one month mark, the grass had yellowed and was a complete contrast to the aquatic 'Garden of Eden' I had gazed at in total wonder only three weeks earlier.

Serpents in the Garden of Eden

Yellow grass didn't look quite as pretty as lush green grass, and my experiment was now something of a dismal failure. At that point, I was glad the idea wasn't mine.

Did the grass wither because of the lack of a strong natural light, or because it drowned?

On the lawn the grass is only flooded in a few inches of water. Perhaps it's OK for grass to be underwater for a short period? Maybe a new submerged grass would have grown. Everyone knows the leaves of Far Eastern Amazon Sword plants wither and the new submerged leaves grow.

Perhaps the temperature was too high. I had not thought about that and, I suspect,

neither had my fishkeeping friend with the dazzling ideas! Perhaps it was a combination of all these facts, but I don't know.

The experimental tank was broken down and the sod replaced in the space in the lawn. There are too many influencing factors to say which problem brought down the best-looking tank I had ever seen. Perhaps, in a more controlled test, several tanks could be established... maybe food should be given to the grass, maybe a warm-water species of grass should be introduced... maybe I should talk to Vivian de Thabrew, who worked on lawns... maybe he can tell me what I did wrong...

Was the grass tank doomed from the start, like all those rainbow dreams??

One question can now be answered. If the tank had been a great success this article would have been written long ago.

Now, I want to try the Grass Tank all over again, but this time... well this time, it will be different, or so I keep telling myself!

Many thanks to Barry Black, Neville Carrington and Peter Whelan.

News from the societies

News from the FBAS

The following changes have occurred to FBAS Council positions. **Jack Stillwell**, of **Portsmouth AS**, has retired from the position of Minutes Secretary after almost 20 years of continuous service. However, Jack is only relinquishing his reporting post, as he will still be available as an FBAS Judge for Shows and, of course, will be continuing to be active in the ASAS Group. His Council post will be filled on a temporary basis, for the remainder of this year, by **Adrian Dempsey**, of **East Kent ASG**,

who has been co-opted on to the Council for this purpose.

In view of the Federation's heavy commitments for the coming season, with two major events already planned and co-ordinated (in addition to the normal comprehensive FBAS services) **Dick Mills**, currently **FBAS Bulletin Editor**, has agreed to act as **FBAS General Secretary** for 1990, rather than expose a brand new Secretary to all the traumas all at once! His address, to which all correspondence concerning the FBAS should be sent is: 10 Rosken Grove, Farnham Royal, Buckinghamshire SL2 3DZ.

The 1990 editions of the

FBAS YEARBOOK (Booklet No 7) and **NATIONAL SHOW FISH SIZES** (Booklet No 6) are now available. Each costs £1.50 and can be obtained either from the Federation's Show Stands, or direct from the **FBAS Merchandising Officer**, 14 Upper Dane Road, Margate, Kent.

There is a new title in the Federation's extensive list of publications. Although its actually the twentieth Booklet to be produced (in addition to well over one dozen Supplements), rationalisation of title numbers has decreed that this shall be **Booklet No 8 — The Forming and Organisation of an Aquatic Society**. Whether you are

setting up a new society, or want to have some constructive guidelines as to how your existing society might run a little smoother, then this Booklet, priced £1.00 is for you.

Supreme Festival

The FBAS is pleased to announce that, in addition to the joint organisation of the **Supreme Festival of Fish-keeping** (at Weston-super-Mare in November), **Interpet** have also very generously agreed to sponsor **FBAS Championship Trophy Classes**, **FBAS Supreme Championship and Best in Show Awards** during 1990.

Diary dates

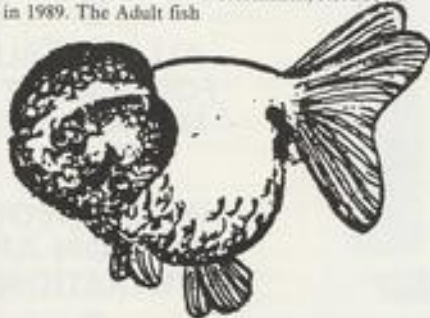
Association of Midland Goldfish Keepers

The Association of Midland Goldfish Keepers' first meeting of the season was a great success, with guest speaker, **Dr David Ford**, giving two very interesting talks on Fish Nutrition and Fish Keeping Around the World. The next meeting is set for **13 May**, when **John Parker** of the Goldfish Society of GB will be showing a video of the Rancho Show held in Tokyo in 1989. The Adult fish

Table Show will also be held on the night.

Anyone interested in joining the society should contact **Karen Thompson** 34 Ninth Avenue, Grantham, Lincs., NG31 9TF.

The Annual Show of the AMGK is being held in Coventry on **24 June**. Show schedules can be obtained by sending a S.A.E. to **Andrew Barton**, 41 St. Barnabas Street, Wellingboro, Northants., NN8 3HA.



Port Talbot & District Aquarist Society

The 20th Open Show of the above society will take place on **30 June**. Venue: Taibach Youth Centre, Port Talbot. Further information available from **John Egan**, 53 Pentre Afan, Baglan Moors, Port Talbot, West Glamorgan, SA12 7RN. Tel. 0639 821126.

Capital Aquarist Society

Edinburgh's Capital Aquarist Society (now nearly two years old) will stage its 1990 Open Show on **20 May**. Details of venue, show schedules, etc., are available from the Club Secretary, **Ronald Brunton**, 1/8 Inchmickery Court, Muirhouse Grove, Edinburgh, EH4 4SC. Tel. 031 336 5396.

Swindon Aquarist Society

The 8th Swindon Aquarist Society Open Show will be held at **Oakfield School**, Marlowe Avenue, Swindon, Wiltshire (the same venue as last year) on **6 May**. Schedules from **Miss Jean Perrett**, 20 Arnfield Moor, Liden, Swindon, Wilts., SN3 6LR. Entries: **C. Walton** (Show Secretary), 4 Kershaw Road, Eldene, Swindon, Wilts. Tel. 0793 642903; or from the Assistant Show Secretary, **K. Curtis**, 78 Downton Road, Penhill, Swindon, Wilts. Tel. 0793 728194. Postal/telephone entries to be in by **4 May**. Booking in: 9.00 a.m. — 12.00 noon.

B.K.K.S. (Lower Thames-side section)

Koi Show — The Lower Thames-side Section of the B.K.K.S. is holding a Closed Koi Show on **Sunday, 20 May** at the new venue — **Scout Hall**, Collier Row Road, Romford, Essex (Corner of Collier Row Road and White Hart Lane). Full details from **Valerie Radley**, 76 Whitehouse Meadows, Leigh-on-Sea, Essex SS9 5TZ.

Southend, Leigh & District Aquarist Society

This year's SLADAS Open Show will be held on **5 May** at **St. Clements Hall**, Leigh-on-Sea, Essex. Around 500 entries are expected, from over 100

exhibitors, making this one of the larger club shows in the country. For full details, contact **Chris Cheswright**, 2 Cedar Avenue, Wickford, Essex, SS12 9DT.

Stafford Aquatic Society

The 4th Open show of the SAS will be held on **Sunday 17 June** at **Universal Grinding Wheels Social Club and Canteen**, Doxey Road, Stafford. The Venue is large and conveniently situated to attract a large number of competition entrants and visitors. For full details contact **Larry Lainton** (Show Secretary), 280 Sandon Road, Stafford, ST16 3HP. Tel. 0785 44406.

British Aquarists Festival (Advance Notice)

Following last year's successful 'relaunch', the Federation of Northern Aquarium Societies have announced that the 39th British Aquarists Festival will, once more, be held at **Bowlers Conference and Leisure Centre**, Longbridge Road, Trafford Park, Manchester. This year's dates are **Saturday 27 and Sunday 28 October**.

The BAF committee would like to thank all those who supported the 1989 Festival, helping make it the tremendous success it was, and look forward to seeing them again, along with new faces, in October.

Diary dates

Transfer and other facilities, e.g. free bus service from major rail and bus terminals in Manchester, ample parking space right outside the venue, etc., are all being planned along the same lines as last year. Interest in the Festival is already gathering pace, so early applications for space are invited.

Trade Enquiries: Alan Darby, Trade Manager - B.A.F., 1 Perrin Street, Hyde, Cheshire, SK14 1LE. Tel. 061 368 4868.

Other Enquiries: Arnold Chadwick, Show Organiser - B.A.F., 9 Bronville Close, Chadderton, Oldham, OL1 2RH. Tel. 061 652 6207.

Romford and Beacontree Aquarists' Society

The 1990 Open Show of the Romford and Beacontree Aquarists' Society is scheduled to take place on **24 June**. Full details and schedules available from the Show Manager, John Stannard, 12 Heynes Road, Dagenham, Essex, RM8 2SX.



Yorkshire Koi Society

The YKS will be holding its 12th Open Spring Show on **Sunday 27 May** in the grounds of Harewood House, the stately home of the society's President, Lady Harewood. The show is open to all Koi-keepers, whether they are YKS members or not. As well as the actual Koi Show, there will be numerous Koi dealers, etc., displaying their fish and goods and, of course, the YKS stand displaying a small pond, videos of ponds and computerised information, as well as good old fashioned chat and advice on Koi. There will also be raffle

and tombola stands full of fantastic prizes.

In case of inclement weather, the whole show and dealers' stands, etc., will be under cover in a giant marquee. In addition to the Koi Show, there will be a craft fair in the extensive grounds, which also provide ample space for a picnic, as well as some lovely walks. The House is open to the public and is a treasure trove of British Heritage. A further attraction is the extensive Bird Garden next to the Estate Lake.

Trade Enquiries: Steve Lamb, 24 Patterdale Drive, Rawcliffe, York, YO3 6TW.

Competition Enquiries: Ian Wallace, 5 Victoria Rise, Pudsey, Leeds, LS28 7SU.

Membership details: Mrs M Buck, 38 Brook Park, Briggs-wath, Sleights, Whitby, YO21 1RT.

Thorpe & District Aquarist Society of Norwich

The Norwich - Thorpe & District A.S. Open Show will be held at Hewett School, Norwich on **Sunday 20 May**. For further details, contact Paul Sparks on Norwich 406276 or write to him at 5 Gowing Close, Hellesdon, Norwich, NR6 6PX.

A Query Fit For Sherlock Holmes?

(See Letters Page)

All, or any, of the ideas put forward might be the cause of the trouble. The only definite thing to come out of the deliberations is the real need for problem writers to give as much information as possible; without that we're back to plain guesswork!

Dick Mills

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Spotlight on Goldfish

THE GOLDFISH AQUARIUM

If you've never set up a goldfish aquarium, go no further until you read **Pauline Hodgkinson's** guidelines. They could save you a great deal of heartbreak and frustration, and prove of immense benefit to your fish.

**First
STEPS**



A spectacular arrangement of rocks and natural plants in a Bristol Shubunkin aquarium.

Setting up an aquarium for cold-water fish is usually considered to be one of the first enjoyable steps into what might be termed a fascinating hobby. Providing you take a little time and trouble in the preparation, choosing the best and most suitable equipment, best location, and cleaning the gravel properly, then all should go well and give years of interest and pleasure.

When the fish you intend to keep are subjects from the group known as Fancy Goldfish, then the aquarium you choose must not be too small. Remember that those beautiful, colourful, exotic little fish which look so attractive, are going to grow, given the right conditions, attaining a body size perhaps in the region of 5 or 6in (13-15cm), or much larger if they belong to one of the single-tail, slim-bodied varieties. There are even some twin-tail types which reach proportions that could easily classify them as 'Whoppers'.

The aquarium

The most popular sizes of tanks appear to be 24 x 12 x 12in (60 x 30 x 30cm), 36 x 12 x 15in (90 x 30 x 38cm) and 48 x 15 x 15in (120 x 38 x 38cm) but, of course, aquaria come in many sizes. You can even have them made to

your own requirements. I think that it is wiser to buy the largest tank you can afford, or that will fit into the chosen location. This is, firstly, because the larger the environment your fish are kept in, the more control you have over the conditions, since larger volumes of water take longer to pollute than smaller ones, and there is less chance of rapidly fluctuating temperatures which can affect the health of your fish. Besides, if my own experience is anything to go by, you will be so enthralled and enthusiastic about the whole business of fishkeeping, particularly keeping the exotic fancies, that you will find it difficult not to keep adding to your collection.

The temptation to overcrowd will, without doubt, result in disaster if not resisted, or, as in my case, in the setting up of more and more aquaria until other members of the family cry "enough is enough" and the whole lot, is re-located in the garden shed, which, in turn, soon runs out of space! Now, I am not only adding tanks to my collection, but sheds to set them up in!

The most popular aquaria now available are the 'all-glass' type constructed, literally and solely, from glass, held securely with silicone sealant. They have many advantages over the old, angle iron-framed tanks of the past in that they are lightweight, rarely leak, are relatively inexpensive and, unlike their iron-framed counterparts, do not require the occasional lick of paint to keep them looking at their best. Should one of the panes of glass be cracked, then it is usually a simple matter of applying a little sealant over the crack on the inside of the tank to make a repair.

To add to the overall good looks of the aquarium, it should have a hood which must be fitted with a condensation tray. However, the hood is also an important addition because the lights, which are another vital feature if you intend to grow real plants, are housed in this unit. Besides, additional lighting is required, particularly if the tank is situated in a dimly-lit place, because it will highlight and help to bring out the attractive colours in the fish. The condensation tray is also important because it prevents water, both from splashing on the lights situated in the hood, and from coming into contact with the electrical wiring. In any case, the aquarium should be covered to keep out dust and aerosol household sprays, not to mention the feline with the superb angling skills (yet

another story which I, for one, can add to experience).

To filter . . . or not

To filter or not to filter, that is the question. There are many people who have gone to great pains to point out to me that the use of a filter in a properly balanced set-up is not necessary and that they have tanks which have been in operation for long periods of time without having the need for any form of filtration. Well, that may be so, but I, personally, think that some type of filter is very important in a set-up for goldfish.

We have to take many aspects into consideration before dismissing filtration as an unnecessary item. First, there is the type of fish being kept in respect to their size and their potential size, the number of fish and (what is also a most important factor) the knowledge and experience of the person tending the aquarium. Feeding, plus the amount of time and maintenance given to the set-up are also important factors.

Filtration is an important aid in removing dirt and harmful elements from the water, and only when the fish are kept in good, and clean conditions, can they look at their best and remain in good health. Therefore, a filter is an essential aid in my opinion, and should be regarded as a most important item of equipment within the goldfish aquarium.



Coloured gravel and artificial plants can look very attractive in a tank housing fancy varieties of goldfish.

The type of filter to install can be quite daunting to those people on their first steps into fishkeeping; there are so many to choose from, so many types and sizes, and so many manufacturers claiming that their's are the best. In fact, it is simply a matter of choice — they all have their advantages and disadvantages, from the cheap and simple, but still very effective, box type corner unit, to the considerably more expensive internal or external power canister filters.

Mechanical Filters

These are operated by drawing water either through a foam pad, filter wool, or nylon floss, which removes particles from the water. Solids are collected in the medium and the clean water is then returned to the aquarium. These filters are usually made of plastic in the shape of a round or square box which can be concealed in a corner of the aquarium.

They are easy to install and maintain; it is quite simply a matter of removing the filter medium from its container and rinsing it in lukewarm water so as not to kill the helpful bacteria which will have colonised the material. These bacteria are an important aid within the filter because they help to purify the water by converting nitrogenous waste, first into nitrites, and then into nitrates. This important task of cleaning out the filter should be done on a regular basis, because it prevents clogging and therefore ensures the efficiency of the filter, giving excellent results.

Another, even simpler, form of mechanical filtration is represented by the cylinder-shaped foam cartridges which are pushed onto a plastic tube, and operated by means of an airline. The water is, again, drawn through the foam, up through the tube and escapes at an outlet at the surface.

Chemical Filters

This type makes use of materials with porous surfaces, such as charcoal. The water is drawn through and the harmful substances are absorbed, while the clean, purified water is returned to the aquarium.

Biological Filters

Biological filters are very popular, utilising bacteria which colonise the filter to break down and nitrify toxic organic wastes. The most popular form is the undergravel type which, as the name suggests, consists of a filter plate placed under the gravel across the base of the tank. Water passes through the gravel and through tubes which carry it to the upper level of the tank.

This flow is set up by using an air pump connected by an air tube, that, in turn, is connected to the upright pipe down which the air travels. This forces water out of the gravel, up through the tubing to higher levels of the tank, or pushes water under the gravel so that it rises up through it.

The process of filtration or purification is actually done in the gravel itself by the bacteria that live on the surface of each particle. The gravel bed should be made up of 2-3in (5-7.5cm) of aquarium gravel, avoiding the very small-sized stuff, choosing, instead, the larger, pea size mater-

ial which clogs less easily. It is very important to clean the gravel, at least, every two weeks in a goldfish aquarium. This is more easily done with the aid of a gravel washer, a simple plastic device, obtainable from all good aquatic retailers.

Power filters

Nowadays, power filters are extremely popular. These can be fitted inside or outside the tank. They usually hold two or more layers of different filter materials, and are therefore able to carry out mechanical, chemical and biological filtration, all at the same time. They have their own built-in electric motor, and so, have no need for an additional air pump to operate them.

These units are quite powerful, and many are fitted with a spray-bar attachment to help dissipate the returning water over the whole length of the aquarium or a Venturi system to assist aeration. An added advantage is that power filters can be used in conjunction with undergravel filters.



Round-bodied varieties (this is a young Fantail), or those with long flowing fins, should not be subjected to strong currents such as those generated by large power filters, unless these can be deflected or adjusted.

One word of warning, I think, should be made about strong aeration and water turbulence. Goldfish should not be subjected to such conditions; they are not happy living in a constant battle against strong currents. I realise that some people are of the opinion that it makes fish stronger. In my view, this idea is ridiculous. Would such people like to live their lives in a wind tunnel? Power filters should therefore be adjusted to accommodate the requirements of goldfish, particularly the more fancy varieties.

It is vital to leave filters running for 24 hours per day, otherwise the bacteria will die, causing further pollution. Yet another important point should be made while on the subject of filters and filtration: for many people the temptation to crowd in a huge population of fish into a tank because it has a filter is a big mistake. Never be guilty of reducing the quality of life, or putting the lives of your fish at risk, through your own greed.

Appropriate tank location

When deciding on the location for your aquarium you should consider a number of factors which are important if the overall results are to be pleasing and safe. Do not position a tank in a draught or near room

heaters. These both cause undesirable fluctuating water temperatures which can have disastrous results on the fish. One should also avoid placing aquaria in direct sunlight as this will encourage unsightly algae to flourish. Locating it in a dark recess can be an advantage because it is then easy to control the amount of artificial light to be used to illuminate the aquarium, both for the benefit of the fish and the plants.

A position close by an electrical power socket is advisable because the filter and lights will need to be connected. It is important not to forget to allow for easy access for tank maintenance and other little jobs which have to be carried out from time to time. There is nothing more irritating than having to muddle around in a limited space, making an otherwise easy job twice as difficult and time-consuming.

If you are not intending to put your tank on an aquarium stand, or if it is not one which comes in one of those smart cabinets, then it is vital that the place it will stand on is capable of holding the weight of the tank when filled with water and rocks. It is worth bearing in mind that water is surprisingly heavy: 1 gallon (4.5 litres) weighs approximately 10lb (4.5 kilos).

Also important is a cushion of expanded polystyrene sheeting which should have the same dimensions as the aquarium and which can be purchased from aquatic dealers. Placed under the tank, this will absorb any unevenness in the surface that the tank is to stand on, thus avoiding any stress or pressure on the glass which could result in it cracking.

After choosing the position for your tank, and before commencing the setting up procedure, it is well worth making a check with a spirit level that the tank is going to sit level, because few things can be more infuriating than finding — after all the planning, time spent getting everything into perfect position, and filling the tank with water — that the tank is in a sloping situation and that the level of the water falls to one side. It will not only spoil the whole look, but it will also become a constant irritation.

Setting up

Gravel

Wash the gravel thoroughly with clean boiling water (I use a wooden spoon to stir up the stones so that the grit and debris rise to the surface and can be run over the top of the bucket). Wash small amounts at a time; it really will be quicker and easier than trying to do the lot all in one go.

I probably spend 10 minutes on this part of the task, then change over to cold water, using, as with the hot, several changes of clean water. I never use detergents when cleaning anything which will come into contact with fish. One may feel satisfied that all traces have been removed before one introduces the fish, but the chances are that there will still be some detergent remaining, and this could prove fatal.

When you are completely satisfied that the gravel is thoroughly clean, and only then, you can think about beginning to set up the aquarium. It is well worth taking time to

clean the gravel properly as, if poorly washed, dust will cloud the water and will take some time to settle and clear — unless the whole washing process is repeated.

If you have chosen the undergravel type of filter, you should place the plate into position at the bottom of the tank before adding the gravel. The gravel should be spread out carefully, sloping it from back to front. This will not only encourage any dirt and waste to collect at the front of the tank where it is easy to remove, but it will also help give a sense of perspective.

2 Rocks

Rocks can also be used to give a natural look to the aquarium, though many people like the tank ornaments available from suppliers. I know that some people scorn these objects, but it really is a matter of choice; I certainly would not try to discourage anyone from using them. Though rocks can be used to good effect, a word of caution about using the right kind of rockwork in a freshwater environment is appropriate. The rocks must not have any sharp edges and they must be safe, i.e. they must not give off toxic substances which will poison the fish. That beautifully shaped stone which you found lying in the garden, added to your tank, just might be the cause of the sudden deaths among your fish population.

Rocks which are safe to use are Westmoreland, Granite, water-worn sandstone and slate. When positioning the rocks, work them into the gravel a little to give a natural look. You can also stick pieces of slate together with aquarium sealant to create all types of underwater scenic beauty.

3 Water

The water can be added next. In order not to disturb the gravel, a piece of polystyrene may be placed on top of the gravel and the water gently poured onto the centre. As the depth rises, the polystyrene will float and, as the water gently cascades over the sides, it will not disturb the care and arrangement put into creating the gravel bed.

Before completely filling the tank the plants may be arranged and set into position. I, personally, like those which come ready rooted in their own little plant pot or plug. Begin with the tall specimens, planting them at the back and sides. Group them in clumps as this not only gives a pleasing effect, but is also more in keeping with nature and therefore produces a natural look. Leave an area at the centre and front of the aquarium free from both rocks and plants so that the fish can have space to swim freely and be viewed without obstruction.

Finish topping up with water before introducing the air-stone, or, if mechanical filtration is being used, the box or sponge filter or the power filter canister. If you have chosen an external filter, remember that it will not start to work until it is filled with water, i.e. until it is primed. Instructions on how to do this are provided by all the manufacturers of this type of equipment.

4 Lights

Attention can now be given to the lights which are to be situated in the hood. To use light to its best effect, it should be directed down into the water, so the hood is the best

place to house the lights.

Fluorescent tubes are the most popular form of lighting for several reasons. Their lifespan is quite long and, what is so important, they give a nice even spread of light. They are also cool-running, which, of course, is advantageous, particularly when the aquarium is intended for cool water subjects such as goldfish.

There are different types of fluorescent tubes available; white light gives a good illumination, while a pinkish glow seems to enhance the colours of the fish. You should allow about 15-25 watts of fluorescent lighting per 12in (30cm) length of aquarium. The lights should be on for about 10 hours each day, but the good news is the fact that fluorescent lights have low running costs.



Diaphragm-operated air pumps are relatively inexpensive, efficient and durable essentials. An anti-siphon valve should be used to prevent backflow of aquarium water into the pump housing in case of a power failure.

To run fluorescent tubes, a choke or an auto-transformer is needed. This is usually situated in a compartment which is built into the hood. Although tungsten lamps are less expensive to buy, they generally have rather a short life and therefore, taking into account that they give off too much heat for the goldfish aquarium, and that their light is less flattering to the colours of the fish and plants, the fluorescent tube is no more expensive and, in my opinion, a better option in the long run.

5 Maturation period

The set-up tank should be allowed to mature before any fish are introduced. Of course, it is always a temptation to rush ahead and get the fish in at once. This is a mistake because the water needs to mature and the plants need to have a chance to settle down. If you really cannot wait, then you can speed things up by adding some water conditioner.

6 Pumps

I think that I ought to mention pumps because, unless the type of filter you have chosen to install is of the power canister type with its own built-in motor, you will need an air pump to drive the other forms of filters and the air stone (diffuser). Aeration is important in an aquarium because it facil-

itates the assimilation of oxygen, as well as circulating the water itself, thus helping to push carbon dioxide to the surface, where it can escape.

If fish spend their time at the top of the tank with their mouths at the surface gasping for air, then this can be taken as a sure sign that they are in trouble through an insufficient supply of oxygen.

There is a wide range of makes of air pumps, most of which are excellent, and choosing a 'quiet runner' at the outset can save a great deal of irritation in the future. Most good aquatic retailers make a display of some of their better-selling air pumps actually in operation, thus giving the customer an idea of their performance, and making the final choice much easier. One can choose from single or double outlet types, while some of the larger pumps even have four, though these are generally used to supply air to several aquariums. Some pumps also have a regulator to control the amount of air being pushed through the air line to the aquarium — a most useful addition.

One very important point to make while we are on the subject of air pumps, is that a pump should be positioned at a higher level than the aquarium so that water will not flow back into the pump should it stop operating. Anti-siphon valves will also prevent backflow in the case of pumps that cannot be positioned in this way.

7 Maintenance

No aquarium can function properly without regular and adequate maintenance. If the tank is to look at its best and the fish are to remain in good health, then care must be taken over keeping the water in good condition. Far better to maintain the tank on a regular basis, than to wait until things are looking a mess and the fish are in all sorts of trouble healthwise, before getting down to attempting to repair the damage negligence has caused.

Even with a filter in operation, small partial water changes are most beneficial in a goldfish aquarium. I would suggest that two, small, changes per week will keep the water sweet and fresh. I, personally, like to change about 1/3 of the tank volume, with a more thorough clean-up about every 10 to 14 days or so. This procedure will entail cleaning off the algae from the front glass of the aquarium, and using the gravel cleaner to remove waste and debris from between the gravel grains. If a sponge or filter box is in use, then this, too, should be cleaned out so that it can continue to perform at its best.

Final word

Never overstock your aquarium. This is, I think, the golden rule. It has long been accepted that, for every inch (2.5cm) of fish (body size), 24 square inches (150 sq cm) of surface area should be allowed.

However, I believe that 30 square inches (190 sq cm) is a better guideline because, then, it means that you are providing the fish with room to grow and develop properly. They also appear to suffer less from stress under such conditions and, therefore, their health is better and they live longer.

Coldwater jottings

Stephen J. Smith

Watercolour competition launches Koi food

Most Koi enthusiasts and pondkeepers are particularly proud of their collection of Koi, however humble, as well as the pond in which they are kept. The opportunity to have your own favourite Koi or pond immortalised in watercolours is one which is likely to appeal to just about every Koi enthusiast or pondkeeper. So, a competition which provides just such an opportunity should receive a warm reception from pondkeepers and Koi-keepers throughout the country.

To celebrate the launch of a new growth food for Koi, fish food specialists Tetra are providing just such an opportunity. Everyone who buys a pack of TetraPond Growth Food for Koi is invited to enter a competition to identify Koi varieties. The winning entry will receive a framed watercolour of their own Koi or pond painted by John Oliver, who has achieved fame and fortune in Britain and the USA for his paintings of Koi and game fish.



John Oliver, adding the final touches to his latest Koi canvas.

In addition, each of four runners-up will be able to have their Koi or pond professionally photographed and will receive a large framed print.

According to the manufacturer, TetraPond Growth Food has received high acclaim in Japan. The floating food is extruded and is thus apparently easily digestible, helping to achieve its aim of promoting 'streamlined' growth of Koi. I would imagine that, as with similar Koi foods, this would be ideal for other coldwater fish, particularly Goldfish, though don't take my word for it!



Tetra's newest pond food: Tetra Pond Growth Food for Koi.

Tetra is launching the food in two pack sizes, 270 grammes at £3.95 and 1500 grammes at £15.25. Further information is available from Tetra Information Centre, Lambert Court, Chestnut Avenue, Eastleigh, Hants SO5 3ZQ. (Telephone 0703 643339.)

Isle of Wight 'aquatic experience'

Following a brief mention in last month's *Jottings*, information is available about the Isle of Wight Aquarists' Society Open Show in June. The event, to be held on **Sunday 10 June**,

promises to be a major attraction among coldwater and tropical fishkeepers alike, with several activities being held throughout the day. The organisers have also done their homework regarding travel and accommodation arrangements, with the facilities of the venue, Whitecliffe Bay Holiday Park, being available to those in attendance (except, apparently, the outdoor pool).

Transport connections are also being made available from the Sealink catamaran and hovercraft connections at Ryde, providing advance arrangements are made with the show secretary.

According to show secretary Paul Corbett, provisional attractions include demonstrations of all-glass tank construction, advice on fish photography, instruction on judging, aquatic quiz, and fish auction. Trade and society stands (including 1,000 top-quality Koi) complete the attraction, while yours truly has been invited to present the trophies.

I personally wish IOWAS every success with such a bold venture. I understand that this event is the result of several years' preparations, and it is to be hoped that societies and individuals throughout the country, as well as commercial organisations, will give the event their full support.

Further information is available by contacting Paul Corbett, Show Secretary, Isle of Wight Aquarists' Society, The Orchard, Gatcombe, Isle of Wight PO30 3EF (Telephone 0983 721246).

A & P overseas

The continuing development of *Aquarist & Pondkeeper's* readership overseas prompts the following appeal to all fishkeepers in what, to us in Britain are 'foreign climes'. Are the procedures and practices for the fishkeeping hobbyist so different in foreign countries? Do Goldfish breeders in Australia face the same problems as those in the unstable British climate when they go about developing their favourite strains? What level of aquatic

interest is apparent on the South African or South American continents? Is there any such thing as 'coldwater' fishkeeping in equatorial countries?

If you are, or know, an overseas fishkeeper, why not drop me a line at *A & P* to let me know how you tackle this pleasurable pursuit of fishkeeping, and which clubs and associated organisations are available to the enthusiast.

A headstart for young Goldfish

It is always dangerous when preparing *Coldwater Jottings* to anticipate the weather some two months ahead, which is when these columns are written. However, it would appear that (in Britain, that is) some vigorous spawnings of Goldfish should have taken place by now, with these early results being treated to copious supplies of newly-hatched Brine Shrimp nauplii and about to be 'weaned' onto sifted *Daphnia*.

Large quantities of good, clean *Daphnia* are considered essential in the successful rearing of healthy fry, but the problem for many has been where to obtain adequate supplies. Of course, if you live near the countryside, a natural pond — devoid of piscine inhabitants — will provide an unlimited resource. For myself, I prefer to culture my own *Daphnia*, and this can be achieved quite simply in a small garden pond.

This needs to be only three or four feet square and about nine to twelve inches deep. An extra three inches depth in the centre is a useful expedient, as this is where the 'medium' is placed.

A variety of appropriate substances have been employed by breeders over the years, from yeast and sugar to dried cow manure. However, I have found the sludge removed from the bottom of the pond at cleaning time to be most effective. This consists mainly of decaying vegetation and fish mulm and, with the addition of matured water and a scoop of fresh live *Daphnia*, will provide a thriving, clean and healthy colony in plentiful supply — right at your doorstep!



Spotlight on Goldfish

THE REDCAP

Redcaps are available in vast numbers. However, as Stephen Smith explains, top-quality specimens are challenging to produce and only rarely encountered.

(Main photograph: Noreen Tan)

It is said that there are around 120 specialist varieties of Fancy Goldfish, to which can be added any number of variations produced by cross-breeding, a practice which seems to be particularly popular among commercial breeders in the Far East. Many of the so-called 'newer' varieties come and go, while the 'old standards' retain their hardness and their popularity.

One such 'standard' is the Redcap, although it was only until the last decade or so that it, too, was considered a 'newer' variety.

Redcap or Redcap Oranda?

"But isn't that the Redcap Oranda...?" I hear you say. So often hobbyists and retailers make this elementary, and perhaps, understandable, error of nomenclature. Quite simply the Redcap is, indeed, an Oranda (just as a Koi is, itself, a carp, not a Koi Carp). An additional faux pas in my opinion, is the occasional reference to the Redcap as Tanchu Oranda, a practice which does not do justice to the fish or the fishkeeper.

The Redcap stands out among the plethora of Goldfish varieties as the only one which is supposed to sport a red marking on the top of the head. The challenge to breeders is to ensure that the colouring is restricted to the hood development, a characteristic of the Oranda varieties and which, in the case of the Redcap, should be confined only to the top of the head.

Finnage

While connoisseurs of the Oranda strive for the flowing finnage of the Veiltail, it is becoming increasingly evident that the modern Oranda exists in two distinct types: the traditional Veiltail or Broadtail varieties of the 'standard' Oranda, and the Fantailed Orandas such as the Chocolate and Blue Orandas and the Redcap.

Specialists in the latter varieties try to achieve a shorter finnage, with the pectoral, pelvic, and anal fins being more rounded, while the dorsal fin should not be over-developed. The caudal fins should be paired, with the topmost rays as strong and erect as possible to enable the lower rays to fan out in an attractive 'V' profile.

It should be stressed, though, that these

are only guidelines to which the enthusiast aspires, and such aspirations need not be the prerogative of the hobbyist who seeks an attractive and decorative Fancy Goldfish. Just as acceptable, and equally attractive, are the apparent 'failed Veiltails' which display extended forked tails.

Colouring

It is the colouring of the Redcap which is, by far, the most important feature for the specialist, and which, arguably, provides the greatest challenge to breeders.

Few people realise that Redcap spawnings throw mainly all-pink fish, plus a number of red-and-white versions (these should, of course, not be confused with Red-and-white Orandas). Very few Redcap offspring possess the correct colouring of all-white (or pink) metallic-scaled bodies and finnage, with a round marking of scarlet at the top of the head.

As the fish matures, the development of

the hood will become apparent, the two features of hood and 'cap' coinciding perfectly. All too often, however, and much to the frustration of breeders, an otherwise perfectly-coloured 'Redcap' produces very little hood development, while a perfectly hooded fish may well produce inferior colouring. I, myself, own a Redcap which was as perfect as any I have seen: that is, until a couple of years ago, when the scarlet cap gradually turned to white as the hood reached the peak of its development.

Such an extensive and often frustrating challenge has meant that few high-quality Redcaps are generally available. Quite simply, it is not economical for commercial breeders to devote the enormous resources of time and space required to develop such strains. Despite this, good-quality Redcaps are seen regularly at major Goldfish society shows, which is testimony to the dedication of individual enthusiasts, and to the attractiveness of this increasingly-popular Goldfish variety.



The attractiveness of the Redcap is provided by its unique colouring: pink metallic scales and a scarlet 'hood' development. This example of a young Redcap illustrates perfectly the Fantail-type finnage which is more appropriate to the variety.

WHEN THE PRIZE IS FISHY . . .

Jason Endfield tackles the thorny problem of the 'Fairground Goldfish' — a subject he feels particularly strong about



Live fish prizes are now banned in certain areas, but still common in others, as in this fair in the US.

There I was, waiting for the cashier to process a cheque, making polite conversation about the weather and suchlike, as one does, when, out of the blue, the subject of fish came up. Well, they say that pet owners grow to resemble their pets, and I can only assume that I look like a fish because, invariably, that is what most people, usually strangers, decide to talk to me about!

And so, there I was, talking to this nice lady about her goldfish. The ones she can never keep. "Oh, I've tried", she told me wearily, "but they're very temperamental, aren't they?"

It was at this point that I foolishly revealed my fishkeeping activities. I explained that there are a few basic rules to follow, and then, it's plain sailing. But she remained unconvinced and went on to tell me about the various bowls and tanks that she had tried, and then the conversation switched abruptly to rabbits. I keep rabbits as well as fish, which is probably why the subject changed. She must have detected rabbits in my face too!

It dawned on me that I can blame my unfortunate features on my choice of pets (well, I need to blame something!) — just as well I don't keep Aardvarks . . .

So I heard all about her success with one albino rabbit of four years' standing. I think I persuaded her to persevere with her goldfish and I thoroughly recommended ACP to her, of course. I just hope she doesn't recognise herself here . . .

As usual, it's taken me some time to get to the point. This lady had come by her temperamental goldfish via that dubious source — the fairground. In other words, she won them by throwing a hoop over a stick, or some such feat of human skill.

There must have been very few people who haven't won an instant pet by this method, and my heart sinks every time I see a gleeful six-year-old clutching a little plastic bag containing an anything-but-gleeful goldfish. Usually, the stallholder will give the winner the opportunity to purchase one of those round glass bowls in which to house the poor fish. More often than not, however, hasty plans are made to clean out that big

margarine tub in the fridge. Should the thing survive, then the novelty soon wears off.

And so, thousands of goldfish continue to suffer in this way. It's down to inexperience and/or ignorance. Not the fault of the 'lucky' winner, and not only the fault of the stallholder, but surely also the fault of some suppliers — whoever they may be. Surely, this type of activity must be doing some damage to the reputation of the hobby.

These fish can undergo such a lot of maltreatment, even prior to being offered as prizes, that their chances of survival must be small anyway. At a recent community-type show in our area, this fact was brought home vividly to me and, no doubt, very many others, on seeing over 30 goldfish in one small bowl! It's hard to visualise, isn't it? But it was there for all to see.

Letters appeared in the local press, complaining, and, apparently, the RSPCA are investigating, though it's doubtful that too much time will be devoted to the plight of the goldfish when there is so much suffering in the animal world generally.

What transpires is that the unhealthy fish die and the confused new keeper is left with the false impression that fish are difficult pets to maintain — "temperamental", as the cashier maintained — and if they can't even keep goldfish, then the idea of more exotic species must seem 'pie in the sky'. So, potential fishkeepers fall by the wayside.

There is, I suppose, another side to the coin, in that some fish will inevitably survive in the care of a more responsible and better informed keeper, and once the seed has been sown, it generally grows, and so, another hobbyist is born. But these cases are probably on a small scale, and certainly not worth thousands of fish suffering in the process.

Most of us would agree (I hope) that the practice of giving fish as prizes should not be allowed. Surely, everybody would also agree with the banning of fairground goldfish completely. Or perhaps someone could argue otherwise? Even those that argue for the continuance of fish prizes must acknowledge that rigid control should be implemented to govern the conditions under which the fish are kept.

Meanwhile I, and, no doubt, many others, are left trying to restore confidence in those would-be fishkeepers who have become somewhat cynical through their experiences with fairground goldfish. After all, we can't have everyone, like my new friend the cashier, turning to rabbits.

Just think of it — we'd be overrun! Then guess what they'd be giving away as prizes on the hoopla stall . . .

Spotlight on *Goldfish*

THE BRISTOL SHUBUNKIN

Expert advice on this elegant variety of Fancy Goldfish from top UK breeder and keeper, Vic Capaldi of the Bristol Aquarist Society.

(Photographs of the author)

WHETHER you want a cold-water fish for an aquarium or pond, or for exhibiting at a show, you won't go far wrong with a Bristol Shubunkin. Providing you start off with good stock, you will find them in my opinion, more rewarding and easier to breed than the Common Goldfish, as you will obtain results much more quickly. For example, Bristol Shubunkins will start to show some colour only about four weeks after hatching.

Early Shubunkins

The first Shubunkins are said to have appeared in Japan in 1900. They were multi-coloured fish which the American breeders then started to produce, but they had long, pointed finnage. When these fish first arrived in Britain, members of the Bristol Aquarist Society realised that they were colourful and hardy fish. So much so, that in 1934, members of the BAS decided to draw up a Standard for this Shubunkin, which was to be called the Bristol Shubunkin.

Several fish were looked at to decide on an outline drawing: a standard to achieve, rather than a standard to maintain.

The first Standard allocated 35 points for

colour. The only trouble was that fish of inferior shape were winning on account of their colour! So, in 1938, the BAS revised their pointing system and gave 35 points for colour, with 5 extra points for body, tail, finnage, and soft gill plates.

In 1979, after 50 years of Shubunkin breeding by fishkeepers all over the UK, the Standard was again brought up to date by popular request. It includes a 5x20 points system, and a much fuller caudal fin is recognised. The outline drawing of the modern Bristol Shubunkin today has now been adopted by all the major societies in the UK.

Breeding Shubunkins

If you intend to breed this lovely fish, try and get hold of some good stock. If you attend one of the major shows in the UK, I am sure you will not be disappointed. There is a very good exhibition held by the Goldfish Society of Great Britain in London annually. Another good one is held by the Northern Goldfish and Pondkeepers Society at Altrincham in the north; then there's one in Coventry, held by the Association of Midland Goldfish Keepers and last, but not least, there's the show held in Bristol by my own society, the Bristol Aquarist



A Bristol Shubunkin gone wrong — note the double dorsal fin!

Society. Ideally, you want, at least, one female and two or three males, to make sure of good fertilisation. When you are selecting your adult breeding fish, don't pick a fish that has a snout; you want a fish with a nice, even contour from the tip of its mouth, right through to the front ray of its dorsal fin. If you breed with a fish with a snout, you will find that all your baby fish will inherit this characteristic and you have wasted a whole season. Far better to start off right first time up.

You also want, if possible, to have Shubunkins with a nice, full caudal fin, rounded at the ends, not long and pointed like a Comet tail,



An excellent specimen of Bristol Shubunkin with a lot of blue pigmentation.



The large-lobed tail fin which is typical of a good Shubunkin is beautifully illustrated in this shot.

which is an entirely different fish (try and get hold of a Standard Book). All the societies I have mentioned above can supply a copy for a very small sum.

As regards colour, don't expect a perfectly blue Shubunkin. These only come from line breeding, but if your fish are good in the first place, they will still produce show bench fish. I, myself, managed to breed with a dark blue female last year, but the male was predominantly orange. The resulting babies, while not being dark blue, were nevertheless very pleasing. I like to spawn my Shubunkins at about 62° to 65°F (16.5-18°C) in 36 x 15 x 15in (90 x 38 x 38cm) aquaria. If you are going to fill your aquarium with water to the top, put a cover over it as the fish get excited and may jump out during spawning. A piece of nylon curtain tacked onto a frame the same size as the top of the aquarium will do fine.

Another way is to fill the aquarium only two-thirds full. There is nothing worse than to come home to find your prize possessions on the floor, dead. For spawning medium I use Hornwort (*Ceratophyllum*) because it gives the young fry something to nibble on when they are free-swimming.

I know some fishkeepers make up nylon mops out of nylon wool instead of plants, but if you do, make sure that you boil out all impurities before use.

I have not mentioned hand spawning, because I don't like it, and unless you are an expert, you may damage your fish... So I leave it to the experts!

With a bit of luck your fish will spawn in April or May. If they have not spawned after a few days together, it is worth taking off one third of the water in the tank and topping it up with fresh, a couple of degrees cooler. This acts as a stimulant to the reproductive drive of the fish.

Hatching and rearing

Once they have spawned, I take out the adults as soon as possible; otherwise, they will eat their eggs. I then raise the temperature to 70°F (21°C)

and the fry start hatching after four days. Some eggs will be infertile and go white, but if you can see a couple of dozen sticking onto the glass of the aquarium, you can bet there's about another hundred hidden in the plants. I don't feed my fry for a couple of days, because they will live on their yolk sacs over this period. Even, so, the more advanced ones can be seen nibbling at the plants.

After a couple of days I start making up some Brine Shrimp cultures (this is a very good food for the first two or three weeks — you can see it in their tummies!).

By this time the fry should be able to take sifted *Daphnia*, and keep progressing till they can take, adult *Daphnia*. If you can't get these water flea's you will have to sift dried food for the fry.

After about eight weeks you should be able to

see the results of your efforts. Pick out all the bronze metallic-coloured fish, and all the pink ones (flesh-coloured) and cull the rest (ie give them away). You will need to keep about 50% of your spawn, but don't worry, because this will still be enough. This culling process is a blessing in disguise, because you will still have more fish than you will know what to do with.

When the fish start to grow, you don't want more than twenty youngsters in a 3ft (90cm) tank with aeration. It's also worth giving the better-coloured ones a bit more room than this. With a good summer, and maintenance, baby Shubunkins should be 2in (5cm) body length by the end of four months. Then, why not put them in a fish show as a team of four current-year fish?

Who knows, you could win a major prize... and beat the experts in the process!

BRISTOL SHUBUNKIN

THE BRISTOL AQUARIST SOCIETY STANDARD



BODY: Slim and streamlined, with depth of body less than half length of body. Length of head, less than one third length of body. Snout rounded, mouth and nasal septa small, with iris eyes (as opposed to 'button' eye).

COLOUR: To be calico only.

FINNAGE: Dorsal fin to commence at highest part of the body and stand broad and erect. In height, three quarters depth of body, slanting back to caudal peduncle, but not touching base of caudal fin. Top

margin to be slightly concave and first ray slightly convex. Pectoral fins to be paired and of even length, in proportion to other fins, with rounded ends and held well away from the body. Ventral (pelvic) fins to be paired and of even length, being three quarters depth of body, well spread, with rounded ends. Anal fins to be single, long, broadening, and with rounded end. Caudal fin shall be single and carried in a vertical plane without fold or overlap. Lobes to be large, rounded and well spread, according to outline drawing. Distance from top to bottom of caudal fin to correspond with distance from top of dorsal to bottom of ventral (pelvic) fins.

CHARACTERISTICS: The Bristol Shubunkin must be immediately recognisable as such, with an overall impression of brilliant blue, together with the other calico colours. The streamlined slim body accentuates the large flowing caudal fin.

Spotlight on Goldfish

BREEDING GOLDFISH

With the coldwater season well under way, Peter Cole takes a look at some of the most important steps that need to be considered by anyone wishing to breed goldfish, either in ponds or aquaria.

(Photographs by the author)



Spawning taking place during the early hours of the morning.

Goldfish were introduced into Europe from Asia during the eighteenth century and, since that time, and up until this very day, countless households have, at one time or another, been able to enjoy their company.

This has been mainly due to their availability, as production is easy and at relatively high levels, with the Japanese, Chinese and Americans leading this field.

If you are fortunate enough to have a collection of goldfish and a well-planted out garden pool, you may be lucky in seeing a few new arrivals each year. On an average, however, in a normal everyday garden pond and without the intervention of Man, the



When spawning has finished, many of the eggs will be eaten, both by the parents themselves, and any other fish that happen to come across them.

baby goldfish do not always survive, being eliminated through natural selection by disease or internal malfunctions, and becoming food for other species of aquatic life, or even the parents themselves. For the readers who are interested in cultivating the offspring, either to increase their goldfish group, create an indoor setting or, simply, just to own and be proud of a collection which they have raised themselves, the fundamentals of breeding are very easy to follow.

Reproduction can be left to take place naturally in the pond itself, or spawning can be stimulated by placing the parent fish into an aquarium tank of approximately 100 x 30 x 30cm (c 39 x 12 x 12in) that has been arranged for this particular purpose.

in length. Since it could be difficult to determine the sex of a particular fish, it is advisable to buy at least five specimens to make reasonably sure of both sexes being represented.

The art of reproduction

Breeding will start during the warmer months of the year as the water temperatures approach 18°C (64.5°F), which can be from, say, May until the end of September. During spawning, eggs are sprayed among fine-leaved vegetation by the female, while the male presses himself against her abdomen and releases milt in order to fertilise them.

The eggs are approximately 1mm (0.04in) in diameter, adhesive, transparent and



It may take some of the baby goldfish one year before they change colour.

Sexing goldfish

To determine the sex of goldfish, particularly in some fancy varieties out of the breeding season, can be a bit difficult, but this task can be carried out quite accurately during the season itself. The males will produce small white tubercles about the size of a pinhead on their gill covers and, possibly, the first ray of their pectoral fins (tubercles are sometimes referred to as 'pearl organs'). Throughout the breeding season, the females are clearly distinguishable by having a larger abdomen, as they become full of eggs. Outside the season males will retain thickened, roughened edges on the first ray of their pectoral fins, but this is not always easy to detect.

Goldfish will reproduce successfully at approximately 2 to 3 years old, at which time they will be anything from 8-12cm (3- c 5in)

amber in colour, and will become attached to the roots and leaves of nearby plants. The females will always spray their eggs near the surface. Therefore, border and floating plants with roots that hang down into the water are a particular attraction. Ideally suited are Water Lettuce (*Pistia stratiotes*) or Water Hyacinth (*Eichhornia crassipes*). In emergencies, young soft conifer branches can be placed in the water around the edges of the pond. Alternatively, special breeding mats can be used, of course. Any eggs that are not fertilised will turn a milky white within a few hours and possibly become covered with a furry fungus growth by the following day.

A tank containing approximately 25cm (c 10in) of water and plants arranged at each end to leave swimming space in-between will be ideal for spawning most varieties of goldfish. To catch any eggs that do not



A healthy, well-formed 'wild-type' goldfish. At this stage there is no telling whether this fish will ever develop any of the colours which we normally associate with the Common Goldfish or not.



Cross breeding sometimes produces unusual results, but rarely, quality fish.

adhere to the floating plants, submerged plants held down by weights, i.e. stones, can be used to line the bottom.

The feeding of livefoods for a few weeks (e.g. clean chopped earthworms) will help to prepare fish for spawning. Water temperatures of around 16-18°C (61-64.5°F) will influence the actual time of spawning, so monitoring the pond or aquarium water accordingly will indicate that the time for reproduction is near. If the water temperature rises by approximately 3°C (c 5.5°F) it will stimulate spawning. Similarly, if the water temperature is reduced by approximately 3°C (c 5.5°F) this will also create stimulation. The latter is often seen in ponds at the end of the summer season (September and October), after a severe drop in temperature during the night. These conditions can be created in a tank by using a thermostatically controlled heater.

The transfer of parent fish from the pond to the tank can be carried out when both water temperatures are at approximately 18°C (64.5°F), and if, at this stage, the males have been distinguished from the females, one can separate them for a few days using a tank partition. This will increase the chances of reproduction, once the parents have been re-introduced to each other, during the evening, and the temperature is raised by 3°C (c 5.5°F).

In a pond, as within the tank, spawning will begin in the early hours of the morning and continue, with a possible break, through until midday. An average-sized female will

lay approximately 1,000 eggs and continue to do this periodically throughout the summer months, until the end of September.

The parent fish will eat the eggs shortly after spawning. Therefore, if a tank is being used, the parent fish can be returned to the pond or the plants in the pond moved to a suitable tank containing water of the same temperature. As the extreme difference in temperature between the atmosphere and the water could destroy the eggs, it is better to place a plastic bowl below the surface of the pond and remove the plants and eggs without them leaving the water.

At temperatures of around 21°C (70°F) the eggs will hatch out within 4 to 5 days, while at, for example, 10°C (50°F) they will take at the least 2 weeks. If the top of the tank is covered, this will protect it from dust and draughts; this will also help to stabilise the water temperature.

The early stages

Once hatched, the small 4-5mm (0.15-0.2in) goldfish fry will remain attached to the plants or walls of the aquarium and will live on food that is contained in their small abdominal yolk sac. After a few days, the contents of the sac will have been absorbed and the fry will be seen searching for food.

It is now the hobbyist who will be responsible to feed the fry, which will be able to eat only very minute organisms that live in the water. This can be achieved by introducing Infusoria — a term used in referring to

minute single-celled animals (protozoa) that can be found in water that contains decomposing vegetable matter. A good supply of these can be found in stagnant water but, with the risk of introducing unwanted organisms, dangerous water enemies, or clouding the water to a point where we will be unable to see the development of the fry, it would be better to produce the Infusoria ourselves. Alternatively, a good-quality liquid fry food, such as Liquifry, may be used.

Infusoria are required in quantity and must be produced by the hobbyist in advance to meet the demands of the hungry fry. A developing culture can be started the day after the fish spawn at water temperatures of 18-20°C (64.5-68°F). This Infusoria culture can be produced by placing 3 or 4 lettuce leaves or other bruised vegetable matter (or fruit, such as banana skins) into a jar containing water that has been brought to the boil. Add the water very carefully so as not to crack the jar. Once cooled, the jar should be covered and stood in a warm, light place for approximately 3 days. By this time the Infusoria will have developed in sufficient quantity, even at room temperatures. To feed these to the fry, pour some of the water into the tank, periodically. After approximately 3 days the culture will die; therefore, a second one should be started 2 or 3 days after the first. Conveniently, three cultures can be developed, with each becoming mature at an interval of 2 or 3 days.

The tricky part of this feeding method is the difficulty in calculating exactly how much of the water containing the Infusoria needs to be added to feed the fry. Not enough food will starve some of the fry, while too much liquid containing the culture could possibly cause the tank to become polluted. Temperature is also very important. To keep the Infusoria alive long enough for the fry to eat, the culture must be kept at the same temperature as that of the nursery tank.

For the beginner, or should we say, conveniently, Infusoria can be obtained from some



Popular as they are, good-quality Common Goldfish are not always that easy to find.

local pet shops in tablet form. Two or three of these tablets, placed at different points in the tank, will provide enough food for an average-size spawning, with further tablets being added periodically as the diminish in size. Since these tablets will take a few days to release the Infusoria, they should be placed into the tank a day or two before it is estimated that the eggs will hatch. It is, of course, essential to keep the tank clean during this stage of the rearing. This can be carried out by using a small siphoning tube, being very careful not to remove any fry.

After one week, it will be possible to remove the plants on which the eggs were laid, if desired. By now the fry will be able to eat larger meals. Most breeders will continue to feed their fry on Infusoria for a while, but will also start to add baby Brine Shrimps (*Artemia salina*). Brine Shrimp eggs can be found at most pet stores that specialise in fish, and these can be hatched a few days after introducing the Infusoria into the tank. Some companies manufacture special hatching kits which makes the task of producing Brine Shrimps an easy and clean one.

Alternatively, one can use a jar containing 1 litre (about 1 1/2 pints) of tank water, 1 large teaspoon of natural salt and 1 level teaspoon of the Brine Shrimp eggs, aerating the water by means of an airstone. If the water is kept at approximately 18-20°C (64.5-68°F) the Brine Shrimp will hatch within two or three days. To feed these to the fry, remove the airstone and allow the baby shrimps, known as nauplii, to settle on the bottom of the jar.

Quantities can now be siphoned off through a fine sieve, rinsed in freshwater and fed to the fry, being careful to leave behind the empty eggshells.

At two or three weeks old, the young fish will now be able to accept fine powdered fry food which is, again, readily available at all shops. Feed this sparingly, but regularly — it is far better to feed a little and often. During the first four weeks, the fry can be fed at least 3 times a day, reducing this to only twice for the following four months. After this period they can now be fed as adult goldfish.

If fry thrive on the diet provided, then the next problem will be space. If they are fed correctly, one will end up (if a large tank is used) with approximately 100 baby goldfish, from an average spawning, in three or four months.

If it becomes necessary to handle the fry at any time, they must be moved very carefully as they are extremely fragile. A net will possibly cause spinal damage; it is therefore better to use a bowl or ladle in order to catch them.

It would be advisable to use a bare tank to raise the fry, as this can be kept clean easily, moving them to a tank that has an under-gravel filter at about four weeks old. This tank will also have to be cleaned regularly, of course.

Selection

As the aim of the whole exercise is to breed good-quality goldfish to add to an existing

collection, I will leave mass production aside.

To select for beauty will take a keen and experienced eye, but for a basic rule, a beautiful Common Goldfish of quality will be more likely appear from a baby which has relatively long body and fins. A baby goldfish of any fancy variety will need to have a short or long body (depending on variety) and fins that are appropriate to their particular kind, e.g. double, single, upright, drooping, lacking (as in Ranchu, Celestials and Bubble-eyes), and so on.

At this early stage it is difficult for some aquarists and pondkeepers to realise that they have to dispose of some of their baby fish. However, if one wishes to be successful, it is better to make this firm decision. Surplus fish should not be destroyed, but given a chance to survive, for example, by distributing them among friends who have garden ponds.

Thirty or so fry should be retained and the others disposed of. When the largest of the selection are approximately 2.5cm (1in) in length, one can provide them with another tank or divide the existing tank in two by using a piece of glass or perspex. Dividing the larger fry from the smaller will prevent one from starving the other.

After one more month, another selection — this time for shape and finnage — is made, leaving about 10 babies in each group. Finally, a selection of 5 to 6 fish is set aside to become the proud eventual additions to the existing fish collection.

Mr & Mrs A Lisi
Tanglewood
GERRARDS CROSS
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IN-VITRO REPRODUCTION OF WATER LILIES

(A Developing Research Programme)

By Philip Swindells

(Photograph by the author)

One of the more unusual winners of a 1989 SMART (Small Firms Merit Award for Research and Technology) award presented by the Department of Trade and Industry was Wycliffe Hall Botanical Gardens near Barnard Castle in County Durham. The award was made to enable pioneering research to be undertaken into the in-vitro reproduction of water lilies. This is the propagation of water lilies by tissue culture in a laboratory, followed by their return to a natural growing medium.

Background details

The reasons behind this research are many and, if successful, the technique is likely to have widespread implications in the propagation of higher aquatic plants, especially those related to the water lilies or Nymphaeas. Most of the desirable water lily varieties reproduce slowly, so that, by the time plants are saleable, they are very

expensive. In-vitro reproduction would hasten their production and, hopefully, stabilise, or reduce, their price to the pond owner.

Further, many beautiful water lily varieties are no longer available from nurseries because of their slow rate of reproduction, and are therefore in real danger of extinction. Rapid multiplication should, hopefully, have an immediate impact upon the survival of such varieties.

This also applies to wild populations, for the techniques developed for commerce will be just as effective when used on our native water lily. A 1987 survey by the Conservation Association of Botanical Societies, called the 'Water Lily Search', revealed a steep decline in the occurrence of our native water lily and pond lily.

However, the most important outcome of this research will be the containment of the devastating Water Lily Crown Rot disease (see Letters page for further details). Currently, this is the subject of investigation by the Agricultural Development and Advisory

Service, but to date, no cure has been suggested.

Tissue culture should prove to be a most effective way of cleaning up stock and eliminating the disease.

For some years now, orchids have been produced commercially in culture and, increasingly, economic crops like bananas and pineapples have benefited from the introduction of tissue culture, but aquatic plants have lagged behind. Some work in the United States and continental Europe has been undertaken with aquarium plants like *Myriophyllum*, *Vallisneria* and *Cryptocoryne*, but nothing with *Nymphaea*.

Complicating factors

It is not surprising really, for the problems are enormous. For example, tissue culture techniques demand 'clean' plants and a clean environment. Aquatic plants are notoriously 'dirty', and water is the horror medium of all in-vitro practitioners as it transmits pathogens freely. So, researchers have shied away from these very troublesome plants.

Nymphaeas are also afflicted by internal bacteria. We are uncertain why they naturally contain bacteria within their tissues, or what benefit this confers upon the growing plant, but we know that, in tissue culture, these bacteria escape and destroy the young plants.

Several techniques are being tried to reduce the incidence of bacteria in the tissues so that cleaner stock becomes available for use, but it is likely that, ultimately, an anti-bacterial compound will have to be incorporated into the growing media. The research programme is being supplemented by investigating tissue from excised embryos, or the root tips of freshly-germinated seeds.

Heat and light levels also greatly affect the technique to be employed, and varying levels and combinations of each are being used. This is not only to enhance the rate of reproduction, but also in an effort to ensure that tissue is available from mother plants all the year round.

Having developed a method of defeating the bacteria and reproducing plantlets, the battle is not over, for these tissue-cultivated propagules have to be returned to a natural substrate. In the past, this has presented some problems with terrestrial plants. However, we expect the process to be simpler with aquatics. If this is so, water lilies should become much more widely cultivated and enjoyed in a greater diversity than ever before.



Nymphaea 'Froebeli' — one of the varieties being investigated as a suitable candidate for tissue culture.

Koi Talk



By John Cuvelier

Indispensable book

To the average novice Koi-keeper who is, perhaps, just starting his/her first full season, there can be nothing worse than getting up one morning to be confronted with the sight of an obvious problem with that favourite Koi. Perhaps it just doesn't look right, or is skulking on its own, away from the other fish. It may even have some visible sign of illness, such as a patch of fungus, or a thick layer of excess 'slime', or it could be breathing excessively fast. Whatever the signs, something needs to be done quickly, but what?

It has to be said at the outset that diagnosing 'fishy' problems can be VERY difficult, particularly if you are new to the game. While there are many books available which cover the hundreds of different fish ailments, the majority appear to be aimed at the owners of a degree in veterinary science, in addition to a working knowledge of Latin!

Many of the excellent 'hobbyist' type of books now available give mainly 'first line' information on disease and treatments, but there is one more comprehensive volume which I, as an amateur, would recommend to all. **DISEASES OF FISHES** by C van Duijn, jr, published by **Butterworth and Co, London**, is an absolute must for the library.

Not only is it written in language that even I can understand (and that's saying something!), but separate chapters cover such things as detailed breakdowns of the

effects which various metals can have on fish, environmental aspects, and a truly excellent chapter entitled 'The Medicine Chest'. Tables for all those bothersome conversions and simple instructions for measuring and making up stock solutions of medications are all there. Hundreds of very clear drawings and photographs enable the most dedicated investigator to identify, with the help of a microscope, all those nasty little invaders which attack our fish from time to time.

Get hold of this book if you can; you'll find it indispensable!

Non-competitive show talk

By the time you read this, Koi Show time will be with us once more. If there is one thing which has always been a matter of personal regret, it was the introduction of a competitive element to the pleasure of keeping these lovely fish.

I can understand the thinking behind the large shows for the Koi breeders in Japan, as the years of dedicated work which go into the introduction of a new variety of Koi, or even an exceptional example of an existing variety, are deserving of some recognition. Unfortunately, until such time as Koi breeders in the UK reach the same standards of skill as their Japanese counterparts, the only 'skill' to be rewarded here (in my opinion, I hasten to add) is the ability and willingness to part with large sums of cash when buying Koi.

Before some system of control was brought in, there were even cases of individuals buying a Koi at a show and entering it at the same show and winning top trophies with it!

I'm the first to admit that without these shows many people would be denied the pleasure of seeing those magnificent top drawer fish, but wouldn't it be nice if their owners could be persuaded to exhibit their fish without the necessity of awarding prizes, thereby removing any excuse for the tantrums sometimes thrown by the non-winners which have spoiled more than one show?

Of course, such a viewpoint could only come from a com-

pletely non-competitive type like me who has never had any inclination to be proved better at anything than my fellow men, but I'm sure that there must be many more with a similar outlook.

Miscellanea

1 I, for one, breathed a sigh of relief at reading in my Sunday paper that the water undertakings around the country have decided that the fitting of water meters to all consumers' properties would be too expensive and complicated an operation. The bad news is that they are now considering a 'Poll Tax' type of charging for water supply. 'Nuff said! It's to be hoped that a 'head count' of our fish is not contemplated when arriving at a figure!

2 News has also surfaced that the manufacturers of my favourite Koi stick food are launching a new food product in the near future that is even better (if that's possible). I await with interest!

3 While on the subject of foods, I know for a fact that many people still feed their Koi with trout pellets as these can

undoubtedly work out considerably cheaper than the normal Koi pellets, sticks etc, particularly if Japanese foods are involved. However, caution should be exercised in view of the fact that trout pellets are intended to put weight rapidly on to fish intended for table use, longevity of trout life being of no interest to trout farmers.

The very high protein levels found in trout pellets could well be harmful to Koi if used as a staple diet. Used as an additional part of a normal diet, trout pellets are perfectly acceptable, the rule being, as in many things, to use a little commonsense.

4 Our little corner of rural England has been blessed with the opening of a large veterinary practice just four houses away from my own home. I'm already trying to get my foot in the door by attempting to generate an interest in aquatic diseases with one of the partners who, I'm reliably informed, already has an interest in exotic species! Should I be fortunate enough to collect any interesting tips or facts along the way, watch this column.

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SCIENCE SERVING AQUATICS

Naturalist's notebook By Eric Hardy

London aquatic wildlife finds

Last year, the *Aquarist & Pondkeeper* drew attention to the expansion in alien crayfish farming in Britain, introducing many specimens to British waters where they now breed wild and are increasing. A Nature Conservation Order banning them was made under the Wildlife and Countryside Act to protect Woolcombe Fen in Dorset, an SSSI, when it was threatened by crayfish farming.

The Long-clawed Turkish Crayfish, *Astacus leptodactylus*, subspecies *salinus*, with slightly curved claws, has bred for several years near London in ponds on Hampstead Heath and Clapham Common, and in Suffolk. When the Hampstead Lock of the Grand Union Canal was temporarily drained, British Museum zoologists identified a further thriving colony of the same subspecies. Though susceptible to crayfish disease, this crayfish grows faster, and is more fertile, than our native species and, tolerating a wider range of water quali-

ties, may threaten its future.

From the new pools excavated in the old Surrey Docks, to Tower Hamlets in London's East End, London naturalists also listed five breeding species of dragonfly: Blue-tailed and Common Blue Damsellies, Common Darter and Brown and Southern Hawkers, plus a further six visitors. In the 20 mile radius of St Paul's, 25 species have been recorded breeding, 11 of them commonly; but two others have been extinct since 1949.

London Natural History Society's survey of the 'New River' (a very old aqueduct) from Ware to Stoke Newington, found the rare River Dropwort, *Ceratophyllum demersum*, widespread in the northern and central zones. This half-submerged native water plant is confined to the East and West Ridings (Yorks), S E England and central and eastern Ireland, with a former site in Anglesey, and one extant in Denbighshire, near Wrexham.

Research projects

University College, London, research attributed the decline of Hampshire Natterjack Toads to acid air pollution, while the Nature Conservancy last year granted £20,000 to Sussex University to study the terrestrial ecology of these toads.

They also granted the British Herpetological Society £959 to survey Sand Lizards, £4,000 to the University of East Anglia to research the decline and re-establishment of higher plants in the Norfolk Broads, £13,334 for the National Environmental Research Council to make a nutrient assessment of Loch Eye and £49,787 for Miss E. Charter and Miss S. Bell to survey the freshwater lochs of northern Scotland.

Leicester Polytechnic received £21,567 to survey amphibian communities; £8,000 went to investigate the control of New Zealand Swamp Stonecrop, *Crasula helmsii* (see **The Swamp Stonecrop Threat**), by Lindsay Complin, in the July, 1988 issue of *Aquarist & Pondkeeper*, in British waters and £37,000 to the conservation of British freshwater fish.

Facts and figures

The world trade in aquarium fish was estimated in 1975 by FAO to be worth around US \$4,000,000,000. In Britain, 2 million households were believed to possess aquaria at the time (currently, the figure is 2.4-2.8m) and ten times this were in the USA. Germany had the largest number of ornamental live fish per head of population.

The Environmental Investigation Agency of London recently informed the Council for Europe that 500 live reptiles a week, including rarities like the Gila Monster, were found in a survey last year at Amsterdam central post office. CITES, the endangered animals trading legislation, had figures showing that 145,879 wild reptiles were imported into the EC between 1985 and 1987, an underestimate because single shipments often numbered 10,000 animals. Small lizards comprised most of this trade. The

UK in that period imported 6,470 Royal Python's packed inessian sacks in crates for air travel.

Dr K. E. Banister, a British authority, informed the R.S.P.C.A. that between November 1987 and October 1988, 202,238,623 live freshwater fish were imported into the U.K. on 772 licences, and assumed it continued like this the following year, with 484,250,623 fish on 955 licences.

About 90% were commercially-bred, he stated, and two-thirds of the tropicals were from Far Eastern fish farms. Several South American fish which cannot yet be bred in captivity were wild-caught. He considered that up to 80% mortality occurs in the transport of fragile *Rasbora* species from Asia. Some collectors and exporters were accused of using hormones to improve breeding colours, at the same time making the fish sterile to ensure a constant trade demand.

In 1988 the British Ministry of Agriculture and Fisheries issued licences free to import 484,000,000 live fish. As these licences are not recovered there is no check upon how many times they are used.

SSSI drained

The North Wales Nature Conservancy at Bangor told me they had to give consent recently for the drainage of Llyn Traffwll, an SSSI (Site of Special Scientific Interest) of rare water plants and waterfowl in Anglesey, near Valley, because it is privately owned. The water is being drained to remove its coarse fish and re-stock as a trout fishery. Some irregularities e.g. no basket on the pumps and some diesel pollution, were dealt with by the Water Authority in January.

It is the fourth Anglesey haunt of the Waterwort, *Elatine hydropiper*, and has the Spike-rushes, Flowering Rush, Ivy-leaved Duckweed, etc. A former nesting haunt of Bittern and Marsh Harrier, it is Anglesey's main wintering ground for Shoveler. Great Crested Grebes and other waterfowl nest there. Negotiations to purchase it for a nature reserve at some £350,000 the other year, fell through.



Darter Dragonflies are now breeding in newly excavated pools in Tower Hamlets in London.

WALTER J. MURRAY

PRODUCT ROUND-UP

BY DICK MILLS

PROSIGN

Keeping a check on the water temperature comes second-nature to most tropical fishkeepers, not only during the day-to-day running of the aquarium, but also at other specific times — when treating disease or doing partial water changes, for instance. PROSIGN's digital thermometer allows a continuous readout of temperature, plus more.

Using the maximum / minimum readings, the DIGITAL MAX / MIN THERMOMETER also gives you information about the operating efficiency of your thermostat. Any widening of the gap between maximum and minimum values shows that the bimetallic strip (in electro-mechanical type thermostats) is 'sticking' and nearing the end of its useful life.

The max/min readings are re-settable, and the thermometer actually checks the temperature every 15 seconds, which is more than adequate in aquarium usages, but not where very rapid temperature changes occur. Even at this sampling rate, the alkaline battery should last at least a year.

Of course, such an instrument has many other uses around the house too, checking fridges and freezers, green-houses (max/min readings vital here), photographic processing and, not forgetting, home brewing! Further information from:

PROSIGN, 80 Windsor Drive, Wigginton, York YO3 8YE

UVAQ

By the time you read this, UVAQ will have unveiled their latest UV STERILISERS for the 1990 season.

Their new range of UV units are the result of listening to customers' suggestions, coupled with their expertise as the UK's major professional UV design specialists.

The units promise to be the very latest in weaponry designed to clear algae and control bacteria in ponds.

Maximum safety (through professional design), large UV

contact chamber, completely shielded from the elements, larger inlet diameter (1.5in BSP thread) — all worthy qualities in themselves — have been coupled together with one more vital ingredient — incredibly low prices! Add to this, a new AQUARIUM UNIT too, and you can see that UVAQ haven't exactly been idling away their time this winter. For more information contact:

UVAQ, Division of UV Systems Ltd., P.O.Box 797, Sudbury, Suffolk, CO10 6FL (Tel: 0787 76259)

AQUARIUM PHARMACEUTICALS INC

What can you do if you haven't treated the tapwater previously to using it in the freshwater or marine aquarium, or if you suspect ammonia is building up in the established aquarium itself?

AQUARIUM PHARMACEUTICALS suggest that you reach for AMMO-LOCK, their new aquarium water conditioner which will instantly rid the aquarium of any ammonia, chlorine or chloramine.



The new range of Ammo-Lock from Aquarium Pharmaceuticals.

Not only does it remove chlorine and chloramines from tapwater, but Ammo-Lock also locks up toxic ammonia produced by decaying plants, algae, fish waste, dead fish and uneaten food, without affecting the use of medications such as

methylen blue, malachite green or acriflavine. Containing no copper or formaldehyde, it will not change pH nor deplete oxygen levels. Dosage is 1 teaspoonful (5ml) per 10 gallons (45l) of water (dilute this dosage with a capful of water before using in the marine aquarium). Available in 1, 2, 4, 8, 16oz bottles, or 1- and 5-gallon professional-size containers. Watch for the Doc Wellfish sign at your aquatic dealer. Details from:

PET PHARMACEUTICALS, Building No 1, Royal Ordnance Depot, Weedon, Northants, NN7 4PS. (Tel 0327 349295, Fax 0327 349001), or AQUARIUM PHARMACEUTICALS INC, PO Box 218, E Hamilton Street, Chalfont, Pennsylvania 18914 USA.

LOTUS

With ever-increasing 'green' awareness, gardeners and water gardeners are more fearful of using chemicals to cure their problems. Fortunately, LOTUS's chemical-free SILTEX is on hand to remedy that silted-up pond without any harmful side-effects.



Siltex — the answer to silt-associated pond problems, from Lotus.

Increasing amounts of silt harbour disease and allow acid and methane build-up. The use of Siltex prevents silting, improves water clarity, increases oxygenation and provides a buffer against acidification. Although a relative newcomer to the garden trade, Siltex has a proven track record in the Norfolk Broads (it's delivered by plane!), London's park lakes and reservoirs. Lotus

knows it works, and you can prove it too. Details from:

LOTUS WATER GARDEN PRODUCTS LTD, Chesham, Bucks.

MEALWORM COMPANY

Mealworms, Maggots or Waxworms? If you can't tell the difference, you're in good company. Many forms of larval life are used as bait or as food for birds, reptiles and amphibians, and now the MEALWORM COMPANY has recognised that there may be a ready market for them in aquatic circles too.

Waxworms, to put the record straight, are larvae of the Waxmoth (*Galleria mellonella*) and a common source of them in warm months are out-of-use beehives. However, a far better, reliable and safer source is by Mail Order from the Mealworm Company. Waxworms are easy to store; in boxes of 50, 100 or 250, they will keep for several weeks at temperatures around 7-10°C (45-50°F). Lifespan is severely curtailed above 10°C, and prolonged storage below 5°C is fatal.

Although the editor's cichlids and my own Angelfish shared our ignorance about actual species identity, they did recognise the waxworms as food, and made short work of them! Waxworms are a safe and nourishing food too — they do not feed on meat, so there is no risk of botulism, and they contain over 50% protein. Further details about this new food source:

THE MEALWORM COMPANY, Phoenix Bird Food Ltd., Unit 1, Universal Crescent, North Anston Trading Estate, Houghton Road, North Anston, Sheffield S31 7JJ (Tel: 0909 568953/4 Fax: 0909 568666)

ROLF C HAGEN

The serious marine aquarist not only knows the importance of accurate Specific Gravity measurements, but also that these also vary with water temperature.

HAGEN have released a

combined **HYDROMARINE HYDROMETER / THERMOMETER** to make this job easier. The unit is simply floated in a beaker filled with the water under test and the SG read directly off a scale. A Salinity Graph (drawn from temperatures at 5°C intervals) is included in an information sheet available from Hagen. Recommended retail price is £29.99. Further details from:

ROLF C HAGEN (UK) LTD, California Drive, Whitwood Industrial Estate, Castleford, West Yorkshire WF10 5QH. (Tel 0977 556622. Fax 0977 513465).



Specific Gravity and temperature readings made easy, courtesy of Hagen.

GREENAWAY

Four 'ready to go' external pond filters have recently been launched by **GREENAWAY**. Capable of dealing effectively with ponds from 200-1,200+ gallon capacities, each unit is spraybar-fed, returning the filtered water, by gravity, via a biological filtration medium to the outlet pipe, and, back to the pond.

Increasing the pump size, and/or using multiple units, allows ponds up to, and over 5,000 gallons to be treated. Information on installation and operation can be obtained from:

GREENAWAY POND FILTERS, Long Melford, Suffolk (Tel 0787 71351).

AQUA-SOIL

Following the dreadful winds of early 1990, outdoor fishkeepers may well be wary of putting up any high structure near their ponds for fear of damage to liners or pre-formed ponds from falling debris.

AQUA-SOIL have recently launched a new product which, coincidentally, has passed

exposure to those very elements with complete success.

The **PONDOLA** is a pond-enclosing pergola, the area between the four uprights being approximately 8 by 5 feet, although the overall dimensions are 10ft 3in x 7ft 3in x 8ft 4in high. The construction features pre-drilled and greased timbers and the 3 x 3in legs may be supported by any 'post-anchoring' systems commonly found at DIY centres. The decorative top is fashioned from 5 x 1.5in and 4 x 1.5in members and all wood is painted with a weather-proofing material.

The **SAKIMOTO SUN SERENITY PONDOLA** is also functional, as well as beautiful to look at: it acts as an heron-deterrent and wind-break; it provides an excellent base, too, for trellis-work, climbing plants, hanging baskets, shading material and even garden lights.

The 'built-to-last' Pondola is factory-supplied to retailers for £163.45 plus £25 delivery and VAT, although direct-customer delivery can be arranged through TNT at no extra cost. Full details from:

AQUA-SOIL PRODUCTS LTD, Mount Zion Mill, Diptford, Totnes, Devon TQ9 7NG (Tel 054 882 592).

INTERPET

It is difficult to judge just when an ordinary fluorescent lamp is not quite up to scratch in its light output. There's no such problem with **TRITON HI-SPEC FLUORESCENT TUBES** from **INTERPET** — they just stop working after some 7,500-10,000 hours of providing just the right light for your aquarium, including those light-demanding marine corals and invertebrates.

As virtually all the energy is used in the desirable light spectrum, fewer tubes are necessary to reach any chosen light intensity using Tritons (They're consequently cheaper to run).

Everyone knows that the different 'colours' of light are absorbed at different rates as water depths increase, and Triton lamps are designed to compensate for this. This is why Triton tubes do not set out to mimic the spectrum of daylight. For further details contact:

INTERPET, Interpet House, Vincent Lane, Dorking, Surrey RH4 3YX (Tel 0306 881033. Fax 0306 885009).

HANNA INSTRUMENTS LTD

The original, easy-to-use **PHep** electronic pH tester from **HANNA** has been joined by two stablemates — the **CHAMP** and the **PHep+**. The **Champ** is a factory pre-calibrated model and, as the most inexpensive tester in the range, is suitable for schools, universities and domestic applications, including, of course, aquarium use and garden soil testing. The **PHep+** has twice the accuracy of the **PHep** and features Automatic Temperature Compensation.



The latest Hanna collection

All testers are lightweight (65gms), cover the full pH range (0-14) and have a 1,000 hour battery life and clear LCD read-outs. For more information contact Valerie Delph at:

HANNA INSTRUMENTS LTD, Happy Valley Industrial Park, Primrose Hill, Kings Langley, Herts WD4 8HZ (Tel 09277 60655. Fax 09277 68669).

ARCADIA

Nothing detracts more from the immediately attractive, well-stocked aquarium than a tangle of cables supplying the 'electrics'. Furthermore, when associated with such a 'damp' hobby as fishkeeping, nothing could be more dangerous!

The **ARCADIA** range of fluorescent lamp fittings will make for both tidy and safe installations: the lamp holders (available to fit three tube diameter sizes — 3/8in, 1in and 1 1/2in) are water-resistant, and the non-toxic plastic spring clips can be held in place with adhesive pads, obviating the need for any metal parts near to the water. Details of all Arcadia products from:

JERRARD BROS PLC (Tel 081 688 8222. Fax 081 681 3119).

KING BRITISH

Pond owners can look forward to a successful (and stress-free) season by putting their ponds and fishes on a continuous combined treatment of two important **KING BRITISH** products — their **SAFEWATER** water treatment and **POND FOODS** and **PELLETS**.

By regularly using **Safewater** you can maintain the natural bacterial balance within the pool, vital for denitrification and nitrification purposes, and the resultant healthy conditions will allow the fish to take full advantage of the nutritional benefits found in the wide variety of foods; in short, promote health, growth and activity the **King British** way. (By the way, **Safewater** and **King British** foods work just as well in the indoor aquarium too!) Full details from:

KING BRITISH AQUARIUM ACCESSORIES CO LTD, Hayfield Mill, Haycliffe Lane, Bradford, West Yorkshire BD5 9ET (Tel 0274 573551. Fax 0274 521245).

STAPELEY WATER GARDENS

Garden centres are great places to browse around (especially those with water garden specialities), but sometimes you come away with more questions than answers. **STAPELEY WATER GARDENS** (Europe's largest Water Garden Centre) must have realised this for, with a great sense of responsibility and anticipation, they have arranged Sunday afternoon 'master-classes' for June and July, just as the season is really getting into its stride.

Subjects to be covered are not limited to water-gardening and include Conservatory Plants, Trees and Shrubs for Small and Large Gardens, National Trust Gardens, Rose Care for Maximum Flowering, Insect-eating Plants, Border Perennials for Spectacular Effect, Koi — Selection and Care, Pools and Filters, Water Lily Walk, Hanging Baskets, and Pests and Diseases of Pot and Garden Plants. The two subjects most applicable to our readers take place on **Sunday 15** and **Sunday 22 June**, respectively.

Well before the summertime lecture series, **Stapeley Water Gardens** will be celebrating their 25th Anniversary at the Chelsea Flower Show; already winners of 2 Gold Medals in

1989 with their display of tropical water lilies, this year's presentation will include a lily named after one of the founding brothers of Stapeley's — the new *Nymphaea Ray Davies*, together with the beautiful 'Queen of Whites' and 'Perry's Pink'.

Should you not have room for a pond, then Stapeley's will be showing how to create a colourful TUB GARDEN. These can be filled with lilies, other aquatic plants and even goldfish, and are ideal for any limited space on the patio, roof garden, conservatory or even window sill — all at very little cost.

You can see the complete range of products on the Stapeley Stand, where two other items will prove to be invaluable when the Show is over — the *Stapeley Book of Water Gardening* and the *Stapeley Water Gardens Catalogue* (also available by Mail Order).

Stapeley Water Gardens are at Nantwich, Cheshire (Tel 0270 623868. Fax 0270 624919), and full details of all events are



STAPELEY WATER GARDENS

A tub garden idea from Stapeley, available from Barbara Kay or Melissa Hay at:

KVO ASSOCIATES, 107 Lancaster Gate, London W2 3NQ (Tel 081 723 0725).

WARDLEYS

You can get geared up for the outdoor season with a range of quality products from WARDLEY'S.

Adding POOL SUPER-CHLOR to any tapwater intended for pond use will dispel chlorine and chloramine instantly and safely. A 4oz (120ml) bottle will treat 2,000 gallons (7,570 litres). ALL-CLEAR 2 ALGICIDE is very effective and will not colour the

water. Safe to goldfish and Koi, if used as directed, Allclear is also safe with most aquatic plants. Each packet of 12 tablets will treat 600 gallons.

The T.E.N. range of Pond foods (GOLDFISH T.E.N., KOI T.E.N. and POND T.E.N.) — it is claimed — will feed up to four times more fish than competitive brands due to higher bulk density. The Goldfish T.E.N. range is available in two distinct juvenile and adult floating formulae, and in two pellet sizes: the juvenile (small pellet) size comes in 2.5 and 5oz packages; the adult (medium pellet) in 2.5, 5, 17.75oz and 3.25lb.

Koi T.E.N. comes in eight sizes: the juvenile (medium pellet) in 5, 17.75oz and 3.25lb, with adult (large pellets) in 5, 17.75oz and 3.25lb and 12.5lb sizes available in buckets or boxes. Pond T.E.N. FLOATING FOOD STIX for Goldfish or Koi is available in 14.5oz, 2.75 and 11lb sizes. Further details from:

IMPELEC LTD, Bury Farm, Chesham, Bucks. or



HADDONSTONE LTD

Haddonstone's newest designs.

with Palmetts and Scrolls, can be used either as a fountain or a planter. The kerb section has a continuous moulding enriched with Ovolo on Palmett designs. A plinth is also available which is particularly suitable to the larger pools.

A feature of Haddonstone Products is that they develop an attractive 'aged look' patina much earlier than natural stone. Each design can be supplied in Bath, Portland, Cotswold Stone or Terracotta finishes. For further information contact Simon Scott at:

HADDONSTONE LTD, The Forge House, East Haddon, Northamptonshire NN6 8DB (Tel 0604 770711. Fax 0604 770027).

APOLOGY

In Product Profile (Product Round-up, A & P March 1990), there was an inaccurate caption to the illustration of an aquarium heater; unfortunately, a triac (a switching component in a solid-state circuit) was described as a bi-metallic strip. Our Editor pleads 'guilty' on the grounds of diminished electronic knowledge and not being fully switched on at the time! We apologise to the relevant manufacturer who may have felt more than a little misrepresented.

★ ★ ★

PLEASE NOTE THAT AS FROM 6 MAY ALL LONDON TELEPHONE NUMBERS NOW START WITH 071 OR 081 — CHECK DIRECTORY OR CALL ENQUIRIES FOR CORRECT NUMBER BEFORE DIAL LING.

Fishfeed



THE WARDLEY CORPORATION, PO Box 2687, One Aquarium Drive, Secaucus, New Jersey 07096 USA.

HADDONSTONE

Looking for something traditionally elegant to finish off the pool? Made from reconstructed stone, the HADDONSTONE-POOL SURROUNDS are available in four sizes — small, medium, large and extra large.

The very popular HALF SMALL POOL surround features a Lion Wall Fountain, the Vase section of which, in the shape of a Conch shell and flanked by two Dolphins, and supported by a base decorated

ENVIRONMENTAL HEALTH FOR NATIVE MARINES

(3: Foods and Feeding)

In this article, **Andy Horton** examines the feeding cycle in the seas, and discusses some of the edible molluscs and crustaceans found on the shore, plus foods available from aquatic shops, that are suitable for British sea life kept in aquaria.

(Photographs by the author)

Big fish eat little fish. However, this is a grossly simplified view of the undersea 'jungle'. An understanding of the dynamics of the marine food chain reveals a more complex picture and provides some guide to the keeping of fish and invertebrates alive in aquaria. In the accompanying generalised diagram of the organic cycle of the sea, it is possible to see that the presence of one group of creatures provides sustenance for more complex animals.

Natural cycle

Real seawater contains phytoplankton, invisible micro-algae and single-celled organisms, principally diatoms and flagellates. Phytoplankton provides the food for filter-feeders like the Sea Mats (Bryozoa), Sea Squirts (Tunicates), and bivalve molluscs such as mussels and oysters. It is eaten by the zooplankton, 90% of which consists of very small crustaceans; it also includes the eggs and larvae of fish and invertebrates.

If we follow the cycle round, we will find that the zooplankton is consumed by other invertebrates, including the Hydroids and Sea Anemones (Coelenterata), and Crustaceans. Zooplankton is a vital part of the diet of fry and juvenile fish of all species, as well as the adults of others, such as Pipefish and Sea Horses. All, in turn, are preyed upon by larger animals.

Dead animals and decaying organic waste is scavenged by specially adapted creatures: the whelks, worms and some of the crabs. Even detritus is eaten by the Lugworm and certain Cushion Stars like *Porania pulvillus*, found offshore in Scottish waters. Ammonia is expelled directly by the fish and other animals, and is also released during the decomposition of dead organisms. The final stage is acted upon by bacteria in the 'Nitrogen Cycle', leaving nutrients which are used in the creation of algae, the phytoplankton and larger seaweeds. There are other waste products as well, the most important of which is the carbon dioxide respired by all living creatures, including bacteria, and which is essential in photosynthesis.

Aquarium feeding strategies

Aquarists should try to mimic the conditions found in the oceans. However, in the small confines of a home aquarium, it is (obviously) not possible to create an identical habitat.

Most of the species kept are predators and scavengers, often non-discriminating feeders. They will eat everything meaty presented to them.

Personally, I prefer to feed the various fish and invertebrates what they would eat in the wild. There are two principal reasons. Firstly, their chances to thrive in a healthy condition are improved if they are fed on

natural livefood. Secondly, one of the major fascinations of keeping British marine life in aquaria is what can be termed the 'ecology of behaviour' of the varying creatures.

As feeding is one of the principal activities, it is interesting to watch how the different fish and invertebrates deal with items of prey. The aggressive Shore Crab, *Carcinus maenas*, for example, has a particularly varied diet. On the shore, it is frequently found with a polychaete worm in its claws. In aquaria, it demonstrates its ability to tackle mussels and cockles, shrimps (Crangon), univalve (snail-like) molluscs, Hermit and other small crabs. It is generally regarded as undesirable because large specimens will prey upon the more delicate animals.



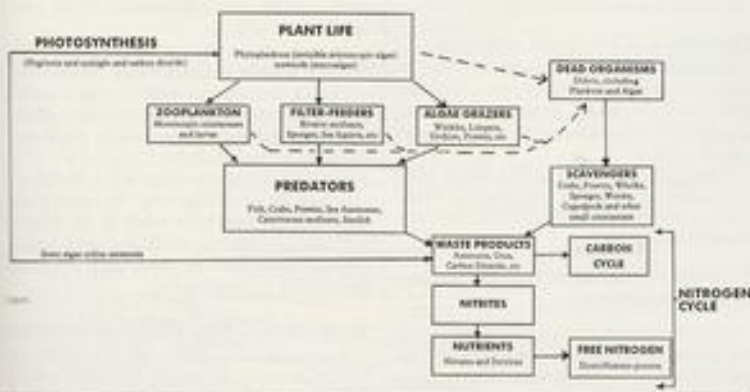
Dog Whelk feeding on a Mussel. This carnivorous mollusc chemically bores a hole in the shell of its prey, and digests the flesh. A white Dog Whelk will then change colour to purple. This change can be seen in aquaria. The small dark nudibranch on the mussel shell is *Acanthodoris pilosa*.

Shore collectors will have access to a range of molluscs, worms and crustaceans found in the littoral zone. Tropical aquarists are, however, warned against using most of these foods because of the likelihood of introducing disease organisms, sometimes from unexpected sources. For instance, parasites can occur as free-swimming animals. Therefore anemones (which contain seawater) could be responsible for introducing pathogens into the tank. Gamma-irradiated frozen natural foods from aquarist shops, provide a useful, safe, alternative diet.



The ubiquitous Shore crab eats a wide variety of foods. Here it can be seen examining a cockle, with barnacle-encrusted limpet attached.

ORGANIC CYCLE (SIMPLIFIED)



My observations on British rock pool fish indicate that parasites are regularly present. Pragmatically, the most sensible protective procedure to adopt is to ensure healthy conditions in the aquarium, since most parasites only become unsightly, and a danger to a fish, if it is already weakened by poor husbandry.

Little and often; this is the general advice for a healthy aquarium. Two feedings a day is an acceptable practice. Even so, British fish and crabs are extremely greedy, so, if you do not feed them enough, they will start eating each other. It is unlikely, however, that you will overfeed the fish.

Nevertheless, it is certainly possible to 'overfeed' the tank, the uncasten food using up oxygen during putrefaction, with excessive ammonia excretions subsequently poisoning the water directly, or causing an explosion in oxygen-consuming bacteria. Ensure that you remove food that is not eaten. Also, watch all the fish and invertebrates closely; the less competitive and slower-moving creatures often fail to get their share.

Fish and other animals require a diet comprised of proteins, carbohydrates, fats, vitamins and minerals. Since British shore species are carnivorously inclined, providing the essential amino acids means that a large part of the diet must consist of fishy foods found in the natural environment, or substitute food providing similar ingredients.

NATURAL FOOD STUFFS FROM THE SHORE

Mussel — *Mytilus edulis*

This bivalve mollusc can be found in dense congregations of millions of individuals on many shores. It attaches itself by the means of byssus white threads which secure it very firmly in locations where the water movement and the force of the waves would dislodge a less securely fixed animal.

It ranks as first choice of food. Most rock pool fish and crabs will eagerly feed upon the nutritious flesh. Pour boiling water over the shells to open them. Scrape out the rich orange flesh and feed whole and in pieces.

Mussels reproduce in spring and afterwards become depleted of flesh. The small female Pea Crab, *Pinnotheres* sp often resides



Gem Anemone, *Bunodactis verrucosa*, is found on wave beaten coasts in the south and west of Britain. It is known to feed on small mussels, ingesting the complete shell.

inside. Cemented to the outside are Acorn Barnacles which provide equally attractive food.

Whole mussels (up to 6) can be kept alive for a few weeks in aquaria and will provide natural food for the Common Starfish, *Asteria rubens*, and the Dog Whelk, *Nucella lapillus*. There are at least 8 species of mussel found in British seas, including the Horse Mussel, *Modiolus modiolus*.

Edible Cockle — *Cerastoderma edule*

Cockles can be found buried just below the surface of the sand. They can be prised open by inserting a knife in between the two halves of the shell, and fed raw to the fish and crabs.

They will also survive for over one month in aquaria. There are numerous other sand-burrowing bivalves, such as Carpet Shells, and Tellins, found on British shores.

Limpet — *Patella vulgata*

On certain shores, where mussels and cockles are absent, the Common Limpet proves to be the easiest choice of natural food.



Shrimps and prawns are nutritious foods for many native marine fishes.

At low tide Limpets will clamp themselves firmly to the rock, and the collector will need a strong knife to insert underneath the mollusc, which is likely to be damaged in the process.

Limpets feed on algae, and undamaged specimens (collected on their feeding forays) can be kept for over one year.

Limpets have tough flesh and are best fed after they have been boiled for over 5 minutes. They are relished by Wrasse, but all fish prefer a mussel diet.

Shrimp — *Crangon crangon*

Shrimps inhabit sandy shores. They are quickly attacked by a wider range of fish and crabs than the prawn. Because of this, the introduction of a netful of shrimps will start a feeding frenzy.

Young shrimps are found in sandy pools on mixed shores in the company of young Gobies (Gobiidae). They provide excellent livefood.

Prawns — *Palaemon elegans* and *P. serratus*

The two commonest species in the south reach lengths of 5 cm (2in) and 10 cm (4in) respectively. The second species is large enough to make human eating worthwhile.



Pipefish will eat a variety of livefoods, as long as they are small enough to be swallowed whole.

They are also easy to keep in a properly established aquarium, where they will scavenge for food. Visitors are frequently fascinated by their complex behaviour and feeding habits.

Small prawns will be immediately attacked and killed by Wrasse (Labridae), and swallowed whole by young Bass. The Bullhead, *Taurochilus bubalus*, will ambush this crustacean, and diminish a population kept in the same aquarium. Only newly-moulted prawns fall victim to Beadlet Anemones.

Live prawns are the second most important natural food. Many aquarists keep a spare tank to ensure a supply throughout the winter, when they are found in deeper water offshore. Freshly-killed prawn is sometimes accepted by difficult species that refuse Mussel.

Other Small Crustaceans

Numerous small crustaceans are important because very young fish, and adults of some species eg Dragonet, *Callionymus lyra*, sometimes refuse dead food. The commonest species found are Isopods, Mysids, Sandhoppers and other prawn-like creatures.

Isopods are marine 'woodlice'. The largest, known as the Sea Slater, or Sea Louse, *Ligia oceanica*, is not liked by any fish. All other Isopods are eaten.

Mysids, or Chameleon Shrimps, *Palaemon flexuosus*, are readily consumed by young Wrasse and adult Pipefish (Syngnathidae).

The Amphipod, *Gammarus locusta*, is found under rocks among large brown seaweeds. It crawls away on its side and is swallowed by small Butterfish, *Pholis gunnellus*.

Shore Crab — *Carcinus maenas*

During late spring and summer, small Shore Crabs can be found in their thousands hiding underneath almost every rock and scampering over the sand.

Young crabs will be eaten whole by Blennies and Wrasse. Expect to find this crab emerging in your tank without deliberate introduction (young multi-coloured crabs conceal themselves in small rock crannies and among the weed).

Ragworm — *Nereis diversicolor*

Ragworms are found in sand and mud on the shore and in estuaries. They are readily taken by almost every fish. They are an

important food because fish from sandy shores, small Flatfish and Dragonets may refuse other items.

Other worms can be tried, but detritus feeders like the Lugworm, *Arenicola marina*, tend to foul the water and are best avoided.

Periwinkles — *Littorina littoralis*

Boil this abundant mollusc and extract the flesh with a pin. It is a popular food. Empty shells can be placed in the tank for the smaller Hermit Crabs.

Live winkles may be responsible for the introduction of the parasite *Cryptocotyle lingua* which encysts to form black blisters on shore fish such as the Butterfish and the Rocklings.

It does not seem to be worth collecting Topshells and other gastropod molluscs as regular foods, because of the small amount of flesh on each animal.

OTHER FOODSTUFFS

Gamma-irradiated Frozen Foods

A large selection is available, including Brine Shrimp, Mussel, Squid, and Crab. Even people who live beside the shore may use these foods in their display tanks. If used regularly, it becomes an equal to any of the collected foods, with the exception of raw Mussel.

Raw Fish

Raw whitefish, like cod and plaice from

the fishmongers, can be fed to the larger fish. Avoid oily fish like herring and mackerel which will pollute the water and leave an oily film on the surface. Cooked and frozen prawn is often refused.

Garden Foods

Some aquarists feed their fish and invertebrates on earthworms and woodlice. I have never found this satisfactory. They justify their decision because this reduces the possibility of introducing disease. I believe that these foods lack certain ingredients necessary to keep marine life in a healthy condition.

Brine Shrimp Eggs

Brine Shrimp eggs (*Artemia*) are available from aquarists shops and can be hatched out in a special hatchery fitted in the corner of the aquarium. The temperature should be above 20°C (68°F).

These miniature Brine Shrimps will be fed on directly by small Pipefish. They also provide a substitute for some of the natural zooplankton. Plumose and Sagaria Anemones benefit from this livefood as it seems to stimulate their 'catch-tentacles' to search for larger prey and consume dead food such as Mussel.

Many filter-feeders exclusively consume phytoplankton, and keeping them alive can be difficult. Hatchery researchers have fed the larvae of Oyster on cultures of minute green flagellates and diatoms. Marine Rotifer cultures are now becoming available through specialist aquarium retailers.

Adult Brine Shrimps (Live)

Adult Brine Shrimps are available in marine aquarist shops on one or two days during the week. They are eagerly pounced upon by the Sea Stickleback, *Spinachia spinachia*, which feeds exclusively on livefood in the form of small planktonic animals.

Marine Flaked Food/Dried Foods

Although prawns and young Grey Mullet, *Chelon labronus*, will feed ravenously on dried and flaked food, many native shore life forms will need their diet supplemented by flesh foods; raw fish etc. Liver pieces can be used as a supplement.

Reference/Further Reading

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THE ORNATE RAINBOW

Rainbowfish specialist **Robert Kirkup** introduces a small, peaceful and interesting species from eastern Australia

(Photographs by the author)

Don't be fooled when first seeing this little character with its shimmering wine colours and soft finnage, that it is a delicate fish, to be avoided or to be kept away from your own fish back home. *Rhadinosentrus ornatus*, the Ornate Rainbow, is a truly beautiful fish, which deserves to become extremely popular.

Exclusive features

The Ornate Rainbow grows to around 2in (c 5cm), making it ideal for small community aquaria. Males have a chubby appearance, with their heads being noticeably a different shape than other 'Bows we have seen. They have a face and gill structure not unlike the Siamese Fighters (*Betta splendens*) in that when a male approaches a female, or a rival male of any species, his face appears to drop lower as his gill plates expand and the red membrane which runs from his gills (under his head) can be clearly seen. He will then circle his 'friend or foe', with his fins fully expanded, and his already-colourful body intensifying in colour. The finnage of this fish at this stage reminds you of a Knifefish, as the individual fins 'join-up' and appear as one fin, starting behind the head and running along the back, over the tail and under the body. The rippling movements of the body, starting from the front end and progressing to the rear, enhance this similarity even further.

This fish has always remained the exclusive possession of Australian aquarists, and is known as the 'Perch Sunfish' to the millions of Australian 'rugrats' (youngsters) who catch them in ditches, etc near their homes.

Colour varieties

There are two distinct colour varieties of Ornate Rainbow which are totally unrelated to geography, as they can both be found in the same stream:

A) Red Wine Variety: differs from (B) by having a red second dorsal fin an entirely red caudal fin, and further red pigmentation on 70% of the long anal fin. The body also has iridescent red and blue coloration.

B) Blue Variety: has no red coloration. The fin rays are streaked with a neon blue (both varieties have a black edging to the fins). The caudal fin has a neon blue fork, with the inner part dark blue/black. Both varieties have dark edges on the scales making a pretty pattern not unlike a bees' honeycomb. However the blue-bodied variety shows this more boldly.

The females, coloration is more drab, and their fins are shorter, with the dorsal and

anal fins rounded and not pointed. They will either show a blue or red iridescence along the body, depending on variety.

Habitat

The first scientific papers on *Rhadinosentrus* were published in 1914.

The Ornate Rainbow, the single species in the genus, appears over a wide range east of the great dividing range of Australia (Queensland and New South Wales). It is also found in a few sandy islands, including Frazer Is. Moreton Is and North Stradbroke Island.

It usually inhabits strongly stained acidic waters (use only 50% tapwater in attempting

to breed this fish) in coastal waters in sand/soil country, being then found in stagnant pools.

Both varieties are abundant in the densely populated Brisbane area where they are said to be as common as Sticklebacks.

Aquarium care

A temperature of between 20-30°C (68-86°F) is adequate for the Ornate Rainbow. A pH of between 5.4 and 6.5 is recommended for this fish, but it will also live in neutral water.

The rear of the aquarium should be well planted. Species such as *Limnophila*



An adult male showing the characteristic honeycomb scale pattern.



An adult 'Red Wine' male.

(*Ambusia*), *Cubomba*, *Cryptocoryne* and *Hygrophila* will do nicely, providing cover and a place to rest.

If you're not able to supply rainwater, a piece of bogwood in the aquarium will help to provide adequate conditions.

Feeding is not a problem; but the odd treat of livefood (Bloodworm, *Daphnia*, etc) will prove rewarding.

Suitable tankmates

The Ornate Rainbow is quite a peaceful fish, and ripped fins seldom occur in their squabble, to establish a pecking order. It is quite acceptable to place other small fast-moving, acid-loving fish in their aquaria for them to shoal with. Typically, Cardinal Tetras, X-ray Tetras, Phantom Tetras Checker/Cherry/Odessa Barbs, various small Rasboras and the odd *Corydoras* are ideal.

If you would like a true community aquarium, then the following Australian species are compatible with the ornate Rainbow (*Rhadinocentrus* co-exists with a number of other species in the wild). Any of the *Crateocephalus* (Hardyheads), *Quirichthys*

stramineus (the Strawman), *Hypseleotris* (colourful Sleeper Gobies), *Galaxiella munda/nigrostriata/pauilla* (Galaxias), *Chlamydogobius eremius* (Desert Goby — becoming readily available) *Cairnichthys* Rainbow (formerly *Rhadinocentrus*, central water), *Triatherina tomeri* (Threadfin Rainbow — any variety), the larger species of *Pseudomugil* Rainbow, or Australian Pipefish which carry their young in a pouch, as in the seahorse. You will of course, find the second choice of community aquarium difficult to set up as it will be a challenge in itself to obtain the fish mentioned; but that's the aquarium hobby!

Aquarium breeding

Firstly you do not need a large aquarium. I use an 18 x 8 x 8in (45 x 20 x 20cm) aquarium and try to include 50% filtered rainwater, a pH of 6.4 and a temperature of 26°C (79°F).

I then add a sponge filter (without the sponge), some floating plants (*Riccia* is ideal), a small piece of bogwood (to provide shelter for the female), a blanket of Java Moss (*Vesicularia dubyana*) on the floor of the aquarium and that's it!

Feeding in the breeding tank, should consist of livefood only. The Ornate Rainbow's mouth is at the top of its head, so mosquito larvae are at the top of the list, plus *Daphnia*, making sure that one is only adding *Daphnia*!

I then add the conditioned female during the day, and the male at lights out. Next day, just watch them go!

You will get just as good results from one pair, as from a shoal. In fact, if you use a shoal, the males will waste time and energy sparring with each other, while the females will peck at the foliage in their search for eggs.

The Ornate Rainbow is not a shy fish, and if you sit still you can see the fish 'shimmy' together as they lay their eggs, maybe half a dozen each time. It seems that morning sunshine is the key to the male's eagerness. At such times his nuptial stripe looks like it will explode, as he frantically searches out his mate.

The pair may spawn as many as a dozen times, and then rest up for the evening sun's rays to hit them... again! I believe that if the fish were constantly under the sun's rays, they would breed all day long!

The eggs, which should be visible hanging from their threads, will take seven to ten days to hatch out.

At this point, I decide I will not place all my eggs in one basket, so to speak. I have another aquarium standing by with an inch (2.5cm) of old water, some plants and a couple of Apple Snails (to generate infusoria for the tiny mouths of the hungry fry). As the fry begin to hatch — usually at first light — I remove them, with a gallon (c4.5 litres) of their water and place them in the second aquarium.

I aim to put some 50 fry in this aquarium, while leaving the parents spawning in the breeding tank. I use a pipette, like an eyedropper, to remove the tiny black fry from the surface and place them in their new home. It takes me about four days to collect enough fish which I know I can feed in the shallow water, without them crowding themselves out.

I then remove the parents, from the first aquarium, and await the population explosion from the eggs that escape their notice.

The fry are minute. For example, a newly-hatched *Bedonia geayi* (Madagascar Rainbow) fry will eat *Artemia* (Brine Shrimp), while a *Rhadinocentrus* (Ornate Rainbow) fry would make a meal for a passing Brine Shrimp! Infusoria are therefore essential for the first 10-14 days. Because of the acidity of the water, the bacterial count will be low, thus cutting down on eggs fungussing. This means that the hatching rate is generally good, so an ample food supply must be available.

The fry will spend all their time at the surface, so that is where their food must be during this period. After about 14 days they will be big enough to take Brine Shrimp. Once the fry begin taking the various livefoods, growth is rapid. With frequent water changes the fry begin to colour up at three months. Sexing is possible after four months and a size of 25-30mm (1-1.2in) — and well worth the wait.



Young Ornate Rainbows just beginning to colour up.



Two weeks later, the colours are much more pronounced.

"NICE DAY" AT KEY WEST

Queen Conchs and Nurse Sharks were just two of the many attractions Jonathan Moss discovered at Key West's refreshingly different public aquarium.



The furthest (western) point at Key West — home of a refreshingly different public aquarium.

"Never dive wearing jewelry," said the Key West Aquarium Tour Guide. "If it catches the light, it'll sparkle and the barracuda will think you're a fish. If that happens, you've got big problems!"

The Key West Aquarium is concerned with showing visitors the inhabitants of the waters in the immediate vicinity and informing the aquarium's guests of the inmates' unique characteristics.

Key West is the southernmost island of the Florida Keys, a chain of coral islands south of Miami, linked by 42 bridges. The aquarium is at the end of a road which leads to the sea. There is a small jetty in which small pools are built containing sawfish, sharks and turtles. On a hot Florida day, it's great to have the opportunity of walking down the jetty and viewing the Florida sealife at your leisure.

Robert Cerkleski, the curator, thinks that the best way of sustaining the continued interest of the aquarium's visitors is by involvement. "Our aquarium is small, and the fish are purely local. We are anxious to show visitors what lives around us here in Key West, so the best way of doing that is by talking to them and involving them."

Conch warning

I went along to the three o'clock tour. Twenty to thirty people assembled at the Touch Tank. Our tour guide introduced himself and told us how delighted he was

that we had picked the aquarium in which to spend the afternoon. We were bid a "nice day" and that marked a (welcomed) end to the social niceties and the beginning of our tour.

We were invited to pick up anything we found in the Touch Tank. After a number of Horseshoe Crabs, Sea Cucumbers, Pencil Urchins and Queen Conchs were fondled by inquisitive hands, our guide picked up the Florida Pink Queen Conch. The conch (pronounced "conk") is the delicacy of the island.

Conch fritters, conch chowder and conch salad can be found in the majority of restaurants on the island and at a great number of

foodstalls on the roadside. A fit and healthy conch can travel one mile in 24 hours, which is fast for a snail.

We were given a warning; if we get the chance of catching a conch we should think again. It is illegal in the Keys. Offenders risk a \$500 fine or 30 days' imprisonment. The conchs in the local restaurants are imported!

Florida charm

"Aren't mosquito bites a nuisance?" continued our guide. He then called for three volunteers. He asked them to raise their knees. He then reached for a hermit crab and allowed it to run its claws up and down their legs. "I bet you forgot about your mosquito bites!" We laughed after removing the crabs.

Such is the Florida charm, but I did find myself wondering what was coming next, as our guide announced that we were moving to the shark and sting ray tank. It was no disappointment. We were shown how Nurse Sharks got their name. The sharks were fed some mullet and we listened to the noise they made while feeding. When they were originally named it was thought that, when feeding, they sounded like nursing babies. It sounded to me more like the noise plungers make when withdrawn from a blocked-up sink, but "Plunger Shark" just does not go as well I suppose!

Having netted a Nurse Shark, we were allowed to stroke the fish, making sure we stayed clear of its 300 "teeth". Everybody agreed to stroke our new-found friend and our guide held up the shark and explained to us that the Nurse Shark, Lemon Shark, Bull Shark and Sand Tiger do not have to swim in order to breathe, as they have a pumping mechanism. All others have to remain moving.



A Hammerhead welcomes visitors to the Key West Aquarium.



KEY WEST AQUARIUM

The Touch Tank is one of the most popular focal points of a visit to the aquarium.

Turtle pool

We then moved outside onto the jetty to see the pool of turtles. We saw Green Sea Turtles which, from the days of Columbus, have been hunted for their meat. Turtle soup and turtle steaks are made from the meat of Green Sea Turtles. We also saw a Hawksbill Turtle from which turtle shell jewellery comes from. They are so-called because their beak looks like a hawk's bill.

Again, we were given a word of warning. There has been a recent study of the cause of death of the turtles of the Florida waters. Beer can rings have been discovered in their stomachs and small plastic bags have been found about their heads, suffocating them. We were told to respect the beaches and waters of Key West.

Personal insight

Speaking to Robert Cerkleski, Curator of the Aquarium, gave me an insight into the features of the Key West Aquarium and also the aquaria in the areas around. The aquarium was built in 1934. It used to be com-

pletely open air, but algae-growth became too much of a problem and a roof was put on. In World War II, the aquarium was used as a pistol range and bullet holes can still be seen in the structure.

About 150,000 visitors come to the Key West Aquarium each year. According to Robert Cerkleski they are attracted by his shark pool. "Sharks have a massive attraction. Coming face to face with one in the confines and security of an aquarium is very appealing indeed. At present the aquarium is also breeding Green Sea Turtles, raising them and replacing them in the wild.

Robert Cerkleski takes particular pride in a Tarpon which he has had since 1967, and mangroves which he grew from seedlings. He also has a collection of Sailfin Mollies, which he caught in a local pond. They are living in conditions of high salinity and are growing rapidly.

Big business

"Public Aquaria" is big business in the States at the moment. An aquarium which is

soon to be completed in Tampa, the "Florida Aquarium", hopes to take in \$1 million a month!

I was also shown the proofs of the artwork for the New Orleans Aquarium. "The Aquarium of the Americas" will be completed in 1990. The picture is of fish swimming around a reef which, to the uninformed foreigners such as myself, is just a beautiful scene of the apparent harmony of a reef. It was then pointed out that the reef was specially designed in the shape of Louisiana, the state which New Orleans is in!

The Key West Aquarium has an array of tanks, housing, predominantly, only the local species, worthy of particular mention being the splendid Moray Eels, Jewfish and Porcupine Fish.

After leaving the Key West Aquarium, not only had I spent a very entertaining afternoon, but I had borne witness to a very refreshing approach to the concept of a Public Aquarium.



PHOTOGRAPH BY JIM AUSTIN

Feeding the Nurse Sharks is a noisy, impressive — and very wet (!) — spectacle.



ROBERT CERKLESKI

Feeding time at the outdoor shark pool.

Getting there

Key West has a small airport, with commuter flights from Orlando, Miami and Fort Lauderdale. Planes are small, seating up to 20 passengers. The islands can also be reached by car on Greyhound Bus.

I took the plane from Orlando. It was only a 70-minute journey.

ESSENTIAL DETAILS

Address: Key West Aquarium, 1 Whitehead Street, Key West, Florida 33040. Telephone 305 296 2051.

Admission: \$5 Adults. \$2.50 Children. \$4 Concessions/Students/OAPs.

Opening Times: 10 am-6 pm. Seven days a week.

Tours: 11 am, 1 pm, 3 pm, 4.30 pm.

Reflections



by David Sands

Who wants to join a fish club?

How many fishkeepers 'out there' are shy of fish clubs? There are many experienced fishkeepers who enjoy the hobby but don't want to become involved in what I call the Organised Hobby (OH).

My first years in fishkeeping were quite innocent of the OH. It was my first visit to the British Aquarist Festival at Belle Vue, Manchester, that changed my life.

A Basingstoke aquarist called 'Blake' (I can still see the name and results on the blackboard) won several places in the catfish classes, within which my interest was in *Corydoras*. Adrian Blake, who became a firm friend of mine in the years that followed, cannot remember the Northerner who asked him how he grew his *Corydoras* up to such a massive size.

I had only ever seen juvenile *Corydoras* for sale and did not realise the size some could achieve. I promptly went home and began feeding my fish twice as much as before.

I had always been told to feed a little...

My brush with the OH changed my view of fishkeeping, and I subsequently went on to become involved in a number of committees.

My involvement soon became strained, though, when the ugly side of 'politics' reared its stupid head, and when personalities began to clash. I believe I have promoted catfish keeping as well as any other person around today, but the OH has often kicked me in the teeth!

I can therefore understand why some experienced fishkeepers may want to leave clubs alone. These days there are many social distractions to attending a club night, not the least being television and video. Nowadays, you can watch *Wildlife on One* and almost be in the South American/African rivers with the fishes.

Why attend a meeting to be bored with committee reports and suchlike if you're not that way inclined?

Some clubs are not prepared to pay a fair price for good speakers; so those members who like listening to good lectures may not wish to attend club nights when such talks are not on the agenda.

Apathy can then set in, so the few dedicated people who are prepared to stand for reelection to the committee, do so, with the result that 'new blood' can prove hard to find, and individuals can become 'larger' than the club.

I have always believed that politics shouldn't stain fishkeeping. Many individuals do, indeed, help to make shows and conventions memorable and stay outside politics, but in the end, the cancer can arrive, especially when people put pressure on themselves and others to over-achieve instead of simply enjoying the hobby!

Recently I have been involved with some aquarists who have found it easier to be negative than to be positive, and easier to criticise than to be constructive, in the end, wasting more energy causing disputes than in directing matters to the good of members.

To any enthusiastic and budding new fishkeeper out there... one just like me the day I spoke to Adrian Blake at Belle Vue, I'd say, "Keep your enthusiasm for as long as you can. If you're full of ingenuity, some committee will appoint you as a lay member before you can say FISH, and then, if you become a 'sit-back-and-let-it-happen' kind of person - you are likely to fall asleep!"

Fairy story

In my experience, there are two main types of scientist. One is an elitist, who writes and

speaks to members of his/her own community in technical and protective terms, the more obscure, the better. Such a scientist hasn't the time to use plain English or speak to the enthusiastic amateur.

The other is human. Such a scientist enjoys his/her subject being understood by everyone; s/he doesn't see 'the competition' that other scientists live for and believes that science can receive input from any direction.

There is a scientist who began his career as a 'technician' in a public aquarium (he cleaned the tanks, etc) who benefited from the kindness of the second type of scientist. This scientist gave him time to study fishes and even allowed him to assist him in his own work.

The kind scientist was not at all 'paranoid' that this enthusiastic 'outsider', without formal training, would eventually take over his work or compete with him. Instead, he was happy for the technician to become accomplished in his own field and, eventually, to undertake his doctorate and, in title, become his equal.

The trouble began because the ex-technician liked being a doctor. He enjoyed the correspondence and visits from other scientists and he 'bathed' in the limelight that his published work and the questions of simple enthusiasts placed him under.

All the time he was thinking, "Once, I was a simple enthusiast, and now simple enthusiasts look to me for answers to questions... Isn't life marvel-

lous?"

Of course, questions are much simpler than answers, and he soon bored with trivial questions. After all, he was now a scientist... why should he bother with enthusiasts...? If they were anyone, they'd do just what he'd done and become someone else.

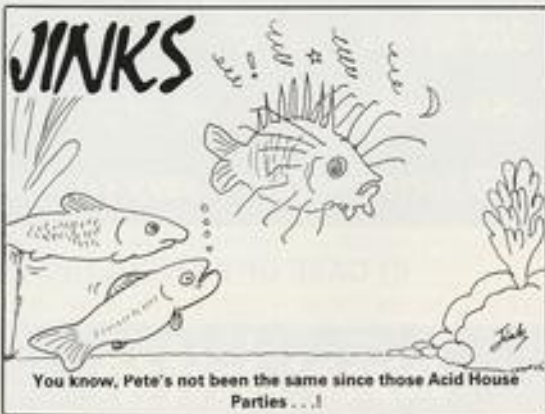
During this period, a dedicated enthusiast began to converse with the kind scientist, and this made the new doctor very nervous. Perhaps the dedicated enthusiast could accomplish the same and become someone more than a simple enthusiast... He would have to be stopped, or a nervous breakdown would completely wreck the new doctor's plans!

Any work the 'new enthusiast' published would have to be wrong, even if it contained original thinking. The new doctor could not assist the new enthusiast in any way because, in his paranoid world, he would be a threat to the new doctor's position.

The new enthusiast praised both the kind scientist and the new doctor, almost always acknowledging their assistance and work, but jealousy still ate away at the new doctor.

He was protective of his work - like scrooge was protective over his money... Why should anyone come along and use any of it for their own work? Humbug, goodness me, that wouldn't do at all!

I mean, what elitist scientist on earth would give an enthusiast the opportunity to become involved in his 'serious' work?



Books

PRINCIPLES OF FISH NUTRITION

By: Werner Steffens
Published by: Ellis Horwood Ltd
ISBN: 0 745805558
Price: £59.95

This 384-page comprehensive review of the complex subject of fish nutrition is not for the faint-hearted... or for the non-scientific reader. Members of the scientific community — or those involved in the research and development of fish foods — will, however, find it difficult to resist buying this excellent, detailed work.

The author is Head of the Department of Fish Nutrition at the Institute of Inland Fisheries based in Berlin. He is also Professor of Fish Culture and Nutrition at Humboldt University, Berlin. It would therefore be difficult to find anyone better qualified to tackle this subject.

The original version of *Principles of Fish Nutrition* was published in German in 1985. This was followed by a Spanish edition in 1987 and, most recently, the English edition in 1989.

A great deal can (and does) happen in many areas of study in as short a time-span as four years, and fish nutrition is no exception. As a result of such developments, translations of previously-published works are often sadly out of date by the time they eventually see the light of day. This is not the case with Steffens' book, however. It actually takes into account research findings published as recently as 1988 — a major feat for an academic publication of this kind.

The main subject areas covered are: Principles of metabolism, Anatomy and physiology of the digestive tract, Nutrients, Energy requirement, Vitamins and Minerals. In addition, there is an extensive Bibliography (pages 317-365), a very useful Glossary of fish species, and a Subject Index.

Within the Nutrients chapter (which extends from page 66 to page 183), proteins, fats and carbohydrates each receive very detailed treatment, making this section of the book about the most comprehensive discussion of these dietary components that I have ever come across. Of particular usefulness is the way in which the relationship between these three major groups of nutrients are considered, eg, we are told that, even when the protein and energy levels of a diet are high, negative effects on growth will result if there is large-scale replacement of carbohydrates by fats (p. 171).

The text is full of such statements which, while not appearing to be of immediate or direct relevance to aquarists and pondkeepers are, indirectly, absolutely crucial to us all. The reason is that this is

precisely the sort of information that those who are responsible for developing the ever-widening range of aquatic foods which we use every day need to know.

The same goes for the chapters on Vitamins and Minerals. Both stand as authoritative reviews in their own right, but their real value emerges when they are considered in conjunction with the Proteins/Fats/Carbohydrates chapter, something that the author does with great skill.

In conclusion, I would say that, while *Principles of Fish Nutrition* will only find an extremely limited market among the aquarium and pondkeeping fraternity, it will be 'voraciously devoured' by all those whose interests — both commercial and academic — lie in this complex, but fascinating, area of ichthyology.

John Dawes

MALAWI CICHLIDS IN THEIR NATURAL HABITAT

By: Ad Konings
Published by: Verduijn Cichlids
ISBN: 90-800181-3-9
Price: £29.50 (incl postage and packing)
Sole UK Importers: British Cichlid Association, Book Sales, Brandy Hall, Bradshaw Lane, Bradshaw, Halifax, W. Yorks, HX2 9XE

Some years ago, we were all raving about the spectacular cichlids from Lake Malawi, wishing, at the same time, that someone, somewhere, would be able to crack the numerous nomenclature problems that existed at the time. Today, we are a bit further along the road to untangling these problems, but the problems are still very much with us.

For instance, it may be correct to refer to a particular fish as *Pseudotropheus species zebra* cobalt, thus indicating that it may well not be *Pseudotropheus zebra* as such, but something else which is, nevertheless, pretty close to it in biological terms. However, this does not make life easier for all those who like their species neatly packaged up in manageable 'parcels', of course. Unfortunately for such people, life is not normally like that... and fish taxonomy, in particular, is hardly ever like that.

Malawi Cichlids faces these challenges head-on, highlighting the nomenclature difficulties that exist among the (larger) haplochromines and the (smaller) rock-dwelling mbuna of this unique lake, and directing interested readers towards David Eccles' and Ethelwyn Trewavas' recent (1989) monumental work, *Malawian Cichlid Fishes: The Classification of some Haplochromine Genera* (Lake Fish Movies, Hesten, FRG). As the author, Ad Konings, points out:

"The immense work of Eccles and Trewavas is said to be preliminary but, considering the many difficulties in assessing the true genetic relationships, it will take years before other scientists will be able to improve on their classification."

Other subjects dealt with in the early sections of this fantastic book include the lake itself, the development of feeding specialisations, territoriality, mate recognition, egg dummies, breeding, O and OB colour morphs, the species concept, speciation (including sympatric speciation), and evolution.

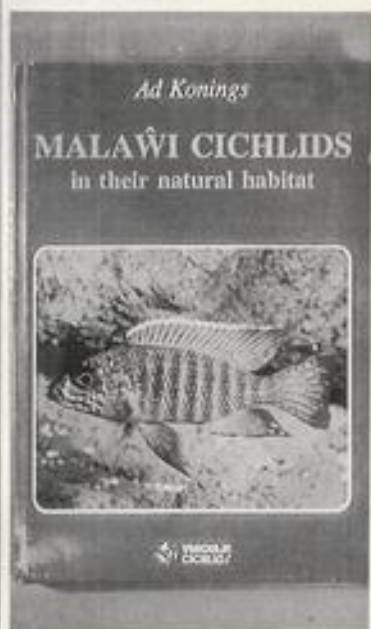
Following this, there's detailed coverage of the various habitats that are recognised within Lake Malawi, such as: wave-washed upper rocky habitat free of sediment, sediment-rich rocky habitat, intermediate habitat, shallow sediment-rich bays, sand, and open water.

In the process of grappling with this diverse range, Ad Konings refers to every species that is currently known in the lake, dealing with aspects of their behaviour, or morphology, or classification, or ecological niche, or any other aspect which appears relevant at that particular point in the text.

Malawi Cichlids is neither a catalogue of species nor a guide to their care in captivity. It is, instead, a superb book aimed fairly and squarely at the ever-increasing number of cichlid fanciers who have gone beyond the basics and want to know what their fish are really like.

This is a great book by a great author.

John Dawes



News

Lotus Launches Promotional Campaign

Lotus, one of the UK's best-known suppliers of water gardening products, has recently launched a promotional campaign designed to boost sales of the company's highly successful Mermaid Pump and its new foods Koi-Sen and Lotamax.

The offer is quite simple: buy a Mermaid Pump and get a free 1-litre drum of Koi-Sen Fish Food (recommended sale price £2.99). The cost of the campaign is being met in full by Lotus who will be supplying retailers with the free give-away food drums with their orders. Leaflets describing the advantages of the new foods will also be available from retail outlets.

So, if you're thinking of getting a new pond pump, you could also be giving your fish a real treat at no extra cost.

For further details, contact Stephen Lally on 0494 774451.



Insurance breakthrough for Koi-keepers

Farmer & Clark (Bristol) Limited, a West Country insurance broking firm, have recently announced that they have pioneered a new form of insurance specially designed for Koi-keepers.

The scheme, the first of its kind ever devised, has been arranged in conjunction with Roberts Morris Bray (Insurance Brokers) Limited, specialists in aquaculture risks worldwide, and promoters of the well-known RMB Fishstock Contract underwritten at Lloyd's of London. The Koi-keepers' scheme has, likewise, been insured 100% with Under-

writers at Lloyd's; thus, security and professionalism are to the highest standards.

The scheme has evolved after many months of research and product development and a careful study of the risks of the trade. Andrew Gallop, a director of Farmer & Clark, and a Koi hobbyist himself, had been aware for some time of a gap in the market for this type of insurance. Until a friend of his in the Lloyd's market put him in touch with RMB, he had been unable to attract any interest from insurers in putting a scheme together for Koi-keepers, let alone taking on the risk of his own Koi! This was hardly surprising, since the insurance of Koi, where fish quality is such a key factor in determining value, posed unique problems for any would-be insurer.

According to Roberts Morris Bray director, John Morris "RMB have been creating innovative products for commercial fish farmers for almost twenty years. We see the growing hobby of Koi-keeping as an exciting new challenge with quite different risks compared with those relating to aquaculture. With the best will in the

world, we must anticipate some teething troubles, but we believe that, together with Farmer & Clark, we have covered all the angles as comprehensively as we can at this stage. Only time and experience will tell if we've got it right".

The scheme was launched at the Nishikigoi '90 exhibition at Bingley Hall, where the BKKS, who have fully endorsed the product, invited Farmer & Clark to share their trade stand. Already it has attracted enormous interest from, and been welcomed by, the Koi-keeping public, and substantial sales volumes are anticipated.

"If everything goes according to plan" says Andrew Gallop, "we hope to extend the scheme

to the dealer network and to other aquatic species, but that is still some way off. We are taking things one step at a time, and our first priority is to establish a solid base among Koi collectors and hobbyists. We are committed to providing long-term protection for the Koi-keeping industry, and we do not intend to lose sight of that objective".

Further details of the scheme are available from Farmer & Clark (Bristol) Limited, Britannia House, High Street, Bream, Lydney, Glos GL15 6JS, Tel: 0594 564444; Fax 0594 564084.

New course starts at Sparsholt College Hampshire

A new two-year BTEC-approved National Diploma in Aquatics and Ornamental Fish Management will start at Sparsholt College this September. The new course will broaden the range of training offered to the aquatics industry by the College which already runs a successful one-year National Certificate, as well as a number of short courses and conferences.

Entry requirements for the new full-time two-year diploma course are 4 'O' levels — including two sciences and English — and 12 months' relevant experience.

The main subject areas covered will be:

Year I:

Water Quality and Environmental Studies
Fish Biology and Husbandry
Aquatic Plant Biology and Husbandry
Construction Techniques
Health and Safety at Work
Aquatic Retail Management

Year II

Small Animal Care
Fish Health
Aquarium Systems
Pond and Aquarium Equipment Technology
Pool Design Installation and Maintenance
Aquatic Retail Management

In addition to College-based training, there will also be 26 weeks of practical industrial placements.

The new course has been developed after close consultation with many businesses in the aquatics industry, and has been designed to equip students with the skills necessary to gain a management position within an industry aware of the profes-

sional standards required for business success.

For further details contact Keith Devenport or Jane Lloyd at Sparsholt College Hampshire, Sparsholt, Nr Winchester, SO21 2NF Tel. 096 272 444

Open Day at College

If you wish to see the work of the College at first hand — from aquatics to deer management, to bee-keeping, etc then why not pay Sparsholt a visit on their Open Day on Saturday 9 June when staff and students will be available to discuss all the courses on offer?

Further details of this event can be obtained from the College at the above address and telephone number.

'Aquarian' at the Ideal Home Exhibition

'Aquarian' sponsored an aquarium in the Daily Mail's Ideal Homes Exhibition at Earls Court last March.

One of the largest complete homes built inside the exhibition was by Potton Ltd, the Potton Milchester Showhouse. This included a Swedish Pine bedroom where an aquarium was part of the owner's hobby interest. The tank was a 48 x 18 x 15in with Swedish Pine cupboard base and top built to Aquarian's specification by Britain's Aquatic Superstore (Dave's Aquarium) of Bolton.

For safety reasons the mains power had to be turned off when the show ended each evening, so a heater for tropicals could not be installed. A coldwater theme was therefore selected, with the 14 Fancy Goldfish (a shoal of young Veiltails) also coming from Dave's Aquarium.

Since the water needed to be kept very clear and clean, two filters were installed; an Atlantis Powerflow internal filter and an external Atlantis X500. The filter contained only fibre to provide mechanical filtration; some problems could have arisen as a result of the overnight shutdowns had the filter been working biologically.

Plants were plastic (of course) but densely planted, and the aquarium was brightly lit by two Triton tubes. The effect was very attractive and seen by the hundreds of thousands of visitors to the Show House.

The aquarium was installed by Dr David Ford of the 'Aquarian' Advisory Service and maintained by Dick Mills, one of A&P's leading contributors and secretary of the FBAS (Dick works nearby in the BBC Radiophonic Workshop). Dick visited the Show regularly to feed the Goldfish on their 'Aquarian' diet... so the fish were in good hands throughout the whole month.

Aquarian's wonderful world of fishkeeping

Pedigree Petfoods, the manufacturers of 'Aquarian' Flaked Fish Foods are launching an exclusive video, which aims to attract more people than ever into the fishkeeping hobby. **Beautiful Underwater Worlds, A Beginner's Guide to Creating Your First Aquarium** has been written and produced primarily for newcomers to the hobby, and demonstrates how attractive an aquarium in the home can be. Even the most experienced of aquarists will find that the video is packed with useful advice and information, offering an even greater

insight into the pleasures of fishkeeping.

In just 60 minutes, Dr David Ford of the 'Aquarian' Advisory Service, together with Peter Macann of 'Tomorrow's World' fame and his family, survey all aspects of setting up and looking after an aquarium from day one, explaining in clear and simple terms the importance of water quality, including the functions of filtration and aeration. The video is divided into chapters for easy viewing, so each chapter can be reviewed and replayed as required.

From a simple goldfish tank which can be easily maintained and enjoyed by the youngest members of the family, to the more elaborate tropical aquarium, the video illustrates how the fishkeeping hobby is a truly diverse one which can be pursued at all levels and by all members of the family.

Beautiful Underwater Worlds has been available for hire from most good pet shops and aquatic retailers since March. Look out for advertisements in major journals for vouchers offering free hire of the video. The 'Aquarian' Advisory Service

will also be offering the written guide to the video, the **Beautiful Underwater Worlds** booklet, without charge. If you would like a copy, write to the 'Aquarian' Advisory Service at the address below (offer available while stocks last) or visit any pet shop or aquatic retailer offering the video for hire.

The 'Aquarian' Advisory Service
PO Box 67
Elland
West Yorkshire

Tetra Talks Fish Again

The next Tetra 'Talking Fish' evening will take place on **Thursday 31 May 1990** at Lecture Theatre 2, Boldrewood, Southampton University, and will concentrate on 'Maintaining A Perfect Pond'.

Lecturers for the evening will be Barry James of Everglades Nurseries and regular A&P contributor, a well-known author and expert on aquatic plants, and Dr David Pool, Head of the Tetra Information Centre (and also one of our regular authors).

Barry will be lecturing on **Water Gardening in the 1990s** and will concentrate largely on pond equipment and aquatic plants. David will lecture on **The Secrets of Successful Fishkeeping** and will provide details of how to maintain fish in the best possible condition.

In addition there will be a short film entitled **The Battle of the Duck Pond** which examines the other life found in our ponds.

Admission to the evening will cost £2.50, with 10% discount for groups of 5-10, 20% discount for groups of 11+. Tickets are only available from Tetra at the address below. As numbers are limited, and demand is likely to be high, it would be advisable to telephone **Maureen Beart** to reserve tickets.

Each person attending the seminar will receive notes on the lectures given, together with a complimentary pack of Tetra pond food. Coffee and tea will be available free of charge during the evening.

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5 Crypto balansar
5 Cabomba
5 Malayan Sword

GOING DUTCH

(PART 3)

Arie de Graaf continues his series on how to set up a spectacular Dutch Aquarium
(Illustrations by the Author)

Plant
STEPS

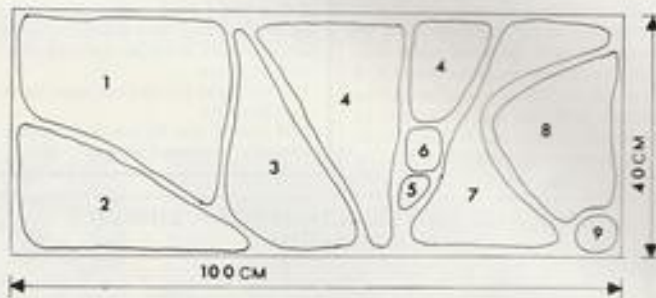
Is it possible to create rules for the maintenance of an aquarium? Most authors evade this problem. For instance, Cor Stam, a practised Dutch aquariumkeeper who wrote an excellent series regarding the setting up of a community tank, goes no further than recommending the updating of a so-called 'aquarium logbook', something that I agree with in principle.

Unique aquaria

The fact is that there are no two identical aquaria in the whole world. For a start, the natural permeating light is quite different for every aquarium. Even additional artificial light, which can be fixed, will differ in some way for every aquarium. This, in turn, causes specific differences within each aquarium.

Since no two rooms in which aquaria are placed can be identical, and since the tanks can be heated in different ways, this, too, produces individual variations. Further, the quality of the water, the mixture or type of substratum, the livestock (regarding species and number, etc) are all factors which differ for every aquarium. All the above, put together, cause very divergent biological reactions in aquaria, giving each set-up its own unique characteristics.

Every aquariumkeeper should strive to create a so-called 'biological balance' in his/her aquarium, according to type. An aquarium set up according to the principles of the Leiden School, for instance, will result in good ecological stability. As pointed out earlier in this series (see Part 1) the plant-mix of such an aquarium consists mainly of *Cryptocoryne* species. Representatives from the genera *Echinodorus* and *Aponogeton* are also typical of 'Leiden' aquaria, while the 'Leiden Plant' *Sagurus cernuus*, should not be forgotten, of course. All these plants are slow growers. It should be clear, therefore that such an aquarium requires little maintenance. For example, changing the water is not encouraged since it carries the possibility of causing rotting of the leaves of *Cryptocorynes*. Unfortunately, *Cryptocorynes* have pretty well disappeared from the Dutch plantaquarium, being replaced by quickly growing plants from the genera *Alternanthera*, *Ammannia*, *Heteranthera*, *Hygrophila*, *Lobelia*, *Ludwigia*, *Rotala*, etc. As a result, these kinds of aquaria are, generally,



Plan view of F. Zinken's aquarium.

unstable and require a great deal of maintenance.

Rules for maintenance are not, therefore, particularly useful. The basic of each maintenance programme is shaped by the experience of the aquariumkeeper. These experiences should, obviously, be exchanged at aquarium society meeting and published in aquarium magazines, thus serving as a useful means of improving techniques overall.

Although, in my opinion, 'rules' as such are not to be recommended, some basic guidelines may prove very helpful for beginners wishing to set up a Dutch Aquarium.

One particular useful 'tool' is the 'Plant Disc'. I have therefore chosen an actual example of an aquarium that has been set up

to show how the Plant Disc principle can be applied to good effect.

The Plant Disc

The proverb "Who does not honour the small, is not worth the big" can be applied to the aquarium owned by F. Zinken of Heerlen in The Netherlands. This aquarium (100 x 40 x 40cm — 39 x 16 x 16in) is the living proof that it is possible to produce a beautiful set-up from a small aquarium.

This is achieved by limiting the number of plant species (rule of thumb: one species per 10cm — 4in — length of the aquarium) and grouping richly contrasting plants in the right manner. And this is the problem, of course, for how many plants be combined and contrasted?

The contrast of plants contains three



As this photo of F. Zinken's aquarium shows, correct use of the plant disc can produce excellent results.

elements: colour, size and shape.

A small aquarium (relatively speaking) offers beginners unlimited possibilities for experimentation. Some time ago, an attempt was made in the Zuid-Holland-Zuid district of the NBAT in Holland to provide a helping hand by means of a so-called 'Plant Disc'.

The disc is divided into a number segments. Every segment is given a capital letter. A list of plants (one for each segment) is then selected. Each plant is also given a capital letter. Say the disc has been divided into eight segments (A to H). The plants could then be allocated a letter according to their overall degree of similarity so that, the closer they appear on the disc, the more familiar they are. For example A would be more similar to B (and H) than to C and G, and so on. In such an eight-segment disc, the most dissimilar, and therefore most contrasting pairs of plants would be A and E, B and F, C and G, etc. These would be the best combinations. A-D and A-F would also be good combinations, A-C and A-G less, while A-B and A-H should be avoided.

EXAMPLE OF HOW TO CHOOSE PLANT COMBINATIONS USING A PLANT DISC

According to the Plant Disc:

A-E is the best combination because *Cryptocoryne willisii* and *Ceratophyllum demersum* differ in size and shape;

A-D is a good combination because *Cryptocoryne willisii* and *Echinodorus tenellus* differ a little in size and shape; A-F is also a good combination because *Cryptocoryne willisii* and *Cryptocoryne beckettii* differ in colour, size and a little in shape;

A-C is not so good a combination because *Cryptocoryne willisii* and *Heteranthera zosterifolia* differ only a little in shape;

A-G is not a good combination either because *Cryptocoryne willisii* and *Cryptocoryne tendii* differ in size and only a little in shape;

A-B should be avoided because *Cryptocoryne willisii* and *Samolus parviflorus* do not differ significantly;

A-H should also be avoided because *Cryptocoryne willisii* and *Cryptocoryne parva* are virtually 'sister and brother'.



PLANT AND FISH SELECTION FOR F. ZINKEN'S AQUARIUM

PLANTS

- 1) *Cabomba aquatica*
- 2) *Hygrophila polysperma*
- 3) *Alternanthera reineckii*
- 4) *Vesicularia dubyana*
- 5) *Nymphaea lotus*
- 6) *Rotala rotundifolia*
- 7) *Hygrophila difformis*
- 8) *Vesicularia dubyana*
- 9) *Hydrocotyle leucocephala*

FISH

- 2 *Corydoras aeneus*
- 2 *Apistogramma agassizii*
- 2 *Apistogramma borellii*
- 2 *Gyrinocheilus aymonieri*
- 5 *Hypessobrycon flammeus*
- 9 *Paracheirodon axelrodi*
- 5 *Aplocheilichthys panchax*

It is clear that such a Plant Disc has many shortcomings, but these can be redressed through experience. The aquarium owned by F. Zinken (filtered by means of an Eheim pump (390 litres per hour) and illuminated by four fluorescent lamps of 30 Watts with the colours: warm-white, GroLux, daylight and Truelight) was designed according to the Plant Disc principle and is an excellent example of how effective this approach can be.

FRED THE PIRANHA.



BY PETER MCGEOUGH

B.T. Foden

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UK KOI PRODUCTION

Nigel Caddock recently visited Treecircle Ltd, and found it to be an exciting, enterprising company that is rising to the daunting challenge of producing quality Koi fit to challenge the hitherto impregnable supremacy of the Japanese Koi industry.

(Photographs: Courtesy of Nishikigoi International)



This superb brood Koi, a 22 inch Shiro Bekko, was recently awarded Best Bekko and 2nd Best Koi (size 5) at the UK dealers' show, Nishikigoi '90

ALL Koi-keepers understand the problems associated with the successful keeping of Koi. Few, however, fully appreciate the gargantuan problems faced by the breeders and producers of our beloved fish. Koi that are available for sale in the UK represent, perhaps 0.05% of the total initial production, as many of the eggs and fry die and the fierce culling regime deals with a further, staggering, 30% of total production. In simple terms, the total percentage of Koi that actually reach the market is very small, and the number of excellent-quality Koi is totally minuscule.

The apparent shroud of mystery which surrounds Koi production in Japan, combined with climatic disadvantages and the lack of a mass market outside Japan, has tended to discourage Koi production outside the traditional Japanese breeding regions.

Pioneering UK Koi centre

That is, until now! An exciting new UK company has been slowly developing techniques and facilities to meet the epic challenge of Koi production, and has established a major breeding and sales unit in the heart of the Cheshire countryside.

Treecircle represents a marvellous combination of true entrepreneurial business acumen, with a high degree of skilled scientific knowledge, allied both to the commitment and single-minded determination that form a cohesive team which is really beginning to "produce the goods".

The Treecircle enterprise is the brainchild of the effervescent entrepreneur Barry Morgan, who has created and developed a major UK Koi production and sales facility. In addition to producing UK Koi on an unprecedented scale, Treecircle have created the UK's first 'Koi Supermarket'. There are over 25,000 Koi currently available from Japan and Israel and, in addition to the UK Koi, Treecircle have a wide variety of Fancy Goldfish available.

The 100-acre Treecircle site nestles in the sleepy Cheshire village of Alsager, with only 10 acres of the available 100 currently developed, and on-going construction underway to develop much more. The current site already has a staggering five million gallons of water! In addition, there is a 150' giant 'Koi Bubble'

which houses the main retail facility, consisting of some 15 fully-filtered ponds holding a further 250,000 gallons.

The two prime objectives of Treecircle are to refine and develop Koi production techniques and to offer UK hobbyists and dealers a major source of Koi from Japan and Israel. The Koi production process is scientifically controlled, planned, timed and executed with surgical precision from start to finish, and the care and attention that is lavished on the Koi from spawning to sale is quite remarkable.

Key resources

One of the key available resources is a supply of superb natural spring water which occurs courtesy of local artesian wells. The quality of the natural water is superb, and its high mineral content renders it ideal for Koi production and growth. This rich natural resource also helps with running costs, as the only tapwater used is for supplementing the natural water on a topping up basis. Not only are these Koi British, they are 'Organic Koi'!

The heart of any Koi production unit is the 'brood' or 'parent' Koi, and much of the last two years has been spent acquiring high-grade broodstock. The 20 high-grade breeding trios at Treecircle have the incredible potential of producing more than ten million eggs a year!

The production techniques being used are



Treecircle Sales unit during their recent festival '90 event which attracted almost 2000 visitors over the weekend



One of Treecircle's mud ponds under construction

similar in principle to those applied in the intensive rearing of carp, which, with some fine tuning work, is perfectly acceptable for the production of Koi. The impressive numbers which are currently being produced and reared fully validate this theory.

Treecircle have, to date, invested over £750,000 and, with major on-going development projects, are ready, willing and able to invest a lot more in the pursuit of their very exciting ambitions.

To mark the successful culmination of an intensive twelve-month construction programme, a Koi Festival was recently held, attracting visitors from all over the UK, including AGP's own Roger Cleaver, and several visitors from Europe.

It is, indeed, time we, in the UK, began to challenge the Japanese at their own game. As the learning curve is long, the sooner we begin in earnest, the sooner such efforts will begin to show results and yield top-quality home-produced Koi we can be proud of.

Treecircle is open to visitors throughout the year. For further information contact: Barry Morgan, Treecircle Ltd, Home Farm, Hall Drive, Alsager, Cheshire. Tel: 0270 877989. Fax: 0270 872131.

* Nishikigoi International is a UK specialist Koi magazine. It is a quarterly publication produced jointly by Nigel Caddock and Greg Peck and offers high-quality Koi information with lots of colour photographs. For further information ring 061-747-3390 or write to: Nishikigoi International, Highways, 1096 Snowden Avenue, Urmston, Manchester M31 3EF.

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OUT AND ABOUT

Second successful year for Nishikigoi '90

By Stephen Smith

The middle of March, and the finest weekend so far this year, brought Koi fanciers out in their thousands to Staffordshire County Showground, the venue for the second festival of Koi appreciation, **Nishikigoi '90** (17/18 March).

Full marks to the organisers for their choice of venue. The show hall is situated within the showground and was easy to find, while parking was simplicity itself. The hall is also the ideal showplace for any weather conditions, being cool inside, despite high temperatures outside. The organisational aspects themselves appeared to be first-class, with sensible layout of the exhibition hall and adequate

provision for refreshments.

Such organisation deserves success, and the organisers (a group of Koi dealers, comprising Infiltration, Clearwater, Koi, Ching Koi, Coldstream Koi, D J Koi and Kent Koi) are to be praised on getting just about everything right.

Praise should also go to the exhibitors, without whom, after all, there simply wouldn't be a show. All areas of the hobby were represented, including manufacturers and retailers, as well as craft stalls; visitors could, in fact, obtain just about everything they required for the upkeep of their Koi, including some very reasonable fish, at some very reasonable prices.

My personal pick of the stands was the magnificent display mounted by Shirley Aquatics, who have been fine ambassadors to the hobby for several years, while just a hint of criticism should go to those manufacturers and retailers

who weren't there.

If you did attend **Nishikigoi '90** this year, whether as an exhibitor or visitor, I have no doubt you will want to be there

again next year. If you didn't attend this year, make sure you don't miss out on what deserves to become a major event in the Koi-keeper's calendar.



Joe Wilmington, holding the Grand Champion Trophy he won with his Maruten Kohaku at Nishikigoi '90. In addition, Joe also won the following awards: Supreme Champion, Best Koi (Size 4), Best Koi (Size 5), Best Koi (Size 6), Best Adult Koi, Best Mature Koi, Largest Koi in Show.

Tewin revisited

by John Dawes—

Last August I wrote about some of the exciting developments that were taking place at Tewin Mill Fish Farm (**Out & About** — August 1989, page 89). I also referred to some of **Martin Symonds'** plans for the future.

Well, that future has now arrived... so, not surprisingly, Martin has a whole new set of equally exciting plans for the 'next' future!

The fact is that there's always something happening when one visits Tewin. Where other people talk, Martin acts. And he doesn't believe in half measures either. If something is worth doing, it's only worth doing well... or not at all.

Second-time (or nth-time) visitors to Tewin will know exactly what I mean. For instance, if you visited the site following my last article and return now (following this piece), you will find that the tropical and marine sections are more than twice the size they



Across this bridge lies Tewin Mill Fish Farm — a modern, spacious aquatic centre that's really going places.



A newly-arrived shipment of Fancy Goldfish is examined by Glen Bird prior to acclimatisation.

were. The coldwater section has also been expanded. So have the holding/quarantine facilities (these are due for a further — and very substantial — increase as part of Martin's next set of improvements). So has the volume of home-produced Blue and Golden Orfe and Ghost Koi which, incidentally, are being offered at unbeatable prices.

Despite all these expansions, what return visitors will probably notice, above all else, is the almost unbelievable numbers (nearly 1 million fish, in fact) of Koi and Goldfish swimming around in the numerous earth ponds that, only eight months ago, were fully stocked with trout.

The trout are still there, of course, forming an important part of Tewin's varied offerings to the public, but the bulk of the space available is now taken up with Israeli Koi and Goldfish.

"So, what's new about this?" you may ask. After all, other people sell Israeli fish — not just Tewin. Yes, fine... but how many of these have taken the trouble (and have invested the money) to import the fish in autumn, gradually hardening them off to British climatic conditions, and then keep them in outdoor ponds throughout the winter in order to be able to sell them fully-acclimatised in the spring? Well, this is precisely what Martin Symonds, in conjunction with Adrian Barnes, his dynamic partner from Pisces Ltd (the Israeli farm responsible for producing the present stocks), has done.

The fish I saw in the ponds during my visit were in tip-top condition; they were feeding voraciously as well. Once a week, some of these fish are netted and transferred to the coldwater retail area — a never-ending supply of top-quality 'Anglicised' Israeli Koi and Goldfish which stand every bit as good a chance of doing well in our garden and patio ponds as any top UK-produced — or Japanese-imported — equivalents.

Martin's and Adrian's plans don't end there, of course. Their aim is to set up a large-scale Koi and Goldfish holding and acclimatising unit at Martin's 50-acre Norfolk farm, where the Orfe and Ghost Koi are currently being produced. The scale of the operation is likely to be such that stocks will be available, not just for sale to the UK trade, but also to other



Tewin produces all of its Golden Orfe... and Ghost Koi.

European countries, with Tewin Mill Fish Farm acting as the sole distributor of Pisces Koi and Goldfish for this part of the world.

In order to get things moving on this front with the minimum of delay (and with 1992 just round the corner), the next large batch of fish for acclimati-

sation will be brought over from Israel in June.

As I said earlier, there's always something happening at Tewin. Why not pay them a visit and see for yourself?

Tewin Mill Fish Farm is open seven days a week, from 9 am to 5.30 pm. Ring Martin Symonds or Glen Bird

(Tewin's Manager) on 0438 716019 for further details.

Tewin Mill Fish Farm and Fisheries Ltd, Kingsbridge, Tewin, Near Welwyn Garden City, Hertfordshire AL6 0LJ is situated on the B1000 between Hertford and Welwyn.



Fully 'Anglicised' Israeli Koi overwintered at Tewin.