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AQUARIST AND PONDKEEPER

MAY 1989
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COVER STORY

(Photograph: Jane Burton/
Bruce Coleman Ltd.)
The Tinfoil Barb — also refer-
red to as the Goldfoil or Sch-
wanenfeld's Barb, is a large,
active shoaler with a wide
distribution in the Far East
and an equally wide following
within the aquarium hobby.
Most specimens sold in
shops are around the 2-3in
size (5-7.5cm). Given ample
swimming space and an ade-
quate diet (often consisting of
all the soft succulent plants in
an aquarium!), Tinfoils can
grow to over 12in (30cm). A
golden, red-tailed variety of
this attractive fish is also
available.

GUEST EDITORIAL

Dr. David Pool, head of the Tetra Information centre for the past three years, took his first degree in Zoology at Liverpool University. His PhD — also at Liverpool — was on fish diseases. Since then, David has lectured in fisheries biology at Liverpool University and Polytechnic. David has been keeping fish since he was six and, since joining Tetra in January 1986, has been a regular contributor to A&P and has lectured widely both in the UK and overseas.



Is the water safe?

With the impending privatisation of the regional Water Authorities the variable quality of tapwater and its effect on us has been highlighted. For aquarium and pondkeepers there is also the concern of how the water will affect their fish.

Most people are aware of the presence of chlorine in our tapwater and the adverse effects it can have on fish, plants and invertebrates if not removed. There are also a number of other chemicals which are added to the water, including chloramine, lime and flourine. Some, such as flourine, appear to have no adverse effects on fish, whereas others, eg chloramine, are very persistent and can cause severe problems to all aquatic life.

It is the Water Authorities' responsibility to provide water which is suitable for human consumption and the chemicals that are added all have a specific part to play in achieving this. Lime, for example, is used in many areas of the country to raise the pH and so prevent the corrosion of old lead and copper pipes. Although we may complain about the unsuitability of such water for fishkeeping, the alternative is to have acidic water which is rich in lead and copper from the pipes, with their consequent risk to our health.

Chloramine is added to water in selected areas and this can cause severe problems to aquarium life if not removed. It tends to be added in areas with a great distance between the source and the tap. Its persistence in water ensures that such supplies are free from dangerous bacteria, and so, safe for us to drink.

Nitrates get into the water source as a result of intensive agriculture or sewage farms. Although nitrate removal is possible it is expensive and so is not often undertaken. The result is that the tapwater in some areas can have nitrate levels which will damage fish and make marine invertebrate keeping very difficult. In these areas a water change can have adverse, rather than beneficial, effects.

There is growing pressure on the Water Authorities to improve tapwater quality, making it safer to drink, and hopefully to keep fish in. Let us hope that privatisation speeds this process up, rather than stop it because it is not profitable.

Dr. David Pool

David Pool

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POWER TO THE PEOPLE!

Hurricanes, marathons and switched-off power filters — all in one article. Impossible? Not so, says Amanda Grimes. Read on . . .

I was interested to read the Seaview page in *A & P* (March issue). Although I have been told time and again that I am fussy about power filters, I was delighted to see Gordon Kay confirm my ideas. Let's face it, most of my views are so wide of the mark you might well wonder what exactly I was aiming for . . .

Anyway, he reckons that if power filters are turned off for more than an hour, they should be cleaned before starting up again. And it is just this that not only caused me a headache about 18 months ago, but this is a yearly hazard for me in late April/early May. Not, I hasten to add, that I don't clean these filters out regularly — but life, God and the Electricity Board (are they one and the same? Time will tell . . .) add their little bonuses.

Remember the 'hurricane' of October 87? I put it in quotes in case the Meteorological Board are reading this and sue me under the Weather Descriptions Act. Well, my quiet, self-effacing corner of the British Isles (London) got a bit of a bashing from this unexpected breeze. I woke about 3 am to the sound of my motorbike being gently scraped around the front drive, and the sight of the beech hedge doing Fonda-type aerobics. While all outside was howling and crashing, the silence within became ominous. The power was off.

It took a while for my delight to diminish. I admit it — I get a kind of anarchistic thrill when one of the biggest cities in the world grinds to a halt. As a born Londoner, with a deep love for my home town, I loathe seeing it paraded as something infallible and all-powerful. All-powerful it certainly wasn't that night. But, as I said, when I stopped sniggering to myself, I lit a candle and went

round the flat, unplugging all the power filters.

Later that morning, the streets were filled with the sound of chainsaws and council vehicles, clearing up the beautiful, broken trees of our neighbourhood. And I am glad that I didn't see the worst of it. There can never be anything even slightly amusing in such destruction.

No, I was indoors, up to my elbows in the sink, cleaning out the filters and waiting for the power to come back on . . .

But, of course, that's a one-off. Unless you live in Greenwich, about 400 yards from the start of the London Marathon. Now I make no claims about the amount of wind that can be generated by several thousand runners charging past your door. But my neighbourhood becomes a war zone about this time of year.

Here we are, all sleeping peacefully, trying to recover from, or forget, a late Saturday night, when this awful droning breaks through our sleep. Yes, I have one of those pumps, too; those ones that gradually work their way across the tank lid until they find a particularly acoustic spot to vibrate on . . . But I'm talking really big droning here — helicopters and those 'blimp' things that I always thought were dots on the radar screen that you track and shoot down, until someone pointed out they're 'blips'. That's okay by me; blips, blimps, shoot them all down.

Anyway, here we are in 'M.A.S.H.' territory; choppers, balloons, light aircraft — you name it, we have it. The world's media is at the door — or a quick walk away on the Heath, which is much the same thing. And they're hauling into place this huge gun — hopefully to shoot down the blimp? It's a yearly anti-climax when they lower its sights

and use it to, ostensibly, start the run, but local rumour has it that they're really trying to deafen us all so that we won't complain about the traffic-noise from the new road they're planning . . .

So, what has all this to do with power filters? Patience, I'm getting there, as the driver said when following the signs on the new road. You see, this remains another local mystery. Every year, sometime in the night, the power goes off. Don't ask me why. Maybe they have to plug in all that television gear. Or maybe they test the gun early, with a silencer, and get the elevation wrong. Or maybe . . . But before I go any further, if they are plugging in all that electronic equipment, whose meter is it going through?

The fact remains — the power goes off. And I never know how long it's been off, because all my electrical equipment is of that really helpful type that goes back to zero. And worse, flashes at you. 'Look, look, I'm back at zero,' the video simpers. 'All your timer programmes are cancelled.'

The heating and hot water haven't come on as the clock's up the creek and the radio alarm doesn't wake me to see the start of the race. In fact, if you can manage to make your way to my area on the day, you will see what the cameras never catch — the unofficial Marathon that all the local entrants run to get to the start on time because the power's gone off in the night and their radio alarms didn't wake them, either . . .

So think of me, about this time of year, late on Saturday night, traipsing round my tanks to disconnect all the power filters. And while you're sprawled in front of your televisions, watching the fun and games of this great run, I'll be up to my elbows in the sink, cleaning charcoal and wool, and that funny ceramic macaroni . . .

Herpetology matters



By Julian Sims

Tadpoles in the grass

Common Frogs, *Rana temporaria*, spawn in very shallow water at the edge of ponds. This strategy helps to avoid predation from fish which extract and eat the egg from the centre of each protective sphere of jelly or consume the tadpoles after they have emerged.

With a lot of rain in the months of March and April, field ponds overflow, the surrounding land becomes waterlogged and large expanses of standing surface water collect. Under such conditions it is not unusual to find tadpoles swimming about between the submerged blades of grass.

In the early stages of development, frog tadpoles are herbivorous and feed on vegetation using their rasping horny jaws. As they grow, frog tadpoles become carnivorous, feeding on the tiny invertebrates including the infusoria (Protozoa and Rotifers) which also inhabit "field" water.

Tadpoles in flooded grass can thrive because they have a much larger area in which to feed, hide and disperse. In such low densities, predation from blackbirds, fish and the aquatic larvae of Dragonflies and the Great Diving Beetle (*Dytiscus marginalis*) is less serious than will occur with the dense black wriggling masses of tadpoles which feed around the edge of a pond. However, swimming into

flooded grass can pose one serious threat to life. If the flooding drains away or dries up before the tadpoles complete their development, many of these adventurous juveniles will become stranded and die.

Herpetological Congress

Symposia are exciting events, providing the opportunity to meet (and listen to) experts and fellow enthusiasts in a specific field of interest.

In 1980, a five-day European Herpetological Symposium was held at the University of Oxford and in the following year an International Herpetological Congress was held at the same venue.

Annually, an International Herpetological Symposium on Captive Propagation and Husbandry of Reptiles and Amphibians is held in the United States of America. The 13th such event will take place this summer.

Other symposia are regularly organised in Australia, Europe and North America. Against this background of broadly based international events, the rather grandiose named First World Congress of Herpetology will be held at the University of Kent at Canterbury (UK) from Tuesday 12 to the evening of Monday 18 September of this year.

With the exception of the name, this seven-day event promises to be extremely exciting with lectures on Behaviour, Ecology, Evolution, Classification, Genetics, Physiology and Conservation. In addition to this "symposium" pro-

gramme, a range of "round-table" discussions, tours and visits are planned. Accommodation is available on the University campus.

For further information of this event, write to: First World Congress of Herpetology, Ecology Research Group, Rutherford College, University of Kent, Canterbury, Kent, CT2 7NY.

Field Guides

If you are planning a visit to Europe or North America this summer, don't forget to pack a field guide for the identification of the native reptiles and amphibians. Due to their relative light weight, and for sheer clarity of illustration, the following are recommended, although not one of these four books could truthfully be described as "pocket sized."

A Field Guide to the Reptiles and Amphibians of Britain and Europe by E. N. Arnold, J. A. Burton and illustrated by D. W. Ovenden. Published by Collins. A well illustrated guide with very useful distribution maps.

Amphibians of Europe — a colour field guide by D. Ballasina. Published by David & Charles. This is an excellent book for the positive identification of Europe's amphibians, being fully illustrated with colour photographs. A comprehensive range of symbols

During periods of flood, adult frogs, spawn and even tadpoles can be found in normally-dry habitats such as meadows and pasture.



helps further with identification using underside marking, the habitats colonised, behaviour patterns and the shape of spawn clumps.

A Field Guide to Western Reptiles and Amphibians (of North America) by Robert C. Stebbins. Published by Houghton Mifflin Company. Well illustrated with black and white and colour diagrams, together with distribution maps. This book describes the reptiles and amphibians which inhabit "the West" from New Mexico in the south, northwards to the Arctic Circle.

A Field Guide to Reptiles and Amphibians of Eastern and Central North America by Roger Conant and illustrated by Isabelle H. Conant. Published by Houghton Mifflin Company. The companion volume to the Western guide, this book covers the remainder of the North American continent. In addition to diagrams and maps, this book also contains black and white photographs, including illustrated First Aid for snake bites!

Regurgitating Snakes

Snakes fed on large, dead mammals such as rats or rabbits sometimes regurgitate their food several hours later. This problem is caused by the bacteria which naturally live inside the gut of mammals.

Bacteria help with the digestion of plant material eaten by omnivores and herbivores such as mice, rats and rabbits. During this digestive process, the gas methane (CH₄) is produced. Digestion of the gut contents continues even after the mammal has been killed, thus the rat or rabbit swells up like a balloon inside the snake and causes discomfort. The result — the prey is regurgitated.

This problem can be prevented by cutting a slit into the abdominal cavity of the dead mammal before it is fed to the snake. This operation will also allow the reptile's digestive juices to work more easily because they can enter and attack the inside of the mammal at the same time as the outside is being digested.

Books and videos

T.F.H. New Book News

Dwarf Cichlids

By: Dr Joeg Vierke
ISBN: 0866229825
Style No.: TS118
Hardcover: 5.87in x 8.12in (145mm x 205mm)

Pages: 160
Colour photographs: 190
Retail Price: £13.95

Cichlids have endeared themselves to aquarists all over the world with their colour, ease of keeping and breeding and their fascinating behaviour. Dwarf Cichlids also have some advantages over their larger cousins. For example, because they are smaller they are more comfortable in smaller tanks, making them more suitable for keeping by beginners. In addition, they are generally less aggressive than the larger cichlids.

This book provides vital information about all Dwarf Cichlids — setting up the tank, breeding and keeping them healthy — accompanied by coloured photographs and drawings that serve as an identification guide.

African Cichlids of Lakes Malawi and Tanganyika — Twelfth Edition

By: Dr. Herbert R. Axelrod and Dr. Warren E. Burgess

ISBN: 086622 887X
Style: PS 703
Size: 5.5in x 8.25in (140mm x 210mm)
Pages: 447
Colour photographs: 745
b/w photographs: 48
Retail price: £14.95

Earlier editions of African Cichlids of Lakes Malawi and Tanganyika kept readers up-to-date with the newest names that should be applied to the species that had

already been imported and established in the hobby, as well as the newest species and/or morphs that had appeared. This edition — which has been expanded through the addition of almost 100 new photographs — performs the same much-needed task even more thoroughly.

The cichlids of each lake are grouped, for the most part, in separate sections, with one section for the fishes of Lake Malawi and one for the fishes of Lake Tanganyika. Within each section the fishes are grouped by genus and species so that the reader does not have to skip through the book trying to compare a photograph on one page with another in another part of the book.

The Complete Book of Dwarf Cichlids

By: Hans-Joachim Richter
ISBN: 0866227016
Style No.: TS121
Size: 8.75in x 11.25in (225mm x 285mm)
Pages: 208
Colour photographs/illustrations: 491
Retail price: £16.95

This book, written by one of the world's foremost fish photographers and breeders, covers all the fish species popularly known as "Dwarf" Cichlids — those members of the family Cichlidae that have all the good points of their larger relatives, but with none of the drawbacks. The text concentrates on providing readers with practical, sensible, easy-to-apply tips and techniques on keeping Dwarf Cichlids healthy and breeding them successfully.

This comprehensive book is written in a style that makes for ease of understanding and contains hundreds of colour illustrations which provide a perfect identification guide to the difficult species and sub-species, thus helping beginners achieve expert status more quickly.

Keeping Freshwater Fish Alive

By: Allen Breilig
Produced by: Petvision/Video Vision Int'l/ASPC Inc.

Available from: Petvision (UK), 11 Meadowway, Harpenden, Herts, AL5 1JN. Tel: 058-276 1674

Price: £29.95 (also available for rental through petshops).

This useful video is part of a series prepared by Allen Breilig under the overall title of Introduction to Fishkeeping, the other titles being: Introduction to Saltwater Aquariums, Keeping Saltwater Fish Alive, Selecting Compatible Saltwater Creatures, Introduction to Freshwater Aquarium and Introduction to Cichlids.

Coming, as it does, after an introductory video, *Keeping Freshwater Fish Alive*, quite naturally, assumes that the viewer already knows a bit about the subject. Even so, it goes through the main aspects of the nitrogen cycle in simple, easy-to-understand terms, and links it quite effectively with the wellbeing of the fish. It's also nice to see that adequate emphasis has been given to the role of stress in the maintenance of health.

The parts played by beneficial and harmful bacteria, UV sterilisers, water changes, adequate feeding, pH, water quality, treatment of common diseases and the value of well-informed dealers are all given due credit as well.

The photography is generally very acceptable, and the pace at which the whole thing rolls along is easy to assimilate. So, overall, there's a great deal going for this packed video which should prove quite helpful to a lot of aquarists.

While obviously being available for purchase by individuals, I can also see *Keeping Freshwater Fish Alive* being used to good effect by aquatic societies, where screening at club meetings could be followed by a discussion of the various points raised in the film.

One very important point that needs to be borne in mind when viewing the video, though, is that dosage levels are given in US units. A US gallon is smaller than an Imperial one (3.8 litres as opposed to 4.5 litres) so, if the guidelines given in the video are followed without knowing the above relationship, then an incorrect dose of medication will result.

Although this, and the other videos in the series, were originally produced for the US market, I still think that this important point should have been considered before they were released in the UK. Let's hope that the oversight is rectified in the next batch.

Exciting news of a forthcoming competition — for the chance of a Trip of a Lifetime
See Page 23

Books and videos

It would also be nice to see "valuable" correctly spelt, "aerate" correctly pronounced and "bacteria" referred to in the plural next time round.

Quibbles aside, Petvision have taken a bold step in going into video production in a bigger way than virtually anyone else. In fact, the six videos of the **Introduction to Fishkeeping** series represent a small part of a much larger catalogue consisting of over 40 titles in all.

I believe that the company will have a stand at **Fishworld '89** at Alexandra Palace between 27-29 May. Pay them a visit — there's very probably a video on the subject of your choice worth casting an eye over.

John Dawes

Carp Farming

By: V. K. Michaels
Published by: Fishing News Books Ltd
ISBN: 0-85238-153-0
Price: £15.25

Bill Michaels has been associated with carp farming longer than virtually anyone else in the UK. In fact, he was responsible for establishing one of the first carp farms in the country and was also one of the pioneers of Japanese Koi importation.

I met Bill for the first time several years ago when I visited Newhay Fisheries, the company he was involved with at the time, for a special *A & P* feature. I was struck, not just by his knowledge of carp and Koi, but also by his infectious enthusiasm for the fish.

From parasites to pond preparation, and from carp rearing to carp recipes (yes, this extremely wide-ranging book even includes these) there's little about carp that Bill Michaels doesn't know. And it's all in this book... and in everyday language.

The 24 chapters range from the **History of Carp Culture** to **How to Start Koi Farming** and virtually everything else possible in between, including **Intensive Carp Farming**, **Comparisons between Carp and Koi**, **Summary of the Carp Farmer's Year**, **Diseases and Parasites**, **Predators**, **Ghost Koi**, **Table Carp** and **Induced Breeding**.

Yes, despite the apparently "heavy" nature of the topics, the text is highly readable — not even the rigours of book-writing can dampen Bill Michael's enthusiasm.

Carp Farming has not been produced primarily with aquarists or pondkeepers in mind. It is largely aimed at professional fish farmers but, even so, it could (and should) be read by anyone interested in carp and/or Koi.

Probably because the book is not aimed at hobbyists, it contains no colour photographs, and the overall presentation lacks

some of the flair which we've come to associate and expect from mass-market aquatic books. Yet, if it were colourful, then this would have to be reflected in the price and, while £15.25 seems pretty fair for the book as it stands, the £20.25 tag which colour would impose would probably push it into the more "expensive-for-what-you-get" bracket.

My only other significant quibble is that the Goldfish is wrongly referred to as belonging to the same species as the Crucian Carp *Carassius auratus* instead of *Carassius auratus*.

That aside, I enjoyed this book enormously, and wish Bill Michaels and his publishers great success with it.

John Dawes

Catfish Association of Great Britain (Information Book No. 9)

Edited by: Gina Sandford
Produced by: Catfish Association of Great Britain

Available from: The Editor, 5 Sparrow's Mead, Redhill, Surrey, RH1 3EJ
Price: £1.00 (CAGB Members); £1.25 (Non-members)

This latest and long-awaited CAGB publication lists 21 species of catfish from the families Doradidae, Bagridae, Callichthyidae, Sisoridae, Mochokidae, Siluridae and Pimelodidae.

Each description is accompanied by a high-quality line drawing, a list of synonyms, distribution and size details, description of colour pattern, main identifying characters and general remarks about the species concerned, eg whether it's a shoaling fish or a loner, points to watch when handling or identifying a particular specimen, etc.

Previous titles in this series of Information Books from the CAGB have proved very popular and are much sought after. Book 9 seems no exception so, get in quick if you want to avoid disappointment.

One small criticism: the pelvic fins in all the descriptions are referred to as ventral fins, something that is more typical of American than British publications. In view of the fact that CAGB stands for Catfish Association of Great Britain, perhaps this point could do with looking at in future editions of these extremely useful and inexpensive books.

John Dawes

KENT Koi COLLECTION

AI-GOROMO

The Koi pictured here belongs to the variety **Ai-goromo**. Quality examples of Ai-goromo were produced in 1950, by crossing high-grade examples of the varieties **Asagi** and **Kohaku**.

In Japanese the word *Ai* means indigo blue and describes this variety accurately as the areas of *Hi* (red) have blue bordered scales.

The Ai-goromo pictured here has a beautiful, deep coloured *Hi*; the overall pattern is similar to the type associated with quality **Kohaku** and the blue-edged scales are neatly aligned.

The skin is an intense white and is nowhere marred by unwanted colour.

In the very highest grade Ai-goromo, the *Hi* pattern on the head should be free of blue. These qualities are all associated with the best examples of Ai-goromo.

This female Ai-goromo is a stunning example of the variety. It measures some 24 inches (61 cm), is beautifully proportioned and has excellent body volume.

Kent Koi Ko
Part of the Koi (UK) Group
Polhill Garden Centre
London Road
Badgers Mount
Sevenoaks
Kent
Tel: (0959) 33567
Fax: (0959) 32715
OPENING HOURS: 9.30 a.m. — 6.00 p.m. SEVEN DAYS A WEEK

PRODUCT ROUND-UP BY DICK MILLS

POND PUMPS

Pond pumps come in a very comprehensive range, enabling almost anything in active water displays to be produced — from a small ping-pong ball "balancing act" in the smallest of ponds, to miniaturised representations of the fountains at Versailles or the cascades at Chatsworth. Naturally, the display should be in proportion to the main body of static water and, of course, the waterflow designed to suit the occupants of the pond (Lilies, as well as fish).

Pumps may be referred to as submersible (in the pond) or as surface (externally housed in weatherproof boxes near to the pond): this latter course is more easily accomplished if, say, a raised section of ground is utilised to make a waterfall, the pump house being then less conspicuous.

"Advantages of 'out-of-pond' installations include easier maintenance and access. On the other hand, surface pumps require adequate weather protection and good ventilation (the same weatherproof box will also be needed to house step-down transformers for any low-

voltage pumps, regardless of type).

Careful siting will enable suction and delivery hose lengths to be kept to a minimum. A safety cut-out should be installed so that, if the pump becomes "dry" for any reason, the motor will not overheat.

Submersible pump motors are cooled all the time by the surrounding water. Whatever the type of pump used, it is imperative that all electrical cables are armoured, buried securely (but also identified!) and all necessary connectors completely waterproofed.

Pumps must be chosen with care: fountains require pressure; waterfalls and cascades need volume. Apart from these two differing virtues, the pump must also be able to raise the water to the required "head" (allow extra power to compensate for friction losses in long pipe runs and, of course,

clogging up pre-filters). Generally, surface pumps are the more powerful of the two types.

Siting the pump near to the water "return" keeps water movement through the pond down to a minimum but, while Lilies will appreciate this, other areas of the pond may become stagnant; some compromise should be worked out in these instances.

The position of the pump can also be important depending upon the time of year: water movement through the pond in summer will help oxygenation, the removal of carbon dioxide will lower the water temperature; in winter, this same water movement will cool the pond further by moving the warmer layers of water away from the bottom of the pond, thus destroying the fishes' ability to over-winter safely.

Vertical positioning of the pump should be considered too:



Submersible pumps such as this one (the new OTTER 100) require minimum maintenance, other than regular cleaning of the foam filter.

standing the pump on a few bricks, clear of the pond base, will minimise the amount of mulm drawn into the filter.

Modern submersible pumps require minimal maintenance, but their strainer/filter should be cleaned regularly; surface pumps require slightly more maintenance, lubrication being a priority. Most pumps have a longer life if they are used continuously, rather than being shut down during winter.

BERESFORD PUMP

Quality pumps without the usual hype in prices is the achievement made by BERESFORD PUMPS with their new OTTER submersible range.

The use of ceramic shafts and bearings have eliminated wear, while the pump bodies (with new fountain heads and versatile "T" pieces) are ultrasonically welded for increased safety and each carries a two year guarantee.

At £27.90, the Otter 100 is already the best-selling pump in 1989. Other models are the 180, 300 and 450 at £39.90, £49.90 and £59.90 respectively. (The model numbers represent flow-rates as GPH — gallons per hour).

There are also seven PV SURFACE PUMPS, ranging in output from 200-4, 500GPH at between 10-50 foot heads. For full details of all Otter water gardening products contact: BERESFORD PUMPS LTD, Carlton Road, Foleshill,

NEW PRODUCTS

Coventry CV6 7FL (Tel: 0203 638484. Fax: 0203 637891).

BLACK KNIGHT BRUSHES

Now into their third successful year, BLACK KNIGHT filter brushes are not only continuing to fulfil their early promise of a good product at reasonable cost, but also to exceed expectations of performance.

The main advantages over other forms of filtration (gravel, sand, etc) is ease of use and low maintenance — some aquarists have simply stopped even rinsing the brushes, as biological growth then occurs even in settling chambers of pond filters! Add to these factors the need for only modest-sized filters, the extra efficiency of a non-clogging, difficult-to-bypass filter medium (made from entirely safe materials to your

own physical requirements if necessary) and you have the makings of the ideal filter system.

Aquarists are constant experimenters, and Black Knight Filter Brushes have also found favoured use among marine fishkeepers, so much so that the company is now making MARINE QUALITY BRUSHES using stainless steel wire of a higher specification (316 S11) than that required for freshwater use.

It doesn't take too much



Part of the Black Knight filter brush range — high performance at modest cost

brain-power to apply the filter brushes' trapping ability to materials other than dirt: a more productive use is as an egg-trapping medium and so the BLACK KNIGHT SPAWNING BARRIER has been launched. The 8' 6" long brush has a 5" diameter and it is reported that the eggs show up very well against the black polypropylene strands; removal of the Spawning Barrier to a rearing pond or tank after spawning is completed is recommended and quite straightforward.

THE SPEEDY BRUSH COMPANY LTD, Mercury Works, Kingswood Avenue, Swanley, Kent BR8 8AW (Tel: 0322 62480).

BETTER WATER GARDEN PRODUCTS

The AMPHIBIOUS range of pumps are versatile pieces of equipment, being suitable for both submersible use and (with the addition of a Non-

Submersible Kit) as a surface pump.

The drive from the completely sealed motor unit is magnetically coupled to the impeller and the pumps are rated for continuous use, so making them ideal as motive power for biological filters.

Naturally, actual performance of any pump depends on the task demanded of it, but models can provide the following flows between the figures shown (note flow decreases with the increased "head"): P180 (400-50GPH at 5-foot head), P300 (500-135GPH at 6-foot), P450 (690-185GPH at 7-foot), P620 (800-180GPH at 10-foot), P770 (890-100GPH at 14-foot), P1400 (1650-100GPH at 14-foot) and P1800 (2000-400GPH at 15-foot).

The two largest models have 1.25in threaded outlets for larger display pipework. Electrical consumptions range from 50 to 175 watts. Full details from:

BETTER WATER GARDEN PRODUCTS, Blagdon Water Garden Centre Ltd., Bath Road, Upper Langford, Avon BS18 7DN. (Tel: 0934 852973. Fax: 0934 852998)

CURIO WOOD

Despite some very accurate mouldings and colourings some aquarists may still find it hard to accept synthetic substitutes for the real thing. Quick to support such traditionalist views comes CURIO WOOD, marketed jointly by NEIL HARDY AQUATICS LTD and MONKFIELD AQUATICS.

The very attractive, misshapen knarled branches come from tropical savannahs and edges of rainforests, but before you start getting "over-green" about things, the wood is collected from dead, not living, trees.

Obviously our primary interest in it is as a submerged decorative feature in the aquarium, although it can be used to equally good effect in flower arrangements, indoor gardening displays, window dressing and many other aesthetic uses.

Hardness or pH of the water do not seem to be affected, even after prolonged use, but some discoloration of the water may occur; however, this can be minimised by repeated soakings in hot (not boiling) water before use.

No two pieces are the same shape and come in weights of 250gm upwards. Dealers are supplied in 9, 23 and 92 kilo packs so there should be plenty to go round. Details from:

MONKFIELD AQUATICS, Monkfield, Bourn CB3 7TD (Tel: 09544 205)

CYPRIO

CYPRIO have researched the problems of pump-life pretty thoroughly and have come up with two major conclusions: pumps using "circulatory" technology often fail to deliver sufficient "head" or to have enough power to work filters adequately and, while their impellers are protected by a simple strainer, the necessary cleaning almost becomes a daily chore.

Vertical-spindled, centrifugal pumps certainly provide sufficient lift, but continuous pond use, as opposed to intermittent use (as in cellar pumps lifting quantities of the amber nectar to floors above), means the price paid is significantly increased wear and tear on bearings and seals.



Cyprio's Premium Pump — fully repairable & serviceable, and built to last. CYPRIO LTD

The Cyprio PREMIUM RANGE pumps do not use "sealed for life" units but incorporate parts which are all replaceable. If the pumps are returned to Cyprio for an annual service (costing around £25.00 + postage & packing), life-expectancy of continuously-run pumps is in excess of five years.

The range includes five manual models at present, with automatic, float-switch-equipped versions to follow. Models 1-5 feature flow rates of 1000, 1400, 2000, 3200, and 4300 gallons per hour, all at 6-ft head. Prices, inclusive of VAT, range from £125.00-£220.00, and all pumps carry 12 months guarantee.

Optional accessories include Base Plate Adaptors (horizontal or vertical), Pond Vacuum Conversion Kits, Venturi-aerators, Fountain/Waterfall Attachments and a range of Hose-packs.

Further details from **Malcolm, Ann or Robert Goodson at: CYPRIO LTD**, 133 Eastgate, Deeping St James, Peterborough PE6 8RB. (Tel: 0778 344502)

GTI FILTERS

Three forms of high performance external pond filters are offered in the GTI range: TRICKLE CASCADE, SINGLE CHAMBER and MULTI-CHAMBER UNITS. All provide mechanical and biological filtration with low maintenance.

UPVC pressure-grade pipework and fittings are used and



A free-standing, attractively disguised GTI filter

media support trays, hoesail connections and drain taps are all included as standard.

The Trickle Cascade Filter is free-standing and attractively disguised in its decorative stained-timber container. A gravel-filled pre-pump unit provides mechanical filtration, and the water is sprayed over the filter media to cascade down to a sedimentation section at the base. The filtered water then passes through zeolite on its way back to the pond.

The Single, and Multi-Chamber units have aeration venturi inlets as standard; mechanical filtration is

achieved by brushes, but the biological filtration medium is provided by the customer.

The ESCORT FILTER series are basic, "full flood" biological filters, again using pressure-grade pipework and fittings, venturi and support trays as standard. Details from: **TECHNICAL SHEETING DEVELOPMENTS LTD**, PO Box 274, Wheathampstead, St Albans, Herts AL4 8NA. (Tel: 0438 832152)

OMEGA KOI PELLETS

Visitors to the September '88 Trade Show at Alexandra Palace will have seen the colourful display of OMEGA products, including their new KOI FOODS.

Now, to coincide with the new season, comes the launch of the foods in two larger seasonal forms — Floating Summer Pellets and Slow-sinking Winter Wheatgerm. Three different pellet sizes are available in 1kg packs.

Among the many advantages claimed for these British-made foods are those of guaranteed freshness and lower cost, when compared to imported foods (each pack carries a "use by date"). Both types contain *Spirulina* for natural colour enhancement.

Summer Pellets retail at £3.95 and Winter Wheatgerm at £4.25.

Dealers will also have point-of-sale leaflets *Advice on Koi Nutrition* for distribution to customers. Details of Omega Products from:

OMEGA PETFOODS, Edward Baker Ltd, Great Conrad, Sudbury, Suffolk CO10 0JA (Tel: 0787 72353. Fax: 0787 311774).



Koi pellets for all seasons — courtesy of Omega

News from the societies

Hucknall & Bulwell Aquarist Society

Recently received from Clive Hinton, the H.B.A.S. Secretary:

"Just a few lines to inform your readers that the Hucknall & Bulwell A. S., Nottingham's only aquatic society, is still around after 21 years and

thriving, which, in the current times, is very good news. While membership at other societies around us is flagging, ours is actually increasing.

Here in Nottingham, we are very much in no-man's land, with Yorkshire to our north, F.N.A.S. to our west, and A. of A. and F.B.A.S. to our south, so we are proud of our existence.

New members are always welcome to attend our meetings held at the Half Moon Pub, Hucknall, Notts., on alternate Wednesday nights, when we hold regular table shows and have talks on the many aspects of fishkeeping.

Last year saw the most successful year for the society on the 'Open Circuit' with placings

of our tableau in all the major aquarist festivals and 15th in the Yorkshire 1988 show league with 107 points".

For further details on H.B.A.S., contact the Show Secretary, Clive Hinton, at 45 Wollaton Avenue, Gedling, Notts., NG4 4HY. Tel. (0602) 876657.

Diary dates

Southend, Leigh & District Aquarist Society

The 1989 S.L.A.D.A.S. Open Show will take place on **6 May** at St Clement's Hall, Leigh on Sea, Essex. Approximately 500 entries are expected from over 100 competitors, making this one of the larger club shows in the country.

For further information contact Chris Cheswright (Show Secretary), 2 Cedar Avenue, Wickford, Essex SS12 9DT.

Aberdare Aquarists' Society

The 7th A.A.S. Open Show will be held at the Cynon Valley Community Activities Centre, Godreman Street, Godreman, Aberdare, on **Sunday 14 May**. For further details, contact A. Jones (Secretary), 34 Maeshy-fryd, Cwmbach, Aberdare, Mid Glamorgan CF44 0DN.

Thorpe & District Aquarist Society of Norwich

This year's T.D.A.S. (of Norwich) Open Show — sponsored by Tas Valley Koi — will be held at St. Andrews Hall, Norwich, on **Sunday 14 May**. Further information from Paul Sparks, 5 Gowing Close, Hellesdon, Norwich, NR6 6PX. Tel. (0603) 406276.

Corby & District Aquarist Society

The C.D.A.S. 1989 Open Show will take place on **Sunday 21 May** at Corby Civic Centre. Benching: 10.00 am — 12 noon. Details, schedules, etc. from the Show Secretary, 5 The Nook, Corby, Northants, NN17 1XA.

Capital Aquarist Society

The first Open Show of the Capital Aquarist Society will be held on **Sunday 21 May** at Ferryhill Primary School, Edinburgh.

Benching: 10.00 am — 1 pm. Auction: 1.30 pm. Further details from the C.A.S. Secretary, Robert Hawes, 78/4 Granton Crescent, Edinburgh, EH5 1PB.

Fishworld '89 exhibition at Alexandra Palace, London N22, 27-28-29 May 1989

The UK's largest fishkeeping event takes place in association with the Federation of British Aquatic Societies and includes trade stands, lecture theatre, demonstrations and Open Show featuring the new British Open Championship. Further details Fishworld '89, Cliveden House, Priors Way, Bray, Maidenhead, Berks. SL6 2HP. Tel: 0628 38912 or 770500. Telex: 848794. Fax: 0628 29942.

Redcar Fishkeepers Society

The R.F.S. annual Open Show will be held at Marske Leisure Centre on **28 May**. Open to the public: 12.00 noon. Judging: from 2.00pm. Auction: 1.00pm. Further details from B. Lacey (Secretary), 14 Lockwood Court, Bankfields, Eton, Middlesbrough, Cleveland TS6 0TQ.

Yorkshire Koi Society

The 11th YKS Open Spring Show will be held at Harewood House, near Leeds on **Sunday 28 May**. This show is for Koi measuring up to 16 inches in

length, judged in two size classes: 0-10 inches and 10-16 inches (various variety classes/size groupings). For entry forms and further details contact Trevor Hall (Show Manager — YKS), 39 Hazel Crescent, Chickenley, West Yorkshire, WF12 8QF. Tel: (0924) 465764.

Cannock & District Aquatic Society

The C.D.A.S. annual Open Show and Auction will be held on **11 June** at Avon Road Community Centre, Cannock. Benching: 10.30 am — 1.30 pm. Auction: 2.00 pm. For further details, contact Peter Griffiths (Show Secretary), 10 Meadow Walk, Wilkin Estate, Brownhills, West Midlands. Tel (0543) 371924.

B.K.K.S. (Middlesex & Surrey Border Section)

The Open Show and Auction of the Middlesex and Surrey Border Section of the B.K.K.S. will be held on **11 June** at Hampton Football Club Ground, The Beveree, Beaver Close, Station Road, Hampton, Middlesex. For further details (including trade enquiries) and entry forms, contact the Show Manager, Steve Gould, on (0932) 848147.

Deal & District Aquarist Society

The D.D.A.S. 1989 Open Show will be held on **Sunday 18 June** at the TA Centre, Middle Deal Road, Deal. Full details from Avis Hayward, 9 Meryl Gardens, Walmer, Deal, Kent. Tel. (0304) 366835.

Wear Valley & District Aquarist Society

W.V.D.A.S. are holding their first Open Show at the Henknowle Community Centre, Henknowle Estate, Bishop Auckland, on **Sunday 25 June**. Further information from John Corrigan (Secretary), 8 Clifton Green, Sunnybrow, Crook, Co Durham DL15 0NP. Tel (0388) 745674.

Romford & Becontree Aquarist Society

Romford & Becontree Aquarist Society will be holding their Open Show on **25 June** at Parkside Community Centre, Goodmayes Lane, Goodmayes Lane, Goodmayes, Essex. Further information from the Show Secretary, M Smith, 224 Wood Lane, Elm Park, Hornchurch, Essex, RM12 5NH.

Scarborough & District Aquarist Society

The 1989 Open Show (and Auction) of the Scarborough & District Aquarist Society will take place on **Sunday 2 July**. Benching: 11.00 am-1.30 pm. Full details available from S. Barker (Show Secretary), 64 Wykeham Street, Scarborough, N Yorkshire. Tel: (0723) 353258.

Darlington & District Aquarists Society

D.D.A.S. are staging their Open Show on **3 September**. For further information, contact Kevin Rodway (Show Secretary), 33 Geneva Road, Darlington, Co Durham. Tel. (0325) 487581.

Letters

Water . . . Fit to Drink (or Keep Fish in)?

There have been frequent reports in the press recently regarding the quality of drinking water, with unacceptable quantities of pollution, traces of metal and other toxins.

As water is the one essential and irreplaceable element in our aquaria, I wonder if your prestigious magazine could publish an article on the subject, either to set our minds at rest, or to warn us of the dangers and corrective steps which could be taken.

T. G. Leddon
Leatherhead, Surrey

Editor's Note:

Thank you for your suggestion, Mr. Leddon. We are already following it up and hope to publish an authoritative article on the subject before too long.

John Dawes

Monster or Masterpiece?

Is it not time for responsible fishbreeders to leave the breeding of freaks to those misguided unfortunates in the dog world? I have yet to meet anyone outside of the hobby, and precious few true devotees to the keeping of fish, who actually find the sad monstrosity on the cover of the March issue of *A & P* anything other than obscene. Is this a representative of what you and the importer consider to be a 'high quality fish'? I can only wonder at your definition of the words . . .

I realise you may find my criticism a bit over the top but I actually find the breeding, into any animal, of defects that make its life difficult, let alone impossible in all but the most carefully maintained circumstances, offensive and cruel. I could go on, but I think I have made my point.

Incidentally, I have been keeping fish and reading your generally excellent magazine for over twenty-five years. It went through a relatively low period in the not-too-distant past, but now seems to be growing stronger by the month, with

the many new and innovative features you have introduced. Please keep it up.

John H. Jenner
Hornsey, London

Editor's Note:

While some aquarists abhor the extreme physical characteristics exhibited by the more fancy varieties of Goldfish, numerous others just love them. At *A & P* we try to cater for all types of aquarists, pondkeepers and herpetologists. Therefore, although my own personal favourite variety of the Goldfish may be the simple, unadorned Common one, I fully recognise and respect the great deal of care, patience and expertise that goes into the production of really "good" Fancy Goldfish.

The Florida-raised Bubble Eye illustrated on our March cover was a superb example of its kind and, as such, deserved (in my opinion) the prominence we gave it. Whether

we love it or hate it as a fish is a separate issue altogether.

Similar arguments can, of course, be put forward for/against all other "fancy" varieties of fish, such as Guppies, Mollies, Angels, Siamese Fighters, Swordsails, Platies . . . even Koi.

I wonder what other readers think. Please drop me a line with your views.

It's nice to see that, despite your strong views on the subject, you still feel that we are going places with the magazine. Thank you for your encouragement, John — it's very much appreciated.

John Dawes

Blue . . . But Not that Blue

Your response to a reader's query on "*Haplochromis*" *electra* in the March issue of *A & P* was somewhat misleading. The reply should have gone some-

thing like this:

"*H. electra* (Burgess, 1979) — Synonym "*H.*" *jahnii* (nomen nudum) — is one of the numerous cichlids to come out of Lake Malawi. It is a deep-water species living at 25 metres. It grows to no more than 6-8"TL.

As with a lot of fry, males and females are indistinguishable. As adults, the males generally show a bluer coloration and the females have a darker area around their throat. They should not be kept in a species tank, but in a community. Failure to do this will almost certainly result in the female's death.

Be they tank-bred or wild-caught specimens, these fish are omnivorous, so a varied diet can be given, such as commercially available prepared food with the addition of livefoods. Do not feed Tubifex or, as suggested, fleshy foods, as these will not be digested and could cause problems.

A normal breeding pattern occurs in this species whereby the male entices the ripe female to his territory. There they perform a circular ritual during which the female lays an egg on a flatish rocky surface and the male, following behind, fertilises the egg. On the female's next pass, she picks up the fertilised egg and deposits another one/two. This continues until the female is exhausted of eggs. Broods can be upwards of fifty fry for a mature female.

These fish certainly do not dig nests. Neither should they be fed meat as implied.

While the adult male is, indeed, darker and bluer than the female, it's not that blue — and certainly not "electric blue", despite its name.

As there is still doubt regarding the status of haplochromines in Lake Malawi, one uses "*Haplochromis*" (in parenthesis) not *Haplochromis*. True *Haplochromis* species are found in Lake Victoria. Lastly, all Malawi mouth-brooders spawn in basically the same manner, with or without egg spots.

John Ferguson
Halifax, W. Yorks

NEXT MONTH

AQUARIAN
FLORIDA
COMPETITION

Get set for Florida by entering our exclusive 'Aquarian' competition next month.

The prize: an expenses-paid, fantastic one-week trip for two, staying at a top hotel, to attend the International Cichlid Conference being held in August in Orlando . . . with visits to all the spectacular sights as well, of course. See Disney World, Sea World, Epcot and other major attractions — they are all within easy reach of the Convention venue.

Don't miss this golden opportunity to fly to Florida — the 'Aquarian' way.

- Other highlights next month include our specially commissioned, colourful and comprehensive **Watergarden Supplement**. All the major favourite aspects of this fast-expanding area of the hobby will be tackled by our team of experts. All you have to do to make sure that you don't miss out is book your June issue of *A & P* early.
- John Ferguson and Dr. Ethelwyn Trewavas complete their illustrated, complete, review on *Aulonocara* in **The Peacock Cichlids**.
- Koi from Nigel Caddock, the Flier (a new live-bearer) from Dennis Barrett, Rainbows from Robert Kirkup, the Living Room Reef from Peter Bienias and Jane Tabern . . . plus other specially-commissioned features . . . and all our regulars. There's something for everyone in June's jam-packed, colourful issue.

Order your copy early!

Your questions answered

Having problems? Send your queries to our panel of experts who will be pleased to be of service. Every query receives a personal answer and, in addition, we will publish a selection of the most interesting questions and responses each month. Please indicate clearly on the top left hand corner of your envelope the name of the expert to whom your query should be directed. All letters must be accompanied by a S.A.E. and addressed to:

Your Questions Answered, The Aquarist & Pondkeeper, c/o Dogworld Ltd, 9 Tufton Street, Ashford, Kent TN23 1QN.



TROPICAL
Dr David Ford



COLDWATER
Pauline Hodgkinson



PLANTS
Barry James



KOI
Roger Cleaver



MARINE
Graham Cox



DISCUS
Eberhard Schulze

Amphibians & Reptiles Iguana Companions

I have just acquired a 72" x 24" x 30" high aquarium in which to house my ever-expanding Green Iguana. Rather than heat this expense for a single specimen I wonder if you could advise me as to how to sex these creatures in order than I can obtain a member of the opposite sex as a companion for my original lizard.

If I obtain two males, will they be territorial in this size environment, and will they fight? My present specimen is approximately 8 inches (20 cm) long, excluding tail.

Is it possible to keep other lizards of different species, but of similar size, and with similar environmental needs, in this size aquarium?

Adult male Green Iguanas (*Iguana iguana*) are larger in abdominal girth than the opposite sex and become orange coloured compared with the light-green females. Unfortunately, these two features will not help you very much as your specimen is relatively young — adult males can grow to a length well in excess of 4 feet!

A much more likely diagnostic feature is the fact that male Green Iguanas have a row of pores (which look like transparent spots) on the underside of th thigh of each leg.

IMPORTANT NEWS

Owing to popular demand, we are expanding our free Question / Answer service to A & P readers with the addition of a section dedicated entirely to amphibians and reptiles as from this month.

In charge of this new department will be our resident herpetological expert, Julian Sims, whose fast-expanding mailbag has led to this latest, and very welcome, development.

Please indicate clearly on the top left hand corner of your envelope that your letter is intended for Julian's attention and do please accompany your query with a stamped addressed envelope.

A male Green Iguana also has a well-developed serrated dorsal crest and tubercles scattered over its head and neck, as well as a prominent dewlap (a supported flap of skin) under the throat. The tail is long and usually banded. These last features are also present in the females but are not so well-developed. Many of these adornments are used for display purposes because male Iguanas are highly territorial. By extending the dewlap and flexing the tail, a male Iguana looks threatening and "warns off" a trespassing male — thus avoiding physical combat and possible damage.

Therefore, to avoid stress, it is NOT advisable to keep two males Iguanas together, but a true pair should do well.



With regard to keeping a lizard of a different species with your Iguana, I would be inclined to select a heavy-bodied, ground dwelling reptile such as a Blue-Tongued Skink (*Tilapia multifasciata*) to avoid competition for "tree" space. However, another Green Iguana of the opposite sex would be preferable.

Marine Predatory Ribbons

At present I have a tropical marine aquarium based on a 36 x 12 x 18in (90 x 30 x 45cm) tank. I am keeping fishes such as a Copper-

band Butterflyfish, Banana Wrasse, Neon Damsel, Yellow-tailed Blue Damsel, Percula Clownfish and Seawater Catfish. I would very much like to keep a Moray Eel as well. Please could you tell me if I could keep any other coral fishes in the tank with the eel? Which species of eel would be the best to keep?

The first observation which I must make is that your aquarium in its present state already sounds dangerously overcrowded. I don't know whether you realise it or not, but a 36 x 12 x 18in tank such as yours, even if totally empty of all coral sand, rockwork and corals, etc., only has a gross capacity of 28 gallons (126 litres) even if filled brimful of water. After making due allowance for free-board at the top of the tank and water displaced by the coral sand and rockwork, you will almost certainly find that you only have 24 to 25 gallons (108-112.5 litres) of actual seawater.

You don't give me the sizes of your fishes, but I would estimate them as follows:

Copperband	
Butterflyfish 2in (5cm)
Banana Wrasse 2in (5cm)
Neon Damsel 1in (2.5cm)
Yellow-tailed Blue	
Damsel 1in (2.5cm)
Percula	
Clownfish 1 1/2in (3.75cm)
Seawater	
Catfish 2 1/2in (6.25cm)

TOTAL LENGTH OF FISH 10in (25cm)
Now, using the time-honoured rule of thumb of 1in

Spotlight on

Cichlids

THE GOLDEN MOZAMBIQUE MOUTHBROODER

William Ross extols the many virtues of one of the least aggressive of all the tilapias found in the aquarium hobby
(Photographs by the author)

MY interest in tilapia was aroused in 1983 when I was fortunate to discover some of these fish living in the wild, see Ross, 1984. Following this humble start with *Oreochromis mossambicus* (Peters, 1852), I collected and bred various *Oreochromis* species and hybrids of the same, see Ross, 1986.

I was therefore delighted when I found that my local aquarium shop had some gold-coloured *O. mossambicus* for sale. These beautiful cichlids had been imported from the Philippines and were approximately 7.5cm (3in) overall length and, at this size, were sexable. With previous experience of keeping and breeding the normal coloured Mozambique Mouthbrooder, I purchased one male and three females of this new coloured variety.

According to Goldstein, 1973 the golden/red strain of *O. mossambicus* appeared in the hobby in 1971. It apparently was developed in Los Angeles by Hillard Marcus of the Aquarium Stock Company.

One word of warning; this fish is not to be mistaken for the Red Cherry Tilapia which is a hybrid of *O. mossambicus* and *O. aeneus* *holbrooki* Trewavas, 1966.

Aquarium Requirements

The four newly purchased *O. mossambicus* were placed in an 85 x 35 x 35cm (33.5 x 13.55 x 13.75in) aquarium with undergravel filtration and the temperature was maintained at 25°C (77°F). Bunches of *Ceratophyllum demersum* (Hornwort) weighted with lead were used for decoration.

Coloration of the fish at this time was an overall gold, both sexes being identical. As the fish matured, the male developed a matt gold spot on his scales which resembled a pine cone. His dorsal, anal and caudal fins became dotted with bluish coloured spots, whereas the female's coloured spots remained clear. Some males develop a red edge to their dorsal and caudal fins similar to their normal-coloured relatives. Fed on a varied diet accompanied with 25% water

changes weekly, the fish soon reached 10cm (4in) in length.

Spawning

It wasn't many weeks before the male went into the gravel moving business, playing havoc with the undergravel filter.

As with most maternal mouthbrooders, it was the male who became territorial, his excavations forming a saucer-shaped depression in the gravel. Into this nest he enticed the females to spawn.

The courtship period is brief and, unlike normal-coloured *O. mossambicus*, there is no significant difference in the pair's colours; the male's may just possibly be slightly enhanced. Once the female has laid her eggs, she collects them in her mouth and leaves the nest to find a quiet spot to brood them. The male will then continue to court the other females. It is this courtship behaviour of the male that influenced my choice of selecting one male and three females when breeding these fish. In this ratio, the male has several females to keep him occupied after spawning, thus reducing the risk of any one single female being unnecessarily over-pursued.

Occasionally, two females were observed in the spawning nest at the same time, one collecting the eggs laid by the other. Apparently, *Synodontis multipunctatus*, one of the catfishes from Lake Tanganyika, deliberately lays its eggs in the nests of spawning mouthbrooding cichlids, the eggs being picked up and brooded by the cichlids along with their own, see Sands, 1986.

Egg and Fry Care

A brooding female tries to find a quiet spot to incubate her eggs which are constantly moved in her mouth by action of her jaw and throat. At this stage the brooder may develop faint bar markings on her back and flanks; these are possibly the remnants of the warning markings found on normal-coloured brooding *O. mossambicus*, see Ross, 1985.

The fry are usually released around the tenth day — often only a few at first, as if the brooder were testing the area for the safety of her offspring. If she is satisfied that her

babies are safe, the remaining fry will then be released from her mouth. At this stage the fry are grey coloured and, in typical *Oreochromis* behaviour, will remain in a shoal close to their mother's head. According to Baerends and Baerends van Roon (1950), when threatened, the female gestures to the fry and they return to her mouth for protection. It is amazing to see the fry pack themselves into their mother's mouth.

Females become territorial and aggressive towards all other fish when they are brooding fry. On occasions, a particularly dominant female will even collect another brooder's fry, continuing to brood these along with her own.

Somewhere around the 20-25 day mark the fry are ejected and left to fend for themselves. Their colour at this stage is greyish-gold with clear fins. The dark ocellus (eye-spot) seen on the dorsal fin of normal-coloured *O. mossambicus* is absent, but several faint vertical bars develop on their sides, instead.

Growth and Development

Following the break-up of the mother/fry relationship, the fry continue to shoal for a time. In nature this shoaling behaviour is of great survival value. The dark ocellus on the dorsal fin of normal coloured *O. mossambicus* is thought, to constitute a shoaling signal which the fry use in order to keep together. In the absence of the ocellus, it is possible that the gold fry may orientate towards the faint bar marking on their siblings' sides. As the young fish grow these markings fade and eventually disappear along with the urgency to remain together.

Somewhere between the age of three and four months, the males become recognisable by the development of larger dorsal fins and the appearance of random matt gold spots on their scales. These spots finally become regular, giving the pine cone appearance seen on adult males. With a nutritious diet and frequent partial water changes, these fish will mature and spawn by the time they are four months old.

Unusual Female Behaviour

An interesting feature arising in adult *O. mossambicus* is a situation where some females will construct a nest, lay eggs in it and then brood them for about four days, after which they eat them. They do this entirely on their own.





Adult male Golden Mozambique Mouthbrooder.

Usually the females that go through this false pregnancy, are ones that have raised broods in the past. Some gold females raised on their own away from males, have also exhibited this phenomenon. It appears that once a female has reached the stage of developing eggs, she acquires an unstoppable urge and will lay eggs with or without the assistance of a male. This situation has been observed with normal-coloured *O. mossambicus* (Ross, 1985) and has been referred to as Pseudocyesis.

I have raised a batch of nine *O. mossambicus*, which eventually matured into seven females and two males. It was extremely interesting to watch the behaviour as the two males first established territories and excavated nests, and then enticed females to spawn in them. There was a great deal of aggressive behaviour exhibited but never



A spawning pair. The female, partly hidden from view, is in the process of picking up the eggs she has just laid.

any serious injury sustained by either sex. Most literature cites tilapias as requiring very large aquaria and of being very aggressive. From my experience, I would say *O. mossambicus* is one of the least aggressive. The tanks I use are usually around 85 x 30 x 40cm (33.5 x 13.75 x 14.75in), and so are not really all that large. For an aquarist interested in studying cichlid behaviour, I would have no hesitation in recommending *O. mossambicus*, of either the normal coloured or gold variety.

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Spotlight on

Cichlids

PEACOCK CICHLIDS

(The *Aulonocara* Review)

Part 1

John Ferguson of the British Cichlid Association and Dr E. Trewavas, world authority on cichlids, present the most complete review of Peacock Cichlids ever published in an aquarium magazine.

INTRODUCTION

Several species of the genus *Aulonocara* have been imported under the trade or hobby names before they have been formally described and named. In 1985 Loisel introduced them to the aquaristic world with seventeen colour photographs and notes on the classification, but he did not give any new scientific names. Recently this deficiency has been made good in four publications listed at the end of our two-part article, namely Trewavas (1984), Meyer & Riehl (1985), Meyer, Riehl & Zetzsche (1987) and Tawil & Allgayer (1987). The paper by Meyer, Riehl & Zetzsche is the first of five devoted to *Aulonocara* in a volume edited by Dr. Klausowitz of the Senckenberg Museum, Frankfurt a. Main. Sixteen species were recognised including three formerly separated as the genus *Trematocranus*. Also, one former *Aulonocara* was moved into the genus *Lethrinops*. This has now recently been removed and placed into its own genus, *Alicorpus*. The last paper in the same volume, by Grant, Dieckhoff, Mayland & Meyer, provides some details on the ecology of these species in their natural habitats. The summary table in Part 2 may be useful as a quick reference guide and provide some background information.

Below we have taken the names given in the recent 1987 paper by Manfred K. Meyer, Rudiger Riehl and Horst Zetzsche and, with the best of our ability, tried to put the "Trade" names to these species. We have added, to the last, a few species left out of the paper.

1) *Aulonocara auditor* (Trewavas, 1935).

Originally named *Trematocranus auditor* by Trewavas in 1935. Trewavas noted "That this species may not be closely related to the other two, (*Trematocranus microstoma* and *Trematocranus brevirostris*), is suggested by different dentition, smaller head and different coloration". Three specimens were collected: One, collected by Christy, was caught at Vua; the other two were collected by Rhoades with no precise area given. Loisel, in his 1985 article in F.A.M.A. magazine, featured a photograph of an *Aulonocara* under this name.

However, the fish featured, the "Night" / "White Top" *Aulonocara*, is not *Aulonocara auditor*, but more closely resembles *Aulonocara kueseri*.

2) *Aulonocara baenschi* Meyer & Riehl, 1985.

The type locality is Nkhomo near Benga. Meyer, Riehl & Zetzsche (1987) include under this specific name populations from the following localities:

(a) Nkhomo/Benga (type locality).

(b) Chipoka.

(c) Maleri Islands.

(d) Usisya.

a) Nkhomo/Benga.

Fishes of this population grow to approximately 13 cm (5.1 in) and, in this, and the Chipoka population, the eye is relatively larger than in any other species being imported. The shape of the snout is rather similar to that of *A. maylandi*. It is illustrated by colour photographs with the original description, and in fig. 40 of Meyer et al (1987), female: fig. 39.

The body is, basically, yellow with blue overlay and the head, dark violet-blue. The yellow also extends forwards between the eyes and on to the snout. It is known to aquarists as *Aulonocara* "Benga".

b) Chipoka.

A male from this population is illustrated in fig. 38 of Meyer et al (1987) and resembles that from the type locality (*Aulonocara* "Benga") in coloration and the large eye. In the photographed male, the yellow does not extend on to the top of the head as it does in fig. 40 of a Nkhomo fish.

c) Maleri Islands.

Fig. 41 of Meyer et al (1987) shows a male from this population with a basically yellow body and blue head, as in (a) and (b), and a rather sharp snout. It may be what was called *Aulonocara* "Sunshine", a fish no longer collected because (i) the Maleri Islands are now part of the National Park and (ii) its yellow coloration is not as bright as in the others.

d) Usisya.

This is being exported as *Aulonocara* "Usisya". It also grows to approximately 13 cm (5.1 in) but is of slightly different habitus and coloration from the other populations

assigned to *A. baenschi*. Colour photographs can be seen in Meyer et al. fig. 37 and Loisel (1985) fig. 13. Spreinat (1988: DCG-info 19(5) and personal comm.) considers it may be a population of *A. steveni*, Meyer, Riehl & Zetzsche (see No. 14 herein) and this is more probable geographically too, Kande Island and Usisya being northern localities and Chipoka, Maleri Island and Nkhomo southern. It cannot however, be *A. steveni* because its pharyngeal bone and teeth are very large (Meyer et al fig. 18), whereas those of *A. steveni* (fig. 14) are very small.

The status of the Usisya population must be re-considered.

3) *Aulonocara brevirostris* (Trewavas, 1935).

No data available. This species was originally named by Trewavas in 1935 as *Trematocranus brevirostris* from two young specimens collected at the South end of Lake Malawi. It is known only from these two young preserved fishes and its live coloration is unknown.

4) *Aulonocara ethlewynnae* Meyer, Riehl & Zetzsche, 1987.

This animal, named in honour of Dr. Trewavas, is collected at Chitende Island near Chilumba and is being exported as "Northern" *Aulonocara*. A colour picture can be seen in *Cichliden Band III - Entdeckungen und Neuimporte* by Wolfgang Staack (1983) page 231, also pl. 4 of Meyer et al., (same picture reversed). *Aulonocara* spec. "Fort Maguire" has a very similar appearance and is possibly a sub-species, (see 19).

5) *Aulonocara hansbaenschi* Meyer, Riehl & Zetzsche, 1987, figs. 30 & 31.

This animal was collected at Masinje. We assume this to be near Fort Maguire, on the South Eastern coast. Again, we assume this is the same animal as the *Aulonocara* "Red Flush" being exported to the trade. It is a very rare *Aulonocara* and therefore commands a very high price. This species could be confused with what the aquarium



Top right, *Aulonocara* "Kande Braun" is, as yet, undescribed scientifically. This specimen was photographed in the wild near Kande Island. Right, *Aulonocara* "Fort Maguire" is a relative newcomer. This male was photographed around Makanjia. Right, centre *A.* "Chilendi-type East Coast" is thought to belong to the same species as *A.* "Fort Maguire". Above, *Aulonocara hueseri* (aquarium specimen) — usually exported as "White Top"/"Night Aulonocara". Top, *A. korneliae* "Blue Gold" — now bred in fairly large numbers in Singapore.

trade call *Aulonocara nyassae*, but, considering the differences in size, coloration and price, we would find this unlikely.

6) *Aulonocara hueseri* Meyer, Riehl & Zetzche, 1987, fig. 35.

This animal, collected on the East coast Likoma Island, is being exported as "White Top"/"Night" *Aulonocara*. A colour photograph can be found in *African Cichlids of Lakes Malawi and Tanganyika* by Axelrod & Burgess (9th Edition), page 194 and Loisselle (1985) page 12, fig. 8 (misidentified as *Aulonocara auditer*).

7) *Aulonocara jacobfreibergi* (Johnson, 1974)

This species is found at Nkudzi, Monkey Bay, Nankumba, Domwe Island and Otter Point. The species was originally discovered by the (then) exporters Peter & Henny Davies' son, Trevor, while out swimming, and was first exported as *Trematocranus* "Trevori". It was taken to the U.S.A. and Don S. Johnson named it after a friend and collector, Jacob Freiberg. Thus, it became *Trematocranus jacobfreibergi*. Because of its locality, partly in the Lake Malawi National Park, it is not allowed to be collected any more. The fish, although easy to breed, and still very much in circulation in the aquarium trade, has, unfortunately, through in-breeding, lost most of the true coloration found in the wild.

There is also a subspecies that has been exported under the trade names of:

- (i) *Trematocranus* sp. "Reginae", and



(ii) *Trematocranus* sp. "Carolae". Colour photographs of both the species and subspecies can be found in *A Guide to the Fishes of Lake Malawi National Park* by D. Lewis et al. (1986), page 70, plates 73 & 74 respectively.

8) *Aulonocara korneliae* Meyer, Riehl & Zetzche, 1987, fig. 34.

This animal is collected on the East coast of Chisumulu Island. It, as far as we are aware, has yet to be exported in any great numbers into the aquarium trade.

The only *Aulonocara* on the export list coming from this area is the "Blue Gold"; this fish does not match up with either the description or the colour plate in Meyer et al. (1987). Given that it is both abundant in nature and a regularly exported species, we find difficulty in understanding the omission of even a note to its existence. We assume, therefore, that this is yet another undescribed species.

An excellent colour photograph of the "Blue Gold" can be found in W. Staack's book already mentioned, page 229. A "Sport" of this fish is also available in the trade, originally bred in W. Germany, called the "Red" *Aulonocara*.

9) *Aulonocara maylandi* Trewavas, 1985, Inc. 2 colour photographs by Mayland.

Two subspecies are recognised:

- (a) *A. maylandi maylandi* Trewavas, 1984, including photographs by Richter and Mayland. Well known as the "Sulphurhead", this subspecies is caught at Eccles Reef (the type locality), south of Forth Maguire.

The "Sulphurhead" has been, for some while, a regular export and has proved easy to maintain in the aquarium but, again, in-breeding has given rise to paler, washed out, specimens.

(b) *A. maylandi kandeensis* Tawil & Allgayer, 1987. The population of Kande Island resembles *A. maylandi maylandi*, but has a white blaze instead of sulphur-yellow, and also has stronger pharyngeal teeth than the nominate subspecies. It is known in the hobby as *Aulonocara* "Blue Orchid" and is illustrated by colour photographs in Meyer et al. (1987) figs. 48 & 49. These authors described it but did not give it a subspecific name. In the aquarium, it seems to be a little more aggressive to conspecifics than *A. maylandi maylandi*.

The two subspecies are found at a distance of some 220 km. from each other in the wild and, so far, intermediate populations have not been recorded.

10) *Aulonocara microstoma* (Trewavas, 1935).

Originally named *Trematocranus microstoma* by Trewavas in 1935.

It was collected in both the Northern and Southern parts of the lake. In her description Dr. Trewavas made mention that "This species bears a resemblance to *Haplochromis placodon* in coloration, in dentition of jaws and pharyngeals, in number of gills rakers, etc. It is also, and more nearly, related to *Aulonocara rostratum*. Probably, *H. placodon* is the *Haplochromis* most nearly representing the stock from which *Trematocranus* and, perhaps, some *Aulonocara* have evolved".

Although Meyer et al. removed this species from *Trematocranus* into *Aulonocara*, Oliver (1984) noted similarities between this species, *Haplochromis placodon*, *Haplochromis labifer* and *Hemistilapia oxyrhynchus* and concluded that these formed a homogeneous group. Thus, the decision to include *microstoma* within *Aulonocara* is questionable.

11) *Aulonocara nyassae* Regan, 1921.

Regan's three specimens were collected in 1921. There are no exact data as to where they were collected. We only know that these were collected on what is now the Mozambique coast. This species has not been exported for some years now owing to the political problems out there. It also seems that fish the aquarist has been calling *Aulonocara nyassae* is not the same as the type specimens of this species at the British Museum.

12) *Aulonocara rostratum* Trewavas, 1935.

Again, we have no details on coloration of this species, but Dr. Trewavas did note a difference in the number of bars between this species and *Aulonocara nyassae*. In the case of *Aulonocara rostratum*, there were 6 to 7 bars, whereas on *Aulonocara nyassae* there were 9 to 10. A picture of this species can be seen in *African Cichlids of Lakes*

Malawi and Tanganyika by Dr. H. R. Axelrod & Dr. W. E. Burgess (9th Ed.) page 194. In this edition, it is misnamed as *Aulonocara macrochi* (now believed to be a synonym of *Aulonocara rostratum*).

13) *Aulonocara saulosi* Meyer, Riehl & Zetzsche, 1987, fig. 33.

This species was collected 8km South of Masinge, (East Coast).

It is doubtful if this species is exported out of Lake Malawi.

It looks to be a close relative of the *Aulonocara "nyasae"* known to aquarists.

14) *Aulonocara steveni* Meyer, Riehl & Zetzsche, 1987.

This species is collected at Kande Island, (as well as *Aulonocara maylandi kandeensis*).

As there are no colour photographs of this species available in the 1987 paper, we cannot say whether it is a recorded import into the U.K. or not. Reading the colour description, it would appear not.

15) *Aulonocara stuartgranti* Meyer & Riehl, 1985.

Until its recent classification, it was known as *Aulonocara "Chilumba"* and is still being exported as such. It has long been a firm favourite with aquarists and has been bred regularly. A good photograph can be found in *Cichliden, Entdeckungen und Neumimporte* by W. Staack, page 227, as well as in Meyer &

Riehl's original description and figs. 44-46 of Meyer et. al.

16) *Aulonocara* spec. Meyer, Riehl & Zetzsche, 1987, figs. 28 & 29.

It is collected at Likoma Island and could be the species exported to the trade as *Aulonocara "Greenface Metallic"* (Likoma). Its basic body coloration is of blue, with the head area being a metallic green. This fish has been around for some while but reports of breeding have been quite scarce.

17) *Aulonocara* spec. "Fort Maguire".

This is a relatively new species to be exported. It is collected around Fort Maguire. It is very similar to the "Northern" *Aulonocara* in a lot of details and could be a subspecies. This species or population is not mentioned in the recent paper, (Meyer et. al. 1987). As far as it is known, no colour photographs exist other than the one published with this article.

Its coloration is quite subtle: light brown, with a hint of violet appearing in incident light from certain angles. When exported, its size is quite small, being approximately 5 cms (2 in).

18) *Aulonocara* spec. "Sunshine", (Jaro).

Although mentioned in the paper, the authors put this species in the genus *Cynocara* for some reason. It has not been

imported into the U.K. for some while but looks in every detail an *Aulonocara* species, with a basic body coloration of yellow and a blue head. It is collected around Jaro. One of the reasons for it not being exported now is that it is not as colourful as the other "Sunshine" species. It grows to approximately 15 cms (6 in). A good colour photograph can be found in *Der Malawi See und seine Fische* by Hans J. Mayland, page 139, as well as figs. 42 & 43 of Meyer et. al.

19) *Aulonocara* spec. "Walteri".

This, again, is a relatively new species to be exported. It is smaller than *Aulonocara jacobfreibergi* and is a lot bluer in colour, with an orange band below the dorsal. It breeds well in captivity, so should be with the aquarium trade for a good while. A good colour photograph can be seen in *Cichliden, Entdeckungen und Neumimporte* by W. Staack, page 275.

20) *Aulonocara* "Sunshine" (Likoma).

This species is another one not mentioned in the recent paper. It, again, has been a firm favourite in the aquarium trade and is common in its locality. Its general coloration is yellow with hints of blue in the head region.

A colour photograph can be seen in W. Staack's *Cichliden Band II* (1977) page 171, fig. 118.

(To be continued)



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Spotlight on *Cichlids*

INTRODUCTION TO KEEPING SOUTH AMERICAN CICHLIDS

Allen Brelig, president of Petvision/ASPC Inc, producers of a wide range of aquatic videos for hobbyists, lays down the golden rules of South American cichlid-keeping.

O f all the freshwater fish families that aquarists keep, cichlids seem to generate the most enthusiasm (among researchers) for scientific study and (among aquarists) for attempts at replicating native habitats for their fish.

The diversity of habitat exploited by cichlids in the wild normally does not lend itself to generalisations; however, some characteristics are common to almost all cichlids, including South American species:—

First, they are exceptionally beautiful, their colours being particularly brilliant; similar to those of saltwater species.

Second, they are intelligent, seeming to recognise their owners as individuals and apparently even showing affection.

Third, they will not only breed easily, but often unusually so, many species exhibiting highly developed parental behaviour and

vehemently guarding their young from all potential predators.

A water temperature of 78 to 85°F (25.5-29.5°C) seems to suit many cichlids. If water conditions are correct, and they have an excellent supply of food, breeding will take place at any time of year.

BASIC RULES

Before setting up a cichlid aquarium, there are some rules that should be followed. Cichlids can be aggressive but are generally peaceful when not breeding, when only males are housed in the tank, when only one pair are in the tank, or when they are overcrowded. The overcrowding suggestion, of course, has its problem of water quality deterioration but the benefit is that pairs will form which can then be provided with a separate tank.

Cichlids have a highly developed sense of protecting their breeding territory, which

manifests itself in an aggressive nature. It is a good idea to house only cichlids from the same area in the same tank. Further, any fish half the size of the largest cichlid in the tank may be viewed as food. However, things can be eased by supplying numerous rocks, caves, and other decorations so that the fish will not have to compete for a critical breeding spot.

Also associated with reproduction is the larger cichlids' penchant for manipulation of plants, rocks, gravel and other decorations — there is no really effective way of stopping them. It is therefore far easier to manipulate the environment before they do it for you. For example, you can use plastic plants that may be uprooted but not destroyed. Most important, don't place rocks in such a way that they might fall on top of your fish.

Since cichlids need lots of cover, note that water volume in your tank will be reduced by displacement through the introduction of

Even robust-looking species like *Aequidens rivulatus*, the Green Terror (this is the Gold-edged variety bred by Sanchez Tropical Fish Farm in Florida) benefit from the shelter afforded by caves and drift or bogwood.



HARRY GREIFELDMER, TROPICAL FISH FARMS ASSOCIATION

rockwork, etc. These take space away where water used to be. Therefore, it is good idea to limit one inch (2.5cm) of fish to about two and a half gallons (c 10 litres) of aquarium.

This leads to another rule: to choose the largest tank possible. This is especially true in the case of South American cichlids. Even dwarf cichlids need at least a 15-gallon (67-litre) aquarium. They appear to be more intelligent than other fish, and behave differently, if not abnormally, in captivity.

Some will attack heaters or filtering apparatus apparently just for something to do in their limited habitat. Consequently, you may want to protect the heater and filtering apparatus by egg crating, special heater/stat guards, or with decorations placed so the fish can't get to them. Some heaters can be housed in the outside filters if the filter is large enough.

Cichlids are also great jumpers, so a tank lid is necessary. Finally, in regards to the aquarium itself, since most cichlids are bottom dwellers, a tall aquarium might waste aesthetic space.

DITHER, TARGET AND OTHER SPECIES

All South American cichlids are secretive fish and may hide all day and night in the cover you've provided. Normal functions of eating and spawning can be stressed under these conditions. To avoid this problem, other species of fish should be added to the tank.

Usually, fast swimmers that frequent the upper part of the tank are ideal. The cichlids will feel at ease when they see other fish swimming freely about the tank. The fast swimmers, such as Giant Danios, or Australian Rainbows will feel comfortable in their schools, and be able to avoid the cichlids.

These fish are commonly called "dither fish." They act as "fish psychiatrists" for the sensitive cichlids. Be sure that these schooling dither fish are in a sufficient number to form a shoal (minimum number: six specimens).

Target fish are fish that provide an aggressive outlet for promoting normal pairing and parental behaviour. All the fish, including other paired cichlids, are target fish, but the paired cichlids hold their own against other breeding pairs if other target fish take the brunt of the aggression. Target fish are required to be fast swimmers.

Catfishes serve their usual role as cleaners of bottom debris. Smooth-skinned species do not do well in cichlid tanks, however. They are either destroyed or become large enough to eat the cichlids.

Scavengers need to be tough-skinned, efficient and need shelter of their own. Recommended scavengers are loricate catfishes (eg "Plecos," Horse-faced Loaches and large *Bonia* species, including the very popular Clown Loach (*Bonia macracantha*)).

FEEDING AND MAINTENANCE

Cichlids are voracious eaters. Commercially prepared cichlid food should be the basic diet but livefoods such as Brine Shrimp, earthworms and beef heart, should also be used as supplements. Spinach or



As this photograph brilliantly shows, Earth-eaters (this is *Geophagus crassilabrus*) are superbly kitted out to alter aquarium decorations with the greatest of ease.



Strategically placed flat rocks provide ideal spawning sites for many South American cichlids like *Aequidens itanyi*, one of the so-called *Acaras*.

Romaine lettuce should be offered, as well as thinly sliced blanched zucchini (courgettes).

The more cichlids eat, the better they are prepared for breeding. Yet, the better fed they are, the more waste and excess protein that will accumulate in the substrate or gravel. This leads to an increase of fatty acids, decreased oxygen, rise in carbon dioxide and a lowering of the pH level.

A Rainbow-like film on the surface of the water indicates a build-up of fatty acids (these organic fatty acids cannot be filtered out). You need to do partial water changes or install a protein skimmer which will capture the oily protein in its foam.

Breeding cichlids do not like a strong current; however, when setting up an aquarium, leave places with strong currents and let the fish choose between a strong flow and the gentler areas. The use of combination filtering devices is recommended.

pH AND HARDNESS

The pH level is important to South American cichlids, especially when breeding is a goal. They simply won't breed outside the parameters of their pH ranges.

In general, South American cichlids enjoy lower pH levels. Some popular examples are Earth-eaters, Heros, *Acaras*, Discus, Angel-fish and Dwarf Cichlids, fish which also enjoy softer water. Preferred pH goes from 5.0 to no more than 7.5; the hardness level should be below 17.0, except for Dwarfs which prefer a DH reading below 10.

If your area does not have soft water, you will have to reduce hardness to the correct range. Demineralised water added to tap water may reduce it sufficiently. If not, commercial water softeners can be obtained from your dealer (but make sure that the model you use is suitable for aquarium use).

Water can be acidified by the addition of a strong acid (handle with caution!), or by running the tank water through a peat filter. Peat, however, can decay. Special commer-

cial additives will also lower pH and, at the same time, add important trace elements, such as essential iodine and vitamins.

With a low pH level, the ammonia in the nitrogen cycle is not as deadly since the free ion (NH_4^+) is not attached. However, without the buffer action of hard water, the pH level will not be as easy to control. Therefore test the water often.

WATER CHANGES

Water changes do have some rules. Many cichlids from South America are intolerant of even small amounts of nitrite; Discus and Dwarf Cichlids, for instance, are very sensitive to this product of the nitrogen cycle.

Small, but more frequent, water changes can reduce this type of stress. A 10% water change (for normal conditions) once a week should be sufficient for most cichlids. However, if you test your water for ammonia, nitrite, pH level, hardness and protein build-up and detect an out-of-the-parameter reading, a partial water change could get things back into order.

The major thing to keep in mind when doing a partial water change is to be sure that the new water is as close to the water in the aquarium. Controlling temperature, hardness, pH levels, ammonia and nitrite levels will reduce the stress that weakens your fish. Fish can acclimatise to a wide range of pH and hardness levels but changes must be carried out gradually.

Always check with your water department for the addition of chloramines, ammonia and chlorine. Your fish dealer should have the necessary tools to remove these chemicals, should this prove necessary.

TANK DECOR

Decorate your tank as closely to the natural biotope as possible. The number one item for all cichlids is rock rubble. Be sure that you don't use rock and substrate that will add carbonate hardness to South American or other "soft-water-loving" cichlids.

Remember that cichlids are diggers, and when placing rock in your tank, be sure they are not precarious. They should be pushed down into the substrate to prevent collapse from the fish excavation work.

Flat-sided slate is good for all cichlids. Other non-toxic rocks are basalt, granite, feldspar, quartz and pumice. Pumice is very light and can be easily manipulated.

Driftwood is usually used as a decorative centrepiece, but it must be sanded and soaked. The sanding will remove any toxins that may have been absorbed into the wood, while the soaking will leach out tannin that will discolour the water. It will also waterlog the piece which would otherwise float in the aquarium. This soaking can take six months, but the results are beautiful. Change the water in the soaking vessel often to facilitate the leaching process.

There are many live plants that can be used, but be sure that they are suited to the conditions of the water chemistry and illumination levels for the fish. Rooted plants do better than floating. Jungle Vallisneria and Swordplants are excellent choices, particularly if they are allowed to root for several weeks prior to introduction of the fish.

Spotlight on *Cichlids*

FOSTER CICHLIDS (THE SOUTH AMERICAN WAY)

There are more ways than one to rear cichlid fry successfully, as British Cichlid Association Librarian Jeff Challands explains — even though it may involve bending the rules slightly.

SOME fourteen years ago I had to "foster" a batch of baby cichlids with a species other than their parents. As is often the case, a pair of *Cichlasoma spilargenteum*, the Blue Eyed South American Cichlid, decided to spawn in a large cichlid community tank.

Among the other occupants of this tank were an 8-inch (20cm) male Jack Dempsey (*Cichlasoma octofasciatum*), a 6-inch (15cm) male Texas (*Cichlasoma cyanoguttatum*), plus a few smaller species, namely Convicts (*Cichlasoma nigrofasciatum*) and Firemouths (*Cichlasoma meeki*). The tank had a large amount of rockwork in the formation of caves of varying sizes and a pair of *C. spilargenteum* had set up home in the bottom left hand corner at the front of the aquarium.

One day I observed the female leading about one hundred fry along the front of the glass. The male was following up in the rear, warding off any potential predators, as the fry were considered not more than a meal by the other occupants of the tank. The female was only 2 inches (5cm) long but she still warded off the male Jack Dempsey.

As is often the case, there was no way that I could move the parents and the fry without having to strip down the tank with the risk that the fry would still end up as part of the diet of the other fish. I did not have a spare tank to put them in either, even if I could have safely moved them as I was in the process of setting up a new fish house. So the fry would, unfortunately, have to take their chances. The female was doing a very good job of looking after her offspring but, as they became more adventurous and wandered away from her care, they inevitably fell victim to the other fish.

At the same time as this was going on I had a pair of large Convicts in a very small aquarium and they had also bred and were herding a brood of fry around. I wondered if the Convicts would object to looking after a few more fry if I could remove a few of the Blue Eyes into their tank. These two species are, after all, very closely related and will

cross-breed freely if given the right conditions.

So, with this in mind, I fed the Convict fry in one corner of their tank and distracted the adults at the same time. Prior to this I had taken a length of airline, put it into the Convict tank after starting a siphon from the bigger tank, which was above, and "hoovered" about fifty of the *C. spilargenteum* fry into the feeding Convict fry, thus ensuring that, at least, some had the chance of survival.

Once this was done I let the parent Convicts resume their role of looking after their offspring, which they did without seeming to notice the increased numbers in their family.

This gave me food for thought, should the need ever arise again, which it inevitably did.

Success with Rainbows

Recently, I had reason to remember the case of the "fostering out" of the *C. spilargenteum* and wondered if it could be applied to other species of cichlids... or perhaps I had just been lucky.

Since I have a large number of tanks containing, mostly, cichlids, there is always some breeding activity taking place in my fish house. I therefore decided to experiment a little. The first species that I tried with were *Herotilapia multispinosa*, the Rainbow Cichlid. At the time I had eight specimens in

a 3-foot (90cm) aquarium. They were at the stage where they would be about ready to pair up and breed. Out of the eight fish six formed up into three pairs. The remaining two were hounded by them and so were removed to another tank.

One of the newly-formed pairs started to dig in the corner and soon got down to the undergravel filter plate, something which I soon put a stop to. I put three stones into the tank in different locations which were soon taken over, a pair of fish to each one. Personally, I had expected a lot more aggression than there was, with having three pairs in the one tank, but apart from a lot of chasing and pretence, two pairs spawned within hours of each other, with the final pair laying eggs within the next 24 hours, much to my surprise.

At this stage the aggression really started and the more dominant male began to terrorise the other two males. It was soon evident that I would end up with some dead fish if I did not act. I could have partitioned the tank into three sections, thus, in effect, giving each pair a tank of their own, but I decided to do a bit of experimenting.

I had a small tank set up and running and so I removed the stone of the smallest pair by putting a container into the tank they were breeding in, filling it with water, and putting the stone on which they had laid their eggs into it. This was then moved to the small tank which had the same water make-up and temperature as the breeding tank. Straightaway I moved the parents into the tank with their eggs and, within a matter of minutes, they resumed their guarding duties.

The two remaining pairs still carried on fighting so I removed one of the pairs to a community tank. I did not have another empty tank at the time. At the same time as removing the second pair, and while the

After spawning, Blue Acaras become very protective. Disruption must therefore be kept to an absolute minimum, particularly if an attempt to introduce eggs or fry of a different species is being attempted.



ARNO VAN DEN NIEUWENHUIZEN

other pair were distracted, I moved the stone on which the second pair had spawned right next to the one on which the other remaining pair had laid theirs. Once the task was done and they had all settled in their respective homes, the pair left in the three-foot tank resumed looking after their own batch of eggs, as well as the ones belonging to the other pair.

The stones were laid in such a way, side by side, that they gave the impression of one continuous brood and the female did not seem to mind caring for about twice the number of eggs that were in her own spawning. The fry duly hatched out and were raised in the manner common to substrate egg-laying South American cichlids.

Angelic success

The biggest challenge came when a pair of Marbled Angels (*Pterophyllum scalare*) spawned freely but had the nasty habit of eating their young just after they had hatched out. I could have artificially reared them but I prefer to let nature take its course.

I therefore wondered if I could possibly "persuade" another pair of cichlids to take care of the fry once they had hatched out. The only problem was that I did not have another pair of angels that were breeding at the time, so it was looking like the artificial method was going to have to be applied.

As luck would have it, a small young pair of Blue Acaras (*Aequidens pulcher*) had spawned within hours of the angels and I wondered if I could use them as foster parents to the angel fry. It was worth a try, if nothing else. Acaras (once the fry have hatched and before they become free-swimming), dig small pits in the gravel and move their young from one to the next quite often. It was during one of these moves that I decided to try to install the angel fry in among their own.

The angels had hatched and were fastened onto the leaf of the plant on which the adults had laid the eggs. I therefore removed the leaf into a small container, as previously described, and then, very gently, tried to shake the fry from their perch so that they would end up in the bottom of the container. It was not a difficult task but had to be carried out carefully. It would not have been very practical to put the leaf, complete with fry, into the pit of the blue Acaras when their own young were not adhered to anything. The chances are that they would have picked up the leaf, and fry, and discarded both as a piece of debris.

The pair of acaras were in the process of moving their family from one pit to another at the other end of the tank. It was during this move that I dared to try to introduce the angel fry. No doubt, I could have netted the pair of acaras, or installed a divider while the angels were introduced, but there are two things that I have learned at such times as this. One is to cause as little disruption to the



An adult pair of Convict Cichlids. This species has been shown to be quite capable of acting as good foster parents.

parent fish as possible, or they can end up eating their own, and any other, fry once back with them. I have seen this happen a few times. Secondly, speed is important so as not to chill the fry being moved and to keep the stress factor down to an absolute minimum.

Timing had to be perfect so I chose the moment just as the female acara was going to one pit to pick up a mouthful of her young prior to moving them into their new home. I put one hand in the tank very close to the first pit and, immediately, the male took up the defensive posture and began attacking my fingers. The female hovered over the remaining young that were, as yet, not removed, and also attacked my hand if I got too close.

While this was going on I put the container of the angel fry into the water directly above the second pit. The female came over as soon as she observed a second disturbance, so I could not introduce the fry. After moving my hand above the first pit again, she retreated across the tank to look after her other young and at this point I, extremely carefully, let the aquarium water into the container and then down to the pit, where I very slowly allowed the angel fry to mix with those of the acaras.

Still causing a slight disruption at the other end of the tank, I removed the container, followed by my other hand. Immediately the female came over and began to mouth the fry in the second pit. I half expected her to eat the intruders, but surprisingly, she was only, seemingly, cleaning the fry. She spat them back into the pit and, shortly afterwards, carried on with her previous activities. The angels were then reared as her own and stayed with both of the Blue Acaras for about six weeks with no ill effects.

Basic rules

Over the next few months I carried out a number of such experiments with, virtually, no losses. I always carried them out using various species of South American cichlids and found that they pose very few problems, as long as a few simple rules are followed:

1: Make sure that the water chemistry is the same in both tanks.

2: Temperature is also critical at this stage and should be identical in both tanks as this is when losses can occur. I have found that 2 or 3 degrees F, do not make much difference one way or the other, as long as the container in which the fry are being transferred is allowed to float in the receiving aquarium until the two temperatures are equal.

3: The fry being introduced must not be subjected to excessive stress or undue disturbance during their move.

4: The fry due to be fostered must not, if they are still at the pre-free swimming stage, be mixed with fry that have been free-swimming for a few days, or longer, as the foster parents will not accept wrigglers that they find on the bottom of their tank, if they are already guarding a free-swimming shoal.

There are a few other variations which I have applied to cross-fostering — with varying degrees of success.

For example, I have moved the "substrate rock" belonging to a pair which have laid eggs but begun eating them into a tank housing a properly-brooding pair of a different species. On the odd occasion, the foster parents have eaten the introduced eggs but continued to care for their own but, generally speaking, they've adopted the new batch without trouble.

I have also had pairs which have looked after their fry until they become free-swimming and then have started eating them. What I have done on such occasions is removed the parents and introduced a different pair, along with their own free-swimming fry, ensuring that both batches become well-mixed.

Again, on odd occasions, the foster parents have objected to the move and have reacted by eating all the fry. At other times, they've undertaken to rear all the fry successfully.

Timing, I think, could be the crucial factor here but, clearly, more detailed observations are required in order to confirm or deny this.

The fostering approach to cichlid breeding may not be particularly easy but, it can mean the difference between keeping, and rearing, a batch of fry or losing them altogether. Artificially hatched and reared fry provide an alternative approach, but brood care, either by natural or foster parents, is, in my opinion, superior.

It also releases the aquarist from the undoubted pressure of having to find time, especially during the first few days, to keep a close watch on both eggs and fry. By having them cared for "naturally", you can go off to work with the comfort of knowing that your "parental" duties are not being neglected!

Note: In a future article, Jeff Chalands will be looking at fostering among African cichlids.

Spotlight on *Cichlids*

DISCUS FOR BEGINNERS

Dr David Pool of the Tetra Information Centre lays down all the basic rules of successful Discus keeping
(Photograph by the author)

The commercial breeding of Discus has gone a long way towards popularising this beautiful fish. In the past, when only wild-caught specimens were available, the limited availability (= high price) and sensitive nature of these fish resulted in few aquarists keeping them successfully. Now, however, Discus are widely available and tank breeding has resulted in them being more hardy and less expensive.

Although the Discus is not generally thought of as a suitable fish for a total newcomer to the hobby, any careful aquarist can successfully keep them, providing their needs are understood and catered for.

WHAT IS A DISCUS?

The Discus is a member of the family Cichlidae and, as such, is closely related to the many different cichlid species kept by aquarists (a fact indicated by many of their behaviour patterns). Only two species of Discus have been described, namely *Sym-*

physodon discus (the Pompadour or Heckel Discus) and *Symphysodon aequifasciata* of which there are three subspecies: *S.a. aequifasciata* (the Green Discus), *S.a. axelrodi* (the Brown Discus) and *S.a. haraldi* (the Blue Discus). There are also many colour varieties of the above species and subspecies due to selective breeding by Discus authorities around the world and to ecologically separated populations in the wild. Examples of commercial varieties include the Cobalt and Wattle Discus.

THE DISCUS AQUARIUM

Discus are relatively large shoaling fish, growing to between 12 and 20 cm (4.7 - 7.9 in) in length. A large aquarium is therefore

essential if you are to be successful. An aquarium holding 250 litres - 55 gals (eg 120 x 45 x 45 cm - 48 x 18 x 18 in) should be regarded as the minimum size to hold 4-5 adult fish.

WATER QUALITY

The water quality within the Discus aquarium is the key to success or failure. In the wild, these fish live in very soft and acidic water in the Amazon (general hardness 0-3°dH, carbonate hardness 0-2°dH, pH 5.5 to 6.5). Tank-raised fish will thrive in water which falls outside the above limits, with a pH of 5.5 to 7.5 and hardness of up to 12°dH being acceptable. In fact the best Discus I have seen were in water at the upper end of this range (pH 7.5, Gh 10.0).

This range of pH and hardness values means that Discus can be kept in tapwater in most areas of the UK. It must be stressed that such values are for keeping Discus; if you wish to breed them it is necessary to adopt more Amazonian conditions.

Far more important than the actual values of pH and hardness is their stability. A sudden change in the quality of the water will badly stress the Discus, often with disastrous results. To prevent such changes, great care should be taken when introducing new fish, changing any water (particularly if you are artificially acidifying or softening it) and in the choice of substrate (ie avoid calcareous gravel or rocks).

A note on changing the pH or hardness is appropriate here. In the few cases where the water quality has to be changed, it will need acidifying and/or softening. This can be achieved in several ways, but should always be undertaken outside the aquarium; further, sudden changes in water quality must be avoided.

Suitable methods of softening and acidifying the water include:

- Diluting the hard alkaline water with rain water. Do not use rainwater if you are downwind of an industrial area.
- Filtering the water through aquarium peat.
- Using ion exchange resins - ensuring that the resin changes the hardness ions for H⁺ (Hydrogen) and OH⁻ (Hydroxyl) - not Na⁺ (sodium).
- Using chemical pH adjusters and buffers.



Figure 1

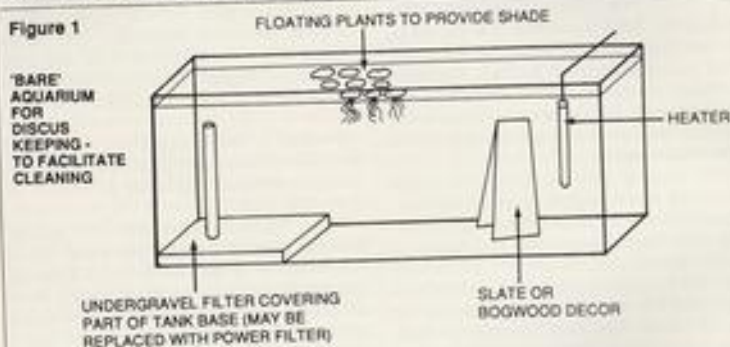
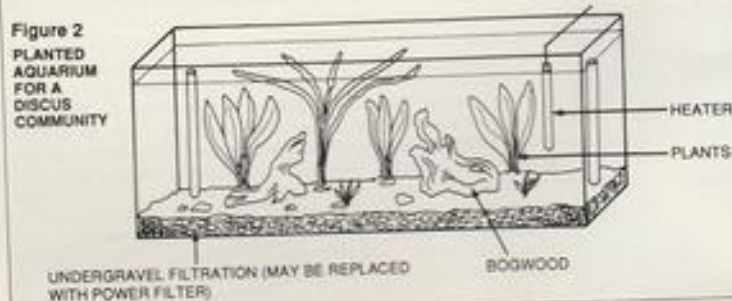


Figure 2
PLANTED
AQUARIUM
FOR A
DISCUS
COMMUNITY





Discus, Clown Loach and various Tetras fighting over a food tablet.

The temperature of the Discus aquarium should be maintained at 28-30°C (82-86°F). Although these fish can withstand temperatures outside this range, such conditions can lead to problems in the long term.

Pollutants in the aquarium are a particular problem, with Discus being more sensitive than most fish species. At the normal "Discus" pH, ammonia is not a problem as it is mainly present as the non-toxic ammonium ion (NH_4^+). Nitrite and nitrate are a problem and efficient filtration, together with regular partial water changes, are important.

The frequency with which to undertake water changes is an area of considerable debate. Some Discus keepers change water on a daily basis, removing up to 50% if they have no filtration. Others change water at weekly or bi-weekly intervals. The main reason for undertaking the water changes is to keep the nitrate level as close to 0 as is possible.

If the Discus are kept in a bare tank, it is necessary to undertake very regular water changes to dilute the nitrate level constantly. In a well-planted aquarium, or if a nitrate-filter is employed, less frequent water changes are necessary (say 25-30% every 7-10 days).

The choice of filtration in the aquarium is a personal one as all types are suitable for Discus. However, it is important to avoid causing fast currents with the filter outflow

as Discus will not battle against them.

Other chemicals in the aquarium are important if Discus are to remain in peak condition. The addition of humic acids to the aquarium in the form of something like Blackwater Extract will reproduce Amazonian conditions and have a noticeable beneficial effect on the fish. The same is true of vitamin and iodine extracts such as those present in some specialised cichlid foods like Cichlid Vital.

AQUARIUM DECOR

Most Discus keepers fall into one of two groups. Either they maintain their fish in a bare or partly bare aquarium (see Figure 1), or they are kept in a furnished aquarium, often with other suitable fish (Figure 2). The choice is obviously a personal one, but for display purposes, a planted aquarium is to be recommended.

The plants for a Discus aquarium need to be able to withstand the soft, acidic and warm conditions. The species listed in Table 1 are all ideal. The plants should be arranged to provide cover, shade and free swimming areas. In 'bare' tanks, floating plants such as *Salvinia* or *Pistia* (Water Lettuce) provide shade and remove nitrate and ammonia.

LIGHTING

Lighting in the aquarium depends largely

on the set up adopted. In a 'bare' tank, lower light levels can be used as a means of showing the fish at their best. A single fluorescent tube such as a Northlight or Truelight will suffice.

In a planted aquarium more light is necessary to encourage plant growth. As a general rule, allow 15-20 watts per square foot of water surface. Shaded areas should be provided using tall or floating plants under which the Discus will congregate.

STOCKING THE AQUARIUM

Discus are shoaling fish and should never be kept as individuals. If you do so, they will behave abnormally and be very susceptible to disease infection.

If you add two fish, one will be dominant and outgrow the other. The submissive individual will often be prevented from feeding and is more likely to succumb to disease. When keeping four or more individuals the aggressive behaviour will be spread between more fish, with less chance of the weakest being badly effected. For similar reasons it is unwise to keep small Discus with a shoal of large individuals.

Other fish species can be kept in a Discus aquarium, providing you choose fish which can withstand the water conditions. It is also important to avoid aggressive species as they will out-compete the Discus for any food and 'bully' them. Suitable species for the Discus aquarium are shown in Table 2.

BUYING DISCUS

Discus are still quite expensive fish. Therefore, it is important to ensure that the individuals you purchase are healthy. Signs of poor health include emaciation, tattered fins, trailing clear faeces, and excess mucus on the body.

The eyes are a good indication of the state of health of a fish. If cloudy the fish is ill, or has been subjected to, poor water quality, or an external parasite infection. Unduly large eyes indicate stunting or malnutrition. Fish with either problem should be avoided.

Dark coloration also suggests poor health, but may be only a temporary effect due to the fish being startled or attacked.

Before buying Discus it is advisable to observe them for some time and look for the above clues. It also pays to see the fish being fed, as an unhealthy fish will rarely feed.

The size of Discus to buy depends largely on your budget. Small Discus (10 pence size) are less expensive, but are more susceptible to poor water quality and malnutrition. Larger fish are more expensive, but have a better chance of survival, and so, are a better investment in the long term.

When introducing large Discus into a new aquarium it is not unusual for them to lie on their sides for several minutes. This appears to be a shock reaction from which it is best to leave them to recover quietly. Prodding and netting will only worsen the situation.

Providing the fish are healthy and are not subjected to a sudden change in water qual-

ity when introduced to your aquarium, they should feed within a few hours. If they have not fed after two days, adding livefoods such as *Daphnia* and bloodworms will often 'break the deadlock'.

FEEDING DISCUS

In the wild, Discus are largely opportunistic and will consume a range of different foods. The same is true in the aquarium, providing you do not allow them to become 'addicted' to one food.

Traditionally, finely chopped lean beef-heart has been used as a food. However, this should be supplemented (or replaced) with flake, tablet, freeze-dried and safe livefoods. Tablet foods which can be stuck on the glass are readily acceptable to most Discus, even those with choosy feeding habits.

Discus, more than most other fish, take some time to accept a new food. Therefore, perseverance is necessary, often for several weeks, before the food is eaten readily.

AILMENTS

Discus, like all other fish, are subject to a range of different ailments. Most of these are common to all aquarium fish and will not be mentioned here, but one complaint — Hole-in-the-Head Disease — is often associated predominantly with Discus keeping.

This disease is caused by a flagellated protozoan known as *Hexamita* and manifests itself as small holes in the head of the Discus (or, less frequently, on the body). These holes may grow, but will remain white, as

Table 1 PLANTS FOR THE DISCUS AQUARIUM

Aponogeton crispus
A. undulatus
Crinum thalianum — Onion Plant
Cryptocorynes
Echinodorus species
Vallisneria species
Pistia stratiotes — Water Lettuce
Salvinia auriculata — Butterfly Fern

Table 2 FISH FOR THE DISCUS AQUARIUM

Neon Tetras
 Cardinal Tetras
 Rummy-nosed Tetras
 Glow light Tetras
 Ramirez Cichlids (Ram)
 Kribensis
Corydoras species
Otocinclus Catfish
 Clown Loach
 Hatchetfish

opposed to the red, inflamed appearance of bacterial infections. The holes may also contain mucus, often in the form of a strand originating from the centre.

Commercial remedies are available,

although only in restricted areas. A more widely available remedy is Flagyl. This drug is available, by veterinary prescription, from a chemist. It should be added to the water at the rate of 5 mg per litre in three doses over a period of 7 days. Before each treatment a partial water change should be undertaken.

If the fish are feeding, it is better to administer the Flagyl as a medicated food. To do this take two tablets of Flagyl and grind them into a powder together with six food tablets, add a little water to form a stiff paste and spread over 10 other food tablets. After allowing to dry overnight, the medicated tablets should be fed at the rate of ONE tablet for TWO fish each day for 10 days.

Raising the water temperature to 33-34°C (91.5-93°F) is also reported to be effective at eliminating 'Hole-in-the-Head' disease. This should be accompanied by large water changes.

With Discus, 95% of the problems are related to poor water quality or unsuitable food. Therefore, if you can follow the guidelines indicated earlier in this article most problems can be avoided.

The information provided in this article is necessarily brief. Interested fishkeepers can find further information in the following books:

The Discus — King of the Aquarium, by B Degen; published by Tetra

Handbook of Discus, by J. Wattlely, published by TFH.

The Discus Fish — The King of all Aquarium Fish by E. Schulze, published by Discus Ltd.

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The lush growth in the L-shaped tank is only bettered by that on natural reefs themselves.

PERSONAL CHOICE: 1. A COVERT TO INVERTS?

Marine aquarist **Julius Pursaill** travels widely in search of the best marine aquaria in the UK. His first stop — a deservedly famous one — is situated just north of London.

(Photographs by the author)

Although large marine fish can be immediately striking, for long term fascination give me an invertebrate system every time.

For some, invertebrates are merely a couple of anemones hosting a few Clownfish, but a genuine invertebrate system represents an attempt to recreate the mysterious and alien beauty of the reef — the complex interaction of fish and a myriad of invertebrates within a stable and harmonious whole.

This is not a project for the novice — a relatively sophisticated understanding of water chemistry is essential. Nevertheless, the advent of the systemised aquarium has brought a "miniature reef" within the horizon for the average mariner. The chance, then, to consult a specialist on the subject is

an opportunity that neither the novice nor the expert should ignore, particularly when the specialist is as willing to talk to either.

Such a person is to be found, just east of London, in Romford. His name is Terry Evans and his shop, WetPets, is famous throughout the country for, among other things, the "Romford Reef."

The "L" shaped tank, containing about 500 gallons (2,250 litres), was established about three years ago. In that time, almost every patch of bare tuffa (no living rock was ever used) has been colonised by invertebrates.

A delicate Gorgonian sifts the gentle currents for food, between a clam and a Brain Coral. The clam's mantle is mottled with iridescent blue against the vibrant green of the coral. A Clownfish nestles in the waving branches of a *Goniopora*, preparing a spawning

site. The polyps of a Red Organ Pipe colony bloom white in the afternoons — this particular rare specimen arrived attached to the base of another clam. Soft corals and *Caulerpa* threaten to multiply out of control.

Fish are strictly limited, but Scooter Blennies flash vivid fins in display while a green Pipefish snakes around the base of the reef, and Mandarins can be seen spiralling upwards in spawning display.

Vital statistics

Terry argues that it is only by learning about other people's experience that our own ability to maintain captive marine life will be improved. He is still experimenting, observing the effect of alterations, and so developing a better understanding of the miniature reef environment. Here then, are

Brain Coral, a gorgonian and a clam's mantle (extreme foreground). *Caulerpa* and *Xenia* complete the picture.



Unusual red macro-algae compete with pulse corals and yellow polyp colonies in one section of the tank.



the current vital statistics of this remarkable system:

Filtration. Basic filtration is by Tunze and is a superb testament to the range's effectiveness. Additional pumps are used to provide adequate water movement for the now enormous population. This combination of mechanical filtration, bioreactors and protein skimmer produce, not only zero nitrite, but also zero nitrate.

Carbon. Carbon is used intermittently on this tank, to remove any yellowing of the water. Terry tells the tale of the mysterious death of an Emperor in an otherwise healthy tank, including extremely delicate Moorish Idols. When a Queen Angel began to go the same way, Terry, having already tried copper, resorted to carbon in desperation. Miraculously, the fish responded immediately.

Experiment time

Ultra Violet. This was introduced to reduce water-borne bacteria levels to those found on the reef (almost zero). This is currently the subject of one of Terry's experiments and has been removed. Will the increase in micro-organisms benefit the filter feeders more than the increase in bacteria levels will harm? As yet, it is too early to tell.

Ozone. The tank is also treated intermittently with ozone. This, perhaps, goes some way towards explaining the very high redox potential — around 450m.v.

Redox potential. Perhaps the least understood of technical jargon, redox potential simply refers to the balance between oxi-

dising and reducing agents in the system. A predominance of oxidising agents will allow aerobic bacteria to oxidise nitrite to nitrate, whereas a predominance of reducing agents would cause anaerobic bacteria to convert nitrate into nitrite.

A simple guide to redox potential is provided by the type of algal growth in the tank. Lower levels will encourage red blanket algae; as levels rise, green filamentous algae will dominate and, finally, Caulerpas.

Terry reports a temporary drop in redox potential following a water change. This supports the view that nitrifying bacteria operate more effectively in osmotically stable conditions.

Water changes. These are currently at the rate of 10% per week, using water treated for nitrate, but not chloramines. Surprisingly, Terry does not pay excessive attention to matching density during these changes — a hydrometer is all that is used.

Terry showed me a soft coral, moved from a density of 1.026, to 1.024 the day before. It was clearly thriving. The excellent water quality appears to allow both invertebrates and fish to adjust to the slight changes in density caused by water changes, without ill effects. However, Terry recommends the hobbyist takes extreme care in this area as these effects are not fully understood.

Lighting. This is by metal halide, supplemented by actinics. Although much is said concerning the importance of output ranges, Terry feels the main contribution of actinics is simple colour enhancement. It is, of

course, only fair to say that many people have reported considerable improvements following the addition of actinics.

Feeding. This is once a day, with live brine shrimp and the juice from frozen foods.

The future

What of the future? Terry Evans describes himself as basically lazy, ever in search of easier ways of doing the same thing. This claim is belied by his commitment to continually improving the captive marine environment under his control.

The next advance will be the preparation of pure water for water changes. Reverse osmosis units can produce volumes of pure water using mains water pressure and a semi-permeable membrane. These are already used in the States as water purifiers and over here by the milk processing industry. Terry hopes to retail these units at a reasonable price in the near future.

Water changes will then be increased to 20% per week, with a new extension allowing this to take place without exposing any life in the upper regions of the tank.

Terry would also like to find time to devote to fish breeding and also waxed lyrical over the possibilities offered by a truly large tank — two-hundred-strong shoals of Moorish Idols and Powder Blue Surgeons!

Amid all this activity Terry remains extremely approachable, keen to pass his expertise to anyone willing to learn. Further innovations are just around the corner!

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THE RED-STRIPED KILLIFISH

(*Aphyosemion striatum*)

Brian Tate, Chairman of the British Killifish Association, introduces a spectacular and hardy fish which is ideal for anyone contemplating taking up this colourful and interesting branch of fishkeeping.

(Photographs: courtesy of the British Killifish Association)

We have many sources of fish in our hobby. There are, for example, fish that are captured from the wild and are not normally bred in aquaria or fish farms. Other fish, although found in one part of the world, are bred in fish farms in other areas of the world.

This spectacular killifish is one that has been collected more by hobbyists than commercial collectors. It has been maintained and distributed by killifish hobbyists worldwide and is regularly available today to all fishkeepers in most areas of the world.

The very tolerant nature of *Aphyosemion striatum* makes it one of those killifish recommended to new killi-keepers. The colourful coat of male killies is well-known and attracts fishkeepers towards the many species that make up the family of fish commonly called killies (Cyprinodontidae — according to traditional classification). The male of this particular species is no exception.

Spectacular coloration

The male *A. striatum* is, as the name suggests, a striped fish. The stripes are horizontal, and are made up of lots of red dots which, in places, are missing. This creates the effect that the "painter" involved has not quite finished the sketch! The back of the fish tends towards a green effect, particularly if viewed from above, while the belly is light brown.

The shape and size of this killie conforms to the general shape and size of most "Aphyos", as they are often nicknamed, the size being around 5 cm (2 in). The shape is best described as a thin bullet with fins placed well towards the tail.

The caudal (tail) fin carries the body stripes and flares out slightly with only a hint of an extension in the outer rays. The unpaired fins also carry the red spotting and in the anal, a stripe is normally present. It can be seen from the accompanying pictures that variations do occur naturally.

The female is a typical *Aphyosemion* female in that she carries little colour and is difficult to distinguish from other female killies. The colour is best described as a muddy brown with a few red dots here and there. The fins are smaller and less exaggerated at the tips, often carrying rounded edges where the male carries points.

Basic requirements

This fish will live to three or more years. Many males can be kept in a single tank — a distinct advantage where killies are con-



A. striatum males are very variable in colour pattern. This spectacular specimen comes from an unknown location.



Males from Lambarene are characterised by the vivid contrasting patterns of their caudal and anal fins.



An overall yellow/golden body base is typical of males originating from Cape Esterias.

cerned — and fry are likely to appear in the tank if enough cover is provided. *A. striatum* also appears to enjoy water movement and, although it is not quite a surface swimmer in the way that *Epiplatys* is, it does, nevertheless inhabit the upper areas in tank environments. It also has a wide tolerance of temperature, but is normally kept at 72-74°F (22-23°C).

Water hardness is not a critical factor with these fish as they are often kept in tapwater in very different areas of the UK. Even so,

many of the people who specialise in keeping killies collect rainwater to mix with normal tapwater to create softer conditions. *Aphyosemion striatum* will welcome this, but it is not a requirement and, similarly, it is not essential to provide acidic conditions.

Slow growers

The growth rate of fry is generally felt to be slow when compared to other similar killies. It has been recorded within the British Killifish Newsletters that fry given a

higher temperature do significantly increase their growth rate. The recorded effect is that, for *A. striatum*, fish start to mature at 6-7 months at higher temperatures, whereas for fry raised at lower temperatures, maturity is less predictable and can occur between 9-12 months.

The highest temperature in a trial conducted by a member of the British Killifish Association was 82°F (28°C). At lower temperatures (in the mid 70's°F-24°C) the fry often seem to stand still, in growth terms, when they reach 1/2 in (1 cm) long.

Perhaps, in natural conditions, the fry are generally found at the water's edge where temperatures are more subject to the extreme heat of each day, and consequently, may grow faster than in aquaria.

Captive breeding

The mature fish are normally kept at a cooler temperature (72-74°F/22-23°C) where they will breed well if maintained on a good diet. About 20 to 30 eggs can be expected each week from a healthy pair of adults.

Once per month the male and female should be separated to ensure the female is allowed a small respite. If a shoal of fish are maintained, this separation is not really necessary.

If the keeper of these fish wishes to collect the eggs and hatch them in a separate environment, then this is easily accomplished. The amount of plant cover is reduced and a substitute plant is introduced into which the fish spawn (examples of a

replacement medium are nylon mops, peat fibre, willow root or coconut fibre).

The medium is removed frequently and the eggs collected by hand; they are quite strong and can be handled without any damage occurring. The eggs are then placed in the container holding water (normally from the spawning tank) to observe the fry hatch. This takes 12 to 14 days and results in fry which need to be fed straightaway, ie without the two days or more delay normal for fish that hatch with a yolk sac.

Killifish fry are similar to all other fish fry in requiring a higher level of protein while engaged in the task of reaching maturity.

It is often stated that killifish require a 100% live food diet. Like all generalised statements this is not true in many instances. Yes, some killifish are totally carnivores, but in the case of *Aphyosemion striatum*, flake food is taken.

By introducing dried foods during the fry stage any killifish fry being reared are thus encouraged to eat whatever is available. The rule is to try everything normally fed to other fish and observe the results. Even when flake food is taken and spat out, some residue is probably digested. Repeated feeding can then result in a marked change as the fry begin to recognise the flake as food and to take in more than they did at that first feeding.

Aphyosemion striatum is a fish for all aquarists, even those who have a heavy water turnover due to powerful filtration. The species is pretty, hardy, easily fed, a surface occupier and an excellent introduction to

killifish spawning/egg development/fry raising for those who wish to see what they can do in the aspects of maintaining one type of killie.

A. striatum can be thoroughly recommended as an addition that is just that little bit different to all community aquariums where similarly sized fish are being kept.

NOTES

1. The Publicity Officer of the B.K.A. is **Adrian Burge, 14 Hubbard Close, Wymondham, Norfolk NR14 0DU.** Please enclose a large stamped addressed envelope.
2. Members of the BKA can obtain slides of killies through the Association, the original material having been donated by fellow killi-keepers for reproduction. The member of the management committee who handles this aspect of the B.K.A. facilities also provides a service to all aquarist societies who may wish to hire audio-visual programmes. Eight of the ten slide shows available are designated as suitable for normal fish club nights. (The pictures accompanying this article all came from the above-mentioned source). The address for Club Secretaries is: **Johnny Walker, 222 Bournemouth Road, Poole, Dorset, BH14 9HZ.**

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NIGEL CADDOCK

Top-quality Koi pools such as this one owned by Ian Stewardson are impossible without a good, well-planned, filtration system.

KOI POOL FILTRATION — THE "SYSTEMS" APPROACH

Sort out your filtration system and every other aspect of Koi-keeping should prove easier to handle. Nigel Caddock begins a mini-series of detailed articles on this fundamental and controversial subject.

There are many topics in the amazing hobby of Koi-keeping that generate discussion, speculation and argument, but I think it is fair to say that of all the contentious subjects, "filtration" is the most contentious of the lot.

It really is "dicing with death" to dare to try to cover such a subject, but I believe very strongly that successful Koi-keeping is totally dependent on the maintenance of good water quality, which is only obtained by a successful filtration system, so I will risk it.

Some people reading this may think they don't need filters as their Koi are quite happy without them. For those among you who fall into the "them" category, I can tell you that, for every one of "them," there are a couple of thousand of "us" who have learned the hard way a very simple FACT: in order to live and flourish, Koi need good-quality, stable water.

This is not achieved by accident or by luck; it is achieved by applying some fundamental guidelines to your system and by successfully filtering your Koi's life-support system — the water.

Koi are like humans. If they exist in a

pleasant healthy environment, they are happy and remain in good health. However, if we are forced to live in poor conditions with bad air, poor ventilation, and in our own wastes, we soon begin to show signs of distress. Koi are the same and virtually all their ailments are a result of a poor environment.

For Koi the problems are compounded by their genetics which render them less resistant to disease — that is the price we pay for their superb colours.

Filtration systems vary enormously and no two are the same. They can be sophisticated or simple, extensive or compact. They are never cheap, but can be "less expensive." There are some basics that they need and some optional extras which can be added or not to suit individual requirements (and pockets).

There is an apparent mystique surrounding this whole, admittedly complex, subject but, take it from me, it is NOT mysterious. It is NOT a "black art," and beware those "experts" who try and make it so.

You should visit as many ponds as you can, visit as many dealers as you can, visit as many Koi shows as you can, and pick as many people's brains as you can — BEFORE

you start; it will save you untold heartache and a lot of money. There is no mistake that has not been made by someone, somewhere, while building a system, so ask, ask, and ask again.

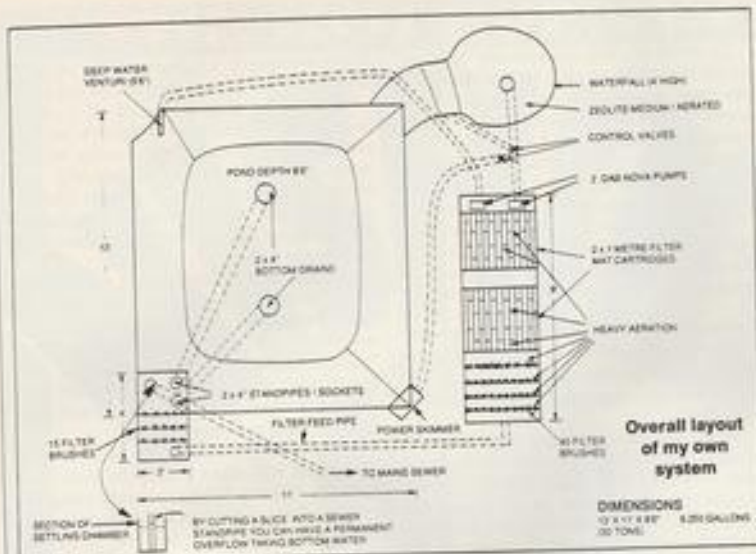
PLANNING

Of all the aspects I want to tackle I believe this to be the most important and often the most ignored. Before you do anything, be it constructing a pond, altering a filter, or anything, you should plan it in as much detail as you possibly can and try to think of every possibility including water levels, flow rates (are your feed pipes big enough?), pumps (where will you put them, and is there electricity available?), water return pipes (do you need valves?) if so, do you need non-return valves? . . . and so on.

There are a million detailed questions which you should try and answer before you start; it will save you a fortune.

Detailed planning will also enable you more accurately to assess the cost of your project. This is very important as you can adjust your requirements as you go along, rather than run out of cash half-way through and have to skimp on "vitals."

For example, it is far better to buy a



reliable pump than 10 tons of your preferred (probably most expensive) rocks. Sort out the fundamentals first — they are more important, and you can always add the "extras," especially the cosmetic extras, later.

It is also a good idea to have at least a rough drawing of your pond or system with all the detail shown. This will help you focus your mind on important detail while also being useful to show to your friends who may just spot a glaring omission that you have just not seen.

At the end of your planning stage you should aim to have:

- An exact site plan of your new/revised system.
- An exact plan with details of pipework/pumps/valves/electrics, etc.
- A detailed specification with all materials required.
- An itemised estimate of all costs.

This may seem a bit of a tall order but it will help minimise the ultimate cost and help you not to miss anything vital. In any case, it can be great fun and, if you are into computers, it can be even more fun.

A filtration system should strive to be a complete system. This means that a system is not just the actual filter chambers, but the media, the pumps, the flow rate, the type of feed, the pipework, the drains, etc. Only when all these components interact successfully will you have a successful system.

This "system" approach is absolutely fundamental, and it is very important to understand that, in any Koi set-up, every single component remotely related to the system, has an effect on its performance. This is why attention to detail is absolutely paramount and all the "bits" should complement and blend together to form a cohesive filtration unit.

BASIC REQUIREMENTS

There are, in my opinion, three "non-negotiable" requirements of a successful Koi pond filtration system:

- 1 A means of achieving mechanical

filtration of the water.

- 2 A means of achieving biological filtration of the water.

- 3 A means of removing bottom water and detritus from the pond water.

Mechanical filtration

Mechanical filtration is the removal of suspended solids of various sizes from water through trapping by mechanical means or physical barriers and/or settlement. This type of filtration should occur before biological filters, the objective of mechanical filtration being the removal of heavy solids which are more difficult to break down biologically.

There are many ways of removing suspended solids, ranging from a simple settling chamber to a settling chamber with mechanical solid catchers, such as nylon or foam traps which block easily and can be a bit messy, to the more sophisticated filter brushes which have found prominence in recent times.

Filter brushes are superb at catching all manner of solids and I strongly recommend them. You can buy proprietary Koi filter brushes, customised for filter use, which are available from most Koi dealers, or you can just buy brushes. The best I have seen are available from the Speedy Brush Company and are excellent: "you pay your money and takes your choice."

It is important that if you have a settling chamber you should incorporate a means of draining off bottom water. This can be done either by a bottom drain or a siphon pipe.

A possible scenario would be to have your settling chamber as a receptacle from your main pond feed with a pipe then feeding into your main biological filter.

Vortex settling chambers

More recently a major development has emerged with the availability of Vortex Settling Chambers (VSC). These units are really state-of-the-art solids settling devices which are incredibly efficient at settling all manner of large and smaller suspended solids.

VSCs are, basically, a cylindrical shaped vessel with a tangential pond feed in the middle, directed against the cylinder wall, an opposed tangential exit pipe nearer the top of the cylinder facing into the induced direction of the flow, and a bottom valved exit pipe by which deposited solids can be removed.

The action of the water being introduced via a tangential feed in one direction and gravitated out through a higher exit port induces a vortex which forces most of the suspended solids to the bottom of the VSC by a combination of centrifugal force and good old gravity.

The bottom of the VSC can then be purged and the deposited solids removed. The principles of operation are really very simple and, like many simple devices, it works beautifully. If you want a definitive settling chamber then a VSC is for you.

There is, of course, some bad news; proprietary models usually made in fibreglass are quite expensive and very bulky and heavy. They also require well-planned pipe work runs, and incorporation of such a device has a fundamental design implication for the rest of your system. So, if you do plan to put one into your system, plan its inclusion at an early stage; this is definitely NOT something to add on later.

As an alternative to buying one of the excellent "off the shelf" models, it is possible to construct a D-I-Y VSC out of brick or block work with concrete and fibreglass. The added advantage of this, in addition to a significant cost saving, is that these units can be constructed in-situ and customised to meet individual requirements.

VSC's offer a definite settling option and, when used in combination with a small settling chamber with filter brushes, offer a system that will catch a high percentage of all suspended matter before it reaches your filter, thereby relieving the pressure on the main filter and leaving it to get on with what it does best, biological filtration.

Biological filtration

This is the single most important part of your Koi pond and it must be effective. To this end it is of paramount importance that it is correctly designed, is the right size, contains the right media and runs out at the right flow rate. It is only when all these vital components interact successfully to filter and purify your water effectively that your system will come together and work.

Every pond is different, and every filter is different, but in designing a filter, the following factors should all be considered:

- Total pond gallonage.
- Approx stocking rate (fish inches).
- Efficiency of pre-filter settling.
- Required flow rate through filter.
- Optimum filter media.
- Dimensions of filter.
- Size of filter feed/return pipework.
- Location of pumps (submersible/external).
- Back-flush facility.
- Location of aeration.

I wish it were possible to offer some definite information on all the above com-

ponents, but the permutations and options are endless. The best I can do is advise you of a filter that works and offer guidelines on that basis.

My system contains 6,250 gallons (c 28,000 litres) and feeds bottom water through two bottom drains to a 5 x 2ft (1.5 x 0.6m) settling chamber with 20 filter brushes. The water then goes into a single filter chamber measuring 9 x 3 x 2ft (2.7 x 1 x 0.6m) which has 50 biological filter brushes (just filter brushes I never clean off). It then has two 3 x 2 x 2ft (1 x 0.6 x 0.6m) filter mat cartridges and returns to the pond via a deep water venturi and a waterfall.

It is most important to realise that it is the application of the afore-mentioned principles that is vital, as every system is unique, the actual details varying widely in every case. It is only when the fundamental principles are understood and incorporated, in whatever form, that a system will work.

An important aspect to consider is that there are many types of bacteria present in a filter. Generally these are categorised into aerobic bacteria (the "goodies") and anaerobic bacteria (the "baddies"). It is our objective to promote the aerobic "goodies" which effectively consume all manner of biological nasties, "do the business" and purify the water. Aerobic bacteria only thrive in oxygen-rich conditions whereas anaerobic ones can only thrive in a low-oxygen environment. The double jeopardy of reduced levels of oxygen in filters is, therefore, that when low levels exist, not only do the aerobic bacteria struggle, but the anaerobic

"baddies" thrive and ultimately take over. Result = BIG TROUBLE!

To avoid this and promote the "goodies," filters should be aerated, in my experience, the more heavily the better. It should be noted that the bacterial action of the aerobic bacteria converting pond nasties into pure filtered water is a chemical reaction and consumes large amounts of oxygen; this reinforces the need for in filter aeration.

This is an important consideration when selecting filter media and it should always be the case that, whatever medium is used, the conditions within are well-oxygenated.

Beware the "meddling factor"

The biological filter is the very heart of any Koi pond, and its success, or failure, will determine the ongoing health (or not) of your Koi.

When you have designed and built your system, I would make a sincere and heartfelt plea — LEAVE IT ALONE. One of the biggest mistakes made in filtration has nothing to do with design or construction; it is the "meddling factor." I have seen many a pond that clearly does not work but would equally clearly work if the Koi-keeper would just leave things alone.

I have mentioned that every component has an effect on the entire system and some people find it almost impossible to stop "meddling." A biological filter relies on the natural development of bacteria. This takes time and, despite the optimistic claims of some, the development of a significant population of bacteria takes a minimum of

eight weeks and can take up to two years to develop fully to a stable level. Two-week filters are simply a figment of the imagination. Take it from me; they just do not exist.

The development phase of an in-filter population of bacteria is known as the nitrification process and this process MUST occur in every pond. It is, basically, the process that takes place when the filter is maturing and is beginning to succeed in being biologically active and converting nitrite into nitrate.

The problem is that, before it reaches this stage, the level of nitrite, and often ammonia, both of which are toxic to our Koi, build up to a significant level. At this stage the filter "ecosystem" is very vulnerable and any "meddling" runs a real risk of totally disrupting the bacterial development and putting you back to square one.

This is a doubly trying time because your nitrite test will often go off the scale and resemble "Cherry B." This is only cause for concern if this continues for more than two weeks and, even then, the best palliative measure is to increase the water changes slightly and leave nature to take her inevitable course.

Patience is vital and any "meddling" will inevitably delay the development process further. So, please, leave well alone . . . !

NOTE: In Part 2, Nigel Caddock will be looking, among other things, at bottom drains, filtering media, pumps and so-called filter "feeds."

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IN QUEST OF THE O

Armed with licence and camera, Dr Gareth Evans set off in search of one of our most spectacular and endangered amphibians . . . and found it.

(Photographs by the author)

With holes in the ozone layer, the atmosphere turning into a giant double glazing advert and the rain forest being felled at an incomprehensibly large acreage (or hectare if you believe in 1992) per year, the Green Issue, thankfully, now means more than a debate over wellie colours to an increasingly large number of people. However, it's really not necessary to jet off to somewhere hot and ridiculously expensive to encounter species near to the edge of extinction. Conservation, rather like charity, can best begin at home.

The Great Crested Newt, *Triturus cristatus*, is one of a number of native British animals whose status in the wild is most optimistically described as threatened. Growing to around 12-15cm (4½-6in), this black newt, its bright orange/yellow belly spotted with black or grey, is the largest of our three native species. The common name comes from the extravagant, jagged dorsal and



The striking underside of *Triturus cristatus* (the larger specimen is the female).

caudal crests which adorn the male in the breeding season.

Breeding

Breeding itself, and the courtship leading up to it, is a fairly protracted and fascinating

procedure. Unlike the free-for-all of frog and toad communal spawning, the newts engage in an altogether more elegant performance. The male actively pursues the female, positioning himself broadside-on to her path, then approaching until their snouts meet. Holding his body free of the substrate on stiffly extended legs, he arches his back, and bending his white-sided tail towards the female, repeatedly lashes her lightly with it. At the same time, he appears to release some form of sexual attractant (presumably with the "great smell of newt"), the tail slapping also serving to fan it in her direction.

After this impressive visual, tactile and chemical display, he stretches himself out flat, and with characteristic body writhing, he releases a packet of sperm, the spermatophore, which the female then crawls over. This attaches itself to her cloaca, sperm transferring themselves into her body.

This whole ritual may be repeated several times until, at last, the male swims off. Usually, he will court a number of females



The Italian Crested Newt (*Triturus carnifex*) is very similar to our own Crested Newt and can hybridise with it. Treat with caution!



A male Crested Newt in full breeding regalia.

CRESTED NEWT

over the season, before leaving for dry land later in the summer.

Beginning around May, some 2-300 eggs are laid singly, each being placed on the underside of a small water plant leaf, which is then curled around it for protection. The eggs hatch into 8-10mm (3/16 in) long, yellowish coloured larvae in around 2 1/2-3 weeks. They have enormous appetites and by September, the tadpoles approach a length of 8cm (3 1/8 in). They now metamorphose and seek out winter quarters on land where they will hibernate until the following spring. After two years, they become mature and again return to the water.

Egg laying in this species, although beginning in early summer, continues over a long period, and some of the later hatching larvae do not complete their life-cycle in the first year, over-wintering instead within the pond.

Chosen Habitat

Seldom encountered at altitudes much in excess of 1,000m (3,280ft), the Crested Newt often ranges some distance from standing water outside of the breeding season, and may frequently be found in surrounding woodland. It selects large, deep ponds or lakes as breeding sites, preferring those with both dense aquatic vegetation for egg-laying and deep areas of little plant growth with bank overhang or canopy cover for courtship.

The Garden Pond

As a result of their rather detailed needs, and in consequence of the enormous decline of wetlands in general in this country over recent decades, the Crested Newt has been one of the hardest hit of native amphibian species.

Although the more common varieties have found many garden ponds suitable as breeding sites the Crested is, in many areas, too scarce to colonise them naturally, and demands, in any case, larger facilities than many gardens can easily accommodate. However, in suitably spacious artificial ponds, the species will thrive — and its relative rarity makes the establishment of new strongholds, no matter how small, a very worthwhile conservation effort.

It is, though, a rather slow and long term project, since the newts do tend to wander off, and even if breeding does successfully take place, with their lengthy maturation time, it will be around 24 months before any significant population increase becomes apparent. Indeed, even in a pond specifically designed to be everything a Crested Newt dreams of as a "des. res." (such as the small "reserve" for which I am responsible) colonisation can be a frustratingly protracted affair.

Much of what makes a good pond relates to its general topography. Ideally, to cater for

this particular amphibian species, there are a number of key features to be incorporated in a new facility, and when starting from scratch, this should not present too much of a problem.

Obviously, the pond should be as large as possible, offering an area of open water, adequate weed growth, a variety of sloping and steep banks, and marginal cover around 15-20% of the perimeter. In a pond large enough for it to be a viable proposition, an undisturbed "island" will also prove a useful addition.

Amphibian ponds generally need not be more than 60cm (24in) deep, for although frogs and some individual newts will over-winter at the bottom, few winters will be severe enough to freeze to this depth. However, to provide the best conditions for Crested Newts, significantly large areas of the pond should be deeper still.

The materials for construction are largely a matter of individual preference, and there are many suitable fabrics available. As a general rule, though, it seems you get what you pay for, at least in terms of durability and longevity.

Legalities

Their scarcity *per se*, and the threats to their habitats, have caused the Crested Newt to be afforded specially protected status under the Wildlife and Countryside Act, 1981. Interference in any way with these animals is prohibited, except under licence from the Nature Conservancy Council, to whom all requests for relevant and exact legal information, or for legitimate sources for stocking new ponds should be addressed.

These newts must never be simply removed from the countryside. Not only is this illegal, it also weakens an already poor wild population.

Incidentally, the closely related Italian Crested Newt, *Trimerus cristatus* (formerly *T. cristatus carnifex*) is sometimes offered for sale quite legally in aquarist and pet shops. Their

Crested Newt habitat at Yariet Naturo Reserve.



release into the wild, and even into your own pond, unless guaranteed absolutely 100% escape-proof, is expressly forbidden, since they would hybridise with, and thus dilute, native Crested stock.

Closing Remarks

Sadly for the traditional garden pond enthusiast, fish and newts mix poorly, the former being greedy and efficient consumers of the latter's tadpoles. However, the positive value of affording sanctuary to one of our most striking and endangered amphibian species must surely rank as considerable consolation.

Any viable breeding colony of Crested Newts is an important component of our natural heritage, and one in our own gardens not only provides a free pest-control service, but can also offer a fascinating and entertaining insight into the private life of one of Britain's most secretive animals.



Female Crested Newts don't have the dorsal "ornaments" which are characteristic of the males.

News

Latest from Fishworld '89

Don't let the kids stand in your way of attending the brightest fishkeeping exhibition in town — **FISHWORLD '89** at Alexandra Palace, over the Spring Bank Holiday weekend, 27-29 MAY. In addition to the aquatic attractions, there will be full supervised care for youngsters, ranging from creche facilities for the tiniest 'breeders teams', to a super play area for older children. Parents can wander around the Show in complete confidence knowing their youngsters are in the best of care.

Turning to the fishes, this is your last reminder to enter two great Classes. If you have anything suitable for the Big, Bad & Ugly Class (fishes only please!) then there is a place for it at Ally Pally; bring it along to interest, terrify or intrigue the visitors. Not only could it win you a sponsored prize, and a Special Trophy, but it will also be eligible to be judged as a

normal entry, in its own fish Class, in the Show proper.

Maybe your fish won Best in Show, or equivalent during 1988? If so, it qualified for any of the top competitions held at last year's major Exhibitions. The FBAS organisers urge you not to let your prizewinner remain just a prize fish in its own small 'pool', but to put it on display against all the other winners in the first **BRITISH OPEN CHAMPIONSHIP**.

Show Schedules are now available and entries are FREE (except for benching on the day). Judging starts at 11 am on the 27 May and you can bench your fish from 12.00 noon to 6.00 pm on **Thursday 25**, 12.00 noon to 9.00 pm on **Friday 28** and from 8.00 am to 9.30 am on **Saturday 27 May**. Remember, too, for every 50 entries benched (maximum of



10 plants) Societies are automatically eligible for inclusion in a Grand Draw for prizes worth £80 - £100 — and there's seven of them!

If you're stuck for tanks, then there's 200 of them for **FREE LOAN** (sizes up to 12 x 8 x 8in on a first-come, first-served, basis).

Get your Show Schedule from: **T. W. Waller, Show Secretary FISHWORLD '89**, 32 Hamilton Road, Heath Park, Romford, Essex RM2 SSD (Tel: 04024 59982)

Top Aquarists at top show

The increasingly popular 'Aquarian' Fishkeeping Exhibition will be back at Sandown Park, Exhibition Centre, Esher again this year's on 10 and 11 June. This sixth exhibition will be open to all from **Saturday 10 June** at 10.00 am.

At this year's show (for the first time at a UK exhibition), top international aquarists from as far away as the United States will be assembled in an outstanding programme of short lectures on the hobby.

With an international flavour, **Paul Speice**, the "Aquatic Maestro", will give a talk on fishkeeping in his country. In addition, the well-known German aquarist, **Heiko Bleher**, will speak on collecting wild fish.

Top British aquarists will also be out in force. **Dr David Ford** of the 'Aquarian' Advisory Service will be concentrating on helping beginners in fishkeeping while **Aquarist and Pondkeeper's** editor and author **John Dawes** will be looking at the pros and cons of

breeding fish, and **Jerry Gawor** will offer his 10 Top Tips.

On the publishing side **Nick Fletcher** will be looking at putting the hobby into writing, while **David Sands** of Deebie Books focuses his attention on Catfish.

In contrast, **Dave Keeley** of Underworld Products will be answering fishkeeping questions. Meanwhile travelling to Sandown from London Zoo will be **Dr Chris Andrews** who will discuss Saving Fish for the Future.

Pet Sitters (and Home Guards)

Home and Pet Care is a national organisation specialising in property protection and caring for pets.

The company's "Carers" live in the clients' homes during their absence, and feed and exercise the pets, while their presence also helps to deter burglars.

"Our Carers are, typically, retired professionals such as nurses, teachers and clergymen.

Cheddar aquarium reopens

After being closed for a period of two years or more, **Marineland Aquarium** of Cheddar is to re-open for the 1989 season.

Many substantial improvements have been made, none the least to move away from the somewhat 'tacky' image gained over the latter years of its previous operation.

Although a small public aquarium compared to some of the modern establishments now operating in Britain, Cheddar does have some large exhibits, indoors and out, and extra exhibits are being installed. All the displays will be maintained by Marineland's highly experienced owners.

Marineland, as a name, may be misleading to some, as there will be a diverse range of aquatic life on show, both marine and freshwater. However, it was decided that the name is too well established for it to be changed at this stage.

The aims of Marineland are "to provide displays of the highest standard, supported by graphic information that will be educational and entertaining, with the hope of increasing visitors' awareness of that part of our world which is underwater."

One of the most important displays for 1989 is a large coral reef tank that is designed to illustrate the various areas of a reef i.e. the reef flat, and pinnacles, etc.

There are also many plans in the pipe-line for future exhibits.

For further information please contact: **Colin Grist, Marineland Aquarium, Cheddar Gorge, Somerset** or telephone: **Poole (0202) 604793**.

New name for long-established leaders

One of the country's leading aquatic specialists — **The Aquatic Centre** — has changed its name to **The Aquatic Habitat**. The Aquatic Habitat is one of the major retailers of marine, tropical and coldwater fish in the UK, the company having been founded over 17 years ago by **Jean and Ivor Wilden** (and still managed by the owners).

According to **Ivor Wilden**: "Only the name has changed. We still pride ourselves on the size, quality and range of fish — and on our ability to supply everything else the enthusiast could possibly require to create and care for an indoor aquarium or outdoor watergarden."

The Aquatic Habitat occupies a two-acre site at Brockworth on the A46, a few miles from both Cheltenham and Gloucester. The Aquatic Habitat, Shurdington Road, Brockworth, Gloucester GL3 4PU. Tel: (0452) 862791.

Seaview Special

SALTWATER KITTEN SUCCESS

The Saltwater Kittens have hatched! Last month I told you about the Saltwater Catfishes (*Plotosus anguillaris*) which had spawned at the **Underwater World** in Stevenage. This is the second pair of the species which proprietors **Trevor Herbert** and **Ian Eary** have had spawn in the shop — so, as you can imagine, there is a buzz of excitement down in Hertfordshire.

I had a call from Trevor the other day to tell me that the eggs had started to hatch on 28 January and went on doing so until 2 February. At the time of the call, all the kittens were surviving and living off their yolk sac. They were all black and far too numerous to count and, apart from a few stragglers, were already swimming around the aquarium in one large ball. The lads were really determined to succeed and raise the fry this time. **Aqualabs** had agreed to supply the necessary foods, and so, there was a great air of confidence in the way Trevor spoke.

I couldn't resist ringing Trevor and Ian for an update on the situation before sending this off to print and the up-to-the-minute news at the end of February was that there were thirty of the fry left, all doing wonderfully well. They spend all day swimming in their ball formation, just as they do in the wild. At night, with the lights off, this ball is consolidated and no bigger than a fifty pence piece, with the fry spending the night with their heads down into the centre of the ball and their tails outwards.

The tank lights are shone on the front of the aquarium and, when these are switched on, the fry "loosen-up" the ball and spend the day swimming up and down the front of the tank, basking in the light. **Aqualabs** are supplying Brine Shrimp nauplii, which are also attracted by the light, so it is easy (or relatively so) to observe the fry to make sure they are all feeding. They seem to be doing well on this nourishment.

When the Kittens reach three inches or so in length, they will be ready for sale but Trevor and Ian are planning to keep back four of them so that they can attempt to produce a second generation.

The proud "fathers" have done nothing special in terms of water quality parameters to induce spawning and hatching. The shop has a centralised filtration system built by **Tropical Marine Centre** (obviously, the tank containing the Kittens has now been taken off the main system to prevent the fry being sucked up into it.) Temperature is 76°F -24.5°C (virtually constant), specific gravity is 1.022, pH is 8.1 (absolutely constant) and ammonia and nitrite are, of course, nil.

The only problem is nitrate, at about 50ppm. Water supplied by the Thames Valley Water Authority has an alarmingly high nitrate content and the stuff coming out of the taps can read as high as 80ppm. (*Gordon's soapbox No 65 — Buy only organically grown vegetables!*) Ian and Trevor get round this problem by monitoring their supply daily and doing water changes only when the nitrate content is "low" (low?) This rather high nitrate doesn't seem to bother Saltwater Cats, but I would never subject my Butterflies to it!

Trevor and Ian have promised to keep me abreast of any developments, so I'm sure you'll be reading more about the Saltwater Kittens on this page. Meanwhile, **Roy Reeves** (to whom we extend our most sincere thanks) has been down to **Underwater World** to take some pictures so that you can see them for yourselves. However, if they whetted your appetite for finding out more, visit **Underwater World** at **Roger Harvey's Garden Centre**, **Bragbury Lane, Stevenage, Herts.**

Reef Message

I thought that I'd exhausted



Newly-hatched fry (some 21 days after the eggs were laid) are very lightly coloured and have large yolk sacs.



The happy pair.

the topic of Reef Conservation and so had decided to leave it alone for a while but, my local dealer (**The Underworld** in Loughborough) reckons that I should keep plugging away because people just aren't getting the message.

He feels much the same about it all as I do and, for one thing, won't sell real coral. After spending some considerable time explaining the dangers of reef destruction and why he sells only synthetic coral the attitude is usually "Yes it's a shame. Anyway, do you know where I CAN get some real coral?"

What really prompted him to talk to me about the subject was a conversation, of approximately one hour's duration, with a young man and his mother about the scourge of cyanide, its effect on the reef and the dangers of buying cyanide-caught fish. At the end of the conversation the mother said (and I quote) "Well, the reef is a big place, isn't it?" With attitudes like these, is it any wonder that I get depressed?

All this is particularly relevant at a time when an announcement from senator **Joey Lina**, of the Republic of



Close-up of fertile eggs at 12 days old. The blood supply is just about visible on most.



Top view of the "nest" with newly-laid eggs.



26 days after the eggs were laid (4-5 days after hatching). By now the fry have developed quite a bit of their dark pigmentation.



by Gordon Kay

the Philippines, states that the country stands to lose its coral reefs within the NEXT DECADE if sodium cyanide is continued to be dumped into the seas around the islands at the current rate.

Interpet's illuminating approach

And now, on a lighter note (!), news of a new fluorescent tube from Interpet, called Triton, which should be in shops soon. Until now, we have had to make do with non-specific, barely adequate fluorescent lights for our aquariums. Interpet and Thorn Lighting have developed a tube specifically for the aquarium after consultation with scientists and experts from the world of fishkeeping.

The specification was achieved by using a unique blend of rare earth activated triphosphors.

Triton is claimed to have the highest light output of any fluorescent tube normally used in aquarium lighting. In fact, it is twice as bright as the commonly used "plant-growth" tubes. Most importantly, however, is Triton's significantly small fall in light output — something like 10% over the tube's effective lifespan of 7500 hours (18 months for the average system).

The thing which I consider to be the master stroke is that, after these 7500 hours, the tube fails completely, so that there is no need to keep a diary in order to prevent the use of a tube which has passed its useful life!

Triton has been specially designed to enhance the true vivid colours of the aquarium, without creating an undesirable hue. In fact, I saw this tube in its prototype stage while it was being tested and I was impressed, to say the least. It WAS very bright and gave the aquarium a lovely cold, white

look. Algae seemed to flourish and corals seemed to benefit too.

A company spokesman told me that Triton will be available in standard 24" (20 watt), 30" (25 watt), 36" (30 watt) and 48" (40 watt) lengths. When I expressed disappointment at this, saying that 48" tubes do not fit into standard 48" aquarium hoods, he said that the company were aware of this and a 42" (40 watt) tube will be available later. (Hooray for that!)

Gamma-rayed . . . and safe

Ever wondered how gamma-irradiated fish food is produced? Pioneers of this type of prepared fish food were Tropical Marine Centre Ltd (Richard Sankey's "emporium") in Borehamwood. Their "Gamma" range of frozen foods was developed to simulate the natural diet of marine fishes and invertebrates as closely as possible, when the only foods available were either dried (with the resultant loss of vitamins and nutritional benefit) or live (with its inherent risks).

At TMC, all varieties are packed with a minimum of water in special pouches and rapidly frozen to maintain the product in optimum condition. The special pouches are made from a "triple laminate" of polyester, aluminium and polythene. This sandwich of materials creates a total vapour barrier around the product ensuring that no dehydration takes place and preventing "freezer burn".

After freezing, the pouches are packed in insulated cases to ensure that the product remains deep frozen at all times. The final process involves taking the product to a Government-supervised irradiation plant where it is exposed to gamma rays from a Cobalt 60 radioisotope.

This is a "cold" process which destroys all pathogens, either in active or dormant stages, so that the product remains frozen with no residual radiation and no deterioration in quality.

Coldwater jottings



Stephen J. Smith

May revival

May is by far my favourite month. This is the time of the year when, for me, I can come out of the shadows of those short winter nights and make the most of the extended evenings with the fish.

What fruits will this season bring? Will those blessed Orandas actually spawn this year? (I blamed last year's poor performance on the previous mild winter — it was even milder this year!). Will I finally get round to building that ornamental pond I've promised myself for next year, every year? What new ideas, varieties, activities, will emerge as the season progresses?

Whatever happens, I know I shall enjoy it. Fishkeeping is, apparently, one of the most popular hobbies in Britain. This doesn't surprise me: no other pastime provides such a combination of relaxation and exhilaration as keeping fish.

Granted, there is work to be done: ponds should be emptied and scrubbed using plain water (no detergents, please!) to remove all of the winter's debris and to provide the best of conditions for your fish; while plants should be re-potted, even divided, with any dead matter pruned off.

But, having taken care of the welfare of the fish, the most important thing is . . . enjoy the hobby!

Memo to secretaries

Don't forget to let me know about the activities of your society throughout the season. If you are a club secretary, why not drop me a line to let me know about your society, its activities and members?

If you are not a club secretary, give him or her a gentle reminder — or drop me a line anyway, c/o Coldwater Jottings, Aquarist and Pondkeeper, 9 Tufton Street, Ashford, Kent, TN23 1QN.

SVC time again . . . ?

Although much of the hoo-ha of last year's SVC outbreak has died down over recent months, I make no apology for reminding hobbyists, retailers and importers that the dangers of Spring Viraemia of Carp (SVC) still appear to be with us.

Happily, a number of establishments which had been made the subject of closure orders by the Ministry of Agriculture, Fisheries and Food (MAFF) have been subsequently re-opened following the removal of their variation order.

However, the presence of SVC is still evident, with new sites being designated for closure, even over recent weeks.



The nature of SVC, its symptoms and some useful advice is incorporated in this booklet, available free of charge from MAFF (see *SVC Time Again . . . ?*).

While I would not wish to cause a resurgence of alarm throughout the hobby, I feel it is appropriate to remind ourselves that every precaution should be taken to ensure the health of our own stocks.

Remember the golden rule, "Cleanliness is next to Godliness" and you won't go far wrong. And please, do remember to buy any new stocks from a reputable supplier (your local aquatic society will be more than willing to give you advice), and do quarantine your new fish before introducing them to your existing collection.

Specific advice to prevent the spread of SVC is available in a

comprehensive leaflet issued recently by MAFF in conjunction with the Welsh Office Agricultural Department.

Everyone who is interested in carp (and this includes carp-related species, such as Goldfish) is urged to follow the guidance provided by the booklet, which is illustrated with colour photographs and describes the nature of the disease, its symptoms, and the measures which Government fisheries departments are taking to prevent its spread.

The booklet is available free of charge from: MAFF Publications (Ref: UL122), Lion House, Willowburn Estate, Alnwick, Northumberland, NE66 2PF.

Tailpiece

On a much more pleasant note, I cannot conclude this month's missive without at least some mention of the latest bibliographical offering from our editor: **John Dawes's Book of Water Gardens** (TFH Publications, £13.95 and available through A&P).

This is timed just right for the start of the coldwater season and is a book which will, I am sure, be made most welcome by all sections of the hobby.

And no, this is not just another pond book, but one which serves not only as a useful introduction to those who may not have sampled the delights of the pondkeeping hobby, but also as a practical guide to the more experienced hobbyist.

Pricing, too, appears to be exactly right: at £13.95 **John Dawes's Book of Water Gardens** provides possibly the best value for money available from any coldwater publication.

And look at what you get for your money — hundreds of photographs, colour illustrations and diagrams, to accompany a text which evaluates every aspect of "the pond," beginning with its definition and taking the reader through methods of construction to planting and stocking — all presented with the authority and readability which you would expect from an author of such stature, and which puts this book "top of its class."

Derek



"I suppose this sudden interest in fishing has nothing to do with the news report that jeton fish are breeding in the warm water outlets from the local power station?"

Introducing A NEW(?) LIPSTICK GOBY (*SICYOPUS* sp)

What an unspeakable scientific name for such a small and remarkable bottom dweller, and what a descriptive popular name. Here is the "identity card" of this beautiful little fish from Sri Lanka.

Family: Gobiidae.

Sub family: Sicydiaphiinae.

Genus: *Sicyopus*.

Species: At first I thought that this fish was a *S. jonklaasi*. However, close examination of the material, allied to the opinions of other experts such as Arend van den Nieuwenhuisen, indicate that this Lipstick Goby may, in fact, be new to science.

Origin: Sri Lanka: Badureliya, Arweltoea; in moderate to fast-flowing mountainous lakes and tributaries with a sandy bottom, and scattered stones and rocks.

Year of first import into Europe: 1988.

Size: Small: up to 45-55 mm (1.8-2.2 in).

Sex differences: In young fish, not clearly visible. However, in adult full-grown fish, the males are usually somewhat larger in size than the females. However, this does not necessarily result in dominance over other males. For example, within a shoal of 12, even the smallest adult male can show supremacy over the total shoal, taking a dominant place in the available space. The most dominant male shows off his supremacy by curling the rim of his lips outwards, showing the clear red colour of the inner mouth tissues. Therefore, the popular English name "Lipstick Goby" is very appropriate!

Social behaviour in the aquarium: First and foremost, this Lipstick Goby is not a fish for the casual aquarium hobbyist, more for what I call, "the pure-bred aquarist with more than a little biological interest." This species of Lipstick Goby is found together with *Rasbora vaterfloris* and may be very sensitive to sudden changes in the temperature and water quality. Therefore, appropriate water replacement/refreshment should be done by the so-called "dripping method".

As real bottom dwellers, for their protection, they depend highly on their ability to make themselves invisible. Therefore they demonstrate a highly-developed adaptation to the nature of the substratum, changing the colour of the skin to conform with the colour and structure of the tank bottom. If they feel any danger, they disappear with an astonishing lightning-quick movement into the substratum. Alternating the bottom soil with some decorative stones or roots would be interesting, since this will give the males an opportunity to establish more or less separate territories. Especially after Lipstick Gobies have been brought into new surroundings, after reconnoitring, they will fight for what they consider the

Bill Tomey continues his series of occasional introductions with a very special, unusual and, almost certainly, new freshwater goby.
(Photographs by the author)



A male Lipstick Goby living up to its name.

best place to settle. They move and turn around each other slowly and face each other, the most dominant male distending his jaws as wide as possible, holding the lower jaw almost vertically and displaying the vivid red colour of the inner mouth. This power display might last for five to 10 seconds, but will be shorter each time, indicating that the territorial claim has been won.

As far as I can see, females play no part in claiming a territory, but they are allowed to roam freely around. Lying in the bottom layers, Lipstick Gobies are only visible to the trained eye; sometimes only the head extends above the bottom surface.

Temperature: Temperatures ranging between 22 and 25°C (71.5-77°F) are sufficient to keep this "dwarf" healthy.

Food and Nourishment: Lipstick Gobies are not at all fastidious, as long as live food is provided, but they show disdain for any dried or frozen food. They react fiercely to live *Daphnia*, *Cyclops*, Grindalworms, chopped Whiteworms, and so on. However, small larvae of midges and small red, white and black mosquito larvae are their favourite food. Lipstick Gobies exhibit a very interesting biology much of which is, so far, unknown. They have been bred (possibly) only once... so the challenge is there to be taken up. Colour, size and behaviour make these fish charming, though somewhat delicate, dwarfs for the real aquarium hobbyist, who wants more out of an aquarium than just a decoration!



Above, Males often establish an "own spot" on a flat stone from which they can guard their territory.

Far right, female do not possess the fleshy lips of the males.

Right, A Lipstick Goby male emerging from the substratum, "balancing" a gravel grain on his head.



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Left, the pair, male on top. Right, while courting the female will be gently nudged in the belly region.

THE DWARF PENCIL FISH

Ruda Zukal reports on his success with this delightful little fish

(Photographs by the author)

This dwarf Pencil Fish was first imported into Europe in 1928 from the land where the pepper grows — Surinam and the Guyana. Countless jungle brooks and small streams with a well-balanced "climate" (always regular warmth and shady waters) are the natural environment of these small fish which only measure 4cm (1.6in) in length. They live in crystal-clear, red-brownish coloured water in large shoals, often in community with some other species of *Nannotomus*, *Hemigrammus*, *Pristella*, *Hypheosbrycon*, *Copella* and others.

The body of these characoids is short and plump and the adipose fin is missing. On the flanks of the body are three longitudinal bands which are red and gold-yellow in colour. Besides the caudal fin, which is colourless, the male's fins are mainly blood-red. This, plus other sexual differences are clearly visible on these fishes — the male is slender, his coloration more intensive and the dorsal fin is rounded.

Regrettably, one will not see these dwarfs in aquarium shops very often, as there are difficulties regarding their reproduction and the number of fry which they produce is very small. That is one of the reasons why these fishes are not profitable enough and are of no particular interest to commercial breeders. Nevertheless, *Nannotomus marginatus* is highly rated by fanciers.

AQUARIUM CARE

They are undemanding and peaceful and will look very effective in the aquarium, in a shoal of their own kind. They can also be kept with other small sociable fish, eg Neons or Glowlight Tetras and any other peaceful characins. The tank should be on the larger or medium sized side with a rich supply of

plants, normal tapwater of neutral pH value (maybe a little alkaline) and a water temperature of 22°C (c 72°F).

Soft water does not suit the Dwarf Pencil Fish; they love lightly salty water and will avoid glaring lights. Therefore, floating plants should cover the water surface as the fishes swim to and fro searching continuously for food among the plants as well as along the bottom.

AQUARIUM SPAWNING

The marvellous courtship display and the spawning act of this species do often happen in a community tank. In addition, they are, unfortunately, strong egg predators and will eat their own eggs immediately after release. The spawning of these fishes is not as difficult as is often stated (a few years ago it was still regarded as a "problem fish"). One merely has to keep in mind the predatory tendencies of the parents.

I take the following steps in breeding these dwarfs:

In a tank holding 10-15 litres (approx 2-3 gallons) containing fine-leaved plants, at a water temperature of 25°C (77°F) and normal planting arrangements, I put a male one day ahead of a female. As soon as I add the female the colours of the male will darken and he will soon start to impress and court her, while the female goes pale and tries to avoid the nudges of the male. The male continuously attempts to get alongside the female and he accompanies his "wooing" with tender butts.

The chasing, courting and impressing continues for about two hours.

After this the fish change their behaviour. The pair adopt a certain swinging motion. Thus giving each other a sign that they are

ready to spawn. Soon the female starts searching for a suitable spawning place, leaning against the plants while the male butts her gently in the belly region. The pair then snuggle up to each other and spawn. After parting for a moment, spawning continues, with short breaks, for some hours. As it takes several days before the spawning comes to a final conclusion the spawning place will change continuously.

PROTECTING THE EGGS/ FEEDING THE FRY

As I have already mentioned these fishes are avid egg eaters and must be taken out of the tank immediately after spawning, otherwise not a single egg will be left. In my experience, even waiting this long is already too late, as the fish start eating the eggs while still spawning. Some aquarists, therefore, recommend a layer of glass rods in the aquarium. This enables the eggs to fall between the rods, out of reach of the fish.

As the eggs will mostly stick to the plants in any case, any such rods make little sense to me. I let the fish spawn when I can be present and, with the help of a siphon, I take away the eggs as soon as they have been laid. This action does not disturb the fishes, providing it is done in a slow and careful manner. It is also a good idea to feed the pair carefully while spawning.

The fishes, as well as the spawn, are very susceptible to dirt and infusoria. The breeding tank should, therefore, be protected against light. After about 36 hours the fry will hatch and hang on the aquarium glass. By the sixth day, they will be free-swimming and have to be fed with very fine food. As a useful guide, the size of the food should correspond with the size of the eyes.

