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Features

POSTER NO 22

Owing to technical difficulties, we are unable to bring you the free poster we advertised in our September issue. We will, however, be able to do so in December. Apologies for the disappointment.

COVER STORY — JAGUAR CICHLID

Photograph: Max Gibbs, The Goldfish Bowl, Oxford

The Jaguar Cichlid is a fish that can easily drag you into deep water. No, not physically . . . just namewise!

Embark on any form of literature search, and you'll find that the Jaguar appears with, at least, 'four different types of spots': you could find it listed as "*Cichlasoma*" *managuense*, *Parapetenia managuense*, *Herichthys managuense* or even *Nandopsis managuensis*, the last of these probably being the current 'most valid' name of the lot.

With all due thanks to our regular cichlid expert, Mary Bailey, for sorting me out on this, I have to admit that, considering the confusion that reigns among humans regarding their name, all the Jaguars which I have seen recently appear to be remarkably identity-crisis-free!

All they seem to care about is doing what Jaguars do best, which is grow (up to 20in — 50cm), eat (virtually anything), dig (i.e. move *everything* about), be aggressive (except towards a well-matched partner) and look absolutely stunning.

Editorial

CONTROVERSIAL ANGELS

How would you feel if you were to discover that a new law was to be passed banning the import of Discus because they were difficult to keep alive for any length of time in aquaria . . . or because they were impossible to breed?

If that law then went further and banned *all* cichlids on the grounds that *some* were known to fit the above two criteria, how sensible would you feel that law to be?

Difficult to keep alive long-term? Impossible to breed? Banning *all* cichlids on the grounds that *some* might be difficult, or even impossible? Relax! there is no such law. If there were, the law-makers responsible, while very likely having the best interests of the fish at heart, could have, possibly quite unwittingly, overlooked some pretty crucial evidence and closed the door on the possibility of anyone ever coming up with workable solutions to the challenges presented by the species concerned.

There's no denying that Discus *were* difficult at one time, and for a while *some* appeared to be almost impossible to breed — at least in commercial numbers. Yet, look at the situation today. We've got more varieties of Discus than any single aquarist could ever realistically hope to keep or even be aware of. We've also learned a lot about Discus themselves as a result of our success with them.

Aquarium technology, knowledge, foods and practical expertise have all advanced to such an extent that anyone can now keep Discus successfully, and breed them, if they just go about it properly. How different things would have been today, though, if bans had been enforced all those years ago, preventing us from ever making the spectacular progress that we have made.

In recent years, there's been a great deal of to-ing and fro-ing along the above lines with regard to other types of fish, most notably, marine Butterflies and Angels. In fact, bans are currently in place in Germany. In some other countries, the intervention of organisations, such as Ornamental Fish Industry (UK), is bringing a timely and much needed sense of balance to the debate.

Controversies remain, though, as the recent symposium held by the Pet Industry Joint Advisory Council in Washington DC, demonstrated all too clearly. We are, for example, still being told that difficult marine species must not be collected. Yet, the chances of us being able to maintain such species with the same ease and success as we now experience with Discus keep getting better all the time as we progress in all aspects of aquarium husbandry. So do our chances of learning about the lives and biology of these species.

It would help matters considerably if, in the first place, the lists of 'difficult' or 'impossible' species were drawn up only after appropriate investigations had been carried out. After all, many Angels and Butterflies are hardy and easy and *not* difficult or impossible, as some of the claims purport them to be. As far as Cleaner Wrasse are concerned . . . are they really impossible to keep alive? I think not.

The debate is, clearly, as alive today as it's been at any stage in the recent past. The evidence provided by practising aquarists could therefore prove crucial if we are to avoid being faced with legislation that is, not only unnecessarily restricting, but also totally out of touch with reality.

See what our resident marinist **Gordon Kay** has to say on this subject in this month's **Seaview**, and then write to us with your views. We'd like to know how you stand on this very important issue.

John Dawes
Editor

News Desk . . . News Desk . . . News Desk . . . News Desk . . . News Desk . . .

Cichlid Availability Service Launched

Ever travelled from one end of the country to another to collect a fish which you have set your heart on, only to find when you arrive at the shop that a shop assistant has already sold the fish?

This is exactly what happened to a friend of **David Mounsey**, which prompted David, along with **Jeff Challands** of the **British Cichlid Association**, to establish a **Cichlid Availability Service**, where aquarists can buy or sell cichlids from a central point.

David has written to every member of the British Cichlid Association for their views, with a positive response. He explained that the service is available to buyers for an annual fee, or as a seller by 'units', with each unit representing one customer (the fees are to cover telephone and other running costs of establishing and operating the service).

"Sellers can also buy, as long as they have units in 'credit', and fishkeepers can telephone details of their stocks, whether fry, juveniles, adults or pairs, to a central database. The same database is used to source buyers' requirements."

Further information is available by contacting **David Mounsey at 12 Mansfield Road, Mossley, Ashton-under-Lyne, Lancashire OL5 9JN. Tel: 0457 834283.**

On The Wild Side of London

London Wildlife Trust has launched a "crazy new initiative which will turn London into a wild and wonderful place".

London Wildlife Week (16-24 October) is being organised by London Wildlife Trust as "a fun-filled journey of adventure discovering the wilder side of life in the city",

the organisers say. Among the activities planned are pond clearing and pond building, with emphasis upon attracting wildlife to the garden pond; while nature walks, 'wild' cookery, a free competition with hidden treasures as prizes, and "midnight escapades in old deserted caves", are also promised.

So, if you're looking for the wild side of London, full details can be obtained by contacting **Ruth Johnson** or **Donald Ritchie** at: **London Wildlife Trust, 80 York Way, London N1 9AG. Tel: 071 278 6612; Fax: 071 837 8060.**

A leaflet, *Nature Reserves in London*, and an information pack published by London Wildlife Trust and entitled *How to look after wildlife ponds*, have been made available, expecially to readers of *Aquarist & Pondkeeper*. For your copy, contact the above address, providing your own name and address details.

Aquarium Code of Conduct

Aquarists seeking the best in aquarium manufacture can be assured that products from at least five UK manufacturers have passed rigorous tests undertaken by an independent laboratory.

Among the first companies to be issued with a special certificate by the Wire Test Centre, part of British Textile Technology Group, was **Clear Seal Aquariums**, whose chief executive **Mike Thompson** remarked: "We provided five different aquaria for testing — all off the shelf. No alterations were made and we are delighted that our confidence in our products has been borne out by these tests".

Joining Clear Seal were **Tahiti Aquariums, Seabray, Merlin, BAS** and **John Allan**, who all co-operated with **OFI (UK)** in setting guidelines and a new Code of Conduct, instigated by OFI (UK)'s Chief Executive **Keith Davenport** (see **News Desk** June 1993).

The tests were carried out over a five-day period, and included:

① A finger sharpness (according to OFI [UK], most injuries with aquariums involve fingers being cut);
② A 24-hour double pressure test;
③ Impact tests, including a heavy ball striking the glass when the aquarium is full of water, followed by a similar exercise using a half-pound steel ball;
④ Inspection, cleaning, and glueing of glass.

Richard Sankey, chairman of OFI (UK) concluded: "I am delighted that the first manufacturers tested have passed with flying colours. It is also pleasing that other manufacturers are lining up to take their products to the Wire Test Centre. I hope that every aquarium manufacturer in the country will soon be able to display the 'Approved Product' logo, which will enable customers to be fully confident about the quality of aquarium manufacture".

FBAS Retirement

Peter Cottle, of Strood AS, has retired from the council of the FBAS after service of 20 years, latterly as chairman of the Federation's Judges and Standards Comittee.

Peter has moved to Scotland to take up a new job, and he intends to keep up his connections with the hobby.

FBAS chairman Joe Nethersell, right, congratulates Peter Cottle upon his retirement after 20 years' service to the FBAS Council.

DICK MILLS

Remarked FBAS chairman **Joe Nethersell**: "Societies in Scotland and the northern parts of England now have a new aquatic expert in their midst. The Federation wishes him well in his new venture and conveys its sincere thanks to Peter for all his hard work on its behalf over the years".

Obituary — Adrian Morris

Family, friends and aquarists throughout the UK are mourning the death of **Adrian L Morris**, who died in July in a vehicle accident.

Aged 36, Adrian was former chairman and convention organiser for the Northern Area Group of the **Catfish Association of Great Britain** and was a well-respected committee member.

Adrian's reputation was as a hard-working man who spoke honestly about all matters. The Northern Conventions, for which he worked hard, will be remembered for their great atmosphere, and he will be sorely missed by all.

Flyer from KWB

Koi Water Barn has issued a new 'flyer', following the success of last year's edition.

The four-page A5 leaflet is produced in full colour with no fewer than 17 illustrations of high-quality Koi and, as the company explains, continues the theme of "the best possible Koi at the lowest possible prices".

"The quality of Koi from KWB is not only reflected in the enthusiastic views of thousands of satisfied customers up and down the country, but also by extremely impressive results from Koi shows," a KWB spokesman told **News Desk**.

He also explained that Koi Water Barn has instigated a customer charter. "This genuine commitment to good, old-fashioned 'quality' combines with a desire for constant improvement and is very important at KWB," he added.

For information, contact **Koi Water Barn, Lillys Farm, Chelsfield Lane, Chelsfield Village, Nr Orpington, Kent BR6 7RP. Tel: 0689 878161. Fax: 0689 877554.**

"More Than Just A Fair" Promised At Duisberg

Organisers of this year's **Ornamental Fish and Aquarium 1993** at Duisberg 'Mercatorhalle' (15-17 October) promise "a big event without comparison, for specialist dealers and consumers alike".

Major international manufacturers will be exhibiting at the show, and ornamental fish will also be on sale; while no fewer than 12 specialist societies will also have fish on display, with some available for purchase.

Supporting the show will be a two-day series of lectures (16-17 October) presented by specialist speakers on a wide range of subjects.

Entry to the show is only DM10, with a family ticket available at just DM15; a day nursery for children is also available. Entry tickets to the show also entitle holders to a reduction in entry fee for the neighbouring zoo.

For further information, contact: **Norbert Zajac, Zoo Zajac, Baustrasse 15-17, 4106 Duisberg 12, Germany. Tel: 0203 446047; Fax: 0203 444346.**

Newts Saved On New Housing Estate

A protected species of newt has been rescued at a new housing development at Uffington, Lincolnshire.

Great Crested Newts (*Triturus cristatus*) were discovered during the spring in a seasonal pond in the village. According to the builder, **David Wilson Homes,** the pond had been disused for several years but wet weather throughout the year had enabled a colony of newts to become established.

Explained **Margaret Leech,** landscape architect for David Wilson Homes: "The Great Crested Newt is a protected species under the Wildlife and Countryside Act so, with the approval of English Nature, we have built a 100 square metre pond with associated planting of aquatic plants, shrubs and trees".

She continued, "As developers, we had intended to provide a pond as a feature to replace the existing one which had become virtually dry. When we discovered that the pond harboured a protected species of newt, we involved English Nature and ecological consultants, who were able to advise us on the best means of making the new pond attractive to the newts and other wildlife, as well as forming an attractive visual feature".

DAVID WILSON HOMES

Pictured, left to right, are ecologist David Jones, landscape assistant Nicola Marks, site worker Dave Brightman, removing Great Crested Newts from the building site at Uffington, Lincolnshire.

Chelsea Winner Opens New Wildlife Pond

Girls at **St Francis' College, Letchworth,** were delighted to welcome Chelsea Gold Medal winner **Julie Toll** to their school to open a new wildlife garden and pond.

Julie is a parent of a pupil at the school, and has helped at every stage of the garden's development, from initial plans to choosing the plants.

"When the garden is established it will be a beautiful and educational feature of the school," Julie remarked. "There is an area of plants to attract butterflies and rocky and marshy areas for variety. The garden will be bordered by a thick hedge of hawthorn, beech and holly.

"The pond is already home to a variety of creatures, including water boatmen, and other insects."

She concluded: "The designers — the girls of the prep department — have decided that no chemicals will be used, and they have chosen organic fertilisers and pest control."

The school hopes that other schools and organisations will make use of the garden as a means of studying the natural habitat of a wide range of creatures living there.

ST FRANCIS COLLEGE

Julie Toll opening St Francis College's new wildlife pond.

Partnership Strengthened

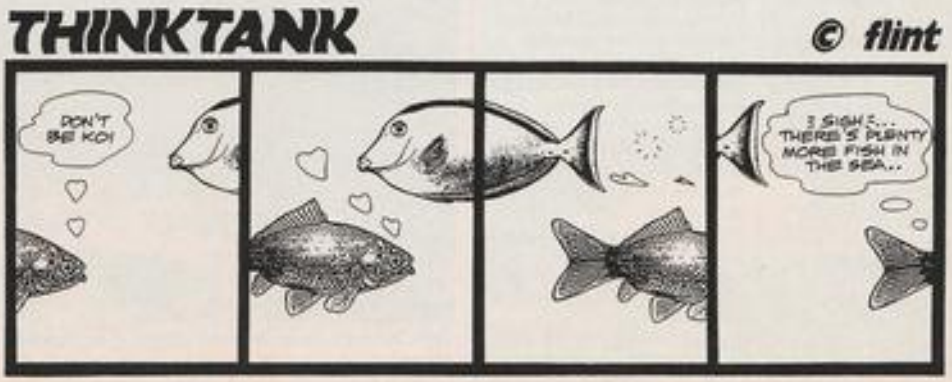
Fish labelling systems manufacturer **Environ Aquarium Support Systems** has strengthened its association with aquatic suppliers **Coral Reef Technology,** and the two companies have become joint owners of the **Environ Fish Labelling System.**

The partnership has installed a new computer system at their premises; all orders will also be handled by Coral Reef Technology.

The labelling system, featured on a number of occasions in *Aquarist & Pondkeeper*, provides easy identification and comprehensive information on fish species displayed for sale, and enables retailers to comply with European legislation regarding labelling of products for sale.

The system has also been welcomed by OFI (UK) who commented: "We welcome any initiative that improves the quality and quantity of information available to the public at the point of retail sale".

For further information, contact **Paul Davies, Coral Reef Technology, 62 High Road, Byfleet, Surrey KT14 7QL. Tel: 0932 355121. Fax: 0932 349718.**



What's your opinion?

By Billy Whiteside, BA, ACP

JONAH . . . WHALES . . . AND DOUBLE STANDARDS

The death took place in late July in Northern Ireland of 25-year-old **Jonah,** generally believed to be the longest-surviving goldfish in a tank or bowl in the country. He eventually made front-page news — an unusual thing for a goldfish to do.

Other front-page news on the fishy front was the beaching of a Minke Whale, on Portstewart Strand, and the general disappointment when attempts to refloat the whale failed and it died. Hundreds of people went to see the body, as whales are seldom seen in my part of the world.

Several years ago I took a trip into the Pacific, off San Francisco, to indulge in some whale-watching — at considerable expense. I did see whales, but they were quite far away and the resulting photographs showed only grey flukes (tails) in dull-coloured seawater.

I had a second go last year, in the Atlantic, off Boston, but, once again, the photographs were disappointing.

If you wish to sample whales in their natural environment by all means go on an organised trip if the opportunity ever arises. If you simply wish to *see* whales up close, try some of the marine theme parks or zoos that keep them in captivity. Ocean Park, Hong Kong has a good display of the inappropriately named Killer Whales; while New York Zoo has a couple of Beluga Whales in large tanks.

Frankly I'd rather see all whales and dolphins — indeed, all large mammals — set free in their natural environment.

However, it's easy to have double standards. I'd prefer to have whales released, yet I'm prepared to pay to see them in captivity in zoos or theme parks. What is your opinion?

OFF TO THAILAND

Some years ago I visited **Eberhard Schulze** at his then North London aquarium shop and took some photographs of his adult Discus with their babies. The shots have appeared in print quite a number of times.

Soon I'll be heading off to Thailand for a few days holiday and I hope to make a trip into the jungle, visit a snake farm and, hopefully, contact Eberhard, who now lives in Thailand, and try to arrange a visit or two to large fish farms. Siamese Fighting Fish are some of the best-known fish bred in what used to be called Siam.

Our editor **John Dawes** very kindly phoned me recently to supply Eberhard's address and telephone numbers in Thailand.

As someone who's affected by a lack of sunlight, I can confirm I have been somewhat SAD (suffering from Seasonal Affective Disorder) this summer. I hope Thailand will be better — even if it's the wet season. I've had all my vaccinations and am on my course of anti-malarial tablets. I have 20 films ready, so I should be ready to take a few photographs of anything interesting.

SAVAGE CATS

Anger is not an emotion normally aroused in me by fish, but I made an exception for my pair of coldwater catfish several nights ago. I arrived home at 1 am and decided to photograph two new coldwater fish in my Fancy Goldfish tank.

When I put on the lights I discovered that my favourite fat Fancy Goldfish had been savaged by the catfish. Yes, *savaged!* Her eye had been sucked out and her fins chewed to ribbons. The poor fish was so disorientated by the loss of its eye and fins that it could not even swim upright and was looping the loop.

I was so mad that I set about catching the catfish — trying to bear in mind that there had probably been no malice in their actions. They were just getting food — and that, despite the £5-plus I spent recently on a small tub of food tables for the catfish and their ilk.

I had to strip the tank of many of its plants and rocks before I managed to net the fish and transfer them to a bucket for the night. Next morning they were placed in a more suitable home.

BILLY WHITESIDE

One of my coldwater cats. Boy, was I angry with it!

Fortunately, the fat, fancy, one-eyed goldfish is doing well. Her eye has healed very cleanly and her fins seem to be growing slowly back into shape. She still loses balance on the odd occasion, but is feeding well and stabilising. Needless to say, I'm going out of my way to accommodate her needs. One of the accompanying photographs shows a coldwater catfish. Take my advice: don't keep them in an aquarium housing Fancy Goldfish. They can be very savage!

BEAUTIFUL RAINBOW

I recently glanced into a small tank in a pet shop and saw a pair of beautiful pastel-pink and blue fish sharing their tank with several Koi. I asked what they were and was told Rainbow Dace. Even before I got a chance to buy them, the dealer told me they'd already been sold.

However, I tried my local dealer next day and he had a pair delivered to me in less than 24 hours. The female is a little drab, but the male is a really stunning-looking fish, in my opinion.

It's the sort of fish that would look lovely in a coldwater, tropical or marine aquarium. The bright, pastel colours glow with a showy sheen as the fast-moving fish dart about the tank. When food is added, the Dace fly round the tank catching falling bits. I can thoroughly recommend the Rainbow Dace for your coldwater aquarium, with or without Fancy Goldfish. I've also seen it kept at tropical temperatures.

BILLY WHITESIDE

Male Rainbow Dace *(Notropis lutrensis)* are beautiful and highly active.

Your questions Answered

Having problems? Send your queries to our panel of experts who will be pleased to be of service. Each 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 experts to whom your query should be directed.* All letters must be accompanied by an S.A.E. and addressed to: **Your Questions Answered, The Aquarist & Pondkeeper, 9 Tufton Street, Ashford, Kent TN23 1QN.**

Herpetology, Julian Sims. **Koi,** John Cuvelier. **Tropical,** Dr David Ford. **Coldwater,** Pauline Hodgkinson. **Plants,** Barry James. **Marine,** Gordon Kay.

MARINE

IDOL ADVICE

My dealer has a Moorish Idol in at the moment. I'm a beginner but I'd love to have it. However, all the writers seem to advise against it. What do you think?

I would be at the head of the queue of people telling you not to do it, particularly if you are a beginner. The Moorish Idol — beautiful though it is — rarely does well in captivity. I had one, a few years ago, which keeled over and died, literally before my eyes. Honestly!

However there is an alternative species — the Wimple Fish — which everyone says looks exactly like the Moorish Idol. I can't say that I agree, but the Wimple is a very strong species in the aquarium.

MAX GIBBS, THE GOLDFISH BOWL, OXFORD

The Moorish Idol rarely does well in aquaria.

CRAWLY WHITE THINGS

The glass on my tank has tiny crawly things over it. They look almost like tiny worms but with little legs. They appear to do no harm to anything, but they worry me and look unsightly. Please help.

These creatures are called Copepods and are the result of overfeeding and a general lack of cleanliness and care.

As you say, they do no real harm, but there *are* dangers.

Firstly, they compete with the aquarium inhabitants for oxygen (with increasing success, if allowed to reproduce unchecked) and, secondly, there is a chance that they will attach themselves to the fish.

There is a plus point in that lots of fish species will eat them. But you really should get rid of them. Do regular water changes, 'hoovering' them out as you siphon out the water.

A product called Sterazin will help kill them, as Copepods are actually crustaceans, not worms.

TROPICAL

MARRIAGE-THREATENING FILTER

My problem is a noisy power filter which, if it carries on this way, is going to threaten my marriage. No matter what I do, I just can't quieten it down. Help!

I hope your marriage is still intact by the time you receive this simple, but effective, solution to your problem. The noise generated by some power filters is often due to the impeller wobbling in its socket.

This can be corrected quite simply by tying a length of nylon cord (angler's line is ideal) around the metal shaft of the impeller once or twice and tying it off with a reef knot. Once you've done this, snip off the loose ends and drop the impeller back in its slot . . . and (Hey Presto!), a silent power filter.

PROFITABLE BREEDING

I would welcome your advice regarding the best freshwater tropicals I could breed for profit.

It would seem obvious that the best fish to breed for profit would be the rare, expensive ones. Not true! Such fish may be highly-priced, but if they do not sell, they are worth nothing, and their rarity could probably be a sign that few aquarists want to own them.

The best choice for profit is the popular so-called 'bread and butter' fish that any aquarium shop will be glad to take off you. Providing they are good size and colour, and disease-free, there are definite marketing advantages in advertising 'locally-bred' fish.

The following are the top ten most popular tropicals:

Neon Tetra (*Paracheirodon innesi*), Cardinal Tetra (*Paracheirodon axelrodi*), Angelfish (*Pterophyllum scalare*), Guppy (*Poecilia reticulata*), Molly (*Poecilia* spp — but not the Black Molly which is really a brackish water fish), Platy (*Xiphophorus maculatus*), Swordtail (*Xiphophorus helleri*), Zebra Danio (*Brachydanio rerio*), Dwarf Gourami (*Colisa lalia*), Cory Cats (*Corydoras* spp).

Read the 'encyclopaedia' books on the species you choose, to determine water conditions for breeding. Remember that lots of aquaria are needed for conditioning, spawning and raising fry. Infusoria, brine shrimp eggs for hatching and then a growth food, are suitable for most baby fish.

HARRY GRIER/FLORIDA TROPICAL FISH FARMS ASSOCIATION

There are numerous varieties of Platy, most of which are relatively easy to breed in large numbers.

COLDWATER

BREEDING TIPS

I would like to breed goldfish but, as this would be my first attempt, I'm at a loss as to which variety it would be best to choose.

It really is a matter of personal choice, although there is a point to consider before making your decision. Though the same methods are used whichever type you breed, the fancier varieties make culling much easier, as faults are more obvious at an earlier stage. This is important if you are limited for space.

Culling is really the key to many aspects of successful goldfish breeding. Not only does it help to produce the finer specimens, but it also helps to improve their chances of survival to perpetuate the line.

Do not attempt to grow on too many of the youngsters. This is where most beginners fail. If young fish become overcrowded, the water quality deteriorates and the fish suffer stress. Consequently, they are unable to grow and develop properly and outbreaks of disease are likely; in fact, you run the risk of losing your whole stock.

Your aims should be to produce strong, well-grown, healthy fish, even if few in number, rather than a large number of stunted, sickly individuals.

LAWRENCE E PERKINS

Faults in young fish are easier to spot in fancy varieties, such as Celestials, than in the more basic ones.

PERIODIC LOSSES

Every three or four months I lose some of my goldfish. I have tried to control the problem by using antibiotics but the pattern remains the same.

I also carry out a small water change every week, but this doesn't seem to help. Neither does the monthly cleaning of the filter.

First, check your stocking levels. Allow at least 30 sq in of surface area for 1in of fish. Overcrowding does not give you the chance to control water quality. It also stresses the fish, making them more susceptible to disease.

The weekly small water change you are giving your tank can be increased to twice per week, and the medium in your filter will also benefit from a more frequent change. When changing the aquarium water, use a gravel cleaner to assist in the maintenance.

I think your aquarium would benefit from a complete clear-out and strip-down. The fish should be housed in temporary quarters until the newly set up tank has settled down (about a week) before they are reintroduced. With better and more frequent maintenance, I am sure that your problems will become a thing of the past.

KOI

INEFFECTIVE BARLEY STRAW

Barley straw may work for some people, but not for me. I packed as much as I could in a pair of tights and put it in my Koi pool.

I left the straw for 4-6 weeks with no positive result at all. I still had green water! I therefore bought a UV unit . . . and it worked beautifully.

The pH in my area is 7.5. Could this have been a reason for the lack of success with the barley straw?

I'm bound to say that I feel 4-6 weeks immersion of the straw was hardly a fair test, particularly in view of your use of tights as a holding medium.

These garments have a very close weave and would not permit good access and dispersion of the water in and around the straw. A bag made from a piece of garden netting, as used by fruit growers, would have provided a much more efficient means of retaining the straw and allowing good dispersion.

A pH of 7.5 is just about ideal for your pool and would not have had any bearing on your results. Green water can be a result of many factors, no two pools being alike, and your lack of success should simply be put down to experience now that your UV seems to be doing its stuff.

'EXPOSED' KOI

I am in a bit of a dilemma concerning the welfare of my 15 Koi and other carp. At the moment they are in an almost-natural, heavily planted, shallow pool with some other fish.

Our new pool is 9 x 7 x 4ft (c 2.7 x 2.1 x 1.2m) and will be completely bare.

Will it be cruel to subject my fish to such a drastic change in environment?

GORDON WILLIAMS

Koi may enjoy open water, but they should also be provided with suitable retreats.

This is one of those problems which I find difficult to answer without stirring up a bit of a hornet's nest! The trouble is that I'm personally opposed to the type of pool you intend to stock.

The concept of a bare, unshaded pool bereft of any shelter for the inhabitants always reminds me of the 'goldfish bowl' syndrome in which the fish just swim around for hour after hour without any interesting nooks and crannies to explore or plants to nibble and browse among. This is purely a personal view, and you must make your own decision.

There should be no problem in actually moving your fish to the new pool, but I would advise caution from a stocking level point of view. Your new pool will have a capacity of just under 2,000 gallons (c 9,000 litres) and as you already have 15 Koi in your present pool, you should bear in mind that these could grow quite rapidly. Therefore, in order for them to reach their full potential, it would be unwise to add any further carp of various varieties to these 15.

PLANTS

MINI RUSH

I know it's probably too late this year, but for next season I would like a small marginal plant for my pool.

I rather like the Bulrushes but they are far too large for my set-up.

I assume by Bulrushes you mean Reedmaces. These are the plants with the brown poker-like flower heads.

JOHN DAWES

The inflorescence of the Dwarf Bulrush (more correctly, a Reedmace). *Typha minima* — a great plant for small ponds.

I would recommend *Typha minima*. This is a diminutive Reedmace which grows only two feet tall, with thin bluish cylindrical leaves and an oval 'poker' about 2in (5cm) long at the extremities of the leaves.

PLANTS FOR SPAIN

A friend of mine who lives in Spain, would like me to take some pond plants out to him, as he cannot find a source over there. Do I need special documents to do this?

Aquatic plants can be transported without restrictions to all EC countries, including Spain. However, a Phytosanitary Certificate is required by Germany.

All plants should have the soil removed from the roots, be thoroughly washed and have any plant pests removed before packing.

HERPETOLOGY

CALCIUM SUPPLIES

Can you suggest an easy and efficient way by which I can provide the tortoises, freshwater turtles and geckoes I maintain in captivity with calcium?

Why is it important that my herpiles receive calcium in the first place?

There are at least two important reasons for providing calcium for reptiles:

1 To prevent rickets: shell deformities in Chelonia and weak skeletons in all reptiles.

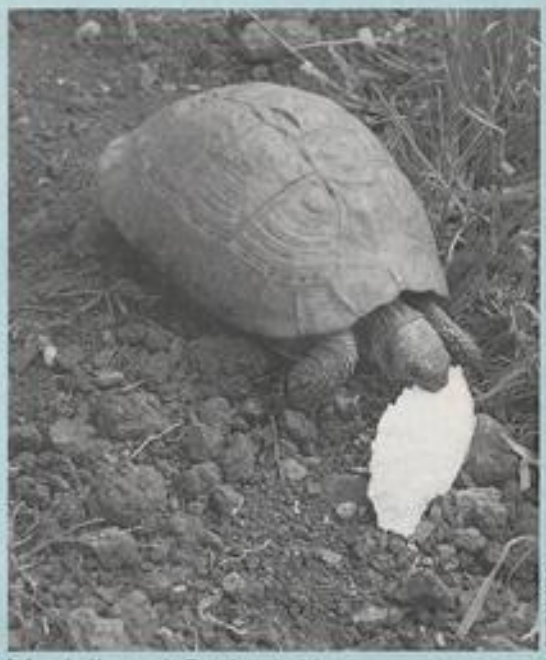
Calcium is necessary for the healthy formation of the carapace and plastron (the upper and lower halves of the shell, respectively), of tortoises and turtles. Unfortunately, symptoms of mineral deficiency are quite common among Chelonia maintained in captivity.

For example, freshwater turtles which have been deprived of calcium at some time during their development can be deformed by their muscles pulling the internal organs forward and causing the front of the soft carapace to bulge upwards and become misshapen.

If the skeleton is weak, then the weight of the animal can cause the legs to bow outwards. This condition is the more usual form of rickets and can be a particular problem with lizards. The early stages can be identified before the disease proves fatal because the reptiles exhibit wobbly hind legs.

2 To ensure successful breeding.

Oviparous female reptiles, i.e. those which lay eggs, require relatively large amounts of calcium to form the yolk and the outer shell.



JOHN SEWELL

A female Hermann's Tortoise obtaining her essential supply of calcium from cuttle bone.

SUPPLYING CALCIUM

Although it is clear that calcium is essential, it is not always easy to get captive reptiles to eat sufficient to remain healthy. Supplements of this mineral can be included in the diet of Chelonia and geckoes in several different ways:

(i) Calcium (together with other essential minerals and vitamins) can be offered by dusting the food with a multi-mineral and vitamin powder, such as Vionate.

Vionate powder is widely available from pet stores.

Most forms of food which are offered to reptiles can be treated in this way, e.g. vegetation, including lettuce or cucumber, or lean beef and live insects such as crickets. Unfortunately, the mineral dust can easily be lost during feeding if the food is shaken by the reptile before being swallowed. With freshwater turtles, multi-mineral vitamin powder can get washed away as these reptiles usually swallow their food underwater.

(ii) Another method of offering calcium is in the form of cuttlefish bone. Geckoes will readily eat small cubes (approximately 2 to 4mm square) if these are provided in a shallow dish in their vivarium.

An entire cuttle bone can be floated in the water of freshwater turtle tanks. These reptiles have powerful jaws and can bite off mouth-shaped pieces.

Similarly, an entire cuttlefish bone can be provided for European tortoises maintained in the garden. Tortoises from warmer parts of the world, for example, South American Red-footed Tortoises (*Geochelone carbonaria*) and Indian Starred Tortoises (*G. elegans*), kept in heated vivaria will also bite into a complete cuttlefish bone, if available.

(iii) Species of snake which swallow small mammals or chicks, obtain their calcium from the skeletons of their prey.

KOI TALK

By John Cuvelier

Greetings! It's good to be back at my keyboard again after such an extended 'holiday'. I wonder if anyone noticed I'd been away? Health permitting, I hope we can get the show back in the groove again.

BLANKET SUFFERING

During the past few months, I have received a string of calls asking for help with our old friend, the dreaded Blanketweed. It appears that everyone has been suffering this year, myself included. I do not think we need to look very far for a reason for this explosion either.

After almost three years of virtual drought, aquifers right around the country reached an all-time low while consumption, if anything, increased. Consequently, the dilution of nitrates, phosphates etc, which normally occurs, thanks to rainfall, simply did not happen. The result was sky-high levels of these and other pollutants which now plague us.

I, for one, have never seen Blanketweed as rampant as the stuff I'm now having to heave out by the barrow load. On a purely personal note, the situation in my own area has been worsened by some modifications carried out by the local water undertaking, which involved the coming on stream of a new 100mm water main linking our area to a larger network.

Our mains water now arrives with a pH of 7.4 and, as a result, our pond water, after filtration, is now hovering around the 8.2 mark! Don't ask me what I can do about it as, apart from adding gallons of some acidic agent, there's nothing to be done.

RUN-ON EFFECTS

Certainly, my Koi have reacted very unfavourably to the new regime, including a delay of about six weeks in spawning. As a result, the fry have only just reached about 5-10mm in length at the time of writing.

This is very different from '92 when, by now, they were already more than twice their size. One curious aspect of this year's hatch is the fact that they are all yellow, as opposed to their usual grey/black hue, so I look forward to some interesting developments.

Staying with the theme of water quality and ponds in general, I hear from my friends at 'Purity on Tap' that their nitrate removal module is now available. While I have not, as yet, had an opportunity to check out the system, I understand that this *rechargeable* pod has quite a long life between reactivation cycles, and that the resins employed are the result of several years of experimentation.

Having just about got control of the chlorine problem, it's good to know that help is at hand with nitrate.

Now, if only someone could devise a method of attacking the Blanketweed problem in a simple and non-chemical manner I feel sure that life would be a lot easier all round, as well as making a lot of money for the individual concerned!

END OF AN ERA

I'm sorry to announce the demise of a very old friend, thanks to the onset of old age. For the past 12 years (not a misprint), my trusty 'Little Giant' 6-CIM pump has done sterling work, both in Yorkshire and down here in Herefordshire. Although too powerful for its service, and needing to be continually throttled down, there was never a complaint, the only attention being an occasional cleaning out of the intake screen.

Towards the end, there were some rather plaintive noises issuing from the area of the bearings and, very reluctantly, an honorable retirement was called for. I can't help wondering if its replacement will give such good service in this age of built-in obsolence?

A lot of thought was given to selecting a replacement and, finally, I opted for one of the Blagdon range of submersibles, a P1400. I rather like the idea of a magnetic coupling utilising the well known 'Hall Effect' by dragging round the impeller via magnetic fields.

Certainly, since it's been in use for a couple of months now, it appears to be behaving very well.

A good pump is, of course, the heart of a system, and woe betide anyone who tries to cut costs by obtaining the cheapest available, irrespective of suitability. There are many pumps around the country struggling to push much greater flows than were ever intended. It really is false economy to buy a pump having water-lubricated bearings for £50 and then wondering why the system gives continuous trouble! Far better to spend a bit extra and get peace of mind.

4-INCH POSER

Had a call (several, in fact) from a reader in the back of beyond who was endeavouring to build a concrete pond almost over the telephone, a task I really enjoy as a means of keeping me on my toes!

One major problem he found was the old query regarding obtaining a good seal around standard 4-inch (100mm) plastic soil pipe, the type used in hundreds of ponds everywhere.

Unless you are very familiar with plumbing in general, this problem can be a real poser. It's five years or so since I first described the gadget in *A & P;* I'm sure that many new builders would be interested and find it helpful.

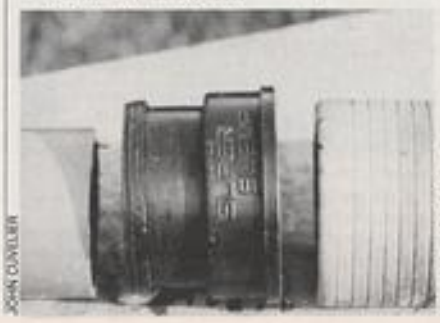
All it is is an adaptor which converts 4-inch plastic pipe to 4-inch clay pipe, the clay pipe being used for the section which is used to work around the cement at the time of laying.

Whether using Fibromix or ordinary render, the seal will be of high integrity and will not 'weep'. It is better to use the unglazed type of clay pipe, though, as this does bond more satisfactorily. It is, incidentally, also possible to obtain these adaptors for use with larger sizes of pipe as well.

I'm always dismayed when I hear of readers spending large sums of hard-earned cash by laying out ridiculous amounts on high-pressure pipe for their pond and filter systems. Take it from an old hand in the water treatment industry: the pressures found in any domestic pond system are many times lower than those at which weepage would occur.

I've actually proved this by propping up a 12-foot length of 4-inch pipe, fitting a 'U'-bend and a couple of connectors and filling the whole thing with water (12 feet being the maximum I could manage without a tower). After 24 hours, there was absolutely no weeping from anywhere.

It is a help, however, if you have an expanding plug for this test, otherwise you could get rather wet!



JOHN CUVELIER

This black pipe adaptor is as simple as it is effective in joining a plastic pipe (left) with a clay one.

Naturalist's notebook

By Eric Hardy

NEW HEALTH LAB

The Government's new £7 million fish diseases laboratory at Weymouth reveals the increasing demand for this research since the outgrown original lab there, established in 1969, was recently demolished. Fish farming and EC obligations necessitate research for a disease-free stock. Britain is recognised by the EC as a comparatively disease-free zone compared with much of Europe, but the single market is already raising problems, not least with imported trout.

The new lab, with a staff of some 60, will be concerned with the control of fish and molluscan hygiene and will have freshwater as well as saltwater tanks. It will be completed early next year.

MIXED BAG

Mention of molluscs reminds me that under the Countryside Act additions, it is now illegal to collect the rare little Hatchet Shell, *Thyasaire gouldii*, from boulders in its few Scottish lochs, also the snails *Paludinella littorina* and *Caecum armoricum* and the sea slug *Tenellia adspersum*, all three in Fleet lagoons.

A reader asks why a sick frog from his pond is shrivelled up and always falling over. This seems to have been parasitised by a Tachinid fly laying its eggs on its nostril, whence the grub crawls up to affect the brain of its host, before pupating in the ground.

I've seen various methods of catching snakes, at home and abroad: cleft stick or long-handled tongs in Britain, even a hand padded with a handkerchief grabbing over the heads of small serpents by a distinguished Israeli herpetologist.

New to me is training dogs for searching out *Trimeresurus*, the Asian Lance-headed Viper, as a Japanese means of controlling them in Ginowan City, in Okinawa.

Turtles, feeding largely on jelly fish, don't usually cause complaints, but Loggerheads, Green Turtles, Kemp's Turtles and the Hawksbills are all implicated in the US summer flounder trawl fishery complaints, according to the Beaufort Laboratory, North Carolina.

SHARK OFFENDERS

Sharks have the worst reputation among fish as killers of humans. Most of this is, like the way of the Piranha, grossly humans. Most of this is, like the way of the Piranha, grossly exaggerated. A 1961 book *Shark! Killer of the Sea* by Helm, brought as much unnatural history as the film *Jaws*.

Newspaper stories in June of an unfortunate Sydney death concerned the White Shark. This is the one dominant danger. In 1959, a more sensible case-book, *Shark Attack*, produced by a Sydney surgeon, **Dr V M Coppleson**, tried to narrow the drama down to proven, identified cases, based upon the Medical Journal of Australia.

They proved to be surprisingly few. Dr Coppleson pointed out: "Readers may be consoled by the fact that the risk of shark attack is infinitesimal". His name was already familiar to us in the Australian fishery journals.

Man-killing, he claimed, is confined to a few rogue specimens which return again and again to claim their victims. They do not attack unless the water reaches 65-70°F; deaths are not found north or south of a belt between the Mediterranean and New Zealand, mostly the tropics. Most are caused by the Great White Shark (*Carcharodon carcharias*). The majority of other species are harmless. Even our local fish and chip shop calls itself JAWS, with a blood dripping show of teeth on its name!

PROTECTION SCHEMES

In contrast, the European Sturgeon, an endangered European species, has earned such respect from professional fishermen that they recently created the Association for the Defence of the Wild Sturgeon. Based at Mortagne sur Gironde, France, this society is to have controls introduced for the survival and free movements of the species.

Much publicity has been given to endangered dolphins; less so to this year's agreement between the French and Italian governments, and Monaco, to a 73,000 sq km sanctuary for these cetaceans in the Mediterranean, from the Hyeres Islands, where I once looked for them off SE France, to northern Sardinia and Genoa.

Protection will be given to some 26,000 dolphins and 1,000 larger whales which frequent this corner of the Mediterranean in summer. Drift-netting will be banned and pollution controlled.

Yet *Another* Nessie?

If the much publicised June visitor to Loch Ness had kept her hair on, instead of rushing into print as an instant authority on the 'monster', she could have had a less romantic interpretation of her 'after vision': the sinuous, serpent-like neck and head of a low-swimming fishing cormorant or a shag, gleaming into view as it surfaced from the featureless deep, dark waters of the loch.

Over 60 years ago, I wrote one of the first articles on the 'monster' in the *Dundee Courier*. For a quote, I turned to the late **Prof Ritchie**, the Aberdeen naturalist, who limited it to something in the loch which hadn't been identified.

That didn't mean it couldn't be identified if adequate details were forthcoming. Unscientific publicists assumed that this, and all subsequent sightings, were the same thing. None had sufficient aquatic biology to identify what he or she saw.

Peter Scott was also trounced severely by the British Museum in the scientific journal, *Nature*.

Routine biological investigations in the loch have been plastered with headlines as if they went to seek this myth. It's time newspapers got some real natural history from Ness, like the success story of the Slavonian Grebes, instead of quoting gullible and biologically ignorant visitors.

ERIC HARDY

Another Loch Ness monster! No, just a shag calling as it surfaces wet and with crest depressed from the dark waters of the loch.

Letters

Ionic Water Protection

I have read with interest your editorial in the July issue of *Aquarist & Pondkeeper* entitled **Filaments and Pea Soup.**

I would just like to bring to your attention a system for which we are agents. We have cleared ponds of algae and bacteria, one in particular being the large pond at the Abingdon Business Park, where we cleared the pond within three weeks. The water is now crystal clear and the plant life and Koi are thriving in their new environment.

We have been having great success with this product in clearing bacteria and scale in pipes and would emphasise that the magnets used are not ordinary magnets; they are unipolar and change the molecular structure of water.

I have to say that the water has to pass through a pump once in every 24 hours for it to keep the effect up, but I think we have found the answer to clearing ponds which suffer from algae, etc.

T A Meredith-Hardy,
Calcat (UK) Ltd,
Oxford.

Prison Club Seeks Visits . . . and Pen Pal

I am writing as a member of the P.P.A.S. — the Perth Prison Aquarist Club. We are all keen aquarists who enjoy working with a wide variety of fish species.

One of the things we need is for people to come and see the variety of fish we breed and have for sale. We do have quite a selection.

I, personally, would also like to find a pen pal with whom I can exchange news and information. Here's hoping you can help via *A & P.*

John Wright,
E Hall, Sec C/12,
Reg 1217/92,
Perth Prison,
Perth, Scotland.

"Isn't it time you cleaned the fish tank?"

OCTOBER — Sunday 3

Halifax A.S. — Open Show and Auction, Forest Cottage Community Centre, Cousin Lane, Ovenden, Halifax. Booking in 11.30 am-12.45 pm. Judging: 1 pm. Details from **David Shields** on 0422 360116.

Thursday 7

Washington ASP — Meeting at Stella Maris Social Club, Albany, Washington at 8 pm. Speaker: **D Bailey** — *Fish Photography.* Details from **Michelle Ann Jacques** on 091 416 7292.

Sunday 10

Preston & D.A.S. — Auction at The **Venue**, University of Central Lancashire, Students Union, Fylde Road, Preston. Ring 0772 321145.

Milton Keynes AS — Open Show, Macintyre Project Moot Hall, Great Holm, Milton Keynes. Contact **N Ridley** on 0908 310 847.

Saturday 16

Northern Goldfish and Pondkeepers Society — Open Show at Trinity United Reform Church Hall, Delamer Road, Altrincham. Details and entry forms from the Show Manager, **Paul Coyle**. Tel: 061 748 7211, or the Show Secretary, **Alan Radcliffe** on 0282 420097.

Sunday 17

Solway AS — First Open Show, Assembly Rooms, George Street, Dumfries. Benching: 10 am. 47 classes. Details from **John Cowan** on 0387 75606.

Monday 18

Reigate and Redhill AS — Bring and Buy Sale at Strawson Hall, Albert Road, Horley, Surrey. Doors open: 7.30 pm. Sale: 8 pm. Refreshments: 9.30 pm. Non-members welcome. Ring **Jeremy Spence** on 0293 512932 for more details.

Wednesday 20

Hucknall & Bullwell AS — Bring and Buy Sale and Auction at the Half Moon Public House, Hucknall Market Place, Nottingham. Booking in: 7.30 pm. Sale: 8 pm. End: 11 pm (latest). For further details, ring **Clive Hinton** on 0602 876657.

Saturday 23

Anabantoid Association of Great Britain (Yorkshire Group) — One-day meeting, photographic competition and auction. The Labour Hall, Low Road, Balby, Doncaster. Noon-6 pm. £1 admission. Lecture by **David Armitage:** *Sanderias in South Africa.* Further details from **Chris Clark.** Tel: 0302 859666.

Saturday 30

Portsmouth Reptile and Amphibian Society — Reptile Fayre at Portsmouth Sixth Form College, Tangiers Road, Portsmouth (just off the A2030 — Southsea turn-off on the A27). Only captive-bred animals will be offered for sale. Further details: **Jon Hollingsworth** on 0329 833017.

Paper Round

By Dr Ian Winfield

FAST-STRIKING COELACANTHS

The Coelacanth, *Latimeria chalumnae*, has featured previously in this column and has now had the distinction of being the subject of one of the most impressive pieces of fish-watching possible. **Hans Fricke** and **Karen Hissmann** of the Max-Planck-Institut fur Verhaltensphysiologie in Germany, recently watched the swimming behaviour of this incredible fish in its natural habitat at a depth of around 200m off Grand Comoro in the western Indian Ocean.

This archaic species is of great interest to students of evolution because of its phylogenetic relationship close to the roots of early tetrapod life, i.e. it is from a species somewhat similar to the Coelacanth that the first amphibians are thought to have evolved. Not surprisingly then, the bulky lobed fins of the Coelacanth led some researchers in the past to suggest that these appendages were used to 'walk' along the seabed in its search for food.

However, Fricke and Hissmann did not observe any such walking behaviour. In contrast, they found that the Coelacanth forages by drifting around in the open water, possibly detecting prey at close range by electroperception, upon which it makes an incredibly high acceleration rate of 20-25 metres per second to capture the unfortunate food item.

In order to control the body during such movements, the Coelacanth uses an alternating co-ordination between both paired fins, such that the right pectoral fin strokes in tandem with the left pelvic fin, and vice versa. The novel slow and fast swimming mode of the Coelacanth was named by Fricke and Hissmann as 'coelacanthiform', in accordance with an established nomenclature for swimming styles.

(**Source:** *Environmental Biology of Fishes* **34**, 329-356.)

WHEN DISCRETION IS THE BETTER PART OF VALOUR

The Oscar, *Astronotus ocellatus*, has long been a favourite fish of mine. I have often tried to think why this is so and have come to the conclusion that much of the attraction of this species has to do with the fact that it is clearly a visual animal and, as such, reacts to many aspects of its tank in much the same way as a human would (well O.K, without spluttering and drowning noises).

Put anything new into an Oscar tank and it comes under a good deal of close scrutiny. **Simon C Beeching** of Slippery Rock University, USA, has found that this visual scrutiny also extends to other Oscars.

By performing a series of experiments using Oscars of between 125 and 255mm in total length and dummy Oscars of various sizes, Beeching was able to show that Oscars are able to assess visually the relative body size of intruders and use this information in deciding the most appropriate strategy in any subsequent fisticuffs. This ability thus allows Oscars to estimate relative fighting ability without tests of strength, which has clear benefits in terms of avoiding injury, or even worse.

However, circumstances do arise where the bout comes to blows, although, of course, in this case, only from the real Oscar towards the dummy. Beeching found that the most intense aggression occurred when the size of the dummy was approximately 75% of that of the real Oscar.

(**Source:** *Ethology* **90**, 177-186.)

SYMBIOTIC SHINERS AND CHUBS

For me, the word 'symbiosis' has always conjured up a picture of clownfish and anemones. Speaking as a freshwater ecologist and aquarist, I have always been a little envious of this shining example from the marine world. Now, I have found what I have been looking for in a study of Yellowfin Shiners, *Notropis lutipinnis*, and Bluehead Chubs, *Nocomis leptocephalus*, in a stream in South Carolina by **Julie E Wallin** of the University of Georgia, USA.

Like our salmonids, many cyprinids of the streams of North America build some form of nest in which to lay their eggs. However, unlike our salmonids, many of them go on to invest some degree of parental care by defending the nest or making sure that it stays clean and well aerated. Such behaviour is shown by the Bluehead Chub, the males of which construct large dome-shaped nests of small stones which they tend until the eggs hatch.

By way of a series of elegant experiments, Wallin was able to show that Yellowfin Shiners also benefit from this devoted chub parenthood by laying their eggs in chub nests, thus benefiting from their nest construction, cleaning and guarding.

To qualify as a true symbiosis, the chub must also benefit from the interaction, and Wallin suggests that one way in which it may do so is that the large numbers of shiners present on the nests may confuse any lurking predators. The presence of shiners' eggs may also benefit the chub by diluting the effects of any successful predator, because chub eggs constitute, on average,

DAVID TIPPINGANGELA HOLLYFIELD

Oscars assess intruders by sight before deciding whether to attack or retreat.

only 3% of all eggs found in chub nests. In other words, a predator is likely to fill its stomach with shiner eggs before it does any real damage to the chub eggs.

In fact, Wallin's results suggested that Yellowfin Shiners will not reproduce unless spawning chub are also present, making the relationship an obligatory symbiosis, as far as they are concerned. Discarded chub nests were not good enough for the shiners and were ignored, probably because, in the absence of any housework, they quickly became silted up.

(**Source:** *Environmental Biology of Fishes* **33,** 287-292).

IT'S ALL DONE WITH MIRRORS

The flood plains of many South American rivers form important spawning and nursery habitats for a rich variety of fish species, one of which is the microcharacid (small Characin) *Cheirodon pulcher*. Some such areas used by this species are 10 km away from the main river, to which at least some of them must retreat before the dry season leaves them stranded.

Luis E Levin, Pedro Belmonte and **Olga Gonzalez** of the Universidad Central de Venezuela in Caracas have examined how *Cheirodon* performs the navigation required for this impressive feat.

A number of fish were collected from one such floodplain to the north of a major river and introduced to an ingenious, many-armed experimental tank in the grounds of the university campus which, by an intricate system of mirrors, allowed the three researchers to 'move' at will the position of the sun relative to the fish. Experiments were performed by releasing the fish in the centre of the tank and then noting into which arms they swam.

When exposed to direct sunlight, the fish swam south, both in the morning and in the afternoon, which in nature would take them back to the safety of the river. However, when the sun was 'moved' by the mirrors, the fish reversed direction and swam north.

The results of this simple but elegant study show that *Cheirodon* orientates by using a sun-compass, which allows them to make efficient use of the floodplain habitats during the wet season.

(**Source:** *Environmental Biology of Fishes* **35,** 321-325).

PUMPKINSEEDS, PLANTS AND PREY CAPTURE

In recent years, fish ecologists have begun to study in detail the effects of the environment on the feeding behaviour of a range of fish. In addition to their fundamental value, such investigations also have applied use in the area of habitat restoration.

Michelle Dionne and **Carol L Folt** of Dartmouth College, USA, have been studying the effects of different plant types on the efficiency with which Pumpkinseed Sunfish, *Lepomis gibbosus*, feed on the microcrustacean *Sida crystallina* and a damselfly larva of the family Coenagrionidae.

Laboratory experiments revealed that prey capture rates were greater when the Pumpkinseeds were feeding among the cylindrical stems of *Scirpus validus* than they were when among the leafy stems of *Potamogeton amplifolius*, even though the Pumpkinseed is a very manoeuvrable fish. The nature of the plant growth form was even found to be more important than its density.

Analysis of the feeding behaviour of the Pumpkinseeds showed that the main effect of the vegetation was to reduce prey location rates, rather than to interfere with the efficiency of attacks once the prey had been found.

The differences in the feeding deficiencies of the Pumpkinseeds in the different plant 'habitats' were such that Dionne and Folt concluded that foraging rates of this Centrachid could vary significantly within and between lakes, depending on the composition of the littoral vegetation. Plant growth form, in addition to density, needs to be taken into account in lake management and restoration plans.

(**Source:** *Canadian Journal of Fisheries and Aquatic Sciences* **48,** 123-131).

LOOK OUT FOR THE 'NEW LOOK' *A & P* NEXT MONTH

KOI CALENDAR

By David Twigg

JOBS FOR THE MONTH

Water temperature is dropping well down now to the point where feeding should be modified according both to the temperature and the weather. If you have not started using wheatgerm pellets, then it would be wise to consider introducing them into the diet, as they are more readily digestible by the Koi at these lower temperatures.

Cold nights are the norm now, so a reduction in quantity is also wise. The metabolism of the Koi reduces with reducing temperature, and time taken to consume and process food is longer.

Covers will be ready for erection by now, if not already fitted. They are a boon at this time of year as they keep warmth in and wind chill off the water surface, thus helping to extend the feeding season.

STOCKING RATE

When I first became a Koi keeper I was always being advised by fellow keepers of various 'rules of thumb'. These have their place as guidelines, but it is necessary to modify each to suit the particular circumstance.

The 'rule of thumb' which I now query is the one which I was told states: "In a well filtered Koi pond, the stocking rate should not exceed 3in of fish per square foot of pond surface area". Now, that sounded reasonable to me and, in my case, with a pond 20 x 10ft, it meant that I could have 600in of fish before becoming over-stocked.

The important part of the above 'rule' are the words "well filtered". The volume of water has been left out of the equation, I guess because the average pond follows certain obvious proportions; a 10 x 10ft pond is unlikely to be 10ft deep!

This brings me to a recently read alternative 'rule of thumb' stocking rate which allows "50in of Koi for each 1,000 gallons of water if the filter size is 50% of pond area". Once again, in my system, I have 6,600 gallons and the area of filter is only, at best, 25% of pond area. If I ignore the smaller filter area, this 'rule' means that I may have only 330in of Koi before being over-stocked.

If I now tell you that I have, as a conservative guesstimate, at least 800in of Koi in my pond, you can understand why I have to work so hard to keep my water quality high! That is a 33% overload on the first formula, and over 140% on the second!

So what is a good rule of thumb for this circumstance? I guess that only the Koi keeper who knows his or her pond, filter system and water quality will be able to answer this. It would be interesting to collate this information from many Koi keepers just to see what the average comes out at. Anyone want to be first to put pen to paper?

CASCADES, RIPPLES AND SPLASH

These are names given to some of the monthly newsletters produced by Koi clubs for the benefit of their members and which are sent to me to help keep you informed as to what is happening in the wider Koi world throughout the UK.

These publications contain a wealth of useful and topical information, as well as keeping memberships informed about what is going on in their particular piece of the Koi world. If you are not a member of one of these clubs, then I can only say that you are not only missing out on a wonderful source of knowledge, but also on the friendliness of what must be one of the most sociable hobbies in the world.

Koi keeping is a hobby that all members of the family can participate in, even from an early age. A couple of weeks ago, Lyn and I had visitors and they brought along their 5- and 6-year-old children. To see the look of wonderment on their faces when they first saw the largest and most colourful fish they had probably ever seen was terrific, but it was even better when they realised that they could literally feed these fish out of their hands! Ours is a wonderful hobby, without doubt.

QUALITY IS THE KEY

Water quality is all important to the Koi keeper and, more importantly, to his/her Koi. Filter systems are incorporated into pond recirculation paths to clean up, mechanically and biologically, that water which the Koi spend their days and nights living in.

This water, however, does not last forever, and is lost by evaporation, flushing and, dare I say, leaks. This lost water must be made up from the domestic tapwater supply.

We are all aware of the chemical content of such tapwater to make it fit for human consumption. This does not, however, mean that the water is fit for fish.

In recent times, many companies have produced filter systems for the domestic market to remove the taste of chemicals, such as chlorine, and these have been adapted for use in the Koi world with a great degree of success.

I have recently received a letter from **Ann Telford** of **AllClear Water Purifiers** in which she outlines the research she and her colleagues are doing in the field of water purification for Koi keepers. By the time you read this column, **AllClear** will have published a leaflet containing articles relating to the substances in tapwater which are harmful to fish. I await this publication eagerly as, at time of writing, I still do not put my freshwater into the pond via any form of filter. For further information, give **AllClear Water Purifiers** a ring on **0227 214911.**

SHOW RESULTS

Northants

Grand Champion, **John Byles** — Size 3 Sanke; Best Adult Koi, **Jackie Bess;** Best Size 2 and Best Tategoi, **Sandra Wilson;** Best Baby Koi, Unique Koi and Ladies' Prize, **Ann Byles.** Other winners were **Peter Taylor, Albert Day, Dave Wilson, Simon Taylor, Sylvia Day, Barry Bird, Ken Chapman, Pete Robinson, Nick Bess, M and S Oatham, Jackie Bess** and **Dot Robinson.**

Lower Thames-side

Grand Champion, Best Mature, Best Size 5 Kohaku, **Susan Barrett;** Best Adult Koi and Best in Size 4, **Mr Brades;** Best Baby, Best Size 3 and Best Size 2, **Jill Coleman;** Best in Size 1, **A Peppercorn.** Other winners were **Alan Smith, A Chong, Brian Collins, D Roberts, Pat Cushion, Nita Goodhart, Chris Stanley, Mick Wiggett, Bob Hart, Chris Dawson, Harry Woolmer, Neil Warren, Nigel Whale, Nicholas Wood, Albert Radley, Mr Goddard, Clarge Morgan, Vic**

Boreham, Malcolm Taylor, Alan Mathews, Dave Wood, Mr and Mrs Nunn, George McKenzie and **Jim Wylie.**

Well done to all the winners and to the organisers of a couple of very successful shows.

DAVID TAYLOR

Magnificent Kohaku which became Grand Champion at the Lower Thames-side BKKS show.

FORTHCOMING SHOWS

2/3 October — Northern Koi Club. 1st Open Show. Tatton Park, Knutsford, Cheshire. This show has a Craft Fair, Kiddies Fair and many top Koi dealers will be in attendance. Contact **Steve Ross** on 0928 564121.

30 April and 1 May, 1994 — International Koi Show at Telford Exhibition Centre.

WHAT'S ON IN OCTOBER

3 — Lower Thames-Side Section BKKS. Monthly meeting. Contact **Val Radley** on 0702 529675.
Worthing & District Section BKKS. Preston Scout Hall, Bognor Regis, Sussex. Contact **Steve Willard** on 0243 267893.

4 — North Lincs Society. *Koi Competition.* 8 pm, Brackenborough Arms Hotel, Fotherby, Nr Louth. Contact **Anne Mawer** on 0472 826605.
Kennet Valley Section BKKS. 8 pm, The Willows Hotel, Padworth, Berks. Contact **Bob Thompson** on 0734 713640.

5 — New Forest Section BKKS. Monthly meeting, Tiptoe, Nr Sway. Contact **Mrs Chris Middleton** on 0425 272732.
Yorkshire Section BKKS. The Holme Leas Inn, Ossett, Nr Wakefield. Contact **Fred Harston** on 0226 722578.

6 — Suffolk & North Essex Section BKKS. 7.45 pm, Prince of Wales PH, London Road, Marks Tey, Colchester, Essex. Contact **Dennis Preou** on 0371 856450.
Plymouth & District Section BKKS. 7.30 pm, The Lyneham Inn, Plympton, Plymouth. Contact **Trevor Ridley** on 0752 690087.
Leicestershire Koi Society, Old Aylestone Constitutional Club, Leicester. Contact **Pip Ostell** on 0533 609707 or **Kevin Luckman** on 0455 250413.

7 — Middlesex & Surrey Borders Section BKKS. CIU Norbiton Club, Kingston-upon-Thames. Contact **Marie Martin** on 0737 844338.
North Wales Koi Club. 7.45 pm, David Bryant Bowling Centre, Frith Beach, Prestatyn. Contact **Roy Clayton** on 0745 889745.
The Potteries & District Koi Keepers Society. The Thistleberry Hotel, Newcastle-under-Lyme. Guest speaker is **Tony McCann,** Chairman Northern Koi Club. Contact **Ivan Rwatschew** on 0782 45864.

9 — East Riding Section BKKS. *Social evening.* Contact **Tim Goodyear** on 0964 542762.
Heart of England Koi Society. Speaker is **Bernice Brewster.** Meeting in Warwick. Contact **me** on 0926 495213.

10 — Northern Koi Club. *Members Open Day.* Contact **Tony McCann** on 061 794 1958.
Mid-Somerset Section BKKS. Speaker is **Bill McGurk** on *Koi — Japanese Way.* Contact **Alan Purnell** on 0458 72132.
Central Section BKKS. Guest speaker at T P Riley Community Centre, Bloxwich is from **Epperstone Park Fisheries.** Contact **Sue Finney** on 021 747 2733.

11 — Northants Section BKKS. Monthly meeting, Saints Social Club, Northants. Contact **John Byles** on 0604 718648.

13 — South Hants Section BKKS. Guest speaker is **Alan Rogers,** former Chairman Judging and Standards committee BKKS, 8 pm, Denmead Church Hall, Denmead, Hants. Contact **George Rooney** on 0420 473169.

17 — Northern Koi Club. All Souls Church Hall, Salford. *Water Purifiers* by **Charles Harriss** of **Purity on Tap.** Contact **Tony McCann** on 061 794 1958.
Yorkshire Koi Society. *The Last Supper (Seasonal meal).* Contact **Rita Thomson** on 0723 864867.
M Buck on 0947 810372.

20 — Peterborough & Cambridgeshire Section BKKS. **Barry Goodwin** relates *One day in the life of a Fish Consultant.* Breaks Snooker Club, Peterborough. Contact **Mrs Marion Parker** on 0733 61016.

26 — East Riding Section BKKS. Monthly meeting. 7.30 pm, Grovehill PH, Holme Church Lane, Beverley. Contact **Tim Goodyear** on 0964 542762.
Mid-Lincs Section BKKS. Monthly meeting, West Ashby, Nr Horncastle. Contact **Brenda Goodwin** on 0522 688631.
Hull Koi Section BKKS. Monthly meeting, 7.45 pm, Telephone Club, South Church Side, Hull. Contact **Chris Kerman** on 0482 493852.

31 — Northern Section BKKS. Monthly meeting. Contact **Phil Adamson** on 051 220 2970.

COMING UP IN NOVEMBER

1 — Kennet Valley Section BKKS. 8 pm, The Willows Hotel, Padworth, Berks. Contact **Bob Thompson** on 0734 713640.

Northern Koi Club. *Beginners Seminar,* Simister, Prestwich. 8 pm start. Contact **Tony McCann** on 061 794 1958.

AN INVITATION

May I remind all secretaries, PRO's and other organisers that I need to have their information **at least eight weeks** before the date of the event to guarantee publication? You may, of course, ring me direct on **0926 495213,** which will allow a little leeway. This request also applies to dealers with special events, auctions, etc. My thanks to the many who have already responded and made this column well worthwhile.

All Koi keepers are welcome at the events mentioned in this **Calendar** (an entry fee may be payable). Further details can be obtained from the contact telephone number quoted alongside the diary entry.

Please write to me at your earliest convenience via the **Editor** at **9 Tufton Street, Ashford, Kent TN23 1QN.**

"Stop worrying Jim, the piranhas are just larking about with you. Besides, I only fed 'em an hour ago!"

REEF REMOVALS

PART 2 Setting up Home

The first set of bags floated in the new tank. Note the hang-on filter.

Philip Hunt completes the move of his reef tank community from Yorkshire to East Sussex.

Photographs by the author

At the end of part one, we were setting off from York with a car packed with fish, invertebrates, and aquarium hardware, half-expecting to drive into a traffic jam stretching from York to Lewes, as it happened to be a Bank Holiday weekend. Our luck was in, however; the roads were quiet, so we were able to go as quickly as our elderly VW would permit.

Even the M25 was relatively calm, and four and a half hours later we arrived and started to unpack. The wrasse looked fairly unhappy, though in retrospect it was probably just 'sleeping' in response to the darkness of the box. The blenny still looked stressed, but the Dwarf Angel and the clown were very lively.

Among the inverts, some of the Mushroom Polyps were extruding mesenterial filaments, which is usually an aggressive reaction to nearby corals, and the gorgonian had suffered some mechanical damage to its branches. The others seemed fine, though all were contracted.

Once released, the fish and corals need to get used to their new, bare surroundings. The Midas Blenny, which later died, is just visible under the edge of the tooth coral.

REVERSE ACCLIMATISATION

As the tank was relatively small, acclimatisation had to be done in relays, reversing the order in which things were taken out of the old tank.

As the first set of bags (fish and hard corals) went into the tank, I added a hefty dose of Hagen Cycle, a maturing agent that contains a high concentration of filter bacteria, which would, hopefully, cover for any loss of viability in the canister filter. This

AS IT ACTUALLY HAPPENED...

YORK	LEWES
- 4 WEEKS: REMOVE ROCKWORK FAIL TO SELL SURPLUS LIVESTOCK!	
	- 2 DAYS: EQUIPMENT READY FILL TANK, ADD SALT & SMALL FILTER
	- 1 DAY: S.G. & TEMPERATURE ARE O.K.
ON THE DAY	
- 1 HOUR: ALL LIVESTOCK BAGGED	
ZERO HOUR: OLD TANK EMPTY & CLEANED OUT. SET OFF ! →	+ 4.5 HOURS: ARRIVE! BEGIN EQUILIBRATION OF LIVESTOCK. CONNECT FILTER FROM OLD TANK. INSTALL EXTRA POLYFILTER
	+ 6 HOURS: SKIMMER RUNNING. ALL LIVESTOCK INTRODUCED
	+ 13 HOURS: AMMONIA ZERO, NITRITE LEVEL FALLING
	+ 2 DAYS: LIGHTS ON. NITRITE ZERO
	+ 4 DAYS: ROCKWORK IN POSITION
	+ 13 DAYS: MIDAS BLENNY DIES
	+ 25 DAYS: PERFECT WATER QUALITY !

was also connected up quickly, and was running by the time the fish were released. I put a polyfilter into the hang-on filter for extra insurance.

As we had so many animals to deal with, we had to be rough and ready with acclimatisation; after all, some of them had been bagged for over six hours.

We settled for floating the bags for fifteen minutes and, during this time, added two lots of tank water five minutes apart, before releasing the animals five minutes later. We started introducing the livestock at 9 pm. By 10.20 everything was out and in the tank. Meanwhile, the protein skimmer was set up and switched on.

FIRST TESTS

Once everything was in, we started testing the water. At 10.30 pm the ammonia level was 0.4 mg/l and a trace of nitrite, less than 0.1 mg/l, was detectable. Three hours later, the ammonia level was down to a trace, just detectable, and the nitrite had stayed at the same level.

The fish seemed unconcerned, with the exception of the wrasse, which was sleeping under a rock. All the inverts had expanded to some degree, and even the damaged gorgonian was opening its polyps.

At 10.30 on Sunday morning the ammonia level was down to zero. A trace of nitrite was still detectable, but the concentration was clearly lower than the previous night's level. The same readings were obtained at 9.30 pm, about 24 hours after the first animals were introduced.

I was starting to feel confident that things were going to be OK; the biological filter was recovering, the fish seemed happy and the inverts were well expanded, though not to their full size as the tank, as yet, had no lighting. Also absent was rockwork; the inverts were simply scattered around the tank base. I'd tried to keep a reasonable amount of space between them, but it wasn't easy; three square feet is not a large area.

Over the next couple of evenings I built a makeshift hood from the old one and set up some lights. The narrow tank, combined with the large protein skimmer, meant that I had to think carefully about getting enough lighting into the small space available. The old tank had been illuminated by five Aquastar tubes and an Actinic, and for the new one I settled for one 30 watt Aquastar and two 60cm Actinics.

The rationale behind making Actinics the majority was that not only do they deliver light rich in the blue and ultra-violet wavelengths needed by zooanthellae-containing coelenterates, but the 60cm tubes run at 40 watts, delivering more light per inch of tube than other types.

SWITCHING ON

The lights were switched on three days after the move, allowing me to get a better look at how things were progressing.

The first thing I noticed was that I needed to get some rock into the tank to spread the inverts out; the tooth coral was taking an unhealthy interest in the *Tridacna* clam, i.e. stinging it. The clam was shedding white mucus in the area that was in contact with the coral's tentacles.

I separated them and the following evening drove to Eastbourne to get some tufa. I bought about 25lb of it, cut up the larger blocks with a hacksaw and washed the dust off, blocking the sink in the process, then arranged it in the tank.

At the same time I added an extra litre of Siporax to the canister filter and removed the hang-on filter. The polyfilter from the small filter was transferred to the canister. I fitted the circulation pump, after giving it a thorough clean, an unpleasant task as it had been sitting in a plastic bag for a week, forgotten in the general frenzy.

The system was effectively complete, but there were a few aesthetic touches required. After a couple of attempts, I managed to arrange the rocks and invertebrates in such a way that they looked good, as well as being correctly spaced, though at least twice as much rock would have been required to get that reef-wall effect which looks so good in invertebrate tanks. In such a small aquarium, however, I felt that I couldn't really afford to displace any more water, so I left it at that.

FINAL TOUCHES

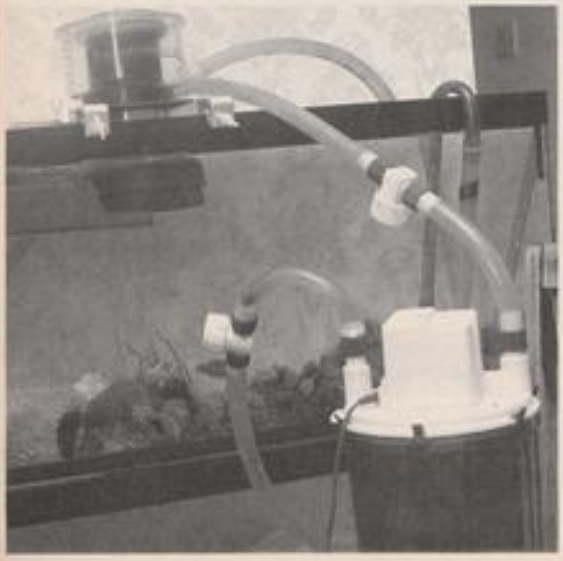
For the final visual touch, the background, I had to call in someone with greater needle-and-thread skills than mine. I like to back my tanks with black velvet; if it is good quality cloth, it looks as black as it is possible to get, and the bright colours of marine fish and invertebrates show up superbly. Eventually, of course, the rear glass of the tank becomes encrusted with algae, but it still looks good.

Fixing velvet to the tank can be difficult, though; on the previous tank it was taped on, and spent a lot of time falling off. This time, I came up with a more ingenious method; I superglued velcro strips to the top inch of the back of the tank, then Emma stitched the other side of the velcro to the cloth, and putting the two together was the work of a few seconds. Now the tank looked good, as well as apparently working well.

A couple of days later, 8 days after the move, I checked the water; no trace of ammonia, nitrite or nitrate, but the pH was low at 8.0. I corrected it using SeaBuff. Everything seemed to be going quite well. The inverts (excepting the gorgonian) looked fine and the fish were lively and feeding well. It looked like a successful move, and I settled down to watching the tank, rather than working on it. After all, aquaria are supposed to be relaxing!

A few days later, though, I thought that the Midas Blenny, despite feeding well, was looking emaciated. The following evening,

The skimmer and canister filled up and running, with all the stock now released in the tank. The 'technology' was, of course, hidden from view later.



The Coral Beauty among the corals in its new home.

The Clownfish feeling at home among the hard and soft corals. The damaged gorgonian can be seen in the background.

13 days after the move, as I was taking a quick glance into the tank before setting off on a trip to Scotland, I noticed that the fish was dead.

I didn't really have time to investigate, so I was unable to ascertain the cause of its demise. I don't know whether the stress caused by moving was responsible or not; the fish had seemed its usual cheerful self, so the cause of death remains a mystery.

When I returned from Scotland, I tested the water again, now 25 days after the move. It looked good; pH an excellent 8.4, no nitrite, no nitrate. I didn't bother testing for ammonia. That night I did the first partial water change of 10%.

As I write, there have been no further casualties. All the Mushroom Anemones, despite being transported 'dry', look fine, and the clam has recovered from its close encounter with the tooth coral. Algae of various kinds are growing, including a few plaques of pink coralline algae, which are always a good sign in a marine aquarium, and Pipe Corals are starting to spread onto the new rocks.

Despite a few hitches, all seems to be well. The new tank has a rather rapid rate of evaporation, perhaps due in part to having such a powerful skimmer on such a small aquarium, and territorial tensions between the remaining fish run a little higher than they did in the previous system, but given the reduction in space, this is hardly surprising.

SIPORAX FILTRATION

The aquarium relies on Siporax for biological filtration; something which continues to surprise me is that Siporax has not caught on more among marine aquarists. A canister filter packed with Siporax probably offers a much greater surface area for bacteria to colonise than is available in an undergravel filtration system, and there are none of the problems associated with gravel, such as the difficulties of keeping it clean.

Gravel also displaces a lot of water; if the rule of 10lb of Calcium Plus or coral gravel, plus 10lb of coral sand per square foot of tank base is followed, the tank described here would require 60lb of substrate, probably displacing 2 gallons of water, if not more. With an external filter and clean tank base, that gives an extra 10% tank volume; worth thinking about.

Of course, in a 'wet' system, such as a traditional canister filter, Siporax as a biological filtration substrate has the disadvantage, like an undergravel bed, of having oxygen availability limited by its solubility in water, and the efficiency of filtration is limited by the high oxygen demands of the filter bacteria. However, Siporax — in my view — offers what is probably the simplest method of denitrification, and since marine aquarists have to keep nitrate levels to a minimum, this would seem to make it an ideal product for the saltwater tank.

The system used on my tank, so far, seems to testify to the success of this approach to filtration, but it would be interesting to get some feedback from other aquarists who have used this medium, in order to work out the best way to use it based on a wider range of experience; after all, it is still quite new.

OVERALL SUCCESS

Overall, it was a successful move, the only casualties being the Midas Blenny, the Curlicue Anemone (which I had to leave behind and which could have been saved if I'd had a cold chisel to hand!), and probably the gorgonian, though it is still alive and active, with polyps extended, as I write. I expect it to succumb to an infection eventually, though, given the mechanical damage it has suffered.

All this goes to show that you can successfully take your aquarium with you when you move house, even if it is that most difficult of systems, the reef tank, given that you are willing to put in some time, money and energy.

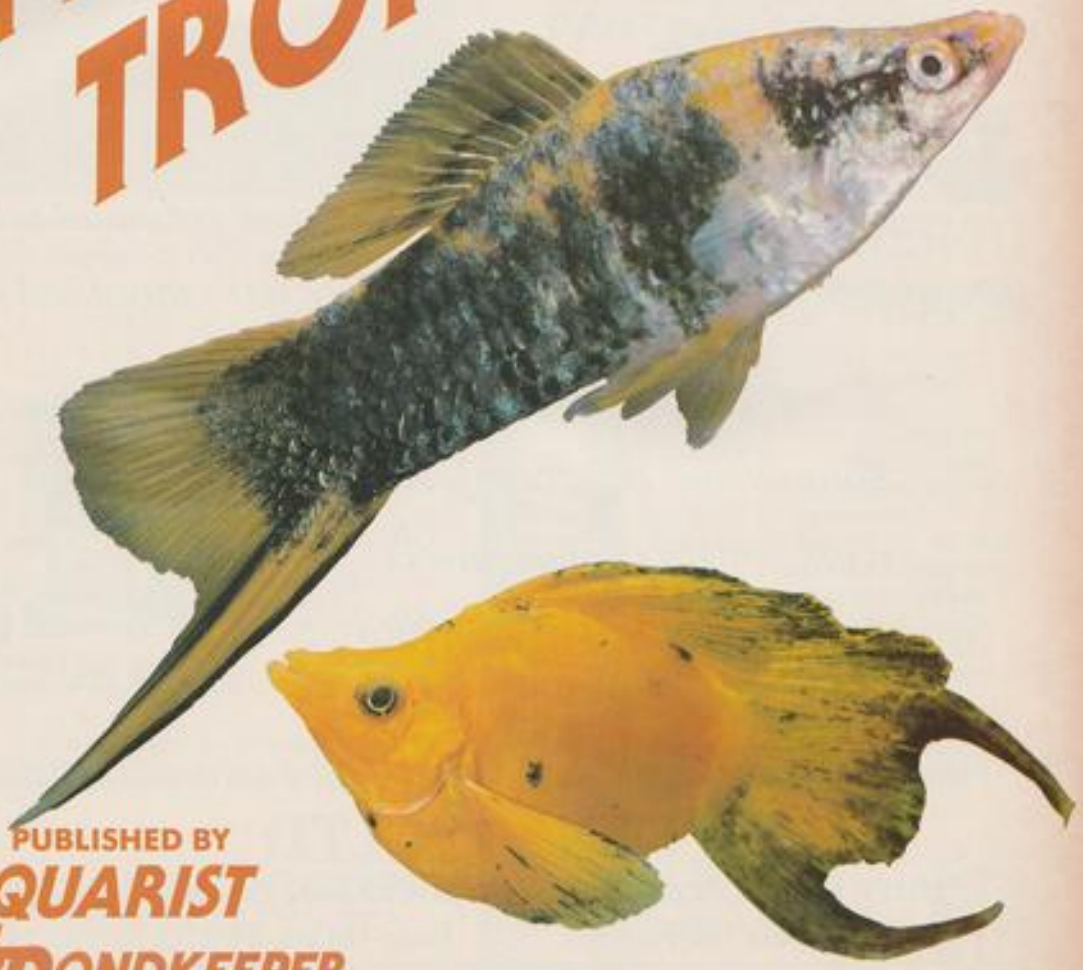
I wouldn't have liked to have tried this if my system had depended on a conventional undergravel filter, however, and I would have much preferred to have had a tank with some sort of matured biological filter waiting to receive everything. It might not have made any difference to the outcome, but I would have felt more confident.

Technology of various kinds was a great help; the Hagen Cycle, which undoubtedly covered for the damage done to the biological filter in transit, was invaluable, as were polyfilters, and I'm sure the protein skimmer prevented too much nitrogenous waste accumulating and overloading the system, though this latter option would not be available in a freshwater aquarium.

I wouldn't say I was looking forward to the next move, but, at least, I know now that it's possible. AP

October '93
SUPPLEMENT

POPULAR FRESHWATER TROPICALS



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POPULAR FRESHWATER TROPICALS SUPPLEMENT

PUBLISHED BY

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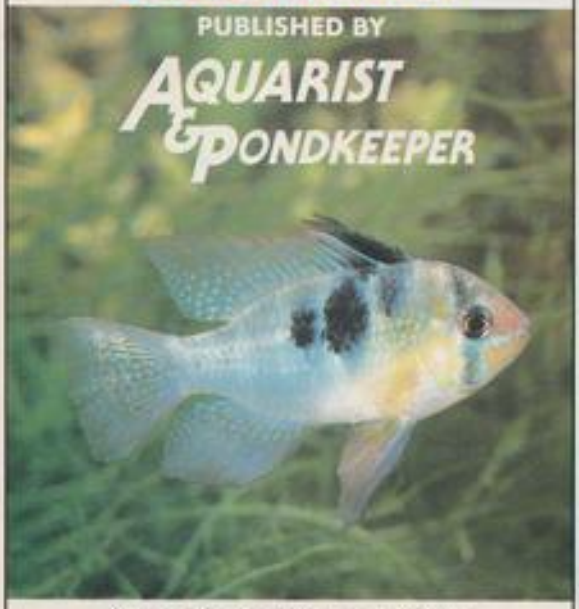

Cover Photographs: Harry Grier/ Florida Tropical Fish Farms Association

Supplement Contents

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Essential Egglayers

Dick Mills presents a 'panoramic' view of most of the best loved egglaying community species.

While not denying the hardiness and popularity of livebearing fishes (ever increasingly so, especially with active encouragement in culturing 'wild' species by specialist societies such as Viviparous and S.L.A.G.), there is no need to think that egglaying species are any different, or far too difficult. Once the assumed problems of sexing are overcome (nothing more than straightforward visual clues in most cases), the breeding of egglayers, with their diverse methods of spawning, is both highly possible and most rewarding.

The following selection represents good, 'basic' fishes on which to found a community collection. All are hardy, colourful and, in most cases, not too difficult to breed.

CYPRINIDS

This large family includes not only Barbs, Rasboras and Danios, but also other equally popular fishes whose connection (scientifically-speaking) to the family might not always be appreciated.

1 Barbs

Barbs are long-established aquarium favourites. The **Rosy Barb,** *Barbus conchonius* (3in — 75mm), is very prolific and sexes are easily determined by the slimmer male's coppery-coloured flanks; a cultivated (non-natural) long finned strain is now available.

The male of the aquarium-developed **Odessa Barb,** *B. 'odessa'* (2.5in — 60mm) can also be distinguished by the colour of the flanks, in this case a broad band of carmine red.

Another aquarium-developed strain is the bright yellow, red-finned **Schuberti or Golden Barb,** *B. 'schuberti'* (3in — 75mm) whose ancestors may have included the **Halfbanded Barb,** *B. semifasciolatus.*

The very much under-rated (and almost undersized) **Gelius or Golden Dwarf Barb,** *B. gelius* (1.5in — 37mm) is a shoaling species that does not need high temperatures for its general upkeep or for breeding (max 72°F — 22°C) and can survive temperatures as low as 65°F (c 18°C).

Two other small Barbs should not be overlooked: the **Checker Barb,** *B. oligolepis,* and the **Cherry Barb,** *B. nineya* (both around 2in — 50mm) are very attractive. The former has dark-edged scales which provide the checkered patterning, while the latter positively glows with a bright red cherry colour. All three small species are ideal for that smaller community tank.

To prevent the **Tiger Barb,** *B. tetrazona* (2.5in — 65mm) from living up to its reputation as a fin nipper, keep it in shoals to occupy its attention fully. The similarly-sized **Black Ruby Barb,** *B. nigrofasciatus,* may appear to be just a fish with four black

HARRY GRIER/FLORIDA TROPICAL FISH FARMS ASSOCIATION

Barbs are among the most popular of all aquarium fish. This is a Long-finned Rosy Barb.

HARRY GRIER/FLORIDA TROPICAL FISH FARMS ASSOCIATION

Among surface swimmers, Danios, such as this Long-finned Leopard, are strong favourites.

bands across the body but, when breeding, the male changes to an overall ruby-black colour.

2 Danios

The surface-swimming Danios bring action to the upper levels of the aquarium. Mostly around the 2in (50mm) size, popular species include the **Pearl Danio,** *Brachydanio albolineatus,* the **Blue Danio,** *B. kerri,* the **Leopard Danio,** *B. frankei* (whose ancestry was examined in the August issue of *A&P*) and, of course, the everlasting favourite (and ideal beginner's fish with which to spawn) the **Zebra Danio,** *B. rerio.*

The much larger **Giant Danio,** *Danio aequipinnatus* (4in — 100mm) is a possibility but, staying with smaller fishes, the related **White Cloud Mountain Minnow,** *Tanichthys albonubes* (2in — 50mm), is a hardy and colourful species which can be kept outside during summer months in an unheated aquarium.

3 Rasboras

The Rasbora group is probably even larger than that of the Barbs and although, like other Cyprinids, most are egg-scattering species, the **Harlequin,** *Rasbora heteromorpha* (1.75in — 45mm), is an exception; it lays eggs under a broad-leaved aquatic plant such as a *Cryptocoryne.*

Rub off the Harlequin's dark triangle and you have the **Fire Rasbora,** *R. vaterifloris* (1.5in — 40mm). Generally an all-over fiery-red, there is a similarly-sized grey strain (with red fins) often called the **Pearly Rasbora.**

The slim-bodied **Scissortail,** *R. trilineata* (3.5in — 80mm), has dark marks on the extremities of the caudal fin. They're not hard to see (the fish is constantly twitching its tail) hence the popular name.

4 'Sharks'

The 'Sharks' are, understandably, attractive.

The ever-swimming **Silver Shark,** *Balantiocheilus melanopterus* (12in — 300mm) has a yellow and black caudal fin.

The **Red-tailed Black Shark,** *Labeo bicolor* (6in — 150mm), often turns nasty when older, harassing other fish which 'invade' its territory.

HARRY GRIER/FLORIDA TROPICAL FISH FARMS ASSOCIATION

The Harlequin is an exception among Rasboras in that it does not scatter its eggs.

Probably the most striking of the 'sharks' — the Red-tailed Black Shark.

HARRY GRIER/FLORIDA TROPICAL FISH FARMS ASSOCIATION

BILLY WHITESIDE

The ever-popular Cardinal Tetra.

CHARACINS

1 Tetras

Tetras are always popular, belying their close relationship to the toothy Piranha; their name means 'square-finned' (from tetragon = four-sided or square, opterus = fin).

The **Black Widow,** *Gymnocorymbus ternetzi* (2in — 50mm) has a sooty-black rear half to the body with a long-based anal fin; a long-finned strain is now available; so is a white variety.

The **Glowlight,** *Hemigrammus erythrozonus* (2in — 50mm) has a delicate glowing line along the flanks, much more subtly coloured than the gaudier **Cardinal Tetra,** *Paracheirodon axelrodi* and Neon Tetra, *P. innesi* (both around 1.75in — 45 mm); incidentally, the Neon has only half of its body bright red — the Cardinal goes the whole way.

At the snout end of things, the **Rummy-nosed Tetra,** *Hemigrammus rhodostomus* (2in — 50mm) is very similar to *Petitella georgiae.* Both have black and white, horizontally-striped caudal fins, but the latter species' red area is limited to the head only.

Sexing the **Bleeding Heart Tetra,** *Hyphessobrycon erythrostigma* (3in — 75mm) is easy; while both sexes show the red spot on the pink body, the male has a large sickle-shaped dorsal fin.

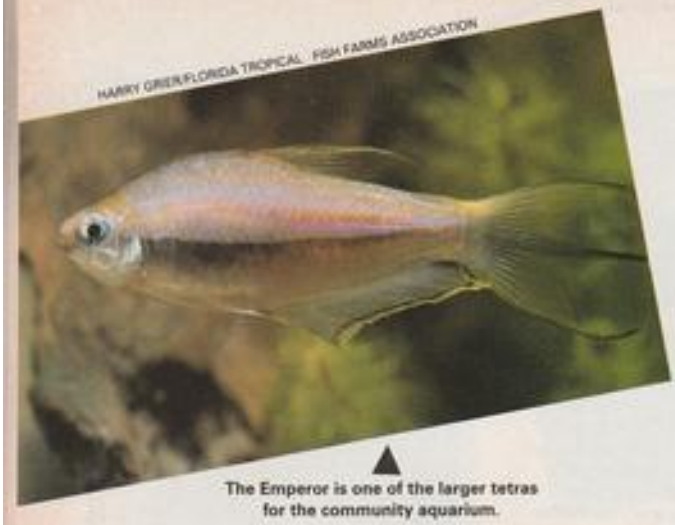
The **Lemon Tetra,** *H. pulchripinnis* (2in — 50mm) has a black and yellow leading edge to the anal fin. Almost needless to say, someone has aquarium-developed an albino strain of this attractive fish.

Another species with a bright yellow anal fin is the **Emperor Tetra,** *Nematobrycon palmeri* (2.5in — 60mm); males have a sickle-shaped dorsal fin and a caudal fin with three trident-like extensions.

The **Black Phantom Tetra,** *Megalamphodus megalopterus* (2in — 50mm) has an identical 'twin' in the **Red Phantom Tetra,** *M. mogleti* (2in — 50mm), but each species comes from a separate part of South America.

The pink-coloured **Blind Cave Fish,** *Astyanax fasciatus mexicanus* (3.5in — 9cm) is a real oddity: coming from dark subterranean caves, its eyes never develop into functional organs but it navigates perfectly well in the aquarium using its lateral line system.

HARRY GRIER/FLORIDA TROPICAL FISH FARMS ASSOCIATION



The Emperor is one of the larger tetras for the community aquarium.

The Firemouth is considerably more peaceful than it looks.

The **Diamond Tetra,** *Moenkhausia pittieri* (2.5in — 65mm) is best viewed under side-lighting, as this shows up its many iridescences to perfection. The same viewing conditions will serve admirably for the male **Congo Tetra,** *Phenacogrammus interruptus* (3.25in — 80mm): he has white edged, exaggerated finnage too, unlike his smaller, drabber mate.

Also representing Africa is the **Adonis,** *Lepidarchus adonis* (1.25in — 30mm), a small shy fish whose dark fin markings are often hard to see.

2 Other Characoids

Some characin-related species have their own peculiar characteristics.

The **Silver Hatchetfish,** *Gasteropelecus sternicla* (2.5in — 65mm) has a deep body which houses powerful muscles with which it flaps its pectoral fins to help it 'fly' over the surface.

The **Spotted Headstander,** *Chilodus punctatus* (4in — 100mm) spends much of its time head down, searching for food, or simply resting. As a contrast, the downwardly-sloping dark stripe of the **Penguin Fish,** *Thayeria obliqua* (3in — 75mm) gives it an upward inclined swimming and resting appearance.

The whole Pencilfish family, including the **Dwarf Pencilfish,** *Nannostomus marginatus* (1.5in — 40mm), take on a patchy coloration overnight before returning to their more expected dark-striped pattern at daybreak.

CICHLIDS

Most parentally-responsible of all aquarium fishes, cichlids either lay eggs on pre-selected locations (in secret or on open sites) or incubate the eggs in the mouth of the female. In all cases, care of the resulting fry is paramount.

The **Ram,** *Papiliochromis ramirezi* (2.75in — 70mm) is accepted as being a 'dwarf cichlid' and comes in wild, golden, long-finned and, most recently, short-bodied forms. Males usually have extra-long second or third rays to the dorsal fin.

The **Kribensis,** *Pelvicachromis pulcher* (4in — 100mm) is a secretive spawner (flowerpots are ideal sites) and the female takes on a rich plum/purple colour around the belly region.

Brichard's Lamprologus or the Fairy Cichlid or Bric, *Neolamprologus brichardi* (3.5in — 90mm) is another secretive spawner, often using the roof of a cave as a spawning site; subsequent broods are often reared in succession, with the young from different broods being collectively looked after (see **Mary Bailey's** article in this **Supplement** for fuller details).

HARRY GRIER/FLORIDA TROPICAL FISH FARMS ASSOCIATION

Several forms of the Ram are available nowadays. This is the wild type.

Angelfish, *Pterophyllum scalare* (5in — 125mm) hardly need a description; suffice to say that many different colour and finnage strains have been aquarium-developed.

Despite its rather fierce appearance, the **Firemouth,** *Thorichthys (Cichlasoma) meeki* (6in — 150mm) is a peaceful species, usually keeping to the lower levels of the tank among the plants. Males have intense red throat and belly coloration during spawning.

LABRYINTH FISHES

Setting aside the more predatory African Bushfish, *Ctenopoma*, species, the Asian members of this family are generally peaceful and graceful in their demeanour. Of course, keeping two male **Siamese Fighting Fish,** *Betta splendens* (2.5in — 60mm), in the same tank could be asking for trouble! Again, all the gorgeous colour strains found today are aquarium-developed, having little in common with the wild fish.

The **Dwarf Gourami,** *Colisa lalia* (3.25in — 80mm) is brilliantly-patterned, the male more so than the female. He takes on parental duties after spawning and ferociously guards the bubblenest with its fry against all-comers.

The **Pearl Gourami,** *Trichogaster leeri* (4.5in — 110mm) is also known as the Lace or Leeri Gourami, an observation on the patterning and on the edging to the wide, long-based anal fin. The male develops bright orange pelvic fins and throat area during spawning.

The slightly larger **Moonlight Gourami,** *T. microlepis* (5.5in — 140mm) has a burnished silver sheen to the body and also orange pelvic fins in the male.

The **Three-spot Gourami,** *T. trichopterus* (4.5in — 110mm) comes in several guises: plain blue or with three spots (one spot is the eye); a sub-species(?) provides the Opaline (Cosby) and Golden Opaline variants.

KILLIFISHES

Although Killifish are a more specialised group, the **American Flagfish,** *Jordanella floridae* (3in — 75mm) might just be nominated as a community fish.

HARRY GRIER/FLORIDA TROPICAL FISH FARMS ASSOCIATION

Angels occur in a bewildering array of colours and fin shapes.

The red-spotted lines on the body are similar to those of the American Stars and Stripes flag; females have a dark blotch at the rear of the dorsal fin.

Spawning occurs among plants or in depressions in the substrate.

CATFISH

If fish wastes and excess foods floated to the surface, you wouldn't call Danios scavengers would you? Well, don't keep catfish to do the dirty work around the tank — feed them properly in their own right as fishes, not aquatic dustbin-men!

However, not all catfish stay on the bottom: the **Striped-tailed Catfish,** *Dianema urostriata* (5in — 130mm) is a midwater swimmer having a black and white striped caudal (tail) fin and long barbels extending out in front of the snout.

For fuller details on a choice of catfish, please see **Gina Sandford's** article elsewhere in this **Supplement.**

LOACHES

Also a bottom-dwelling fish —like most catfish — the **Clown Loach,** *Botia macracantha* (12in — 300mm) is a most highly-coloured species which needs to be kept in a shoal.

When netting, watch out for the erectile spine beneath the eye (if you can catch Loaches, you can catch anything!).

OTHER POSSIBLES

In addition to the foregoing species in the major families, there are many equally fascinating egglayers available which don't fall neatly into any convenient group.

The **Longnosed Elephant Fish,** *Gnathonemus petersi* (9in — 230mm) has, apart from its bizarre appearance, a very sophisticated navigation system; it uses a self-generated electric force-field.

The **Chinese Sucking Loach,** *Gyrinocheilus aymonieri* (10in — 250mm) is almost a con trick of a fish; it's not a Loach and it doesn't come from China either!

The Siamese Algae Eater would be a more correct title, although some aquarists would even query its algae-eating prowess, once it becomes adult.

The **Australian Fire Goby,** *Hypseleotris compressus* (6in — 150mm) and the **Spotted Goby,** *Stigmatogobius sadanundio* (3.25in — 85mm) are but two of the increasing number of Gobies that are being imported; check with your dealer to see if they are accustomed to brackish water.

Similarly, **Rainbowfishes** are also enjoying great popularity (there's even a specialist Society, B.R.A.G.S., for Rainbowfish and Goby fanciers) and, apart from the well-documented large Australian species, the **Threadfin Rainbowfish,** *Iriatherina werneri* (1.75in — 40m) is best considered for that quieter, smaller species aquarium. AJP

Probably the most popular of all the gouramis: the Dwarf.

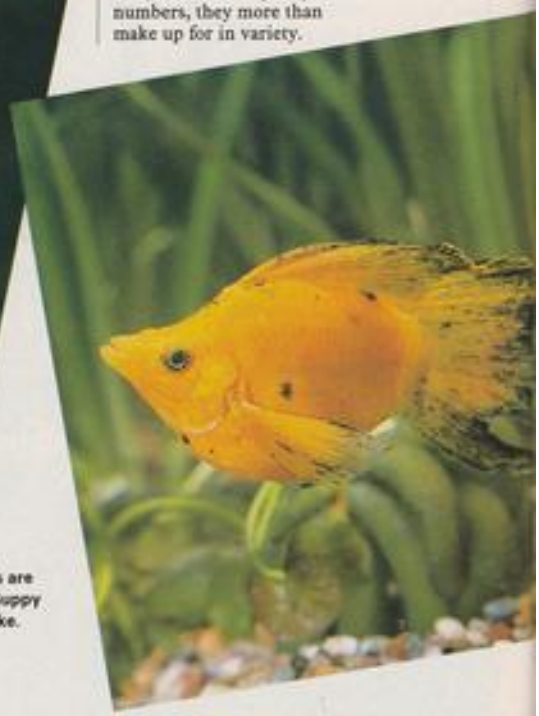
DICK MILLS

IAN ROBERTS

The beautiful shoaling Clown Loach.

Like virtually all other Guppies produced nowadays, the Blue Tux has long flowing fins.

Mottled red-based wide tails are particularly popular among Guppy breeders and hobbyists alike.



TOP LIVEBEARERS

A & P editor **John Dawes** introduces a selection of popular varieties of Guppies, Mollies, Platies and Swordtails.

Photographs: Harry Grier/Florida Tropical Fish Farms Association.

There are about 950 livebearing species of fish alive today. Sharks, rays, dogfish and their relatives account for about 420 of these, spread over no fewer than 40 families. Among the bony fishes, the 510 or so livebearers are scattered across 14 families. They include such diverse species as some Scorpionfish, Oil and Kelpfishes, Mosquitofish and, perhaps the most intriguing of all, the Coelacanth.

Given this amazingly wide-ranging occurrence of livebearing in its various guises, it is quite remarkable that, when it comes to aquarium keeping, the only livebearers to have become universally popular are Guppies, Mollies, Platies and Swordtails.

Guppies and Mollies belong to the genus *Poecilia*, while Platies and Swordtails belong to the genus *Xiphophorus*. So, when we come down to biological detail, we find that virtually all the popular aquarium livebearers in the whole world are represented by just two genera, both of which belong to the same family, the Poeciliidae.

SHARED CHARACTERISTICS

Taken as a fraction of the world 'livebearing' total, the above represents a tiny selection, but what they may lack in numbers, they more than make up for in variety.

This jet-black Sailfin Molly is particularly impressive.

The fact is that all these popular livebearers share some important characteristics, starting with an almost infinite potential for variability, both in coloration and finnage.

They are also very prolific, all the more so since females can store sperm for long periods and can turn to this reserve to fertilise each batch of eggs as it ripens. As a result, once mated, Poeciliid females can produce several broods without the need to mate again for many months.

With so many varieties of these popular fish to choose from, a detailed breakdown of characteristics and requirements is, clearly, quite out of the question. What I therefore propose to do is provide general guidelines for each species which are broadly applicable across the whole range.

Among the latest varieties of Molly can be found several 'balloon' types such as this Golden Sailfin Lyretail Balloon creation.

THE GUPPY

The Guppy, also occasionally referred to as the Millions Fish, is the smallest of the popular livebearers, although some of the Jumbo Guppies currently being produced commercially could easily cloud this fact.

Scientific Name: *Poecilia reticulata*
Range: Widely distributed north of the Amazon: Dutch Antilles, Trinidad, Windward Islands, Barbados, Grenada, Antigua, Leeward Islands, St Thomas, Venezuela and Guyana. Introduced into numerous exotic locations.

Overall size: Males around 3cm (1.2in); females around 5cm (2in) — cultivated varieties are considerably larger.
Water Requirements: Wide range of conditions tolerated in terms of both temperature and chemical composition. Appropriate temperature range for aquarium maintenance and breeding: 21-25°C (70-77°F). A small amount of salt — 5ml (1 teaspoonful) per 4.5 litres (1 Imperial gallon) — may be found beneficial, at least for wild-caught specimens.
Preferred Diet: Will eat a wide range of small live, frozen, freeze-dried and dry foods with a regular vegetable component.
Breeding: Very prolific species producing broods every 4-6 weeks. As many as 193 fry have been recorded from a single female by an aquarist (Joseph Camin), but this is most atypical.

Notes: After *Gambusia affinis* and *G. holbrooki*, the Mosquitofish, the Guppy is the most widely distributed Poeciliine species. Numerous varieties exist in the wild, while even more numerous body and fin configurations have been developed by commercial breeders and hobbyists worldwide, making the Guppy one of the most popular fish in the history of the aquarium hobby. A fairly recent introduction is Endler's Livebearer, an exceptionally beautiful true-breeding, short-finned variety much admired by specialists.

THE MOLLIES

Four species of Molly are generally associated with the development of the aquarium varieties: two short-finned species — *P. mexicana* and *P. sphenops*, and two sail-finned species — *P. latipinna* and *P. velifera*.

1 Atlantic Molly

Scientific Name: *Poecilia mexicana*
Range: Northern Mexico, Guatemala, Honduras.
Overall Size: Males up to 7cm (2.8in); females up to 8.5cm (3.4in).
Water Requirements: Alkaline, medium-hard conditions preferred. Temperature 24-27°C (75-80°F).
Preferred Diet: Range of foods accepted. Vegetable component should be included.
Breeding: Most reports quote 30 or so fry but some go as high as 75-80. Gestation 4-6 weeks.
Notes: This fish is very sphenops-like in overall appearance and is believed by some to be ancestral species from which many aquarium Mollies have been developed. Most references quote *P. sphenops* as the ancestral species but this can be explained by the fact that *P. mexicana* was long regarded as *P. sphenops*. A cave morph of *P. mexicana* has been

Some of the marbled varieties of Molly can be very striking.

The Moon or Southern Platy (this is a Blue Moon) is shorter-bodied than its Sunset relative.

collected by Ross Socolof. This collection included a range of characteristics from eyeless, somewhat deformed individuals to fully eyed ones.

2 Sphenops Molly

Other Common Names: Green Molly, Pointed-mouth Molly, Mexican Molly, Liberty Molly*.

Scientific Name: *Poecilia sphenops*

Range: From Texas down through Mexico, along both coasts to Colombia, but also introduced elsewhere.

Overall Size: Males around 6cm (2.4in); females around 8cm (3.2in).

Water Requirements and Diet: Largely, as for *P. mexicana*, but with 5-10% seawater or salt added.

Breeding: Fairly large broods of around 80 fry every 5-7 weeks. Larger broods have been recorded from aquarium stocks.

Notes: This is a very variable species, a factor that often makes precise identification difficult. Many other species have been synonymised with it at one time or other, only to be accorded full specific status later on. Further refinements will undoubtedly follow in the future.

* The Liberty Molly is a variety of *P. sphenops* which possess a very attractively marked dorsal fin bearing numerous speckles on a predominantly red base, plus a reddish caudal fin.

3 Sailfin Molly

Scientific Name: *Poecilia latipinna*

Range: South and North Carolina, Virginia, Texas, Florida, Atlantic coast of Mexico.

Overall Size: Males around 10cm (4in); females around 12cm (4.7in).

Water Requirements: Slightly hard alkaline water containing about 5ml (1 teaspoonful) of salt per 4.5 litres (1 Imperial gallon). Temperature around 25-28°C (77-82°F).

Preferred Diet: Will accept a wide range of foods but needs a regular vegetable component for long-term health.

Breeding: Very large broods of around 130-140 are not uncommon. Gestation period up to 8-10 weeks.

Notes: Not all males produce the characteristic sail-like dorsal fin. Colour variations occur even in the wild. In captivity, *P. latipinna* has been cross-bred with other species and varieties and has contributed significantly to the wide range of aquarium Mollies currently available.

4 Yucatán Molly

Scientific Name: *Poecilia velifera*

Range: Yucatan Peninsula, Mexico.

Overall Size: Males up to 15cm (6in); females up to 18cm (7in).

Water Requirements and Diet: Basically, as for *P. sphenops* but even high temperatures are preferred.

Breeding: Average broods of around 50 fry are produced every 6-8 weeks. Broods of more than 100 fry are not uncommon.

Notes: This is the largest of the Sailfin Mollies and, like them, is sensitive to poor water quality, developing shimmying if conditions are not right. Numerous commercially developed colour varieties exist.

THE PLATIES

Two species of Platy are normally found within the aquarium hobby:

1 Southern Platy

Other Common Names: Platy, Moonfish

Scientific Name: *Xiphophorus maculatus*

Range: From Veracruz in Mexico, along the Atlantic slope down to Belize, British Honduras and Guatemala.

Overall Size: Males around 3.5cm (1.4in); females around 6cm (2.4in), but often smaller.

Water Requirements: Neutral or slightly alkaline, medium-hard water kept between 20-25°C (68-77°F).

Preferred Diet: Wide range of foods, which should include a vegetable component.

Breeding: Up to 80 fry or so produced every 4-6 weeks.

Notes: This is a very variable species. This inherent variability, plus the species' tendency to hybridise with other *Xiphophorus* species has been extensively exploited commercially, resulting in a wide range of colour and fin configurations, plus a whole spectrum of spectacular hybrids, mostly between it and *X. helleri* and *X. variatus*.

2 Sunset Platy

Other Common Names: Variable, Variegated or Variatus Platy

Scientific name: *Xiphophorus variatus*

Range: Atlantic slope of eastern Mexico.

Overall Size: Males about 5.5cm (2.2in); females up to 7cm (2.8in) — commercially produced varieties often larger than wild-caught specimens.

Water Requirements: Neutral or slightly alkaline, slight- to medium-hard water. Wide temperature range — from 16°C (61°F) up to 27°C (80°F).

Preferred Diet: As for *X. maculatus*.

Breeding: Large broods of well over 100 fry are possible from large females, but an average of around 50 is far more common. Gestation period: 4-6 weeks.

Notes: This is another naturally variable species that has been widely exploited commercially. A natural hybrid between it and *X. xiphidium* — the Swordtail Platy — known as *X. 'hossanderi'*. Aquarium hybrids between *X. variatus* and *X. maculatus* and *X. helleri* (the Swordtail) abound, including a Florida-developed variety that is *variatus*-shaped but carries a sword!

THE SWORDTAIL

Many (most?) 'ornamental' Swordtails that exist today are the result of crosses between the pure Swordtail itself, and one or

A Hi-fin Variatus or Sunset Platy (note the vertical bars on the body — always a give-away as to the true identity of the variety, irrespective of colour or fin modifications).

other of the Platy species described above. Nowadays, pure-bred Swords are probably only found in the aquaria of specialist livebearer enthusiasts.

Scientific name: *Xiphophorus helleri*

Range: Atlantic drainage from Río Nautla in Veracruz, Mexico, south to northern Honduras.

Overall Size: Males up to 14cm (5.5in), excluding sword; females up to 16cm (6.3in), but usually considerably smaller.

Water Requirements: Neutral or alkaline, well-filtered water at around 22-26°C (72-79°F).

Preferred Diet: Live and dry foods including a vegetable-based component.

Breeding: Up to 150 fry or more produced every 4-6 weeks.

The Marbled Black Sword is probably one of the 'best' recently-developed short-finned varieties

A sturdy short-finned Marigold Painted Swordtail male.

find something to meet your preferences among the Guppies, Mollies, Platies and Swordtails that grace our hobby. If, however, you would like to go into livebearers in greater detail, there are two specialist societies in the UK which are well worth tracking down. They will provide you with so many other species to choose from, that your problem will be which ones to select!

AGP

Notes: This is a highly variable species, some populations of which have been afforded specific or subspecific status by various workers. Body coloration can range from red to green, with or without speckling (this last trait often associated with a form previously referred to as *X. guentheri*). Numerous body and fin configurations have been developed commercially, usually involving hybridisation with *X. maculatus* and *X. variatus*.

CLOSING REMARKS

As I mentioned in the opening paragraphs of this article, aquarium livebearers are restricted to representatives of only a few species from the family Poeciliidae.

However, even the small selection presented here, will have, I hope, left you in no doubt that the permutations on the few basic themes are virtually endless.

If you like livebearers, you are bound to

Bloodfin Lyretail Swordtails — more graceful, and perhaps more delicate than their shorter-finned counterparts.

ANTON CASS

Heckel Discus (the fish in the foreground) can always be picked out by their pronounced vertical bands.

ANTON CASS

Cobalt Blues are among the most popular of the domesticated varieties.

ANTON CASS

The beautiful body 'streaks' of the Red Turquoise make it particularly stunning, especially when kept as a shoal.

Beginning With Discus

Despite their popularity, there are still quite a few misconceptions surrounding Discus keeping. **Anton Cass** of Aquaflight puts a few of these to rest and offers some useful tips to set you off on the right track.

Keeping Discus has, for many years, been thought of as a skill practised by only the higher echelons of the aquatic establishment. Indeed, much of the available older literature does little to dispel the myth of Discus being shy, nervous and very delicate.

Today, however, more people are attempting, with a high degree of success, to keep Discus, making it a very popular and highly desirable tropical fish.

BASIC NEEDS

Tank size

The starting point is to consider the actual set-up that is going to be made available, whether it's going to be an existing one or a new acquisition. As Discus have the potential to achieve 6in (15cm) or more, the aquarium size should be a minimum of 35 gallons (c 160 litres), 36 x 18 x 15in (90 x 45 x 38cm) being an ideal size for four to six adult fish.

Filtration

Filtration is all-important, as water quality must be maintained to a high standard. Undergravel systems are OK, but are subject to certain problems. One is that, as the aquarium needs to be a reasonable depth, a good-quality airpump is required, not only for reliability, but also to produce a good enough output that will maintain a sufficiently high water turnover.

Another disadvantage is that decomposed material will, after a matter of time, build up under the undergravel (u/g) filter plates despite regular maintenance with a gravel cleaner.

Furthermore, Discus are messy feeders, taking food in and blowing it out again. The small particles can then become lodged in between the gravel and rot as they cannot be accessed by the fishes. Finally, some types of aquarium gravel can also cause a rise in pH (alkalinity) and hardness.

My own preference is for a system which can be easily maintained and allows for the possibility of using a variety of media for differing functions, i.e. mechanical and bio-

logical filtration, as well as offer facilities for water chemistry management.

Perhaps the best known of this type of filter is the external canister, although there are also several excellent high-performance internal systems on the market.

Decor

It is preferable to keep the decor and substrate to items that are inert or acidify the water. The drawbacks with gravel have already been detailed; silica or silver sand makes an ideal alternative substrate.

Beware, do not buy building sand! It contains chemicals which are harmful to fishes.

'Curio Wood' is ideal to provide aquascaping, as it is heavy enough to sink and, once soaked, it does not release excess tannin; it also has a variety of incredible shapes. It should not be coated with varnish as this will invariably lift off.

Plants

Plants can be grown quite successfully in such a set-up, but ensure that if you intend to pursue such a design, the plants' requirements must also be satisfied.

High temperature, low pH and insufficient lighting are all detrimental to plant health but are certainly beneficial to Discus. Try to select plants that will thrive under such conditions. The *Cabomba* look-alike *Limnophila sessiliflora*, appears to flourish under Discus conditions.

Lighting

Lighting, while maybe not of sufficient intensity for plant growth, does not have to be totally subdued, as Discus, if kept correctly, do not seem to be upset by even the brighter tubes like Triton.

The major problem comes from switching from darkness into sudden light, as this will cause panic, not just in Discus, but in most fishes, and subject them to shock, something to be avoided at all costs.

Water Conditions

Water chemistry is the one subject that seems to be linked to the mystique of Discus keeping. To the beginner, many texts must appear like an excerpt from Mr Spock's memoirs, with their comments on various aspects of what is ideal and how to maintain the right water quality.

Basically, the subject does not require 'Vulcanian' logic, or, indeed, any command of other inter-galatic culture, to keep Discus successfully.

The pH (acidity/alkalinity) should be between 6.5 and 7.3 which represents quite a wide range, while the hardness (dissolved salts) can be up to 10 degrees. Discus can tolerate conditions outside these parameters, but experience has indicated that problems arise over a period of time.

Nitrite levels should be maintained at zero, as any prolonged rise will lead to certain demise of the fish. This is why

JOHN DAWES

Among the newer varieties of Discus produced in the Far East, the Ghost or Gold Crest is becoming very popular.

JOHN DAWES

Golden Discus: one for the specialist.

filtration is a topic not to be taken lightly. Nitrate should also be monitored weekly, as should all other aspects of water chemistry, and reduced by water changes at least weekly.

One vital thing to do is to check the water out of your tap regularly. You may be surprised at what you find. Good quality test kits are readily available in most aquatic outlets.

Temperature is a very important part of keeping Discus. Ensure that you purchase a good quality heater-thermostat that is of sufficient wattage to maintain the water temperature at around 29°C (84°F).

FIRST STOCKS

Assuming everything has been prepared correctly, the aquarium is now ready to accommodate fish. The main problem is that the nitrite content of the water is likely to rise should you add too many fish at once. With Discus it is best to purchase the required number at the same time or within a very short time of each other.

One way round the problem is to try to obtain some biologically active filter medium which should be placed in the filter when the fish are added to the tank. Another is to establish the set-up with some cheaper fish which should be tolerant of Discus conditions and, if they are to inhabit the same aquarium as the Discus, are compatible with them. There are also preparations on the market that are designed to aid the establishment of aerobic bacteria and which can be added prior to purchase of any fish.

The most important part of the exercise is now at hand, the purchase of the Discus. Despite their appeal and the price tag, and even if you can afford it, avoid buying a large pair of fish. Two good reasons are that young fish travel better and more can be purchased. Discus are naturally shoaling fish and the more there are in the aquarium, the happier they will be.

Discus are cichlids, so they quickly establish a pecking order, with the weakest individual being subjected to bullying which will eventually lead to the fish's demise. Removing the weak one will not, however, be of much use, as the others in the tank (assuming there to be a small number) will then turn their attentions on the next weakest, who will be subjected to the same punishment.

Should a fish become ill, it will also be bullied with little respite.

DISCUS TYPES

Discus can be divided into two groups: the wild and the domestic strains.

Wild Species

Specimens from the wild are rarely available as small fishes, and when they are, are quite drab in colour. But they do grow up to make magnificent fishes.

They include the Brown Discus (*Symphysodon aequifasciata axelrodi*), the Blue Discus (*Symphysodon aequifasciata haraldi*) and the Green Discus (*Symphysodon aequifasciata aequifasciata*). The other wild species is the Heckel Discus (*Symphysodon discus*) easily distinguished by its prominent fifth vertical bar. All wild fishes exhibit a wide variation in markings and colour due to geographical distribution.

Domesticated Varieties

The domestic strains are those which have been developed by aquarists and commercial breeders from selected wild fishes. This line breeding has produced the turquoise variants, of which there are many. Solid Tur-

quoise, Brilliant Turquoise and Red Turquoise are the main strains of these, although others are being developed and, indeed, do now exist.

Some Differences

The main difference between these fishes and their wild counterparts is that the domesticated strains are spectacularly coloured even when small and grow up into even more spectacular fishes. They are also available small, usually at a reasonable price (for Discus, that is) making the purchase of a number of individuals a 'non-mortgageable' affair. The time spent growing these fishes to adulthood is also vital, as the aquarist learns to understand the fishes and appreciates them as they develop.

Choosing Discus

Whether wild or domestic, choosing Discus is no different. Always select fishes that are alert and appear to show no fear. Avoid those which hide away or swim separate from the others. Other signs which indicate problems are prolonged dark coloration, fishes swimming in a head-up position, fishes facing the back of the aquarium, i.e. away from the onlooker, and long stringy faeces.

The person selling the Discus should also be able to provide information about their breeding, e.g. whether it is local or otherwise.

GENERAL CARE

Once acquired, the fish should be introduced to their new home with the tank light switched off and water temperature and other conditions balanced gradually.

Do not just tip the fish into the tank. 'Pour' them in, once the temperature has been balanced and tank water has been allowed to mix in gradually with the bag water. Leave the light out for the remainder of the day.

Cardinals can thrive in similar conditions to Discus . . . as long as the Cardinals are not too small and/or the Discus too large.

Feeding

Discus are not fussy feeders and, in fact, a healthy fish will consume a wide variety of food, sometimes even flake food. The main diet should be one of ox/turkey heart foods, either home-made, or one of the proprietary brands available.

As these are frozen, always thaw out before use. A vitamin compound is also useful, either to mix into the food in powder form, or to add to the water as a liquid. Other frozen foods include brine shrimp, bloodworm and Mysis shrimp.

The natural diet of many Discus is, in fact, *Gammarus*, a freshwater shrimp which is abundant in Amazonia. The shrimps are located by the Discus appearing to blow water at the substrate, thus revealing the food. This behaviour can actually be observed in the aquarium as the fish appear to blow food all over the place and then take it in again. Despite the fact that live food is devoured in the wild, resist the temptation to use these foods in the aquarium as there is always a risk of introducing disease.

Health

Apart from the usual aquatic diseases, the main problem with Discus is stress. This can be caused by a variety of factors, including bullying, poor water, incorrect tank location, e.g. too low down, and poor or monotonous diet. It appears that this leads to the fish appearing to lose the will to live, ceasing feeding and becoming listless.

Also, flagellate parasites, whose origin is subject to conjecture, appear to multiply in the intestine of Discus, causing further problems. Always look for long, white, stringy droppings (they should be dark brown to black and break up easily in a healthy fish), prolonged dark coloration and loss of appetite. Seek advice from the source of your fishes if you feel you have a problem but, before doing so, always do a full water test to ascertain if that is the primary cause. Cures are available for the treatment of many Discus problems.

Tankmates

Perhaps the most difficult problem to comment on is the suitability of other fishes for the Discus tank. Indeed, many Discus keepers feel that no other species should be kept with them. These aquarists are meticulous in the keeping of their fishes, quite often maintaining them in 'sterile' set-ups, the tank bottom being void of substrate to facilitate cleaning. Either Curio Wood or terracotta plant pots are, however, introduced to break up the swimming area and provide cover.

For those wishing to add a little extra to the tank, the Cardinal Tetra (*Paracheirodon axelrodi*) is a reasonable choice. Ensure, nonetheless, that they are not too small to be eaten by the Discus.

The Sailfin Plec is a suitable tankmate for Discus, if the aquarium is large enough.

Catfishes as bottom cleaners are quite often desired, but the selection should be researched before purchase. Many *Corydoras* are unsuitable because of their intolerance at high temperatures, although Sterba's Cory (*C. sterbai*) appears to be a possible exception. It is, however, one of the more expensive Corys.

Loricariids (Suckermouth Cats) are also somewhat of a lottery, due to the possibility of large size and their 'JCB-type' habitats. *Pterygoplichthys gibbiceps* (Sailfin Plec) is actually found in similar habitats to Discus, but its large size (18in — 45cm) makes it suitable for only the large aquarium. The Imperial Zebra is tolerant of the Discus conditions and is only a small fish but, again, possesses a high price tag.

Worth trying are the various *Brochis* cats, as these appear to be tolerant of high temperature, are not too large and one, at least *Brochis splendens*, is reasonably priced.

Whichever way Discus are kept, they are very rewarding fish. They soon learn to recognise their owner, becoming tame and feeding out of his/her hand. Eventually, they may even pair off and decide to raise a family, something which is the ultimate dream of many aquarists.

Before just going out and buying, though, take a little time to plan exactly what you want and how you can best provide for your fish. Once the way forward has become clearer, you can go ahead and enjoy keeping Discus. **AAP**

A male Auratus in resplendent coloration.

Blue-tinged mature 'Lombardoi' female.

Although the cichlids discussed in this article have become aquarium favourites, I cannot stress too strongly that they are fishes with specialised requirements and should NEVER be regarded as potential occupants of a general community aquarium. I will therefore start by tackling the basics of their requirements and behaviour.

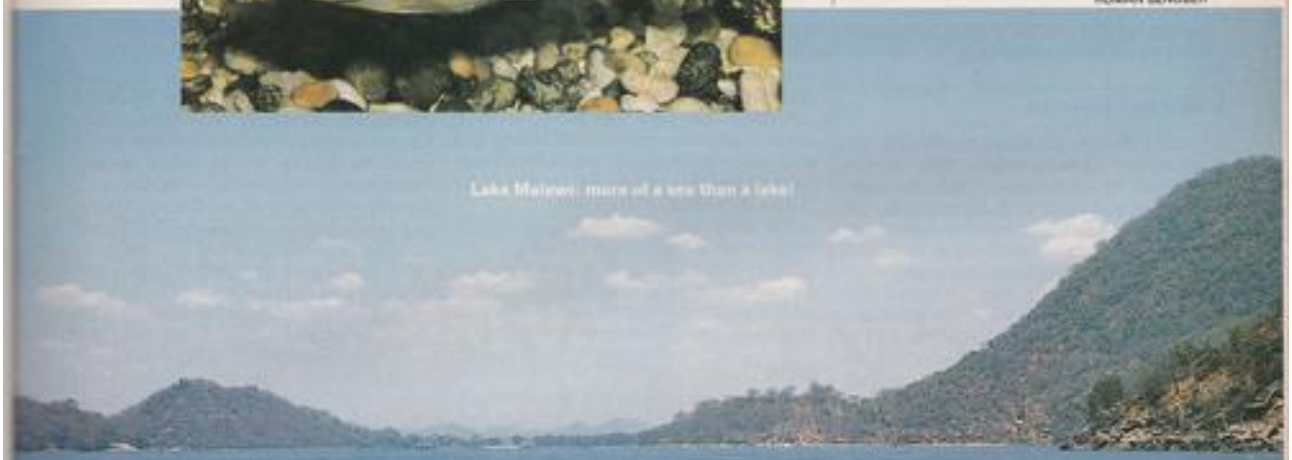
BASIC NEEDS

Lake Tanganyika is extremely hard (15+ dH), with a high pH (8+) i.e. high alkalinity; Lake Malawi is less hard (6-9 dH), but is also alkaline (pH 7.5+). Both are very large bodies of water, more like inland seas, and thus contain extremely pure, highly oxygenated water. The temperature rarely drops below 78°F (25.5°c).

In captivity, hardness has proved unimportant, but an acid pH and/or poor water quality will quickly lead to sick or dead fishes. Without aeration, African Rift Lake Cichlids will gasp at the surface and generally die after a few days. Too low a temperature also means sluggishness and eventual ill-health.

The species which have achieved greatest popularity are from rocky habitats or their vicinity, and require appropriate aquarium

ROMAN SZNOBER



Lake Malawi: more of a sea than a lake!

AFRICAN FAVOURITES

Mary Bailey introduces some of the most popular cichlid species from Lakes Malawi and Tanganyika.

Photographs — unless otherwise indicated — by the author.

A real gem: *Labidochromis caeruleus* female.

The Malawi Blue Dolphin *(Cyrtocara moorii)*.

decor. Some are accomplished diggers, some are naturally vegetarian and are, thus, out of place in the well-planted tank.

Malawi Species

Lake Malawi Cichlids, or Mbuna, are exclusively mouthbrooders; they do not pair, and are not seasonal in their breeding. Males are constantly available to fertilise the eggs of ripe females, and tend to regard their presence in their territories as an invitation to spawn, not taking kindly to refusal.

In nature, females are not forced into proximity with males, but in the aquarium, they have no choice, and this can lead to murder; male competitiveness can also cause problems. The solution to this is to maintain a high, mixed-species population density to reduce territoriality and allow 'under-fishes' of both sexes to lose themselves in the crowd. Even so, a large tank (preferably at least 48in — 120cm) is necessary.

Territoriality and aggressiveness vary from species to species, so it is desirable to mix species of reasonably similar temperament; it is often inadvisable to have more than one male of a species present, unless the tank is extremely large.

Tanganyikan Species

The same principles apply to SOME Tanganyikan mouthbrooders, notably *Tropheus* species, which can be housed successfully with SOME Malawis. But, in general, it is better to maintain fishes from the two lakes separately.

Many of the most popular Tanganyikans are small substrate-spawning rock-dwellers, which require a reasonably sized territory in which to live and breed. They will not find this in a (by normal standards) crowded mouthbrooder aquarium, although many are thus victimised by their owners.

Perhaps 3-4 pairs (at most) of such SMALL substrate spawners can be kept in a 48in tank, but ultimately they do best if kept in single pairs in a tank (at least 24 x 12 x 12in — 60 x 30 x 30cm) of their own.

The maintenance of a mixed Tanganyikan community of substrate spawners and mouthbrooders requires great expertise, especially in choices of species and calculation of population density, and is a project best avoided by the beginner.

Diet

Finally, a word on general considerations of diet. Many East African cichlids are specialised feeders to a greater or lesser extent. Their natural diet should therefore be copied where possible.

They should not be overfed, especially on mammalian proteins and fats; their natural instinct is to feed continuously, which is fine in nature, where the fare is poor quality, but can (and does) lead to gross obesity and degeneration of vital organs in captivity, where the food is richer.

The Malawian Mbuna are particularly prone to this problem. Overfeeding, or a monotonous diet (particularly one of dried food), can also lead to major digestive troubles, including 'Malawi Bloat'.

So, on to the fishes, and first, those from Lake Malawi. I am splitting the fishes of the two lakes for convenience sake, although *some* species from both localities can be kept together.

MALAWIAN SELECTION

Auratus, Kennyi Mbuna and Blue-white Labido

I am going to cheat a little and lump together three species of Mbuna which are particularly commonly available as juveniles, and whose general requirements are the same: the Auratus *(Melanochromis auratus)*, *Pseudotropheus (Maylandia) lombardoi*, occasionally referred to as the Kennyi Mbuna, and *Labidochromis caeruleus*, the (sometimes) so-called Blue-white Labido.

All three are very brightly coloured, even at 1in (2.5cm), can be purchased for the price of a good-quality tetra, and are often found in 'ordinary' aquatic outlets.

Mbuna were the first Malawis imported, remain the most popular, and are probably the most difficult to keep, not in terms of physical requirements, but because of their temperament, which can be extremely murderous. They require huge amounts of rockwork, arranged so as to provide as many caves as possible, and, ideally, extending to near the surface in one or more places so as to break up the line of sight along the tank.

When a female is ripe, she seeks out the male and, after some preliminary courtship, the eggs are laid and fertilised. The female attempts to pick up the 'eggspots' on the male's anal fin, thus taking in sperm to fertilise the eggs in her mouth. After spawning, she is generally best removed to a small tank to brood in peace and quiet, as brooding is physically stressful, especially to the gills, and she may be vulnerable to respiratory distress (possibly fatal) if chased.

Mbuna will eat anything and in quantity, but should be fed plenty of greenstuff and only small amounts of protein-rich foods, as

The Bric — *Neolamprologus brichardi*.

their natural diet is algae and any organisms living in them.

M. auratus was one of the first species imported, is one of the most beautiful, remains very popular, and, in my opinion, should carry a Government health warning! *Melanochromis* (with the exception of *M. johanni*) resent the presence of other individuals with the same longitudinal stripe pattern, and a lot of aquarists have been put off Mbuna permanently by buying them as their first choice.

It is best to have several females and one male, lots of shelter near the top of the tank (where harrassed individuals go to escape), and a larger tank than the recommended Mbuna minimum (48in).

Most books describe males as black with gold stripes, and females/juveniles as gold with black stripes, and this is largely true — but beware of adult females with a reversed colour pattern! The presence (males) or absence (females) of an eggspot is a more reliable indication in fishes of more than say, a measurement of 2in (5cm) Standard Length.

Pt. lombardoi is much less demanding, but equally beautiful, and unusual in that, while in most sexually dimorphic Mbuna, males are blue and females yellow/brown, it has the colours reversed.

Labidochromis caeruleus is an absolute gem; a comparatively recent introduction which is brilliant yellow in colour, with black fin markings. In general, females, even as juveniles, have less black on the anal fin. This species defies the usual Mbuna rules; it is no very territorial, and 2-4 individuals can be kept and bred successfully by themselves in a 30in (75cm) or even a 24in (60cm) tank without much fear of mayhem. It thus offers the chance to try Mbuna and observe the better aspects of their behaviour without the need for huge outlay on fish or equipment. At the same time, it can hold its own in an Mbuna community.

Blue Dolphin

Number two in my Malawian Top of the Pops is *Cyrtocara moorii*, the Malawi Blue Dolphin. In nature, this fish lives among and near rocks, but spends an appreciable amount of time over open sandy substrates. So, like Mbuna, it needs rocks, but not so many, and open spaces as well.

It is far less boisterous than Mbuna, and should not normally be kept with them, unless the tank is very large, offers both rocky and open habitats, and Mbuna represent no more than half the population. Otherwise, it should be kept with other small "Haps" and Aulonocaras (Peacock Cichlids).

Its breeding ritual is similar to that of Mbuna, but it is not essential to segregate brooding females. Juveniles are silvery, with blackish markings, but the appearance of adults is so well known that this muted colour is no bar to impulse purchase.

Males are larger than females, which tend to retain some of the black juvenile markings, but it is not always easy to sex young adults. This species feeds largely on aquatic organisms, so pond foods should form at least part of its diet.

Peacocks

Third is the fish generally known as "*Aulonocara nyassae*" (though it is not actually that species) or as the Peacock Cichlid or Kaiser (the German for "Emperor"). It requires the same habitat as the Blue Dolphin, has a similar temperament, and the same warning about mixing with Mbuna applies, only more so.

Adults are easily sexed: males are extremely colourful and females/juveniles plant. This species can be mixed with other Aulonocaras, but these should be of totally different appearance to avoid mix-ups — the females of similar species look practically identical and both aquarist and fishes may have identity crises!

Aulonocaras are notable for having enlarged sensory pores on the head (not to be confused with Hole-in-Head Disease), enabling them to employ a sort of sonar to locate invertebrates in the substrate. They will sift the substrate, which should therefore be fine-grained, and aquatic invertebrates (*Daphnia*, mosquito larvae, etc) should form the bulk of their diet.

TANGANYIKAN SECTION
Fairies

Probably the most widely kept Tanganyikan cichlid is *Neolamprologus brichardi*, sometimes called the Princess of Burundi or Fairy Cichlid (Yuk!), but more frequently referred to by its owners as The Bric.

It is not striking in its coloration, but its form is most attractive, and its behaviour extremely interesting: juveniles of previous broods look after new fry, leaving the parents free to live a life of ideal luxury.

It can often be difficult to start pairs breeding, as they seem to require the presence of juveniles as a trigger (no problem in the wild, where the species live in colonies); the addition of a few ½in (c 1.3in) fry usually does the trick.

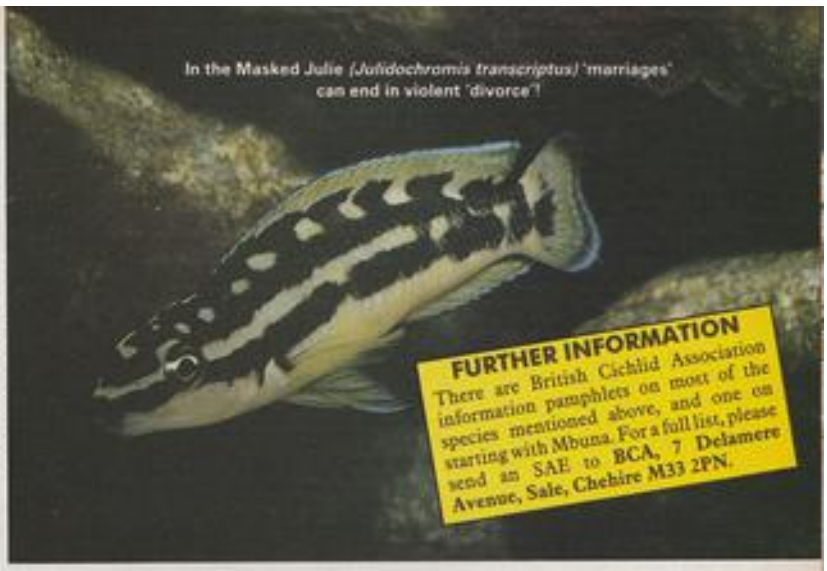
The Bric is a cichlid of rocky habitats but, after 20 years or more of captive breeding, will make do with a flowerpot or two. I prefer to see them with rocks. They are vigorous in defence of their young, but rarely harm other fishes if there is ample space for the latter to get away.

They may not be as well-disposed towards other *brichardi* though, including their own offspring once these measure more than 1in

Top, Peacocks (*Aulonocara* species — this *A.* Peacock Red was developed by Florida Exotic Fish Sales) are medium-sized substrate feeders.

Centre, Frontosa has become a 'cult' fish.

Above, *Tropheus* species (this is a *T. duboisi* Yellow-band female) are popular but not always easy to track down.



In the Masked Julie (*Julidochromis transcriptus*) 'marriages' can end in violent 'divorce'!

FURTHER INFORMATION

There are British Cichlid Association information pamphlets on most of the species mentioned above, and one on starting with Mbuna. For a full list, please send an SAE to **BCA, 7 Delamere Avenue, Sale, Cheshire M33 2PN.**

(2.5cm) and require at least 24in (60cm) of tank length per pair.

The natural diet of the species is aquatic invertebrates. It is also a fish that is readily and cheaply available but, at least to the inexperienced eye, difficult to sex.

Recently a close relative, *N.* species "Daffodil" (from its yellow coloration) has also become very popular and fairly readily available.

Frontosa

Cyphotilapia frontosa is perhaps the best known Tanganyikan, and has become a bit of a 'cult' fish. Because of this, and because it is not often bred, both juveniles and adults tend to be expensive — and there are plenty of people queueing to pay high prices. At the risk of upsetting its fans, I have to say that, while it is striking in appearance, it doesn't do much apart from sit in caves!

Many people do not realise that Frontosa ultimately grows to 10in (25cm) or so (females smaller), and will eat smaller fishes. It is, however, omnivorous, and has been reported as exploiting domestic rubbish thrown in the lake, with a resulting population explosion.

In captivity, juveniles are greedy and will eat anything, while adults tend to be fussy, or lazy feeders, refusing anything that requires chewing.

There are several different forms of this mouthbrooder known from different areas, and these should not be interbred.

Tropheus

It is difficult to discuss popular Tanganyikans without mentioning *Tropheus*, as these are very popular with enthusiasts, but not often available as juveniles, as broods are small (10 is huge) and usually snapped up by friends of the breeder. They are also quite difficult to breed because of intra-specific (within-species) aggression, and because the first few clutches often come to nothing.

Their habitat, diet and general habits are very similar to those of Mbuna, with which they can be kept successfully — a remarkable piece of convergent evolution, as they are quite unrelated (apart from being cichlids!).

Julies

No article on Tanganyikans can ignore the Julies, but it is impossible to say which of the three small ones (*Julidochromis ornatus, transcriptus* or *dickfeldi*) is most popular; after 21 years as the British Cichlid Association logo, *J. ornatus* is probably the best known.

As their habits and availability are similar, I will generalise; and what applies to these small species (up to 2.5in — 6.4cm) also applies in most respects to the rather larger Marlier's Julie (*marlieri*) and the Striped Julie (*regani*), which are proportionately more aggressive and require more space.

Julies are particularly fussy about water conditions, and have a decided preference for their natural diet of aquatic invertebrates.

Their natural habitat is tiny crevices in rocky areas, and they can swim on their sides and upside down in order to utilise holes which other fishes cannot penetrate — and backwards to get out again! You will hardly ever see a Julie with its belly more than ¼in (0.6cm) from a substrate of some kind, be it vertical or horizontal.

The fish are easily sexed in that males always have the genital papilla exposed (but close to a substrate, so not always visible). Despite this it is best to start with several juveniles and offer a free-choice situation, as the major problem with 'made' marriages anmd Julie pairings in general) a 'divorce' if any disturbance occurs, divorce usually being synonymous with murder.

Feminists will be pleased to hear that it is usually the male that suffers. Although males are eventually the larger, females grow faster and are the dominant partner.

Adults, or paired juveniles, will not tolerate the presence of other Julies of any species in their tank, but are peaceful towards other fishes. They may produce fry by 'trickle spawning': a few every couple of days, or in a large brood like other cichlids.

Julies are becoming increasingly available in the shops, but, like *Tropheus*, are often sold by the breeder direct to other queueing hobbyists. With patience and meticulous attention to detail, there is no reason why anyone should not succeed with them on their own in a 24in (60cm) tank, or in a larger tank with 'Brics' and other similar species.

Of course there are many many more species from both lakes, some of them almost as well known and popular as those touched on above; East Africa is one area where we are certainly spoiled for choice. **AMP**

TOP CATS

Our **Tomorrow's Aquarist** regular, and catfish fanatic, **Gina Sandford,** takes us on a guided tour of the best-known and best-loved catfish for community and single-species aquaria.

Photographs — unless otherwise indicated — by Mike Sandford.

The Bronze Catfish is the most popular choice of all, either in its original form, or as albinos.

Whatever type of fish you favour, it is almost inevitable that, at some stage or other in your fishkeeping career, you will have kept at least one catfish. The diversity of this group is such that there is something for everyone. They range from the small Suckermouths Loricariids) such as the *Otocinclus* species, to the large Pims (Pimelodids), of which the infamous Red-tail *(Phractocephalus hemioliopterus)* is but one example.

In order to try to ascertain what are the most popular catfishes, I decided not to rely on my personal preferences, but to go back through my correspondence and see which groups were asked about the most. The fact that *Corydoras* and the Red Tail came out way in front was no surprise. So, let's take a closer look at these ever-popular beasties.

Most of them, with the exception of the Red Tail, can be kept in a community aquarium with a temperature of, say, 21-25°C (70-77°F) and average water conditions; that is, avoid extremes of acidity, alkalinity and hardness.

THE CORYS

There are some 100-plus species of *Corydoras*, many of which are bred commercially and are readily available in the trade. You just have to look in your dealer's tanks and there will be some Corys lurking around somewhere. The Bronze Catfish *(C. aeneus)* — both the albino and standard form — and the Peppered Cat *(C. paleatus)* have always been available and, for many people, they are the first Corys they encounter as cleaner fish for the aquarium.

As a point of interest, the Peppered Catfish was discovered about 150 years ago by Charles Darwin on the voyage of HMS Beagle.

Armour Plating and Spines

These well armoured, South American catfishes have two rows of overlapping plates along their flanks. This affords them protection, not only against predators, but also against desiccation, should their streams or pools dry out, or, for that matter, should they jump out of the aquarium.

Head shapes vary from species to species, some having a rounded snout, others an elongated one. There are two pairs of barbels and, when feeding, these are pushed forward into the substrate. The dorsal (back) and pectoral (chest) fins have stout fin spines which can be locked into position, the adipose ('second' dorsal) fin also has a movable spine in front of a flap of skin. The eyes are movable and often give the impression that the fish is winking at you.

Corydoras are able to survive in oxygen-deficient waters by taking air at the surface and passing it into their gut, where the oxygen is absorbed. This can be witnessed in the aquarium as the fish are seen to dash to the surface for air.

Aquarium Care

Corys are gregarious fishes that are found in large shoals, often containing several species. In captivity, it is best to keep them in groups. As the majority of these fishes spend most of their time on the substrate, it is wise to ensure that there are no sharp edges to the sand or gravel used, otherwise damage will occur to the delicate barbels as the fishes dig for food. This can result in total erosion of the barbels and/or bacterial infections.

However there are one or two, such as the 'pygmy' *C. pygmaeus* and *C. hastatus* which spend much of their time swimming in mid-water.

Plants are beneficial in the Cory aquarium, their leaves providing shelter and security.

The natural foods are small insect larvae and worms which they sift from the substrate. They will take flake and pelleted foods but the inclusion of live and/or frozen foods such as *Daphnia*, *Tubifex* and Bloodworm are essential, especially if you wish to try to breed them.

Breeding

Many species have now been bred in the aquarium. Sexing is relatively simple. Males are slimmer than females when viewed from above, especially when the females are heavy with roe. The ventral (pelvic) fins of males are longer and more pointed than those of the female. In some species, such as *C. barbatus*, the males have cheek bristles and extended finnage, whereas the females do not.

Sometimes, it can be difficult to distinguish the sexes. In such cases, a shoal of half a dozen or so fish should be purchased and they can then pair them off naturally.

Courtship can be prolonged, males following the females around the aquarium. Eventually, a spawning site is cleaned and the pair

HARRY GHER/FLORIDA TROPICAL FISH FARMS ASSOCIATION

There are many different species referred to as Plecs or Plecos. All are attractive and interesting but may grow too big for most home 'community' aquaria.

Beautiful, particularly when in a shoal, this is the Glass Catfish.

Whiptail Catfish are ideal community aquarium fish.

usually adopt a 'T' formation. The eggs are released into the pouch formed by the female's ventral fins and she deposits them on the cleaned spawning site.

There is debate as to when the eggs are fertilised; some say during or just after the 'T' formation, others that sperm is taken into the mouth of the female and smeared onto the eggs. Depending on species and temperature, the eggs hatch in 3-10 days. Infusoria and newly hatched brine shrimp make excellent first foods (See also **Derek Lambert's** article on Corys in the September issue of *A & P*).

OTOS, WHIPS, BRISTLES AND PLECS

The Loricariidae, is another large family of South American armoured catfishes, but they have three rows of plates along their flanks.

Well known as algae eaters, they are frequently purchased to rid an aquarium of this unwanted green slime. However, Loricariids do require additional quantities of vegetable matter in their diet, and this can take the form of lettuce, peas, spinach, potato, courgettes, etc.

Omega-Eyed Depressed Fish

All species inhabit shallow waters where algae grow in abundance, and have developed an eye lobe which is brought down to protect the eye when the fish are feeding in bright sunlight. This gives the appearance of the omega-shaped eye but, if you see the same fish after dark, the lobe is retracted to enable it to utilise any light that is available. At such times, the eye becomes a normal shape.

Most Loricariids are depressed, that is, flattened from top to bottom. The pectoral fins are horizontal and the fish have a sucker mouth. This type of mouth enables them to hold station in fast-flowing waters, while the water passing over the depressed body and spread-out pectoral fins presses it close to the substrate, thus also helping to prevent the fish from being swept away.

Plecos

The most well-known species has to be the Plec or Pleco, *Hypostomus plecostomus*. Now being bred commercially, this fish is offered for sale at about 10cm (4in) in length and, at this size, is admirably suited to the community aquarium.

However, it soon outgrows its welcome and, at about 20cm (8in), can become quite boisterous. It is then suited to keeping with a community of larger fishes, especially cichlids and large cyprinids, particularly as full-grown Plecs can reach some 30cm (12in) in length or more.

Bristlenoses

Often confused with the Plecs are the Bristlenoses (*Ancistrus* spp). These creatures are much smaller and suited to the larger community aquarium, where they will often breed. Males are characterised by the abundance of 'bristles' around the mouth and on the snout; females have tiny bristles around the very edge of the snout.

Widespread throughout South America, these cats inhabit streams and rivers where they graze on algae, plants and fruits, as well as taking the small invertebrates found in the algae.

Bristlenoses are bred commercially. Indeed, they will often spawn in the community tank, and the first the aquarist will know about it is when the youngsters appear at about 10 days old. The amber eggs are laid in clusters in hollows in bog wood or in caves, and are guarded by the male until they hatch. He continues to care for the brood until they are about 10 days old. To ensure healthy fry, provide plenty of green foods, such as lettuce and peas.

Whiptails

Coming down again in size, there are the Whiptails (*Rineloricaria* spp and *Loricaria* spp). These are elongate fishes which are ideal for the community aquarium, where they spend much of their time resting among the plants. Males and females can be distinguished easily during the breeding season, as the males develop cheek bristles.

The eggs from these cats are usually green and will be laid on plants or on the aquarium glass, although much success has been achieved by providing the pair with a length of plastic drainpipe in which to spawn. Whiptails seem to prefer cooler conditions and well-oxygenated water. Feeding is simple; plenty of green foods and they will leave your aquarium plants alone. They will also take flake, tablet, frozen and live foods.

Otos

The smallest of the Suckermouth Cats are the *Otocinclus* and *Parotocinclus* species which only grow to about 5cm (2in). Both are easy to keep, provided the water quality is good. The aquarium should be well matured before attempting to keep these fish, though.

As with the other Loricariids, plenty of green foods are required, but Otos also take small invertebrates such as *Daphnia*. Some species have been bred, and the eggs are laid on plants.

In the aquarium, they spend much time in among the plants and are particularly fond of resting near the spray return from the power filter.

MIDWATER SWIMMERS

Whenever you think about midwater shoaling fishes for the aquarium, the first that come to mind are the tetras and barbs, but what about the midwater shoaling catfish? The diversity of catfish is such that there is one to fill just about every niche you can think of.

Glass Cats

The Glass Catfish, *Kryptopterus bichirrhis*, is an Asian catfish which grows to about 10cm (4in) in the wild, but rarely attains this length in captivity. Most people tend to shy away from it, as it can be difficult to acclimatise but, if you have a mature aquarium, it should pose no problems, as it is not too fussy about water conditions, as long as extremes of pH (acidity/alkalinity) and dH (hardness) are avoided.

Upside-down Catfish *(Synodontis nigriventris)*... doing what Upside-down Catfish do best!

Being a midwater fish, the body of *Kryptopterus* is laterally compressed, that is, flattened from side to side, thus allowing it to swim easily. When at rest, the fish hang at an angle in the water, with their head up. However, when swimming, the water passing over the long-based anal fin gives lift to the body and the fish appear horizontal. Take a look at the accompanying photograph and you can see whether the photographer took the fish at rest or on the move! The internal organs, spinal column and fin rays can be clearly seen through the transparent body.

An insectivore, the Glass Cat thrives on a diet of live foods and, if this is supplied, it will develop a wonderful iridescent sheen on its transparent body. Do, however, watch out if you have small fry in the aquarium, as it is not averse to eating them.

Glass Catfish are egglayers which scatter their eggs over plants. Although this has been observed several times in the aquarium, only one report states that any fry were forthcoming, and this gives no detail, other than two fry were found. Want a challenge?

Too large for most aquaria, the Red-Tail Cat is, nevertheless, a most attractive species.

Debauwis

Another midwater dweller comes from Africa. It is the small, 7cm (2.75in) Debauwi Cat *(Eutropiellus debauwi)*, a graceful fish which must be kept in a shoal, as lone specimens tend to pine away and eventually die. They require a medium to large community aquarium and a good filtration system that provides a through-flow of water because they are active swimmers which are always on the move.

Debauwis are attractive fishes, the dark lines along the body becoming almost navy blue with an iridescent sheen on good specimens. In captivity, they eventually adapt well to aquarium life, but may take several months to settle. During this time, a diet of live foods seems to help settle them, but once this is achieved, they will take all the normal aquarium fish foods.

Personal experience has proved it is possible to breed them. Males are more intensely coloured, smaller and more slender than females when they are ready to spawn. The fish spawn in a shoal, pairs breaking away and shimmying together over clumps of fine-leaved plants where the clouds of eggs and milt are released.

I found that the fish could be induced to spawn by a water change. The only problem was rearing the young; eggs could not be saved as there were other fishes in the aquarium and, when the adults were removed to spawn elsewhere, they declined to do so. I guess it's a case of keep trying!

NOVELTY ANGLE (SYNOS)

Synodontis nigriventris, the Upside-down Catfish, has to be one of the all-time favourites, just because of its habit of swimming upside down for most of the time. It is also one of the few *Synodontis* that are suited to a community aquarium, reaching only 10cm (4in) when fully grown. Its only drawback is that it is fond of eating the odd small Neon Tetra if the opportunity arises!

Best kept in a small shoal, Upside-down Catfish are very active, but if kept as a solitary specimen, they are shy and retiring. To overcome this, float a piece of cork bark, or some floating plants, on the water and the fish will rest inverted beneath it during the day, dashing out to feed if the opportunity arises.

These cats are mottled brown in colour and, interestingly, exhibit countershading: the belly is much darker than the back so that, when swimming inverted, they retain a degree of camouflage.

The diet is mainly insect larvae and terrestrial insects that they take from the water surface. In captivity, they will take flake, frozen and live foods.

One of the few *Synodontis* to have been bred in captivity, males are reported to be slimmer than females. They are also said to spawn in depressions in the substrate, with the parents tending the eggs and fry.

TOO BIG TO HANDLE

There is a great deal of debate about whether or not large catfish should be kept by hobbyists, and I must admit I don't think I could cope with one. In order to keep them in the manner they deserve requires dedication, determination and a large bank balance capable of buying the right sized aquarium, filtration system and paying the feed bills!

Red-tail Cats

The Red-tail Catfish *(Phractocephalus hemiliopterus)* is the most popular of all the large cats.

This 1.5m (5ft) giant is found in the Amazon and Orinoco drainages.

Its dramatic coloration makes it highly desirable, the black back contrasting well with the creamy white lower flanks and belly, while the red or red/orange tail adds a degree of colour that is rare among the catfish.

Red-tails are often offered for sale as small specimens about 15cm (6in) in length, and many people have bought them thinking that they will only grow to the size of the aquarium. How wrong can we be?

Phractocephalus hemiliopterus has a rapid growth rate and a large appetite. In the wild, they feed on crustaceans, such as crabs, but in the aquarium, they will avidly take strips of fish, prawns, etc, but care should be exercised not to overfeed them, or they will become obese.

Water quality is all-important to maintain these fish in good health. Any build-up of nitrite or ammonia will lead to the fish shedding its body mucus, degeneration of the barbels or (especially in young specimens), the fish hanging at the surface. They are also intolerant of large water changes, and a 10% change, using aged water, is the maximum that should be carried out at any one time.

There is also much debate as to whether these fish should be kept as single specimens or with their own kind or other fishes. It would appear that in the confines of a small aquarium, a single specimen is the answer. However, if size permits, two or three can be kept in the same tank, if they are allowed to grow up together.

Likewise, if there is sufficient space, they can be kept with other fishes if all the fish are allowed to grow up together. If you decide to take on one or more of these creatures, bear in mind we are talking of providing aquaria in excess of 2m x 1m x 1m (6.5ft x 39 x 39in) for even a partially grown specimen so, before you buy one, think carefully!

KOI CONCRETE POND CONSTRUCTION PART 2

Is Your Design all it's Cracked Up to be?

Peter Skinner of Koi Kraft completes his two-part guide.
Photographs by the author

So you are going to build a concrete pond, are you? Making that decision wasn't difficult, was it? To those uninitiated to the world of pond building, it all seems straightforward, but this first decision is the easiest of many subsequent brainteasers. How deep, how thick, what mix, how much reinforcing, how do you make it smooth, how do you seal it, etc? If you wish to make a success of your pond, these things need very careful consideration beforehand.

Two widely available and popular sealing compounds.

BLOCKS

For very large or elaborate ponds, it is usual to erect shuttering to create a mould into which concrete is poured to form the walls. This method, however, is expensive and not something the amateur should attempt, although it is a good construction technique.

For most ponds, though, the walls should be constructed using blocks. There are several types of blocks available and care should be taken to choose the right types. Soft blocks, such as Thermalite or Durite, are best avoided because they will not last in the ground and are not sufficiently strong for pond building purposes.

Solid concrete blocks are suitable for small to medium sized ponds, but it must be remembered that although the blocks themselves are very strong, the integrity of the structure is determined by the mortar bond between the blocks.

Since the surfaces of these blocks have no key, frog (indentation) or holes, the mortar relies for adhesion on the fact that the surfaces of the blocks are rough. Although this will give a certain amount of strength, it must be remembered that the forces involved in a large pond may just be too much and structural failure could occur. For this reason, 9 x 9 x 18in (23 x 23 x 45cm) hollow concrete blocks are best, because the hollow flutes of the blocks line up vertically as the blocks are laid. These columns can be filled with concrete which will make the wall very strong indeed.

Three types of concrete blocks suitable for pond and filter construction.

Many Koi ponds will have curved sides which, although perhaps aesthetically pleasing for the finished product, may make construction a little more difficult. If the walls are to be built with blocks, there will be a minimum radius that can be achieved before the strength of the wall is compromised, since your curve will be stepped, rather than constant. This obviously reduces the surface contact area between the blocks, not to mention the extra difficulty of laying blocks this way.

If you therefore have any tight curves, it is preferable to construct these with ordinary bricks or to erect shuttering and then form the curve with poured concrete.

In cases where blocks are used to form a curve, the inside surface of the blocks will not be smooth enough to accept a render. To rectify this, the low points should be filled with mortar the day before the final render is to be applied. Also, any sharp corners, such as where the wall meets the pond base, should be rounded with a fillet. Not only will this make it easier to apply the final coating, but it will also make the pond look more professional.

SPRAYING

The construction methods suggested above are suitable for ponds of almost any size, but for large ponds, there is another option for creating a structure. This is where concrete is sprayed directly onto the excavation and the thickness is built up gradually until the required strength is achieved.

With this method, it is necessary to have first positioned the steel reinforcing so that you have one complete monocoque structure which is immensely strong.

The only significant drawback with this system is that you need to have a sufficiently large area to concrete to justify the cost of bringing in the machinery, although there will be considerable labour savings because the whole concreting job will be done in a day.

RENDERING

Once the inside of the pond is fairly smooth, it is then ready to accept the render coat. This is simply an application of sand and cement to make the surface smooth enough to accept the pond paint.

If only sand and cement are used, the strongest mix that can be employed is about four parts of sand to one of cement. If you use more cement than this, it is highly likely that the rendering will crack because it will shrink as it dries.

Ideally, if you are going to paint the pond, the stronger the mix the better because this will prevent 'dusting' as you paint it. A way of increasing the strength of the mix, and also the durability of the finished coating, is to add special glass fibres to the mix (Fibromix or Fibrin). With this, the mix ratio can be as strong as two parts sand to one of cement. One extra benefit, particularly to the amateur plasterer, is that the use of this material makes it much easier to apply to a vertical wall than a standard mix.

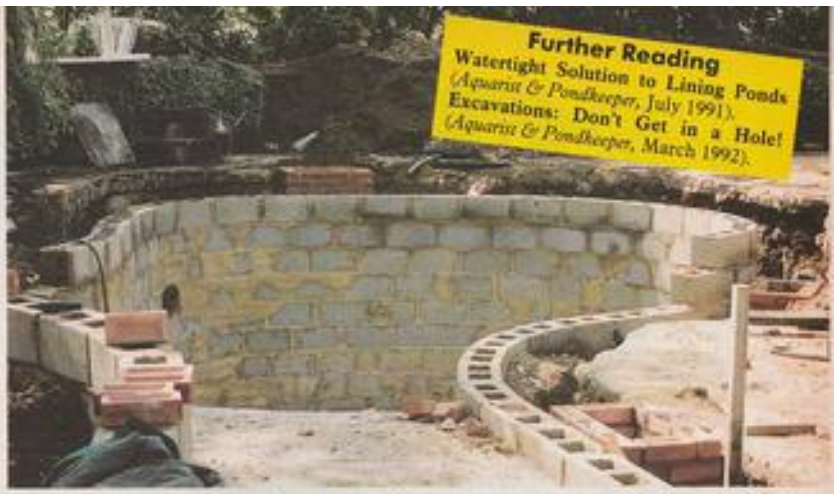
As with all renders, it is vital that it is not applied in direct hot sun, otherwise it will dry out almost as you apply it. This does not allow the proper chemical reaction of the setting cement and so the coating will not be successful. One other tip is to wet a block wall before the render is applied as this will make the render bind to the wall more effectively.

If glass fibres are used in the rendering, it is important that any surface or protruding fibres are burnt off with a blowtorch before the application of the pond paint. If this is not done, the paint will solidify around the fibres and form needle-like protruberances which can cause severe injury to a fish.

SEALING

Once the concrete structure has been finished, it must be sealed on the inside so that the chemical constituents of the concrete do not affect the chemistry of the water. If this is not done, the consequences may be harmful to the fish, since if cement comes into contact with the water, it will raise the pH dramatically.

In fact, only really well built concrete ponds would hold water without being sealed anyway, so it is essential that the coating is applied evenly and without faults; otherwise, water will be lost.



Further Reading

Watertight Solution to Lining Ponds (*Aquarist & Pondkeeper*, July 1991).

Excavations: Don't Get in a Hole! (*Aquarist & Pondkeeper*, March 1992).

A well-built 'contoured' block-walled Koi pool.

COATING

The main factors affecting choice of coating will be either cost, or simplicity of application. Products such as G4 or Pondseal are very easy to apply and have a good life expectancy. The cost of these products usually works out to be fractionally higher than that of a good-quality pond liner.

The alternative is GRP. The application of GRP is more difficult and messy than the one-part paints. You have to work very carefully and methodically, otherwise you will get in a mess and the quality of the coating will be poor. Many people choose to employ contractors to coat the pond with this product.

If the job is done well, then the pond should be watertight for decades. GRP is so strong that it is resistant to damage and cracking.

My advice to anyone considering the construction of a large pond using concrete as the primary material is: take your time and do it properly. Cutting corners is false economy because the time and effort employed in trying to repair a cracked pond contributes little to the fun of Koi keeping.

BEWARE

If you ever order ready-mixed concrete when the temperature is in the upper eighties Fahrenheit, and you know that the concrete lorry is coming a fair distance, you had better be ready for it, because the combination of the high air temperature and the exothermic chemical reaction which will have started within the mix will mean that the concrete will be very warm. If it is warm, the mix will be workable only for a matter of minutes before it starts to go off.

I mention this only because I know someone who has an extremely weird shaped pond because he thought he would have a tea break rather than spread the concrete evenly over the base of his pond as it was delivered. Still, I expect the unusually contoured pond is less boring for the fish! AMP

This is Fibromix. These glass fibres are mixed evenly in the rendering to help prevent cracks forming.

SEAVIEW

By Gordon Kay

This month's **Seaview** is given over to just two items — both, in my opinion, exciting. So let's get into it.

GREAT NEW TECHNOLOGY

First, some news of a range of aquarium technology.

Those among you who keep the 'miniature reef' type of aquarium will be aware of the term *Redox Potential*. In simple language, this is the measure of the aquarium water's potential to oxidise waste.

I have written about Redox Potential before on this page, and regular readers will remember that the potential for oxidation differs from aquarium to aquarium, depending on factors such as stocking levels, flow-rates and feeding levels.

Redox Potentials below 300 mV are too low and organic waste will accumulate. Levels above 400 mV can be dangerous — especially for reef aquariums with invertebrates. The optimum Redox Potential level is between 300 and 400 mV, with the upper levels being recommended by many writers.

At these levels, there will be little, if any, waste accumulation. These optimum levels can be more easily obtained with the application of ozone — an unstable molecule consisting of a combination of three oxygen atoms, which is a strong oxidiser.

All this brings me to the point of this item — the new range of Redox controllers and ozonisers from **Red Sea Fish Pharm Ltd.**

① Ozoniser

Ozone 2000, the manufacturers claim, provides a trouble-free ozone supply, without the need for an air dryer. There are two units to choose from, each producing a variable output up to either 50 or 100 mg/hr. They are compatible with all Redox controllers.

② Ozoniser/Redox Unit

The product I particularly like is the **Redox Plus.** This is a fully adjustable 200 mg/hr ozoniser combined with a Redox controller. The controller has a built-in digital display which is easily read *and* the unit constantly measures the Redox value — switching the ozoniser on and off as required, until the desired level is reached.

Both of the above products have 'ozone-safe' check valves and fan-cooled housing. They also have on/off switches. In my view, this is 'serious' kit. The units are cleverly designed and extremely well made.

CORAL REEF TECHNOLOGY

Ozone and Redox . . . all in one unit.

③ Wavemaker

Wavemaster is a 3-powerhead control system which is designed especially for reef aquariums. This unit will stimulate the ever-changing water currents found on a coral reef. Wavemaster creates randomly-flowing water currents which are indistinguishable from the natural environment.

Currents are produced for a few minutes, then the unit will change the flow again, while sometimes, a period of quiet will occur, replicating almost exactly what happens on a coral reef. Up to three powerheads can be used at the same time, operating automatically. The unit has a 'soft start' in order to protect the powerheads and also incorporates an on/off switch to facilitate feeding. Once again, this is a wonderfully designed and made unit, offering great advantages for the reef aquarium keeper.

All three units discussed above should be available now, but should you encounter any problems, then you can contact the importers and distributors, **Coral Reef Technology Ltd, 62 High Road, Byfleet, Surrey KT14 7QL. Tel: 0932 355121.**

CONSERVATION AND THE AQUARIST

I've just discovered a new Society — **The Aquatic Conservation Network,** which is a Canadian Registered Charity. To tell you about the movement and its aims, I could do a lot worse than simply to quote the sentence which is printed at the top of every page of their journal. It reads: "Aquarists dedicated to the preservation of aquatic life" and that's exactly what the Society is, conservation from an aquarium viewpoint.

There is a quarterly bulletin called, appropriately enough, *Aquatic Survival,* which is full of good, well reasoned and presented stuff on all types of aquarium animals.

In the issue before the one I saw lately, there had been a paper by **Jaime Baquero** — a name I haven't heard before — called **How Environmentally Friendly is the Marine Aquarium Hobby?**

The more recent issue carried a reply by **Frank Greco,** a man who's work is well known to me. Frank is a professional aquarist with the Aquarium for Wildlife Conservation in New York and has done much good work over the years. I remember him well from our mutual involvement with the British Marine Aquarist Association.

The article by Jaime Baquero had, not surprisingly, questioned the ethics of the marine aquarium hobby and its impact on the world's reefs. While agreeing with much of the article, Frank Greco raised several well considered arguments and points of his own — some of which I agreed with completely; others I would, well, question.

For instance, on the issue of sodium cyanide, Frank states that while he acknowledges that this fishing method does contribute to reef degradation and must be stopped, he doubts that its contribution to wholesale reef destruction is all that significant.

Damaging Influences

Activities such as deforestation, dynamite fishing, muro-ami (a method of catching food fish in the Philippines, where young boys drop rocks onto the reef from the water's surface to scare fishes into a huge net) and agricultural fertiliser use, were doing far more damage than catching fish with cyanide.

This statement is true — totally and undeniably true — but, as I've said many times before, the use of cyanide to catch fish is, apart from being unnecessary and dangerous for the fishermen, one of the many pieces in the reef destruction jig-saw. They *all* need to be stamped out if the world is to save one of its most precious resources. Apart from that, how can we, as aquarists, point at all these other factors when we allow the use of sodium cyanide to continue?

While I cannot, of course, comment on every part of the article here (it was, after all, 4½ pages long), mention should be made of a couple of points. Frank lists a few fish species which should be avoided in the aquarium. He does this to enforce his point that most Butterfly and Angelfish species are successfully kept in captivity.

The thing is, that the list, in my opinion, is too long. He

CORAL WORLD ECLAT

The Lemonpeel Butterfly: challenging, yes; impossible, no!

lists Regal Angel (*Pygoplites diacanthus*) and Coral Beauty (*Holacanthus tricolor*) among the Angels, and the Lemonpeel Butterfly (*Chaetodon semilarvatus*) among the Butterfly species, as being unsuitable for the aquarium.

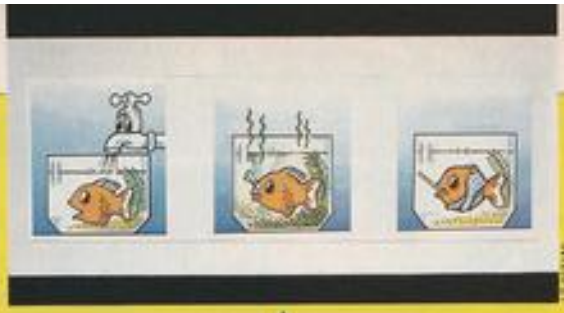
All three of these species are well established aquarium subjects, which live for many years in the care of experienced aquarists. He does, however, make the point that poor diet and overfeeding cause a lot more fish mortalities than can be counted and that incompatibility also plays its part. He also reminds us that a little homework would put the latter right. Bravo to all that!

The best way to find out more is to join the **Aquatic Conservation Network.** Their address is **540 Roosevelt Avenue, Ottawa, Ontario, Canada K2A 1ZE. Membership is $25.**

"You know, you've really got a sick sense of humour!"

PRODUCT ROUND-UP

BY DICK MILLS



Catching 'Em Young

As the early bird catches the worm, so **INTERPET** hope to capture the young aquarist's attention with a new range of 'SAFE' products, known as the Interpet GOLD RANGE.

Realising that children keep the most Goldfish and that, at their tender young ages, appreciation of fishes' health needs is not high (nor perhaps even considered), the new products are aimed at both ease of use, and ease of understanding, to enable Goldfish to live longer, avoiding early disappointing fish losses and, even more significantly, keeping the youngsters in the hobby to become established fishkeepers.

The SAFE range includes TAP SAFE, FISH SAFE and DISEASE SAFE. Tap Safe is an anti-chlorine water treatment designed for use at every weekly water change, and is similar to the company's already tried and tested FRESH START. Fish Safe breaks down ammonia and acts as a general tonic; Disease Safe is a broad-based treatment to combat the more common fish ailments.

Every product in the Gold Range includes a 12-page illustrated leaflet specifically designed to be understood by everyone; it covers basic fish needs and fish tank maintenance as well as outlining how, and when, the product should be used.

At around £1.50 each, is quite within the 'pocket-money' range of most children who can now take on their own responsibility for keeping their fish healthy and, let's face it, they can usually understand instruction manuals far more quickly than their parents anyway!

Not quite shutting the stable door once the horse has gone, Interpet have also just released a FREE full-colour DL-sized leaflet *The Complete Programme For Trouble-free Pond Care*. If you've been bothered by the dreaded twosome, green water and Blanketweed, this past summer, then studying this leaflet (which, in addition to dealing with these two menaces, also covers regular pond maintenance, treatments for diseases, feeding and ornamentation information too) will set you up for next year's summer problems — should we get some prolonged sun, that is.

Available from your aquatic dealer or direct from: **INTERPET LTD, Vincent Lane, Dorking, Surrey RH4 3YX. Tel: 0306 881033; Fax: 0306 885009.**

Nothing Like a Free Plug!

To put it another way, this is a plug for a plug. To support the aquatic trade in meeting new safety legislations to be introduced shortly, **ARMITAGES** are fitting three-amp, fused plugs on their range of NIMROD ADJUSTABLE THERMOSTATIC HEATERS free of charge.

The five heaters in the range come in 75, 100, 150, 200 and 300 watt sizes and are fitted with (unique to Armitages, it is believed) pure silver electrical contacts. These provide far higher standards of reliability than silver-plated or copper contacts and help to eliminate burning or pitting due to poor connections.

The units are adjustable between 22-32°C (c 71.5-90°F), are guaranteed for 12 months and come with a comprehensive instruction leaflet. Colour-coded window cartons make for easy identification of size.

Details from: **ARMITAGE BROS LTD, Armitage House, Mile End Road/Road Number 3, Colwick Industrial Estate, Nottingham NG4 2BA. Tel: 0602 614984; Fax: 0602 617496.**

Repairs At The Speed Of Light!

When you want something fixed, you usually want it done as soon as possible. A new patching (or general repair) material, POLIFLEXSOL, from **GARRARD POLIFLEXSOL**, not only seems suitable for a multitude of applications, but also works fast: from a few seconds up to 24 hours if required.

The secret behind the material's amazing capabilities is ultra-violet light. All the time the adhesive-backed material is shielded from such rays, it remains soft and pliable, but once exposed to daylight, or ultra-violet lamps, it hardens within minutes to form a permanent and strong repair.

As it even cures underwater — but it must be stuck to a dry surface first — it could be a fast solution to patching GRP ponds; simply drain down, apply patch then refill.

Although two sizes are available (150 x 75 x 2.5mm and 300 x 300 x 2.5mm), each can be cut with scissors into smaller patches as needed, the surplus being re-packed for future use. A non-adhesive-backed size, 10 x 1 metre x 2.5mm, is available in commercial grade too.

Full details of Poliflexsol from: **GARRARD POLIFLEXSOL LTD, Wedgwood Way, Stevenage, Hertfordshire SG1 4QT. Tel: 0438 726691; Fax: 0438 742769.**

ARMITAGE BROS LTD

Eating To Stay Healthy

Someone once said, "You're what you eat", an apt quote with which to introduce MACROGARD, an immunostimulant from **VETREPHARM,** a company having aquaculture as its major core business serving the Scottish salmon and British trout industries.

In recent times, an increasing involvement has occurred with the ornamental fish sector and a new range of medicinal products for various species has been developed for release in the coming months.

Most fishkeepers know that fish diseases strike as soon as fish become stressed, or when resistance to disease is otherwise weakened. By increasing non-specific resistance (even only marginally) infections can be arrested.

Enter Macrogard, a food ingredient containing Beta 1.3 and 1.6 linked glucans derived from the cell wall of a yeast. Glucans have been shown to be powerful activators of non-specific defence mechanisms in fish against bacterial, viral and fungal pathogens.

Immunostimulants have several advantages: they are naturally-occurring compounds, not antibiotics, bacterial resistance cannot develop, and there are no environmental impacts nor human health implications.

The company's veterinary director, **Fiona Macdonald,** tells us that the product is available in small, non-industrial sized amounts (25g) suitable for hobby use. Incidentally, Macrogard is a food additive, not a treated food, which allows the fishkeeper to add it to the food that the fish are known to take readily, although tests have shown no resistance to its taste so far.

The powder can be mixed with all foods, using a little vegetable oil to bind it more easily to flake foods if necessary. Macrogard needs no prescription and can be obtained from the manufacturers.

Full details from: **VETREPHARM LTD, Unit 15, Sandleheath Industrial Estate, Fordingbridge, Hampshire SP6 1PA. Tel: 0425 656081; Fax: 0425 655309.**

DICK MILLS

Going A Bundle

Purchasers of computer systems will know all about 'bundling', the practice of including into the package price all the 'extras' (usually software utility programmes). In the fish world, this is not quite so prevalent but, recently, **ROLF C HAGEN (UK)** has taken it up.

Known as **Banded Pack Offers,** these form part of Hagen's major promotion programme and represent substantial savings to aquarists. For instance, free QUICK FILTER CARTRIDGES with AQUACLEAR POWERHEADS; CABLE CONTROL UNITS with TANKS and HOOD KITS; the 2.25oz NUTRAFIN STAPLE FOOD comes with a free 1.6oz NUTRAFIN MULTIPACK and represents a 50% saving on the combined price of the two items. Look out for these banded packs at your aquatic stores (and also refer to the accompanying special offer on this page).

Full details of all Hagen products from: **ROLF C HAGEN (UK) LTD, California Drive, Whitwood Industrial Estate, Castleford, W Yorkshire WF10 5QH. Tel: 0977 556622; Fax: 0977 513465.**

HAGEN *A & P* OFFER

To mark the occasion of their major promotion of Banded Pack Offers **ROLF C HAGEN (UK) LTD** are giving away 50 FREE QUICK FILTER CARTRIDGES to Aquaclear Powerhead users and readers of *A & P.* Just send your name and address on a postcard (or back of a sealed envelope) to: ***A & P* Quick Filter Offer, ROLF C HAGEN (UK) LTD, Whitwood Industrial Estate, Castleford, West Yorkshire WF10 5QH.**

ROLF C HAGEN (UK) LTD

Want To Know The Time? Ask A . . . Fountain?

Sometimes, it takes a little time (sorry, no pun intended) for the penny to drop. Many visitors to the MAFF stand at the Hampton Court Flower Festival thought the two storks in the centre of their LE BATRE FOUNTAIN CLOCK from **FOUNTAINS & LANDSCAPES LTD** worked on the sundial principle, until they saw the water-jets from their beaks were landing next to the hours and minutes figures on the pond surround, and that each bird rotated on its plinth as conventional 'hands'.

The shape of the 'hands' can vary between architectural sculptures: swans and storks, or anything else for that matter, and, being designed to order, each Le Batre Fountain Clock can be scaled in size to suit each application. There is no need for the pond to be completely circular either — arc-shapes are easily accommodated, with the hands having a rapid 'flyback' time at the end of each sweep.

The time-keeping system has no electrical components in the water and the mechanism must have the ability to move heavy figures; apparently, overcoming these needs was more paramount than that of manufacturing an accurate timepiece!

Full details from: **FOUNTAINS & LANDSCAPES LTD, 29a Midmoor Road, Balham, London SW12 0EW. Tel/Fax: 081 675 0667.**

Innovative Aquarium Products

ZENTEC LTD is a new name to be noted come this autumn. It is dedicated to the design, development and distribution of innovative and quality aquarium products, based around the important control equipment areas, such as heating, filtration and monitoring systems for all types of aquarium.

Technical Director, **Murray**

Continued on page 73

Continued from page 72

Pierce, and Commercial Director, **Dave Lunn**, both bring experience to Zentec from the past design of specialist equipment for public aquaria, fish farms and research laboratories, and are positive that their new products will satisfy the needs of aquarists, as expressed to them over past years.

Look out for their advertisements in the coming months and, of course, watch **Product Round-up** for the latest releases from Zentec.

For further details, and to register for further information, contact: **ZENTEC LTD, 10 Lloyds Court, Manor Royal, Crawley, Sussex RH10 2QX. Tel: 0293 400128; Fax: 0293 400129.**

Pick Up a Pipiper

Sorry, but I just had to emulate, either that well-known TV ad for those chocolate-covered biscuits, or that equally familiar TV character Arkwright, from *Open All Hours*.

Those readers with fish-houses will no doubt be familiar with something scuttling around the wall-floor interface (skirting boards to you!) from time to time, attracted there by any fish food that has been spilled (I once sneezed into a tin of flake food; never again!). Depending on their size, they may be anything from a Silverfish(!) to a rat, although usually something around cockroach size is more the norm.

The PIPIPER ultrasound unit, made by **CLEARAIR (UK) LTD**, deters small animals and insects from within its vicinity by radiating a very high frequency as and when their movements are detected by its infra-red sensor. The basic unit, PIPIPER ONE operates for 30 seconds before automatically switching off until re-activated. The standard 'deterring' frequencies lie in swept band of between 25 and 62 Khz (well above the uppermost human perceived frequency of around 20 Khz).

PIPIPER TWO uses a narrower band of 32-62 Khz (above the range 'heard' by cats and dogs).

Most units work by internal battery power (ideal for remote locations), some are mains-powered, some mains/adapted- or car-battery- powered, and extension speakers are available to increase the effective protection zone.

Uses for the unit are quite wide. Apart from obvious applications, such as fish-houses, aviaries, and other captive animal enclosures, safer areas for children to play in can be created by ensuring animal-free zones. It would be interesting to see if it could keep predators away from ponds too — and our cat scratching the furniture?

Full details from: **BLOOMFIELD & COMPANY, 41 Brownswood Road, London N4 2HP. Tel/Fax: 081 800 2677.**

PRODUCT NEWS

There was a new name at GLEE this year (International Garden & Leisure Exhibition, NEC Birmingham, September 26/28).

OASE (UK) is the newly-formed, wholly-owned subsidiary of the German-based company that is widely acknowledged as a top European manufacturer of premium-quality fountain pumps and accessories. The well-established Atlantis, Polaris, Nautilus and Aquarium pump ranges are joined by three significant and totally new product developments within days following their international debut at GAFA (International Garden Trade Fair, Cologne).

Full details from: **OASE (UK) LTD, No 5 Focus 303, Walworth Industrial Estate, Andover, Hampshire SP10 5NY. Tel: 0264 333225; Fax: 0264 333226.**

Herpetology matters

By Julian Sims

JULIAN SIMS

Male Green Lizard *(Lacerta viridis)* eating a rather strange meal which it has just caught: a large bumble bee.

PREFERENTIAL FEEDING

Andrew Holden is currently conducting research into preferential feeding patterns in reptiles at the University of Bangor, North Wales. In particular, he is considering lizards as predators. Andrew would be grateful to receive any observations or other information from *Aquarist & Pondkeeper* readers who have noticed feeding preferences and patterns among the reptiles which they keep.

Please send any observations about the feeding behaviour of your reptiles, especially those maintained in a 'community tank', to:

Andrew Holden,
Reptile Feeding Survey,
c/o Aquarist & Pondkeeper,
9 Tufton Street,
Ashford,
Kent TN23 1QN.

SKIN-EATING HERPTILES

An extensive survey into the species of amphibians and reptiles which eat their own shed skin has recently been conducted by scientists at the **Smithsonian Institution, Washington** and **Texas A & M University, USA.**

The behaviour of eating skin is known as *Dermatophagy.*

In the past, many species of terrestrial frog, toad, newt and salamander, as well as some aquatic species of amphibian, have been observed to eat their shed skin.

Dermatophagy has also been reported among reptiles, especially lizards and, particu-

larly, in the family Gekkonidae (geckoes). There are fewer records of skin-eating among snakes, where dermatophagy is regarded as unusual — sometimes being associated with cannibalism.

Widespread Habit

The North American research team sent questionnaires to zoos, aquariums, museums, universities and other collections worldwide. They received more than 100 replies and this information, together with previously published records, show that shed skin-eating has been observed in 94 species of frogs and toads, 29 species of newts and salamanders, one species of caecilian (legless lizard), 145 species of lizards, the Tuatara, 11 species of snakes and 5 species of chelonia (tortoises).

These records indicate that dermatophagy is not unusual among many of the amphibian and reptile species maintained in captivity. However, the extent to which such behaviour occurs in the wild is not known.

The reasons why dermatophagy takes place are also not fully understood, but several theories have been put forward. For example, eating shed skin may be a method of reclaiming protein and preventing the wastage of nutrients.

Day/Night Similarities

Previous observations report that skin-eating is particularly common among nocturnal geckoes, i.e. those which are active at night. Although such action might recycle protein, it was thought there would be little value in reclaiming vitamin D. This is because vitamin D is only synthesised in the skin during exposure to sunlight.

The results of this latest survey partly conflict with the former theory about reclaiming vitamin D because many diurnal lizards — i.e. those which are active by day — also eat their shed skin. These lizards include eleven species of gecko belonging to the genus *Phelsuma*, and thirty species of iguanid.

Dietary Supplement

The possibility that eating their own skin has importance in recycling essential constituents of the body is supported by the fact that animals which are not in the best of health are less likely to eat their cast-offs.

Research has also shown that unless shed skin is consumed, there can be a considerable waste of energy for ectothermic vertebrates — i.e. those animals whose body temperature varies with, and approximately follows that of, the surrounding environment.

However, the situation may be more complicated than just recycling protein, vitamins and energy.

The remains of undigested skins are occasionally found in the faeces of some species. Such remains would have to be chemically analysed to discover if other essential nutrients, for example, lipids (fats and oils) had been removed and reabsorbed into the body. If little or no digestion had taken place, then this evidence would suggest that there is a reason, or reasons, other than supplementing the diet for eating shed skin.

Other Possibilities

One alternative theory which has been proposed to account for the wasting of skin lost during moulting (also known as *ecdysis*) is that this behaviour removes evidence of the presence of an animal.

A cast-off skin left in the environment advertises the existence of a reptile (or amphibian) to its predators. For example, North American rattlesnakes, which have a formidable natural defence system, do not eat their cast-off skin. Unfortunately, this behaviour pattern is now working against the long-term survival of these reptiles in much of their traditional habitat, since a shed rattlesnake skin can be used as an indicator by human hunters that a snake is in the vicinity.

Other species which have less natural protection against predators may have evolved a different survival strategy — some eat their cast-off skin after moulting to reduce the risk of being detected.

Another interesting variation in the phenomenon of dermatophagy is that some species of reptile and amphibian have been observed to pull off and eat the skin which is being moulted by other members of the same species.

This mainly occurs with species of lizard, for example, the Green Anole (*Anolis carolinensis*) from the south-eastern USA, Cuba and the Bahamas, and the Fin-tailed Lizard (*Hydrosaurus amboinensis*) from New Guinea and east Indonesia.

In the past, some herpetologists have interpreted this behaviour as a form of 'social grooming'. The recent North American survey has revealed that some species of frog and chelonia also pull off and eat the skin of other individuals of their species (known as *conspecifics*).

Further Research Required

Dermatophagy is an interesting biological occurrence which requires further research and documentation. In particular, the nutritional benefits to animals of eating their own skin will require chemical analysis. The significance of skin being removed and eaten by other members of the same species should also be carefully investigated.

Especial attention should be given to recording the age, sex and ranking in the social hierarchy of the animals involved.

If any *A & P* readers have observed examples of dermatophagy among the reptiles and amphibians they keep, I would be pleased to receive details to include in a future edition of **Herpetology Matters.**

NEXT MONTH:
NEW-FORMAT *A & P*
DON'T MISS IT!

Coldwater jottings

By Stephen J. Smith

Spotlight on Scotland

There can be no doubt that there has been a dramatic increase in the popularity of coldwater fishkeeping in the UK over the last decade or so. And such popularity appears to spread right across the geography of the British Isles, despite the vast difference in climatic conditions between Land's End and John o' Groats.

A recent trip which I made to the Highlands of Scotland revealed that enthusiasm for the coldwater hobby, and for fishkeeping in general, is a thriving pastime north of Hadrian's Wall.

ENTHUSIASM REAPS REWARD

West of Scotland Goldfish Society ventured into the world of the Open Show for the first time since their formation two years ago, and the committee deserves heartiest congratulations for a splendid event, which was well-received by hobbyists and the public, held at the PYCA Halls at Priesthill, Glasgow.

Over 100 Fancy Goldfish, the majority of which were of very good quality, and all of which were in excellent condition, were exhibited at the show, which attracted entries from throughout Scotland, as well as the north of England. Despite the fact that the show coincided with the local Pollok Show *and* the first day of the Scottish football season, there was an encouraging number of visitors.

Winner of the Best in Show trophy, jointly sponsored by Hagen and Interpet, was a superb Common Goldfish, owned and exhibited by **John Rees.** Glasgow aquatic retailer, the Coral Reef, sponsored the trophy (together with a voucher for £25) for the AOV class, which was also won by John for his Hamanishiki. The Fish Tank trophy for the member with most points, sponsored by the magazine of the West of Scotland Goldfish Society, was awarded to **Bill Ramsden,** from Boston.

STEPHEN SMITH

A large purpose-designed fish-room at The Coral Reef in Glasgow is expertly managed by William Fraser, seen here in front of an excellent selection of imported Fancy Goldfish.

A wide range of top names in the aquatic hobby also lent their support to the show, including Interpet, Hagen, AquariuManagement, Tetra, Rosewood, King British, Rena, Country Feeds, Coral Reef, Algarde, *Aquarist & Pondkeeper,* and main sponsor, Golden Phoenix Fisheries.

I was honoured to be invited as both a guest judge and as a presenter of trophies, and it was a pleasure to be associated with such an enthusiastic group of people, who really went to great lengths to put Scottish Goldfish-keeping well and truly on the map.

FERGIE'S FISH FINGERS

For most people, the impression of an allotment garden is one of well-tended plots of the finest vegetables or flowers. To **Fergie Brown,** it is the perfect place to tend his Goldfish in a specially-constructed fish-house.

For several years, Fergie, who lives in Summerston, near Glasgow, has kept and bred his collection of Fancy Goldfish in the dining room of his ground floor flat. However, the demands of space, from both his fish and his family, have led him to decamp his fish to a purpose-built fish-house on an adjacent allotment.

"We had to build the structure two feet below ground level, because local planning regulations require that no structure should be above four feet high," explained Fergie. "There were some initial problems with water ingress into the foundation, but they have been largely overcome," he continued.

Fergie's system is fed on a continuous drip feed of water from an outside tank, which is replenished daily from filtered rainwater, and this has resulted in some significant growth of his collection of Hamanishiki (Fergie's favourite fish) and Pandas, spawned from a pair acquired from Golden Phoenix Fisheries. His most recent acquisition is a pair of high-quality Calico Fantails which he hopes to spawn next year following a tour of the aquatic shows this autumn.

So, while his fellow allotment holders boast green fingers, Fergie is turning their heads with his own brand of 'fish fingers'!

TAKE A WALK DOWN PAISLEY ROAD

There can be few areas of the UK where you can walk down one street and find no fewer than *three* aquatic centres, and all on the same side of the street!

Such is the case in Glasgow's Paisley Road West, where I dropped in on **The Coral Reef, M & R Dog & Fish,** and **Aquarium Design Centre.** Whatever your interest in fishkeeping, these three retailers provide a fishkeeping feast of which Glasgow can be proud.

Colin Horsey is a partner at Aquarium Design Centre and, having previously been a customer, has been involved with the company for 14 years of its 25-year existence.

For coldwater enthusiasts, a comprehensive selection of commercial-grade Goldfish is

STEPHEN SMITH

Fergie Brown, in his newly-constructed fish-house on a garden allotment, has given a new twist on the term "green-fingers".

STEPHEN SMITH

A selection of Koi . . . plus a few goldfish, at The Coral Reef, where owner Alastair Finlayson has responded to the upsurge in demand for coldwater fish in Scotland.

provided, and Colin explained that larger Goldfish, as well as the occasional Koi, are also supplied to order. In addition, some superb displays of tropical fish, as well as plants, also caught my eye (particularly a fine collection of Peppered Mollies).

The company also produces its own designed aquarium cabinets, as well as providing a complete set-up and maintenance service.

Personal service is the key to **Wally Lewn's** success at M & R Dog & Fish. Wally has been owner of the company for 16 years, though the shop, which covers two stories, has been at its location for over 30 years.

Wally is particularly proud of his set-up, which includes a small coldwater section, as well as a comprehensive tropical section and a marine aquarium with a trickle-filter system especially designed by Wally himself.

Meanwhile, at The Coral Reef, owner **Alastair Finlayson** is also celebrating 25 years in business, and is one who has been prepared to "stick his neck out" to supply good Fancy Goldfish. "There has not been much call for coldwater fish, although the emergence of the Goldfish hobby in the area has made a difference," he explained.

"Pond fish are not nearly so popular, especially in a city store, as few people in the city keep ponds, and the garden centres tend to provide for pondkeepers." However, a spectacular display of coldwater fish, including some show-class imported Orandas and an unusual and very lively 'frill-tailed' Comet-like Goldfish, formed, for me, the highlights of an impressive set-up, which included a large purpose-designed tropical fishroom.

DOWN DEEP BY THE SEA

Throughout my travels, I have found that more and more people are enquiring about the native coldwater species of the UK, as well as an area of fishkeeping often overlooked (or is it just taken for granted?), that of native marines. So, two attractions on either side of the Scottish mainland which I could not fail to drop in on were **Deep Sea World,** at North Queensferry, near Edinburgh, and **The Sea Life Centre** at Barcaldine, near Oban.

Deep Sea World was opened earlier this year on the site of a derelict quarry adjacent to the Forth rail bridge. An intricate and sophisticated water system permits seawater to flow naturally into every part of the aquarium environment, which houses up to 100 species of fish, all native to Scottish waters. The fish are viewed through a transparent 'walk-through' tunnel, which provides a magnificent experience akin to actually being in there with the fish.

One of the highlights for me, and my family, was to see for the first time shoals of cod and pollack being fed by a diver — a distinct difference from feeding Koi from your hand at the pond surface!

Meanwhile, at Oban Sea Life Centre, we were greeted by the amazing sight of a Gurnard 'walking' around its aquarium on its modified pectoral fins, and a separate display of highly coloured Sticklebacks going through their fascinating courtship routine.

Visitors can also experience first hand an impressive display of skate, ray, plaice and flounders, which can actually be stroked as they linger on the surface before swooping down to the sand; while some impressive aquarium displays include a gruesome-looking Anglerfish, Conger Eels, and even shy Shanny!

One of the Scottish Tourist authorities boasts that "Scotland's for Me!". It would appear that this is especially true if you are a fishkeeper!

PAM RATCLIFFE

I am pleased to join and congratulate the committee of the West of Scotland Goldfish Society on a superb first Open Show.

TOMORROW's AQUARIST...By Gina Sandford

AIRBORNE TA

Well, what else do you do at 33,000 feet above the Atlantic . . . other than write **Tomorrow's Aquarist?** Daydream about the five days ahead, I guess. Two rock concerts, a cruise around Manhattan Island, a possible trip to New York Aquarium and who knows what else.

Pipes and Plants

Right, back to the fishy side of things and a couple of questions for you to ponder. The first: do you use real or artificial plants in your aquarium, and why? The second, why use earthenware or plastic pipes as hiding places for catfish?

Now, I have to admit to using both artificial and real plants and earthenware and plastic pipes at some time or other during my aquatic 'career' (and you can take that word either way — a mad, reckless dash through the hobby, or a chosen path on which to work — I've been guilty of both at one time or another) but why did I choose one in favour of the other or a combination of all of them?

Problem Plants

Let's start with the plants. When I first kept fish, I encountered all the usual problems that budding aquarists come across — some grow, others don't. At the time, there were few books on the subject. You didn't have as many quality outlets from which to get advice, either.

Everyone said you couldn't grow plants and keep large fish, so the obvious choice was plastic. They looked abysmal, nothing like the realistic offerings of today. My Oscars dug them up and towed them around as toys!

It took several years before I came to understand the advantages of real over artificial. Plants are nature's natural filtration system, helping to break down the waste products from the creatures being kept.

If this is so, then logic dictates that I should use them in my aquaria, not as the primary filtration system, although this could be accomplished if you had an iron will and had minimal fish numbers in your tank, but as a supplementary system that is both functional and decorative.

To that end, I decided to grow plants whenever possible. So far, over the years, I've managed to grow something in all my tanks, even the brackish water ones.

To overcome the problems of large fish tearing the normal greenery to shreds, I use Java Fern (*Microsorium pteropus*) which is attached to wood and, perhaps because it isn't planted in the substrate, the fish do actually leave it alone. Well rooted *Cryptocoryne* species and Amazon Swordplants (*Echinodorus* sp.) also survive the onslaught, so do give them a try.

If you are worried about the fish eating the plants, as opposed to digging them up, then feed peas and lettuce to supplement their diet. They'll love them!

Horrible Pipes

Now for the problem of the drainpipes. Why did I use them? A lack of original thought on my part, I suppose, combined with a desire for instant success — not a good combination, as far as fishkeeping is concerned. At the time, pipes were believed to be the best way to keep catfish, but, looking back on our photos of our tanks, they looked horrible!

The earthenware pipes made the water excessively hard (I live in a soft water area, so it really created problems) which resulted in some of the fishes getting white deposits over their eyes. Although this could be reduced by frequent water changes, the eyes never really cleared again.

The fins also suffered. Both the pectoral (chest) and dorsal (back) fin spines were used to lock the fish into position in the pipe and, over time, the ends of the fin spines were rubbed red raw, which resulted in a secondary fungal infection that was often difficult to cure. No sooner had the fish regrown the skin covering the spines, than it returned to its pipe and rubbed it off again!

To overcome this, I used large pieces of bogwood that formed arches or had crevices that the fish could lock themselves into, and it worked; no damaged fins, no fungal infections and no cloudy eyes! I grew plants on the wood and thus killed two birds with one stone.

Okay, we've just passed the point of no return — we're heading for New Jersey. I'm going to leave this for now, read a book for a while, and then write the review and, who knows what else might crop up.

Clay pipes offer shelter . . . but at a price.

SNEAKERS AND IMPERSONATORS

Fish Facts.
By Geoff Swinney and Kate Charlesworth.
Published by **HMSO.**
ISBN 0-11-495121-7.
Price: £3.95.

This paperback looks at the biology of fishes in a new and somewhat different way — cartoons — and some really funny ones at that. Fish are looked at from all angles: habitat, scarcity, lifestyle, freshwater, breeding strategy, saltwater, locomotion, the role of fins, etc.

Now, our editor sent this to me because he obviously felt it was a wonderful little handbook for young people who are interested in fish. Well, I think it's also a pretty nifty little book for those of us who are supposed to know about fish!

Take, for example, the bit on page 22 about the North American Freshwater Sunfish. Did you know there are three kinds of male? Large nesting males, small sneaker males and female impersonators? Or even the note on page 24 that says, "The earliest jaws to evolve were used simply to grasp prey."

Sometimes, for a little light relief, I like to pick up such books as this and just browse through the pages. With this one, because of the novel way it is presented and because of some of the hilarious cartoons, I believe that many of the facts will stick in the mind of any reader. It certainly appealed to my eldest daughter . . . and she doesn't like fish!

For anyone just setting out in the aquatic hobby and wanting to know more, I think that *Fish Facts* gives you an insight into fish and their biology without all the heavyweight reading that has so often discouraged people from taking their interest in fishes further.

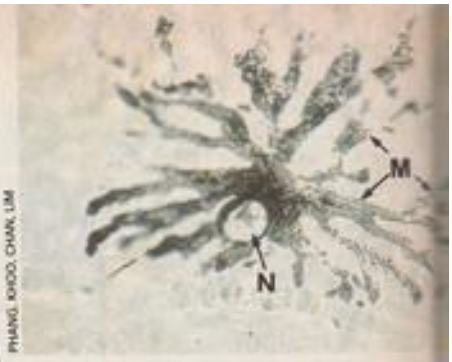
The only thing I think I would have liked to have seen added was a further reading list. Having whetted the appetite for knowledge, it would be nice to point a fin in the right direction to find more.

P.S. — I never managed to see New York Aquarium and the only fish establishment we found was closed on Sundays. Never mind, I still had fun!

SKIN DEEP IN COLOUR

PART 2

Colour Combinations



PHANG, KHOO, CHAN, LIM

K J GOH

Dr Violet Phang, Gideon Khoo, Soo Yin Chan and **Tit Meng Lim** complete their review of the 'building blocks' responsible for giving fish the resplendent colours that make them so attractive to the human eye.

Our perception of colour on the body surface of fishes is actually light reaching our eyes after it has been reflected, refracted (bent) and diffracted (split up) from both coloured and reflective pigment cells (chromatophores). Colours such as blue, green, pink, lavender, purple, etc, often iridescent and exquisite in richness, are usually produced by a combination of two or more different chromatophores.

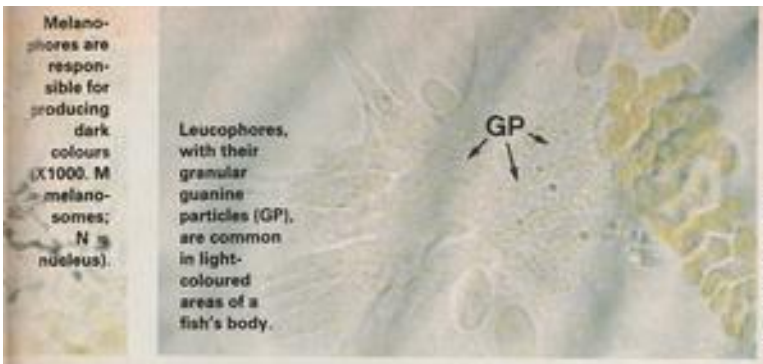
CELL COMBINATIONS

Two pigment cell types can exist in close association; for instance, an *iridophore* above a coloured *chromatophore* which may be a *melanophore*, *erythrophore* or *xanthophore* (see Part 1, published in the August issue of *A & P* for definitions). The reflecting *platelets* in *iridophores* serve as prisms to reflect and refract any incident light on the body.

Light passing through the iridophore may be absorbed by the black melanin pigment of a fully dispersed melanophore beneath it. When the underlying melanophore or brightly coloured chromatophore is partially or fully aggregated, light will be diffracted and reflected by the iridophore, hence producing a wide spectrum of metallic, iridescent hues.

K J GOH

The light golden-yellow colours of the Yellow Comet Platy is produced by a combination of yellow xanthophores, reflecting iridophores and colourless leucophores. (All these terms were defined in Part 1 published in the August '93 issue of *A & P*).



Melanophores are responsible for producing dark colours (X1000. M = melanosomes; N = nucleus).

Leucophores, with their granular guanine particles (GP), are common in light-coloured areas of a fish's body.

PHANG, KHOO, CHAN, LIM

FURTHER READING

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K J GOH

The dark coloration of the Moss Green Tiger Barb is created by black/brown melanin-containing melanophores.

Pearl Gouramis possess a large number of reflective iridophores and colourless leucophores forming the silvery iridescent spots.

All these chromatophores, each with its unique colour and shape, produce the dazzling array of exotic colours and pigment patterns seen in tropical freshwater ornamental fishes.

So the next time you savour the beauty of your fishes, irrespective of whether you are lounging in front of the family aquarium, or trampling around the banks of the Amazon, do remember that their colours are 'skin deep', due to specialised combinations of pigment cells. ■

The myriad iridescent colours are also a result of structural changes in the thickness, angle and arrangement of iridophore platelets in relation to the body of the fish. Incident light on iridophores and leucophores is also subject to "Tyndall light-scattering" which generates silvery iridescence.

Swordtails and Platies have, in addition to iridophores and leucophores, crystalline platelets in the scales. These crystalline platelets may contribute to high reflectivity of the flanks and ventral regions by, presumably, refracting and reflecting light like miniature prisms.

Colour Variations

Cellular analysis of fish coloration is useful in understanding the cause of colour variations. The colour orange, for example, is produced by a combination of erythrophores, xantho-erythrophores and xanthophores; grey by a mixture of melanophores, xanthophores and leucophores; and metallic green, in most cases, is the result of widespread dispersing light from both xanthophores and melanophores, and reflecting light only in the green wavelength.

Cellular analysis has also proven useful to geneticists who are interested in the effect produced by various gene combinations on chromatophores and chromatophore patterns. Chromatophore analyses of newly-hatched fish larvae and fry have enabled different colour varieties to be distinguished.

Also, classification and identification of various fish genera can be performed by taxonomists through the mapping of chromatophore patterns at different larval stages.

PHANG, KHOO, CHAN, LIM

Crystalline iridophore platelets on the scale of a Yellow Comet Platy (X400).

SOME USEFUL TERMS

1. **Carotenoids** — a large class of oil/lipid-soluble yellow, orange or red pigments (biochromes) not synthesised in animals, but obtained from their diet.
2. **Diffract** — to break up a beam of white light into a spectrum of different bands of coloured light.
3. **Guanine** — one of four types of nitrogenous bases found in DNA (deoxyribonucleic acid) with the double-ring structure of a class known as purines; forms part of a DNA unit called a nucleotide.
4. **Intracellular** — located inside/within a cell.
5. **Melanin** — dark brown/black pigment usually found in skin/hair.
6. **Organelles** — any part of a cell which has a particular structural/functional role, and analogous with organs in the body of multicellular animals.
7. **Platelets** — very small, flat plate-like structures.
8. **Pteridines** — the only pigmentary component of xanthophores and erythrophores that animals can synthesise; have close biochemical relationship with purines.
9. **Purines** — one of two types of bases found in nucleic acids; have a double-ring structure.
10. **Refract** — to cause a beam of light to change direction (bend) when passing at an angle through two types of media with different densities.
11. **Vesicles** — small, sac-like structures filled with fluids.

COLOMBIA

Quest for an Elusive Earth-Eater

Norwegian aquarist, explorer and collector **Alf Stalsberg** embarks on the hunt for a rarely seen — and even more rarely bred — mouthbrooding cichlid . . . with great success.

Photographs by the author

Many aquarists have been waiting a long time for this fish to be more widely available, especially those aquarists with special interest in the Earth-eaters (*Geophagus*). The reason that these fish are now in Europe at all is that a growing number of dedicated aquarists today want to visit the places where the fish they are interested in come from, and to study them in their natural environment. This, in fact, was one of the main reasons for my going to South America there to try to collect *Geophagus pellegrini*, for which there is, as yet, no common name.

Some years ago, when I was really involved with the Earth-eaters I read everything I could find about them until my eyes turned red. My dream was that, one day, I would have some of these rare *Geophagus*, and would study them in my aquarium.

I had succeeded in keeping many of the known *Geophagus* species, thanks to good friends and patience, but there were still some *Geophagus* that were just not available, while, at the same time, new species still kept appearing on the market.

One of the rarer species was *Geophagus pellegrini*, first described by Regan in 1912. The fishes he based his descriptions on were three specimens collected by Mr G Palmer in Río San Juán by the town of Tado, out in the Province of Choco in South West Colombia. Mr G Palmer had collected the fishes three years earlier and had given them to the British Museum (Natural History) in London.

Regan also described another *Geophagus* which is better known to aquarists, namely *Geophagus hondae* — the Red Hump Geophagus — today correctly known as *Geophagus steindachneri*.

My journey to Colombia started in February/March. My reason for not going at the beginning of January, which I had done before, was that I wanted lower water levels in the rivers, and two earlier trips had shown me that many of the rivers were far too high at the beginning of the year.

This time, the timing was nearly perfect; in some places, it was too dry, but in those locations where we found our *Geophagus pellegrini*, conditions were good.

FIRST STEPS

We arrived at Bogotá in the afternoon. My friend Adriaan Brugman from Savannah Tropical Fish was waiting and had being doing so for a while.

We had ordered a car in advance and this was delivered the day after when we planned to set off on our journey out to Quibdo in the Province of Choco.

It took us nearly three days to reach Quibdo (you should see the road out there!).

Next morning after breakfast, we packed our gear and set off to drive to Istmina.

First, we drove to the village of Las Animas. In fact, we wanted to go to Tado, because it was not too far away from Las Animas, and it was there that Palmer had first collected *Geophagus pellegrini*. When we came to the bridge and saw the river San Juán, it was big and muddy, so we turned around and went back to the small river we had passed on our way out to Tado. We wanted to see if we could find any *Geophagus pellegrini* there. We did not, but we did collect three small Rust-belly Cichlids (*"Cichlasoma" atromaculatum*) and small *Loricaria* (Whiptail Cats) before we drove back to Las Animas.

We continued on the terrible road to Istmina, hoping that we would get there before dark. If the road that we drove on had been at home, we would not have called it a road, but a track.

We arrived at Istmina at sunset and found the small hotel which was going to be our base out there in Choco. The next morning after breakfast we decided to go to Condoto to see what we would find, both along the road, and in the Río Condoto. The Río Condoto itself was, at the time we were there, a disappointment. It was a rather large muddy river, but, as we had passed a nice small river on our way there, we decided to drive back to it and have a go there.

FIRST FINDS

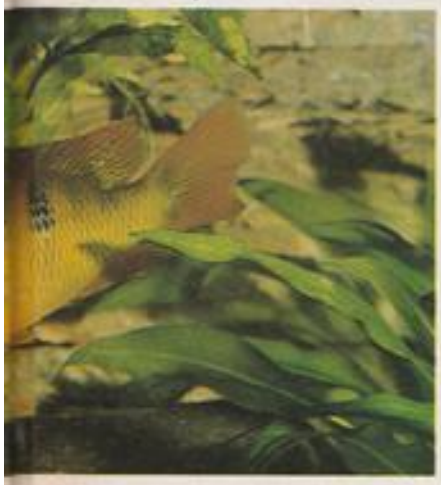
This turned out to be a good decision, because we managed to collect several small *Geophagus pellegrini*, a large (10cm — 4in) female, *"Cichlasoma" atromaculatum*, Blackspot Flag Cichlid (*Aequidens* sp aff "sapayensis"), *Aequidens biseriatus* (?),

▲ We found *Geophagus pellegrini* at this location outside Tado in the province of Choco.

The male releases his sperm in front of the female which then 'picks' out the rock close to the male's anal fin. ▶

A large wild-caught male.

One of the males we brought back — photographed in one of my aquaria.



Emperor Tetras (*Nematobrycon palmeri*), *Poecilia* (maybe *Pseudopoecilia nigroventralis* — no common name), *Loricaria* sp (Whiptail Cat), *Ancistrus* sp (Bristle-nosed Catfish), *Pimelodella gracilis* (?) (the Slender Pim Catfish), several other tetras and a pair of, for me, unknown *Copeina/Copella* (related to the Splashing Tetra).

We took samples of the water and tested them: pH 7, dH 1, KH 2, Nitrite 0, temperature in water was 28.5°C (c 83°F), and in the sun the temperature was 39°C (102°F) at 3 pm.

FURTHER FINDS

Early next morning at five o'clock, we drove north in the direction of Las Animas and several kilometres beyond to a place named Pan Americana. Here we turned onto a road with the same name, namely Panamericana "Highway", our intention being to drive as far as possible to see how far we could get and what fish we could find.

After 60 km the road ended and men were working actually building it! When the road will be finished, goodness only knows. Once it is completed, it will go as far as Ciudad Mutis on the coast of the Pacific.

Since we had been driving up in the hills, most of time there were, no rivers unfortunately, for us to fish, so we turned round and started on our way back.

Coming down from the hills, we stopped by a river which looked very promising.

Later, looking at the map, this river turned out to be a tributary of the Rio Quito which, in turn, is a tributary to Rio Atrato. Here we found *G. pellegrini*, *"C" atromaculatum*, the livebearer *Poecilia chocoensis* (?), *Loricaria* sp, Emperor Tetras which we had seen in every biotope in Choco, *Aequidens* sp, a very special tetra, of which I could only manage to catch three specimens which, unfortunately, did not make it back home.

We tested the water here as well and this was: pH 6.8, dH 0, KH 0, Nitrite 0, mS 24 and water temperature was 28°C (82°F) — the temperature in the shade was 29°C (84°F) and 37°C (c 99°F) in the sun.

The name of this river is possibly the Rio Tirado because, shortly after we started on our way back to Istmina, we came to a road which ended in a small village named Tirado that had a small river passing through it. To be certain, though, I guess we would have had to go up in an aeroplane.

BACK HOME

When I returned home to Norway, it was very exciting to unpack the fish boxes. The one I took care of first was, of course, the one containing the *Geophagus pellegrini*. They had made the trip home very well. In fact, I lost very few fishes during transportation. I lost some of the small *Geophagus pellegrini* later, but I still have eight; three males and five females.

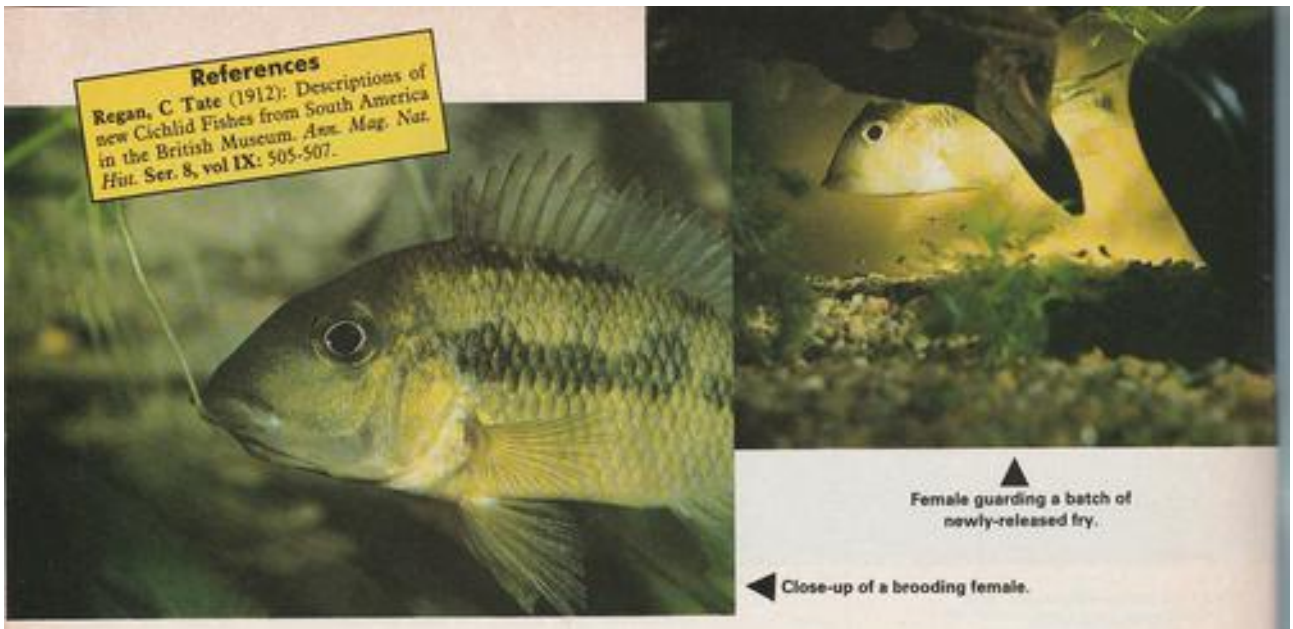
When I wrote this article, my fishes had spawned twice, but the female had swallowed the eggs after three days, so I'm looking forward to the next spawning attempt; I just need to be patient.

First-ever Imports?

As far as I know, and from what I have been told, *Geophagus pellegrini* has never been imported alive into Europe before. Several aquarium shops and importers I have been in contact with claim they have had *Geophagus pellegrini*, but I doubt that.

I have also thought I have had *Geophagus pellegrini* in the past. I have also tried to import the fish directly from Colombia several times when I've seen the name on stock lists, but I have been disappointed every time; they have always turned out to be *Geophagus steindachneri* (Red-humps).

When you see the photos of the fish accompanying this article you will probably agree with me that *Geophagus pellegrini* has



Female guarding a batch of newly-released fry.

Close-up of a brooding female.

References

Regan, C Tate (1912): Descriptions of new Cichlid Fishes from South America in the British Museum. *Ann. Mag. Nat. Hist.* **Ser. 8, vol IX:** 505-507.

probably not been in Europe before. The important thing though, is that it is in Europe now!

SPAWNING

My fish first spawned in the evening. I did not know anything in advance, so I was not prepared for what was going to happen. No one could tell me anything, since nobody had spawned this species before; I had some ideas, however, and these turned out to be correct.

It is a mouthbrooder, or ovophile, like the Red-hump Geophagus. I confirmed this as I watched the fish spawn through the camera lens. I had to get this behaviour on film, so the quality of first shots I took was not too good.

Spawning Sequence

The male followed the female around and then swam in front of her, stopping across her, shivering with the body, shaking his head, and stretching out his fins to impress the female. Later, when the egg-laying tube became more visible in the female, the pair began to make a few false spawning attempts on the top of their chosen rock.

Why they had chosen the top of this rock as a spawning site, I could not understand. The fishes, of course, could not care less about what I thought! I noted, though, that it was in one of the corners of the tank furthest away from the other *G. pellegrini*.

They picked at and cleaned the top of the chosen stone and then repeatedly slid over it with the abdomen. They kept this up for about ½ hour and then the first egg came. I was very glad!

The number of eggs laid at one time varied. Mostly, they were laid singly, but sometimes two or even three were produced in one go.

The female picked up the egg straightaway and the male would then slide to and fro in front of the female, shivering as he did so. The female would then 'pick' at the stone close to the male's anal opening. I guessed this was the time at which the male released his sperm.

The pair kept on spawning for about one hour before they finished. Just before they did, the other *Geophagus pellegrini* suddenly found out that 'something fishy' was going on, and managed to snatch some eggs before the spawning female had picked them up.

Some eggs also rolled down from the stone; I sucked these up with a plastic tube. These eggs had not been fertilised. I estimated the total number of eggs produced to be between 60 and 100; their colour was yellowish and they were about 2.5mm long.

While I was watching the spawning it struck me how lucky I was to see this happen, since no one had seen this before, at least not in *Geophagus pellegrini*. It is experiences like this that get your heart really ticking and make our hobby such a rewarding one.

Post-Spawning Behaviour

After spawning, the male tended to treat the female more gently than in the case of the Red-hump Geophagus. He did, nevertheless, follow her around in the aquarium all the time and then started nipping at her caudal fin, so I decided to divide the aquarium with a fine net.

Three days after spawning, I thought the female's chin pouch looked empty and, when she started eating on the fourth day, I was certain of this.

About one month later, the pair spawned again without any lowering of the pH, but with the same result, so I'll just have to take good care of the fish and wait for the next spawning.

Preparations and Triggers

How long the preparing for the spawning had taken I don't know, but the egg-laying tube in the female became more visible than it had been earlier a couple of days before spawning; picking at the stone and making false spawning attempts took place.

I don't know if the female needed this kind of stimulus to get started, but to me it seems that the female's egg-laying tube became more swollen as it progressed and only then did the first eggs appear.

I'm not sure what the triggers for the fish to start spawning were, but I can make some guesses.

The time might have been right, but it could also be that earlier during the same week that they spawned, I had decided to lower the pH of the water closer to that found in the natural waters where I collected the fish.

The pH in the aquarium was 7.5 at the beginning of the week. I therefore used an outside power filter filled with peat moss and, after a couple of days, the pH was 5.7. Then came the spawning a couple of days later.

I measured the water just after spawning was complete and the pH was still 5.7, dH 1 and the water temperature was 30°C (86°F).

POSTSCRIPT

After I had finished this article, my fish spawned again, once more with the same end result. However, when they spawned for the fourth time, everything went OK.

The female had the eggs in the mouth between 12-14 days. I can't pinpoint the time more exactly than this because I am not sure if spawning took place on the Saturday or the Monday, and it was on the Monday that I discovered that they had spawned.

The fry were about 10mm (c 0.4in) when they were released for the first time; they took newly hatched brine shrimp straightaway.

Except for the first spawning, I have not prepared the breeding tank water in advance. It has always been water from the tap, with a pH around neutral and dH around 2.

My second female has now also spawned. So far, she has been going ten days . . . AMP