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AQUARIST & PONDKEEPER

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COMPETITION RESULT

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EDITOR John Dawes **ART EDITOR** Ian Hunt **ADVERTISEMENT MANAGER** John Young **ADVERTISEMENT PRODUCTION** Gwen McNeil **PUBLISHED BY** Dog World, 9 Tufton Street, Ashford, Kent TN23 1QN.
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COVER STORY — RED PANDA DISCUS

Photograph: Aaron Norman

Following in the footsteps of the great pioneers of the Discus world like Jack Wattley and Eduard Schmidt-Focke, breeders in the Far East are now producing new and spectacular varieties of Discus at an astonishing rate.

Some of the very latest of these are featured in our special **Focus on Discus** in this issue of *A & P*. If you are not already a Discus keeper, you could well become one after seeing some of the new, stunning and beautiful Far East creations featured in both Marc Weiss' and Eberhard Schulze's features.

The Red Panda Discus which appears on our front cover is one such newcomer. Called 'Pigeon Blood' by Chinese and Thai breeders, and 'Red Ruby' at Aquarama '91 (held in Singapore), the Red Panda is currently the rage in Asia, where it has been billed the "Big Money Fish of '92".

1993 will, no doubt, produce its fair share of surprises and new varieties. We hope to be able to bring you news of all of these in forthcoming issues of *A & P*.

Editorial

GOODBYE QUARANTINE?

New Year is the traditional time for resolutions that we always intend to fulfil, but often fail to. Ever-optimistic that *this* year is going to be different, here are a few thoughts regarding one of the 'bastions' of aquarium and pondkeeping.

Quarantine, that magic word that we all tend to use in connection with the safe introduction of new fish into established systems, could well be on the way out!

Surprised? Shocked? Confused? Could we be going back in time to the days when we didn't really give as much thought to — or knew enough about — fish introductions as we do (or should do) today? Well, no . . . not at all.

In fact, if we were really honest with ourselves, we'd probably discover or admit that very few of us actually quarantine our fish in the true sense of the word.

According to *Chambers Twentieth Century Dictionary*, 'quarantine' — a term originally conceived in connection with people arriving from foreign lands — means:

Forty days: a time of compulsory isolation or detention to prevent spread of contagion or infection.

How many of us, I wonder, actually keep new fish away from residents for forty days. And, if we do, does this categorically prevent the spread of a "*contagion or infection*"? The truth is that very few of us observe the 40-day 'rule' and, even if we were to, we wouldn't be able to say that such a measure invariably prevents the spread of a disease.

Some years ago, I was talking to Keith Barraclough of King British about this, and he pointed out that what we, as aquarists, and he and his colleagues, as members of the aquatic trade, actually did was *acclimatise* fish, not *quarantine* them.

I was reminded of this very accurate observation recently during a conversation with another Keith — this time, Keith Davenport, the Executive Co-ordinator of (OFI) UK.

We were talking about SVC — Spring Viraemia of Carp. This terrible (notifiable) disease is only apparent during a relatively short period of the year, as the name implies. Therefore, if you buy a 'carp' of any sort at a time of the year other than spring, then — strictly speaking — you'd have to quarantine the fish until the following spring to know for certain that you had isolated the fish effectively "*to prevent (the) spread of (the) contagion or infection*".

In theory, such a step is, of course, possible. In practice, it's not really on . . . at least, not for the majority of us. So, perhaps, we should consider dropping the term '*quarantine*' altogether in 1993 and adopt '*acclimatisation*' instead.

According to the afore-mentioned dictionary, to acclimatise means:

To inure (accustom or habituate) to a new environment.

Now, isn't that nearer the mark? What do you think?

John Dawes
Editor

News Desk

New-Look Sandown Event Gets Capital Boost

One of the highlights in the fishkeepers' calendar in the UK is the annual show at Sandown Park, which, this year, is being organised in conjunction with the **Federation of British Aquatic Societies** and with support from *Aquarist & Pondkeeper*.

The organisers promise a new look to the show, which has received the support of London commercial radio station **Capital Radio.**

The station broadcasts to over four million listeners and, according to exhibition co-ordinator **Philip Boden,** will provide a major boost to the event: "Capital Radio's support for the show is just one of many exciting features which we intend to bring to this year's event. Initial response among the fishkeeping world has been tremendous, with a warm reception from both the hobby and the trade".

For information, contact: **Philip Boden, Exhibition Co-ordinator, The London Aquatic Show, Apollo House, 5 High Road, Ickenham, Middlesex UB10 8LE. Tel: 0895 622611.**

'Expert' Win for Nottingham Aquarist

Fancy Goldfish enthusiast **Mrs Jackie George,** of West Bridgford, Nottingham, is the delighted winner of the 'Aquarian' **"Win an Expert Competition"** (*A & P* September 1992).

"Jackie is confined to the house and has made a full-time hobby of keeping Goldfish," explained **Dr David Ford,** senior consultant to **'Aquarian',** who delivered the aquarium set-up to her home. "She has a giant 200-litre tank in the hall and two aquaria in the kitchen, which house several Fancy Goldfish. Jackie knows the personalities of each of these fish and they in turn, certainly respond to her presence."

Dr Ford continued: "Each is named after an admiral, such as Blake, Blythe, Hardy, and Nelson — who are actually an Oranda, Veiltail, Redcap and Shunbunkin".

Jackie has kept Goldfish for almost 30 years and was,

Goldfish enthusiast Jackie George receives her aquarium set-up installed by 'expert' Dr David Ford, senior consultant to 'Aquarian'.

obviously, very knowledgeable about their welfare when speaking with Dr Ford. She entered the competition hoping to win an aquarium to install into her main living room and was delighted to hear of her surprise win.

David delivered and installed the set-up, including an **Aqua-top** aquarium and stand together with an **'Aquarian'** filter and **Triton** lighting; not to mention a Moor, Calico Veiltail and a Ryukin, supplied by **Britain's Aquatic Superstore (Dave's Aquarium)** in Bolton — all to be named after admirals.

Silly Monkey!

News Desk endeavours to get its facts correct at all times, but the column's compiler has been corrected by the crocodiles at Thrigby Hall (see **News Desk** November 1992).

The first purpose-built crocodilarium in the United Kingdom, received an award form the **Universities Federation for Animal Welfare (UFAW),** for "its innovative and comprehensive approach to meeting the needs of Marsh Crocodiles and American Alligators", and this award as presented by **Stewart Orr** of BBC Radio Norfolk, rather than **James Ellis.**

James Ellis presented a similar UFAW award for the chimpanzee and gorilla house at Belfast Zoo. Let's hope all concerned will accept the **News Desk** compiler's apologies . . . !

April Date for Cichlid/Catfish Show

The fourth international Open Show of the **Avon and South-Western Cichlid and Catfish Society** will be held on **Sunday 4 April.**

The show will be organised to FBAS rules and will include divided classes for cichlids and catfish; while an auction and trade stands will provide further attractions during the day.

The society was formed in 1991 by members of the **Nailsea and District Aquarist Society.** Its aim is to bring together cichlid and catfish keepers and to form a network of aquarists with the same interests. A monthly report is available to members, providing information on shows, auctions, and shops which provide discounts.

For information, contact: **Shane Hunter, Vice-chairman, Avon and South-Western Cichlid and Catfish Society, Nimrod, 4 Greenhill Close, Nailsea, Bristol, Avon BS19 2EL. Tel: 0275 656142.**

Birthday Celebrations for Tetra Club

The **Tetra Club,** launched at the British Aquarists' Festival in 1991, celebrated its first birthday at the same event towards the end of last year.

"The first year of The Tetra Club has gone very well," commented **Dr David Pool,** head of Tetra Information Centre. "Our emergency telephone hotline has proven particularly popular, with an average of 40 calls a week from members with fishkeeping queries."

The club has a membership of over 6,500, with some as far away as China and Australia. New members receive a welcome box containing sample products and a selection of Tetra 'goodies', £20-worth of discount vouchers to attractions and events throughout the UK, and an information booklet covering all aspects of fishkeeping, as well as a regular newsletter.

Pond, tropical, or children's membership is available, and subscription fees are £10 for adults, £6 for children. Renewal is £7.50 for adults and £5 for children, with a free re-joining gift of a roll bag with the Tetra Club logo.

"Our aim for the second year is to make the Tetra Club even bigger and better, with more giveaways, competitions, and fishkeeping information" concluded Dr Pool.

For membership information, contact: **The Tetra Club, Tetra, Lambert Court, Chestnut Avenue, Eatleigh, Hants SO5 3ZQ.**

Looking Forward to National Pet Week 1993

Well, I'm sure you are, but did you know it will take place over the period **1-9 May 1993?** During this period, a lot of people will be doing all manner of fun things, all connected with pets, but with a common

A selection of items available to members of the Tetra Club, celebrating its first year with a membership of over 6,500.

combination of deliberate aims in mind.

These include promoting responsible pet care, making people aware of the benefits of pet ownership, raising awareness of working animals and increasing public awareness of services available from professionals involved with pet animals.

This **National Pet Week** will be the fifth, and it is hoped to top the 400 or so pet events specially-staged last year. This year's theme is **'Friends for Life',** which ties in nicely with the European Year for the Elderly, although in addition to the comfort and companionship which pets bring to the elderly, the accent will also be on pet ownership from childhood onwards.

At the recently-held launch (attended by regular *A & P* contributor **Dick Mills**) to appeal for volunteers to act as Area Organisers for events, National Pet Week's new chairman **Bradley Viner** said that, ". . . the more people we get on board . . . organising events, the more successful the Week will be. I am confident we will break all our previous records for number of events held and number of people involved".

An extra likely contributory factor for success in 1993 is the admission of the **Pet Trade and Industry Association** as a member of the Liaison Group (see also **News Desk** in last month's *A & P*).

Anyone wishing to get involved in National Pet Week 1993 should contact: **Floss Slade, National Pet Week Secretariat, PO Box 101, Northwood, Middlesex HA6 3RH. Tel: 0923 836333; Fax: 0923 835256.**

A Fish Called David . . . II

Lights . . . action . . . and soft focus. Such was the treatment given to a tub of **'Aquarian'** flake food in a newly-released film *Leon the Pig Farmer.* And part of the support cast (well, almost) was **Dr David Ford,** head of the 'Aquarian' Advisory Service, who provided the aquarium systems for one of the scenes (see **News Desk,** June 1992).

Dr Ford was invited to the film's premier, at Camden Parkway cinema, during the summer, and the film has already won awards at this year's Edinburgh and Vienna film festivals.

Starring **Mark Franklin** as Leon, and former James Bond girl **Miryam D'Abo,** the film is about a Jewish boy who inherits a pig farm. Three aquariums were set up by Dr Ford for a comedy scene. The film is expected to be on general release this month.

COMING NEXT MONTH IN *A & P*

HEALTH SUPPLEMENT DEALING WITH ALL THE COMMON FISH DISEASES, THEIR DIAGNOSIS, TREATMENT AND PREVENTION

A beautiful adult *A. alluaudi* male. Note the greenish body colour.

LAKE VICTORIAN BEAUTY

Dr Iggy Tavares introduces a beautiful and highly desirable species of African mouthbrooding cichlid.
Photographs by the author

Lake Victoria is a large but comparatively shallow lake; much of its 69,000 square kilometres (26,640 sq miles) is, on average, only 20 metres (some 65ft) deep. Victoria, which lies on the equator in Africa, has evolved a fish population which contains in excess of 300 different endemic haplochromine cichlid species, i.e. they are not found anywhere else.

Victorian cichlids are not as brightly coloured as their Tanzania and Malawi counterparts and, perhaps, this is one reason why they are uncommon in the tropical fish hobby. Breeding males, are, nevertheless, very attractive fish, exhibiting a range of colours, with interesting spawning behaviour. *Astatoreochromis alluaudi* (no common name as yet — though Golden Victoria Cichlid might be appropriate) is one such, very attractive Lake Victoria cichlid.

COLORATION AND SIZE

A. alluaudi males are a golden-brown in colour, with the gold being very prominent on the gill covers and the chest. The dorsal fin is edged in black; the caudal fin and even the pelvic fins are all gold. The anal fin of the male is pink and mauve, with several large yellow egg spots. A black horizontal line runs through the eye of the fish. This all adds up to an absolutely gorgeous fish.

Surprisingly, the female fish is as colourful as the male, also being golden-green in colour. The only difference is that the female's dorsal fin is colourless and the anal fin is yellow. Therefore, *A. alluaudi* differs from most other haplochromine cichlids, where the males are usually colourful, but the females are generally only silver-coloured.

Alluaudi males grow to about 6in (15cm), with females a little smaller.

DISTRIBUTION AND DIET

A. alluaudi belongs to a genus which is probably derived from a haplochromine ancestor. Unlike the majority of endemic Lake Victoria cichilds, its distribution extends to Lakes Nabugebo, Edward, George Nakavali and Kachira, the Victorian Nile and also several small lakes in western Uganda; it also freely enters streams and swamps. Alluaudi, compared to other species, also shows a wider distribution within Lake Victoria in water which is less than 20 metres deep.

In the wild, *A. alluaudi* feeds on gastropod molluscs (snails), especially *Mellanoides tuberculata* (sometimes referred to as the Livebearing Snail). Its jaws have evolved into a specialised crushing apparatus which consists of hypertrophied pharyngeal bones (enlarged bones in the jaw) and molar dentitions, particularly in the lower jaw. The shells are crushed in this pharyngeal mill and the soft parts of the snail are then swallowed.

There are two other species in the genus: *A. straeleni*, from the Zaire River area, and *A. vanderkorsti*, from the Malagrasi River system in Tanzania.

BREEDING

Golden Victoria Cichlids are maternal mouthbrooders. Sexually active males build a saucer-shaped spawning pit which they vigorously defend against other males, while courting passing females by fin flaring and shivering body movements.

A gravid female lays her eggs in the nest, a

Females are also very colourful, though not as green in the body as the males.

A pair shown together for size comparison purposes. The fish in the foreground is the male.

few at a time, which are then immediately fertilised there, or after they have been taken up in the female's mouth. Brooding females incubate their eggs in their buccal cavity for approximately 14 days before releasing 30 to 80 fry.

The fry are large enough to take newly-hatched brine shrimps immediately. They grow rapidly and are sexually active in six to nine months.

AQUARIUM REQUIREMENTS

A male and three or four females are easily maintained in a 1 metre (39in) aquarium fitted with an undergravel filter run with a power head. Decoration can consist of plastic plants, since the fish tend to eat live plants.

Alluaudi do well in London tapwater, which is hard, with a pH of 7.8, kept at around 27°C (80.5°F) with a 25% water change every two weeks or so. In the aquarium, they eat everything offered, but do well on a basic diet of commercial cichlid pellets or flake, often supplemented by earthworms and other live foods.

ECOLOGICAL PRESSURES

Although Victorian haplochromines are not exported for the aquarium trade, they have been caught in huge numbers by local fishermen for food. Moreover, the Nile Perch (*Lates niloticus*) which was introduced into Lake Victoria about 30 years ago in order to create a new food source, has prospered. The predatory Nile Perch, which can reach 200cm (c 6.5ft) and over 100 kilograms (220lb), feeds voraciously on the haplochromine cichlids.

A combination of over-fishing and the introduction of the Nile Perch has developed into an ecological disaster for the endemic haplochromine cichlids, many species now being on the edge of extinction. However, because of its wide distribution in Uganda, *A. alluaudi* is probably not as endangered as the other endemic species within Lake Victoria.

CONSERVATION EFFORTS

Several centres in Europe and America are involved in captive breeding projects in order to conserve endangered Lake Victoria cichlids. One such centre is the Horniman Museum, London, which is supported by the International Association for Research on and Conservation of Endangered Cichlids (IARCEC) and works in collaboration with the American Association of Zoological Parks and Aquaria.

The team at the Horniman Museum, led until recently by Dr Gordon McGregor-Reid, have been very successful at breeding these haplochromine cichlids. However, re-introduction of the bred stock to Lake Victoria would be ineffective in the continuing presence of the Nile Perch.

One obvious approach to conservation is to make excess fish available to dedicated hobbyists, which is how I obtained my own specimens of *A. alluaudi*. Moreover, if the Victorian cichlids are more readily available and become popular among aquarists, commercial breeders in Singapore and Florida would become involved, ensuring their survival.

Recently opened at the Horniman Museum is Living Waters, a new and exciting audio-visual aquarium experience, illustrating the global challenge to underwater conservation. The Lake Victoria public display is housed in a large aquarium and has eight different species of fish, including *A. alluaudi*. There is a lot of activity and interaction between the fish, with several males adorned in their breeding colours making for a colourful display. Several of the species have now started breeding in this show tank, enabling one to observe brood care in a semi-natural set-up.

This is a young Nile Perch *(Lates niloticus)* photographed at Living Waters, Beddington Lane, Surrey. This specimen measures some 16 to 18in (around 42cm) in length. The Nile Perch has decimated stocks of some haplochromine species in Lake Victoria.

TRADE SOURCES

Victorian cichlids, obtained from specialist breeders, are sometimes available at **Fishworld,** a large aquatic store at Elephant and Castle, London (Tel: 071 703 2262). This shop is particularly interested in East African cichlids and tries to have these among the large stock of both tropical and coldwater fish.

Thringstone Aquatics (Tel: 0530 222533) — contact **Ray Neal** — stock, not just *A. alluaudi*, but some 20 other Victorian species.

If you get the chance to acquire any of these fish, please do not pass up the opportunity. Victoria cichlids, when in full breeding colours, are very attractive fish with interesting social and spawning behaviour. Moreover, you will be playing a small, but important, role in conserving these fish for future generations to enjoy.

ASP

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Jason Endfield

The Malayan Yellow-Fin Cigar Shark Barb

Jason Endfield liked the 'new' fish he saw. Then he tried to find out more about them . . .

Plato once said: "Better be unborn than untaught, for ignorance is the root of misfortune", and what a clever fellow Plato was, by all accounts. I thought I'd start this month's feature on a cultural note. Now there's only way to go . . . downhill. But there is some relevance in the words of Plato in this month's epic tale, as will become clear.

I was looking around one of my local aquatic dealers' shops recently and my attention was drawn to a tank containing a few specimens of a fish that I hadn't seen before. They were labelled 'Malayan Barbs', but they weren't at all like the only Malayan Barbs I had heard of, those being the Malayan Flying Barbs (*Esomus* species).

No, these were altogether different, and so I enquired further. The assistant came across and I pointed out the fish; "Erm, they're Malayan Barbs", he said rather unenthusiastically. "Well they're not really Malayan Barbs, but that's what we put on the label." Talk about stating the obvious!

As so often happens (regrettably) at a small minority of disinterested dealers, it seemed that a name had been invented to suit the unidentified fish. That really annoys me because they are misleading people, and that can have dire consequences for the fish purchased and, possibly, for its new tankmates too. What if the fish required special conditions, or if it were predaceous, or if it grew to three feet? They were all questions that this dealer would have been unable to answer, and that is adequate proof of Plato's words.

But I liked these fish and so I went down to the library to find out some more about them. After wading through various textbooks (some incomprehensible to me, being a mere aquarist and not a marine biologist), I eventually found my fish in that amazing book *Dr Axelrod's Atlas of Freshwater Aquarium Fishes*. This was the big expanded edition and, as many readers will know, seems to include every species known to mankind (and some perhaps unknown!).

Anyway, I established that the mystery fish were, in fact, *Leptobarbus hoeveni(i)* — a generally barb-like fish that does, indeed, live in Malaysia (among other countries), but which is not known as the 'Malayan Barb' as the dealer would have me believe. In fact, its common name is the 'Red Fin Cigar Shark'. So much for that!

On most other counts the dealer could have got away with his ignorance: these fish were similar in habits to some barbs and could be found in Malaysia; they required the same treatment as other more commonly available Asian Barbs — with one rather important exception — *L. hoeveni(i)* grows to 20in (some 50cm)!

Luckily for me, I had room to accommodate the growing fish, and so I returned to the shop to purchase two and also to enlighten the dealer as to their identity. The fish were still there — but the name had changed . . . to 'Yellow-Fin Sharks'. So he had got the 'shark' bit right, but now it was equally misleading, giving the impression that the fish were in some way similar to the nearby Red-Fin and Red-tailed 'sharks' of the genus *Labeo*. In such cases it is surely preferable to use Latin names in order to avoid such confusing nomenclature.

I casually asked the dealer if he knew the Latin names and he told me in confidence (or so he thought!), that no, he didn't know that because he couldn't find the fish in any of his books. Apparently, he had invented the 'Yellow Fin Shark' tag too, merely because, at a glance, they look a little like *Labeo* species.

As I purchased two of the fish, I began to inform him of their correct name: "*Leptobarbus*," I began triumphantly, but I was quickly interrupted. "Oh," said the dealer, "but that won't be their Latin name," and he shook his head annoyingly. This dealer was even more ignorant than I had given him credit for.

I decided that it was best not to pursue the conversation, but I did advise him to consult Dr Axelrod. He looked blankly at me and said, "Yeah, I will, I'll ask him next time he comes in . . .". Now, I'm not the most well-read or intelligent person in the world (but you know that anyway, don't you?!), but ignorance when it comes to the care of animals, especially wild animals, which is what these fish were, is a serious business.

My two *Leptobarbus* (Leptobarbi?) are flourishing, but what of the others that the dealer sold, some of which may have gone to well-meaning fishkeepers who had been misled by the dealer into thinking that they were buying small barbs or some form of Red-tailed Shark? We have a duty to provide the best conditions that we can for our fish, and especially when the fish are wild-caught, it is particularly important for the dealers to offer sound advice and, of course, to know what fish they are selling.

Yes, I know most dealers are very competent and responsible, but there are some who aren't, and it is that minority who I rap on the knuckles today. My award for ignorance this month goes to . . . well, I can't name names . . . but he will know who he is. I hope you have mended your ways sir, and I'll be calling in to check! I expect to see Dr Axelrod behind your counter — if not the person, then at least his book!

Ah well, as Plato may have said, "Blooming heck, some people, eh . . . !"

New Series

Confessions of a Fish Widow

THE SAGA OF THE ELUSIVE APISTOGRAMMA CACATUOIDES

It all started quite innocently. Then — too late to do anything about it — **Marylin Apps** found out what she had let herself in for!

At the risk of sounding heretical, or perhaps hysterical is nearer the mark, fish are something I can live without (except perhaps coated in batter and fried!). In marriage, however, one must give and take and so, 13 years ago, when my husband suggested setting up a fish tank, I agreed readily in the mistaken belief that it was a harmless enough hobby and I would probably see more of him. (His previous hobbies had been motorbike racing and hang-gliding!)

SPROUTING TANKS

How wrong I was! I was soon to find that there is nothing in life more fanatical than a fishkeeper. How was I to know that those first four Guppies in their second-hand fish tank would grow into an aquarium set-up to rival London Zoo?

Within months, our one small fish tank had become four, and our four Guppies had become 40 assorted fish. Conversation had become peppered with Tiger Barbs, Emperor Tetras, Pearl Gouramis — and fry! Especially fry!

I admit I was quite excited when our first Guppy fry were born. The joy of watching those little black dots shimmy across the tank was, however, soon marred by requests for old pairs of tights or my best tea strainer (to strain the brine shrimp through to feed the fry on, of course — what else!).

Then there was the gravel in the sink, buckets of water everywhere when I wanted to vacuum, and, best of all, white worm cultures under the stairs just nicely placed for our four-year-old daughter to eat handfuls of believing they were 'sweeties'.

MOVING EXPERIENCE

We moved soon after the white worm incident. I employed the worst removal men I could find (an old man with a peg leg and a young boy with acne) in the hope that, at least, some of the now-six fish tanks would get broken in the move. I hoped in vain. While I rode in the rickety lorry with the old man and the boy, and the two children and the cat, the fish tanks journeyed in glorious splendour in the back of the estate car, wrapped lovingly in newspaper.

I was really pleased with my new house. It was modern, spacious, light, and came complete with a huge utility room just off the kitchen. Plenty of room for my washing machine, tumble dryer, freezer, etc. Plenty of room, that is, until I came home from shopping one day to find my husband had annexed half of the utility room to make a fish room.

Fish scales flew! But then, you can't keep a man from his hobby, and after he had explained his desire to breed fish and watch them as they grew from young fry into adult fish — what could I say? What could I say except: "Buy me a new washer/dryer and a new upright freezer to make up for the space you've taken, and I'll never darken your fishroom doors again!".

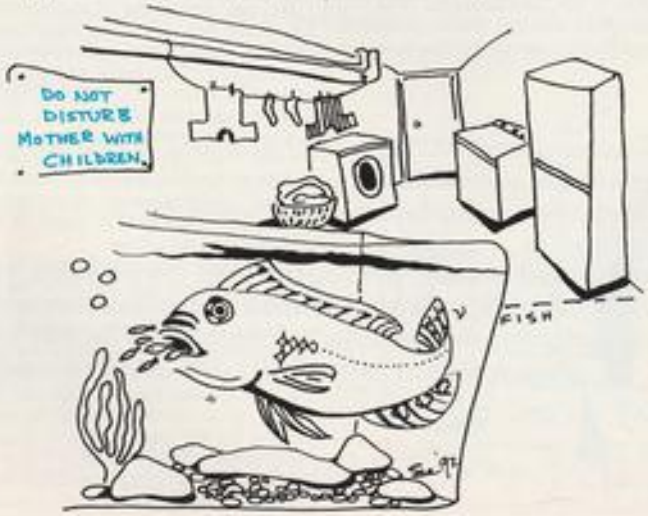
UNEASY TRUCE

An uneasy truce reigned for several years. I didn't look at his breeding fish, and he didn't look into my washer/dryer. I did fume a little, however, as air pumps proliferated on top of the freezer and holes were drilled in walls and ceilings to take water pipes and air pipes . . . and piped music, for all I know!

With a fish room to hide in, the incidences of spotting my husband round the house grew fewer as time went by. So I took up my own hobbies. Well, to be truthful, I supported my children in their hobby of dancing. While the children and I whiled our hours away at dance festivals round the country, my husband went to fish shows and fish shops and garden centres with fish franchises.

THE GREAT SEARCH

It became an amicable arrangement until the great *Apistogramma cacatuoides* search began. These small insignificant cichlids were nearly the final straw in the divorce stakes. The hunt for *Apistogramma cacatuoides* took on fanatical proportions. Not a fish



Tomorrow's Aquarist

By Gina Sandford

EQUIPMENT CHECKS

Over the past four weeks I think we have replaced every heater and heater/stat in the fish house. They have either failed and the tank temperatures have dropped, or, in one case, the thermostat stuck on and I lost my Bolivian Rams. This was most annoying as they were set up for breeding and were going through the motions. So what did I learn from this?

Firstly, always check your tank temperatures. I do this by feel when passing and looking at the behaviour of the fish. But most people have thermometers in, or attached to the tank so they can see immediately.

Secondly, make sure you have spares. We always try to carry sufficient spares for any emergency. Murphy's Law states that if something is going to go wrong or break down, it will always happen out of shop hours and at the most inconvenient time.

Thirdly, check the efficiency of your equipment regularly, especially during autumn when heating equipment that may not have been working at all during the summer months (indeed, I often switch off heaters on many of my tanks during the warm months), is called on to run at full stretch to maintain fish and plants when it's below zero outside.

If the heater fails and the temperature drops, it will be a gradual drop. Do not attempt to raise it again in a hurry; this places a great stress on the fish. Replace the heating unit, allow the temperature to rise gradually, and all should be well.

TAKING YOUR HOBBY FURTHER

While at the Weston-super-Mare Show in November, I came across a lady, **Mrs Gooding**, who had taken her interest in fish and incorporated it into her other hobby — cross stitch embroidery. She had some of her work on display and was offering kits for sale. I particularly liked the Clown Loach.

Thinking this over, I found that there are several other people who have done a similar thing, and I'm one of them. I like to knit sweaters with fish on them. To date, my family (and a few friends) have sweaters featuring *Brochis splendens, Brachysynodontis batensoda, Pseudodoras niger,* a variety of *Synodontis* species (what makes you think I like catfish?) and *Dumoides microlepis,* the Siamese Tiger.

Tucked away in Darwen, Lancashire, lives **Brian Walsh,** whose talent for fishkeeping knows no bounds, but when given a piece of wood and the necessary tools of the trade, he creates a masterpiece. Mike and I were the lucky recipients of one such masterpiece, a *Megalodoras irwini,* but, the icing on the cake was seeing a series of slides taken during the carving when a block of wood was transformed into the catfish with the right number of fin rays, scutes, barbels, etc.

The list of these creative talents know no bounds. Over the years I have seen stunning photographs, paintings and drawings of fish, stained glass fish, stuffed toy fish, even underwear embroidered with fish. Do *you* take your interest in aquatics beyond aquarium keeping? We'd love to know, so drop us a line.

BOOK REVIEWS

Trees and Woodlands (ISBN: 1 85170 870 7)

Rivers and Ponds (ISBN: 1 85170 869 3)

The Seashore (ISBN: 1 85170 871 5)

Author: Cecilia Fitzsimmons. **Published** by **Studio Editions Limited. Price:** £4.99.

A couple of weeks ago, a package landed on my doormat. it contained three small *Pocket Pullout Guides to Rivers and Ponds, the Seashore* and *Trees and Woodlands.* The accompanying note from our editor said, "Please review for **TA**".

Rather than just sit and review the books, I thought it would be more fun to give them a field test so, armed with *Trees and Woodlands,* wax crayons, a pencil and some paper, **Elaine** (middle daughter, aged 6) and I set out to see what we could find.

The book is divided into three sections: an introduction, a nature guide and woodlands around the world, plus a pull-out habitat frieze and tree check list. Identification of leaves proved fruitful, this section having pages devoted to simple leaves, many-sided leaves, divided leaves and leaves like needles. We found it quite easy to identify the fallen leaves using this and could then check the defoliated (leafless) tree shape using the check list on the back of the pull-out section.

Our walk in the autumn sunshine resulted in a handful of different shaped leaves, a couple of sketches of tree outlines and several bark rubbings. None of these activities had resulted in any damage to the trees or the environment, but they did result in a lot of pleasure and much activity by Elaine when we returned home. Some of the leaves were pressed for future reference, while others were used to make leaf rubbings, the best of which was converted into a card to give Granny.

Rivers and Ponds was field tested much closer to home. While I was feeding the fish, Elaine went pond dipping in the garden pond. The guide, divided into sections in the same manner as the trees, proved very useful. The drawings of pond life are very accurate and made identification simple, while the pages dealing with young insects, fliers and skaters, and slow rivers and ponds, were of most interest to me as it is these creatures that I use to feed my fish.

The habitat frieze shows the life forms that can be found in the various stages of the river, from the upland stream, through the middle reaches, to the lowland river and, finally, the estuary. On the reverse is a checklist of animals from soft-bodied creatures such as leeches, through molluscs, arthropods, insects, amphibians and reptiles to mammals, birds and fish.

Unfortunately, we could not field test *The Seashore,* but it follows the same format as the others. All the shore habitats are dealt with, from sandy beaches and mud flats, to rock pools and man-made shore. These are illustrated beautifully, especially in the habitat frieze which has an animal check list on the reverse. I must say I am looking forward to taking this one out in the summer!

All in all, I like these publications, and would most certainly have liked to have had *Rivers and Ponds* to hand when Elaine was studying pond bugs last term. They are easy for young people to understand without talking down to them, and there are suggestions for things to do, as well as useful addresses. Also included are words of warning on what to collect and what not to. Each contains something about pollution and conservation and recommends the use of your local library if you want to pursue the subject further.

My one regret is that I don't think these books will stand up to the wear and tear of a pocket guide. In a single outing, the pull-out frieze of *Trees and Woodlands* is a little dog-eared and, with a little more use, I am not sure that the 32-page book section will remain attached to the hard cover (the format of these books is that instead of being bound in at the centre, the back page of the 'book' section is stuck to the left side of the open hard back cover). Although this protects the pages when the volume is closed, it does put a strain on the glue. Perhaps when reprinting, a laminated pull-out frieze could be considered — at least, the dirty finger marks could then be wiped off the checklist!

"You should see my brother's place, real classy joint, water filter, gravel, toy mermaid . . .".

Growing Tips

By Barry R James

THE 'OTHER' ORCHID

Some twenty years ago, I obtained some specimens of *Barclaya motleyi*. Unlike the well-known Orchid Lily (*B. longifolia*) with its long strap-like leaves, this species had rounded ones rather like a water lily.

The underside of the leaves were reddish-purple and the upper surface olive green. They reached a diameter of about 2½in (6.4cm). The water had a hardness of around 8° GH and a pH of 7.4. The temperature was around 80°F (27°C). Plain Chessel Beach gravel was used as a base.

The bulb sprouted quickly and, within a few weeks, had grown into a beautiful plant. Eventually, it produced a most unusual flower on the surface. I christened the plant the Orchid Lily, a name which has since been used for *B. longifolia*. Of the several flowers which were produced, one developed a seed capsule containing many small seeds, like those of the poppy.

I have never had the plant since, but I think it should be re-introduced, even though, contrary to my experience, some writers refer to it as 'difficult'.

I have the word out among collectors in South Eastern Malaysia where the species is endemic, and hope to receive some specimens soon. There are three or four species in the genus, including one called *B. rotundifolia*.

SUITABLE ROCKWORK

I get lots of enquiries regarding rockwork and as to whether or not it's suitable for aquaria. Any hard rock is suitable, providing it doesn't contain injurious substances such as lime, or soluble metallic ores like copper, mercury, etc.

Lime can easily be detected by pouring dilute hydrochloric acid over it. A vigorous reaction will occur in the presence of lime, with much fizzing and frothing. Vinegar will produce a similar — but much weaker — reaction.

Metallic ores are more difficult to recognise, but, streaks of green, ochre or other brightly coloured areas should be viewed with suspicion.

Lime-free gravel is in great demand, but hard to obtain. Dennerle has just produced some called Crystal Quartz. It comes in three colours: white, brown and grey. The particle size is tiny, about $^{1}/_{16}$in (0.2cm). It is sold in 10-kilo (22lb) buckets for a whopping £21.13.

However, I have been testing lots of samples of both rock and gravel from around the British Isles. So far, I have found one gravel which is a beautiful golden colour and is lime-free, plus several new rock types which I hope to be introducing in the near future. The gravel will retail at £5.18 for 14lb (c 6kg).

BAMBOO POPULARITY

With the growth in hobbyists installing Japanese-style gardens, there is an increasing interest in Bamboo plants. These are not easy to obtain from the average garden centre. Even when available, they seem to stock only the dwarf species. I have several species in my garden and get a great deal of pleasure from the sight of their graceful canes in summer, although they can get rather shrivelled after a hard winter.

One of the tallest species I have is *Pleioblastus simonii*. I grow this one by the poolside. It reaches a height of 10-20ft (3-6m). The leaves are broad (12 x 1in — 30 x 2.5cm) and a rich green.

Another tall species is *Sinarundinaria nitida*. This one is 15-20ft (4.6-6m) and has thin bright green leaves. It is very graceful and arches over when it reaches its full height. The stems are green, becoming purplish with age. This species appreciates a shady situation.

My pride and joy is a plant I managed to acquire from a private garden in Surrey. Huge blue-green leaves up to 14 x 3½in (35-9cm) broad are borne on thin arching stems, very tropical-looking.

Quite small at the moment, but growing taller every year, is *Sinarundinaria anceps*. This plant is somewhat similar to *S. nitida*.

I have several dwarf species. *Pleioblastus pygmaeus* is the tiniest of hardy bamboos. I grow it in shade beneath a large walnut in the fernery. It only grows about 10in (25cm) high, is very invasive and produces good ground cover.

Pleioblastus viridistrianus from Japan is a short plant, reaching only 3-4ft (90-120cm). Beautiful foliage striated in green and

My favourite bamboo is the very hardy species available under a variety of names such as *Sinarundinaria anceps*, *Arundinaria anceps* or *A. jaunsarensis*. This plant, along with many other bamboos, will grow anywhere in the UK, being resistant down to minus 20°C! (Illustration reproduced by kind courtesy of specialist supplier of bamboos, Jungle Giants. Tel: 0568 86708; Fax: 0568 86383).

GENUS: ***Arundinaria***

SPECIES: ***jaunsarensis***

SYNONYM: *A. anceps*

ORIGIN: N.W. Himalayas between 10,000 and 11,000ft. above sea level in Bhutan, Sikkim and Gharwal. Introduced to Britain (Lincolnshire) in 1865.

DESCRIPTION: *A. jaunsarensis* is an extremely hardy Bamboo with very straight culms which arch over at the tips with the weight of fine foliage. This gives the plant a plumed effect. Widely spaced groups of culms offer opportunities for open screening.

yellow, this plant does better in full sun which brings out the variegation.

Over the last few years bamboos have undergone extensive re-naming. In general, however, the specific name remains valid (but not always, though), even if the generic name has been changed.

FROG STOWAWAYS

Of late, I am beginning to wonder if I am in the fish business or the frog business! In every shipment of fish we bring in, there are 50 or so Congo Frogs or African Clawed Toads (*Xenopus laevis*). These cute little amphibians really appeal to customers when added to tropical aquaria.

Of course, I point out the dangers inherent in their prodigious appetite when they grow to their full size, but their owners seem prepared to put up with their vices in return for their intriguing antics.

TOP LIGHTING

I am coming round more and more to the concept of open-top tanks and suspended lighting. The continuous access takes away a lot of the chores inherent in lifting hoods, removing cover glasses, etc when servicing normal aquaria.

Also, the third dimension of being able to view the surface enables the owner to appreciate the floating plants and the flowers of *Aponogeton* and *Nymphaea*.

I am extremely impressed with the new 12 volt Halogen lighting systems. The coloured glass reflectors have the bonus of giving a dappled effect to the water, adding an air of mystery to the scene.

SPANISH AND FRENCH FINDS

We recently took a flying break to Spain. The Rio Grande flows quite close to the old farmhouse we own there. I decided to try a spot of fishing and landed several respectable Dace-like fish using bread paste.

Wandering along the river bed, I noticed several species of aquatic plants with which I was unfamiliar. I brought them home for identification as I hadn't a clue what they were.

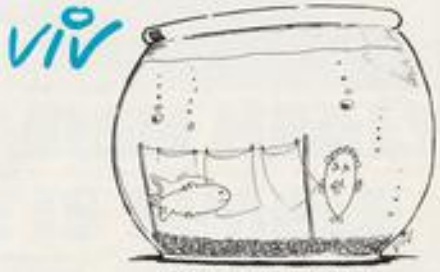
One of them turned out to be one of the Waterworts (*Elatine macropoda*). *Elatine* is a cosmopolitan genus of about 15 species. They are annuals or short-lived perennials of a creeping habit. All are adapted to aquatic biotopes with fluctuating water levels.

This species is found in Southern Spain and North Africa. De Wit says it will form a good 'turf' for the front of the tropical aquarium.

Other plants included a very pretty sedge, only 8in (20cm) high, with drooping terminal inflorescences. It would make a lovely marginal pool plant. But, is it hardy?

A customer brought me in a cutting the other day. He brought it back from a botanical garden in the south of France. He has been growing it outside in his garden pool in Stroud, Gloucestershire for some years where it has proved hardy.

I recognised it as a *Jussiaea* — a member of the Evening Primrose family — by the leaves and flowers. Most Jussiaeas are of upright habit, but this one resembled a *Ludwigia*, to which it is closely related (some authorities have actually synonymised these two genera). It would be a splendid and unusual marginal. It may even grow submerged.



"Now swim around like mad. I need to spin these sheets."

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Seaview

By Gordon Kay

Well, '93 is upon us and all the effects of 1992 — with everything that means — are yet to be seen. Whatever happens, I trust that this year will bring you all that you wish for yourself. Meanwhile, there has been so much to say on all manner of things that there has been a dearth of **Snippets** on this page of late. I think it's time to put that right, so, here goes:

THE 'SNIPPET' BONANZA

1 The scientific name for the Harlequin Tuskfish is *Lienardella fasciata*, *Novaculichthys taeniourus* is the Dragon Wrasse, and *Pteudocheilinus hexataenia* is the scientific label for the Pyjama Wrasse.

Which is the odd one out? None. All three members of the family Labridae. The Tuskfish may not look like yer average Wrasse, but it is!

2 The Grammidae (Fairy or Pygmy Basslets) are a family comprising of only three known species: *Gramma loreto*, *Gramma melacara* and *Gramma linki*. They are endemic to the Caribbean and are closely related to the Pseudochromids, the Dottybacks.

3 The Marine Catfishes e.g. *Plotosus lineatus*, have poisonous spines preceding the dorsal and pectoral fins. This is a gregarious species when juvenile, but this stops when it reaches adulthood. The colour pattern is also lost.

4 What do the pretty *Anthias squamipinnis* Lyretailed Coralfish, the wonderful *Calloplesiops altivelis* (Marine Betta) and the stunning *Cephalopholis miniatus* (Coral Trout) have in common? They are all — despite their widely differing appearance — Groupers, belonging to the family Serranidae.

5 The key sense for fishes on a coral reef is sight. Fishes' eyes are very similar to those of most other vertebrates, except that they have a spherical lens. Fishes can focus on both objects which are distant, and those which are under their noses.

Their field of view is governed by the position of the eyes on the head. Predatory species have forward-facing eyes which allow them to focus on prey in front, while species which are not predatory have eyes on the side of their head, and possess good visual range on both sides — good for defence.

6 Sharks and Rays do not have a bony skeleton, but rather a skeleton made of cartilage. For this reason they are called Cartilaginous Fishes, or sometimes the Elasmobranchs.

Elasmobranchs have broadly the same internal organs as do bony fishes, except that they lack the swim-bladder. Also, near the end of their intestine is a strange, corkscrew-shaped structure known as a spiral valve, which increases the surface area for absorbing nutrients.

7 Apart from the Bony and Cartilaginous Fishes, there is another very strange group of fishes called the Jawless Fishes.

In this group, the digestive tract is little more than a tube from mouth to anus. In addition, Jawless Fishes (like the Hagfish) do not breathe with proper gills but by means of gill pouches which are internal pockets linked to the pharynx and lined with fine blood vessels.

8 Marine Garfishes are often caught by anglers, but many people are put off eating them because of their strange bright green skeleton. No one knows why Garfishes have green bones; the colour remains even after cooking.

9 Even fishes get arthritis! As the Spadefish ages, it tends to develop thickening in its bones and fin rays. This is called hyperosteosis. Affected fishes seem to live normal lives, even though their skulls and fins become grotesquely swollen. This condition could be due to a build-up of calcium caused by the animal's lifetime of munching coral.

10 The water column above coral reefs is an important source of food, not only for some reef fishes, but also for pelagic species like the Striped Mackerel *(Rastrelliger kanagurta)* which feed on tiny crustaceans and other animals of the plankton by straining them from the sea on their numerous slender gill rakers.

Dog fish *(Scyliorhinus)*, along with the rays form the large group known as the Elasnobranchs or Cartilaginous Fishes.

The sea grass habitat, which is often adjacent to a coral reef, is significant as a nursery for many reef species. Some species live there as adults, such as the Parrot Fish *(Lepotoscarus* spp.). Other adult residents are the Garden Eel *(Gorgania nilneri)*, the File fish *(Paramonacanthus* spp.) and some Pipe fishes and Seahorses.

More usually seen next to a coral reef, however, are sand flats. Fishes which live on the sand flats are either coloured in such a way as to look like the sand, or bury themselves either completely or partially, or both. Examples of this are Dragonets, Snake Eels, Sand-divers, Razorfishes and some of the Wrasses.

ENLIGHTENING EXPERIENCE

You may remember that in November's instalment of **Seaview**, I talked about invertebrate aquariums. Part of my rambling was about metal halide lighting and I said to you that this type of lighting costs "hundreds of pounds".

Well, almost immediately after that, I received a letter from **Mr G C H Oates**, who is a director of **Jerrard Brothers**, the company which makes aquarium lighting equipment — in particular the equipment with the brand name of **Arcadia**. He informs me that his company produces an Arcadia metal halide 150 watt pendant with a retail selling price of £169.95. This pendant uses a lamp with a colour temperature of 4300k.

As Mr Oates pointed out, some people would say that this needs to be used in conjunction with an Actinic 03 lamp to increase the amount of blue light, and for this reason Jerrard Brothers also produce a marine metal halide pendant with a blue/white lamp of 6500k colour temperature. This pendant retails at £189.95.

Should anyone require more information, please don't write to me. Write to Mr Oates at:

Jerrard Brothers plc,
Arcadia House,
Cairo New Road,
Croydon,
CR0 1XP.
Tel: 081 688 8222.

Letters

The Mail Order Debate

In response to John Cuvelier's rather irresponsible and ill-thought out 'praise' of two Mail Order companies in a recent issue of *A & P*, I feel I must set the record straight and outline a constructive way forward. I would be grateful if you would publish this letter.

In pursuit of higher, rather than lower, standards of fish, and of aquatic outlets, the dehabilitating effect of Mail Order companies must not be underestimated. None of the money taken by these companies returns to the livestock side of the trade in any significant way.

The nett effect must have been experienced by almost all concerned aquarists: the continued existence of shops with dead or dying fish, poor service, and a general lack of care and concern. It cannot have escaped one's notice that the local Sainsbury's appears to have higher standards of health and hygiene in dealing with its dead stock, than do many aquatic shops dealing with their livestock.

Fish are not the equivalent to bags of potatoes, and require high levels of human input to achieve high standards of health and vitality. Thus, rather than single-time and money-saving centralised systems, the move in the trade within the principal freshwater market should be towards individually filtered tanks that do not rely on the 97% kill rate efficiency of ultra-violet sterilisers, but the 100% efficiency of separation. For many people this will also mean worthwhile and rewarding work, in a time when unemployment remains a problem.

It cannot have escaped one's attention that the successful shops of the eighties, as claimed by their customers, e.g. Birstall and Monkfield Aquatics (with whom I have no connection), run principally individual systems. However, the downside of such policies is increased costs, and, hence, we must see the end to parasitic Mail Order companies who could not exist without retail fish suppliers.

This does not necessarily mean that customers will therefore have to pay vastly more for their dry goods than they have been used to. Indeed, in our shop, we match the majority of Mail Order prices, and believe that continued competition between shops will keep prices low. It is, however, necessary to claw back the significant volume of trade presently being lost to Mail Order companies.

Manufacturers have argued for years that they supply wholesalers and that it is up to the wholesalers as to what happens to the goods next. I regard this as ill-conceived. Higher retail standards nationally would be advantageous to manufacturers and retail customers alike.

The answer in the short term is for manufacturers to sell to wholesalers who agree to supply only genuine aquatic outlets. The definition of genuine could be achieved by requiring that, for instance, 15% of turnover be of livestock purchased and collected from the aquatic outlet. This would allow Mail Order to exist only from genuine stores, allowing re-investment in the part of the trade that really matters, the fish.

Stephen Lee-Son,
The Art of Fishkeeping Limited,
Stockport,
Cheshire.

Animal House Replies

At last, the Mail Order myth is revealed!

The latest official Mintel Survey Report on the total turnover of the UK retail aquatics market indicates that the turnover of the Mail Order segment represents LESS THAN 1% OF THE TOTAL.

On this basis, the effects of Mail Order on the retail trade is negligible and can in no way account for, "the continued existence of shops with dead or dying fish, poor service and a general lack of care and concern".

Cost-effective quality, price and service are the basic tennets of good business. Firms who operate on this basis grow and prosper; those that do not, fail and, as in this case, blame anything from the weather and recession to Mail Order.

We suggest that the complainants would do better concentrating their energies on improving their own businesses, instead of looking for excuses and scapegoats.

As Europe's largest aquatic Mail Order company, we take pride in offering a high standard of customer care and service. This has helped to bring and keep more people in the hobby and provide professional advice to customers who so often complain about the poor treatment they have received from inexperienced or ruthless retailers.

Mail Order aquatics has operated successfully in the UK and abroad for many years with the full support of major manufacturers, as well as a large number of wholesalers and publishers.

In terms of the sale of fish, many retailers sell livestock with little or no dry goods, and vice versa. Our aim has always been to provide the customer with what is obviously the most important aspect of fishkeeping: good quality water conditions at a reasonable price. This, we regard as true fish care. We also run a breeding programme for rare and difficult species which helps conservation.

Our interest is obviously the long-term future of the industry, with the needs of the customer as our primary concern.

Chairman,
Animal House (UK) Ltd,
Batley,
West Yorkshire.

Unsafe Connections (Cont.)

A scientist's right to experiment is not a licence for foolishness.

If Dr Ford's 'lash-up' (**Letters**, *A & P*, Oct '92, p. 17) was intended as a purely temporary expedient prior to providing a permanent installation, then some latitude could be allowed. However, he claimed to the contrary. This means he may not be aware of his legal responsibilities.

The purpose of correct electrical installation is to protect the innocent and the ignorant. If readers wish to protect others, as well as themselves, particularly children and animals, I suggest they err on the side of caution.

Dave Lunn's reference to "IP rated" (same **Letters** page) is confusing, as "IP" is the prefix for a European specification concerned with a variety of enclosures, some of which are only rated as showerproof, **not** waterproof. If his correspondence was edited, this important fact may have been omitted in error. [*No, there was no editorial error in this instance.* **Ed**].

Most pondkeepers have family and friends and their offspring about their gardens and ponds from time to time. It is a legal duty to ensure safety for these visitors. It is only right that, under these circumstances, people are encouraged to use the correct practices for electrical installations.

The use of Electromagnetic Circuit Breakers do not convey legal immunity; these devices can sometimes fail, or operate sluggishly. Unqualified reliance on these devices can result in injury or death.

Dr Ford knows this, I am sure, so why does he defend the indefensible?

M R Taplin,
Worle,
Avon.

R.O Marine Applications

We have been carrying out research since 1968 into filtration of water to maintain fish, and have been breeding fish since 1954.

Up to the early '80s, tapwater seemed to pose few problems, and most filtration was aimed at the 'in-tank' end of the system. However, over the last 10 years, it would seem that mains water has slowly become poisonous to most fish. When asked, the Water Utilities, quite rightly, point out that it is their duty to treat supplies to make them suitable for humans and not fish.

Unfortunately, this means

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that when it comes to breeding fish, keeping marines and inverts, growing food cultures, and making up salt, peat, culture water and vitamin mixes, tapwater is now virtually unusable.

Up until January 1991, I had been filtering all my water through our own Activated Carbon and deionising resins, but, nevertheless, had to use glass distilled water for all cultures and formulae, which became very expensive.

My thoughts therefore turned to Reverse Osmosis as a substitute for the distilled and purer water applications. Results have been excellent. R.O. remove over 92% of the nitrates present, as well as phosphates and other harmful nasties. Although there is a certain amount of waste water produced, this is stripped of chlorine, pesticides, herbicides and other contaminants that the carbons in the R.O. unit will remove, so I see no reason why it could not be applied to 'hardy' species of fish, on an 'at owner's risk basis' without too much difficulty. In any event, the running costs are not excessive, and certainly well below that of my previous process.

Using ordinary tapwater you may get unreliable results when mixing salts and buffers, but with R.O. water the salts stabilise it and you get 'true' readings, unaffected by other salts present when buffers are applied, so the whole process is highly effective.

Provided you remember to aerate the product water, I would certainly recommend the use of an R.O. unit to marine and invert keepers as it makes life an awful lot easier.

Bob Tomlinson,
'Crystal Clear' Products,
Bolton,
Lancs.

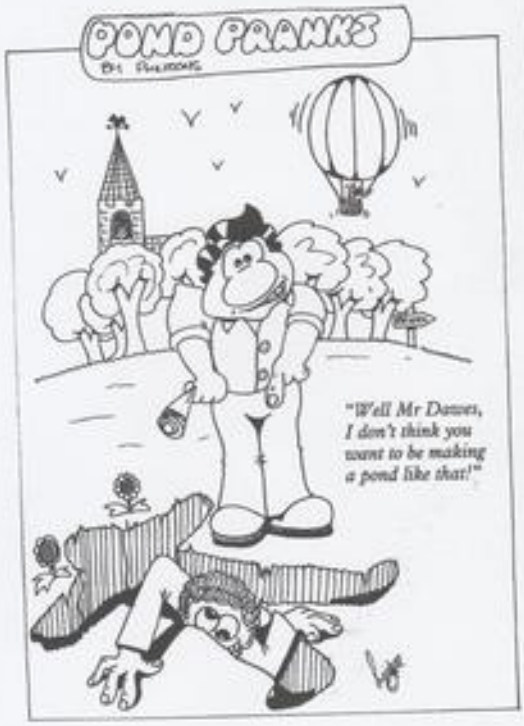
Down to Earth

Having read your editorial **Uplifting Pond Experience** in the October issue of *A&P*, I just had to provide a little 'scribble'!

I was sure that there had to be a cartoon in the idea of hot air balloon rides and fish ponds. I hope you agree.

Phil Norden,
Bracknell,
Berks.

[You're absolutely right, Phil. I love it! **Ed.***]*



Books

Saving the Oceans

General Editor: Joseph MacInnis
Published by: **Blandford**
ISBN: 0-7137 2353-X
Price: £20

It's gorgeous, it's big, it's eminently readable ... and it's important. *Saving the Oceans* presents a series of personal windows into the 70% of our planet that consists of marine environments. One of the many things I found especially appealing is that these personal windows achieve their aim in a way that stimulates the imagination, educates the reader, and makes you want to get up and do something positive in the fight to prevent the destruction of our aquatic heritage.

The authors are all highly respected within their respective fields, yet none is carried away with the importance of their positions. There is, consequently, no pomposity about their 'delivery', although some of the riveting phraseology and composition may well be down to the skills of the general editor, Joseph MacInnis, himself, or the 'in-house' editor at Key Porter Books, the original compilers of *Saving the Oceans*. Whatever the case, the end result is an absorbing, spectacularly illustrated, large-format, 180-page volume at an incredible price.

I found that, being aimed at a wide readership, some of the arguments and examples are, inevitably, not taken to any great depths (forgive the pun). Even so, enough material is presented to provide an overview of many of the organisations, individuals and projects which form part of the worldwide campaign against pollution, over-exploitation, destructive practices and other factors which are contributing towards the demise of the oceans and their inhabitants.

When you couple such strong messages with stunning photography, and quite a bit of fascinating detail, you end up with a book that will strike a chord with a wide spectrum of the book-buying public. If you then include marine mammals, birds, marine reptiles and deep-sea creatures, the allure is complete.

I'm not sure that I would wish to join every one of the 66 marine environmental organisations listed in one of the four appendices . . . or that I share a common philosophy with all of them. However, whether you live in Australia, or Brazil, or Canada, or Chile, or France, or Japan, or the Netherlands, or New Zealand, or South Africa, or Switzerland, or the UK, or the US, there are full details of national and international bodies based in all these countries for you to choose from.

In *Saving the Oceans*, Blandford have once more shown us just what can be offered — when circumstances allow — for the unbelievably low sum of £20. Let's hope they come up with other equally worthy publications in 1993.

John Dawes

Colored Atlas of Miniature Catfish

(Every Species of *Corydoras, Brochis* and *Aspidoras)*

By: Dr Warren E Burgess, with drawings by John Quinn
Published by: **T.F.H. Publications, Inc**
ISBN: 0-86622-441-6
Price: £13.95

Everybody, it seems, loves *Corydoras* catfish. Everyone's heard of them, and the vast majority of freshwater tropical aquarists will have kept them at some stage in their 'careers'.

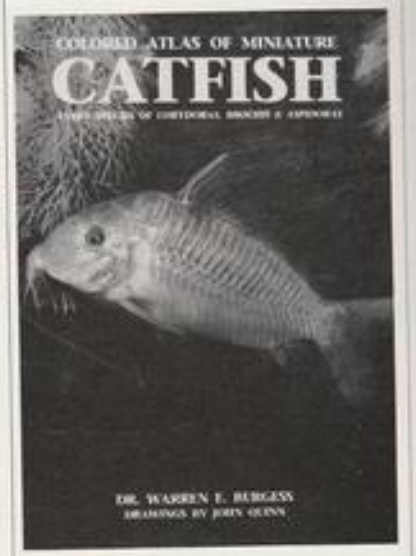
It may therefore come as a bit of a surprise to learn that there has never been a book which illustrates every species of *Corydoras* known within the aquarium hobby. Warren Burgess has now righted this wrong, featuring, not just all the 'hobby' *Corydoras*, but all the other species only rarely (or never) seen in aquatic circles as well.

Actually, in this profusely illustrated, 224-page *Atlas*, he's not only included all the *Corydoras* species described to date, but also the three *Brochis* and fourteen *Aspidoras* species known. The *Atlas* therefore represents, in many ways, the most comprehensive and welcome review of these three genera ever put together for the benefit of aquarists. And a pretty good job it does, too, of covering the territory.

Following a 25-page introduction (pages 7 to 31), there are three further chapters, one dedicated to each of the three genera.

The introduction includes some general features about *Aspidoras, Brochis* and *Corydoras* and provides good guidelines on aquarium care and breeding which every 'small-catfish' fan will appreciate. This section also carries some very good photographs. I feel, though, that we could have done without these (few) well-worn pictures which we've seen so many times before in other books. Some of the artwork, e.g. on pages 22 and 23, also leaves a little to be desired.

I would have preferred a different arrangement for this first chapter, perhaps starting off with a brief introduction, followed by distinct sections on aquarium layout, maintenance, diet and reproduction. In the *Atlas*, all these subjects are there, but they just run on one after the other, without separate sub-headings.



I would, in addition, have liked to have read something about the organisation of the book. In particular, I think there should have been an explanation as to why the genus *Corydoras* has been treated in strictly alphabetical order, rather than within the traditional groupings, i.e. *Acanus, Aenaeus, Barbatus* and *Elegans* groups.

This is not a criticism of the actual content of each entry, which I found more than satisfactory. It is, however, a criticism of the organisation of one part of the very competent and comprehensive contents.

The chapter on *Aspidoras*, quite appropriately, begins with an introduction. *Brochis* also receives this necessary treatment. Yet, surprisingly, the chapter on *Corydoras* dives straight into the first species, *C. acrensis*, without outlining any of the specific characteristics which allow us to tell these fish apart from their close relatives without having to take them apart.

Where such details are provided (as on Page 33 when introducing *Aspidoras*), the terminology is, I'm afraid, of the kind that leaves the average aquarist little wiser: cranial and frontal fontanels, supraoccipital fossa and commisural bars, are all mentioned, but not defined or illustrated.

These are niggling irritations in an otherwise extremely useful and well presented book which no catfish enthusiast should be without. Once more, TFH have dared to go where others have feared to tread, and I congratulate them for it. No one else, I'm sure, would have been able to do this and, at the same time, make the project available for a mere £13.95.

No one else has (to the best of my knowledge) produced such an unusual and beautiful illustrated index either! Well done TFH!

John Dawes

New Book News From Steven Simpson Natural History Books

1 Aquatic Plant Book

By: C D K Cook.
(30 x 21cm, 228pp, 408 text illustrations [mostly composite], glossary, reference list and keys. Softback. £49.50 post free UK.)

This book is a comprehensive guide to the aquatic plants of the world. It describes and illustrates 407 genera, including all ferns and flowering plants that are likely to be found in, or floating on, permanent or semi-permanent, fresh or salt water anywhere in the world.

Primarily a practical reference, care has been taken to describe juvenile and vegetative features which are often ignored in floristic literature but are so important for the identification of aquatic plants. This is particularly important because many species have short-lived or insignificant flowers that are easily overlooked, or do not develop flowers at all.

The clearly laid out identification keys are based, where possible, on easily seen vegetative features. In addition, information is given for each genus on the distribution (native and introduced ranges), similar forms, ecology, pollination and dispersal, economic importance and uses, and references to the literature.

This is a useful book for anyone concerned with aquatic ecosystems, particularly managers, engineers, weed controllers, conservation officers, gardeners and aquarists.

2 A Guide to the Amphibians and Reptiles of Singapore

By: K and F Lim
(15 x 10cm, 160pp, numerous colour photos of species and habitats, checklist, glossary and scientific index. Softback. £8 post free UK.)

One of the very few books on the herpeto-fauna of Singapore, this new, colourful, composite guidebook illustrates 107 of the 160 or so species found in the area, of which 22 are amphibians and 87 are reptiles.

Each species is introduced by popular name and scientific name, with details of toxicity (snakes only), adult size, preferred habitats, diet, reproduction, time of activity, status and relative abundance. This volume is suitable for both field and terrarium use, but of particular interest to readers with a special interest in the herpeto-fauna of the region.

3 The Freshwater Fishes of North Borneo

By: R F Inger and P K Chin
(24 x 16cm, 268 + 47 (supplementary chapter) pp, 165 photos, text illustrations and maps, 28 tables, checklist of local names, keys. Softback. £24.50 post free UK.)

This standard reference to the identification and ecology of the fishes of the region was first published in 1962. Over the last 30 years much new information has been obtained, resulting in this new edition which includes information, illustrations, photos and keys to 61 species not previously reported, resulting in a known ichthyo-fauna of 155 species (including 3 subspecies and 12 imported fish species used in aquaculture).

All three titles are available from: **Steven Simpson, Natural History Books, PO Box 853, Brighton BN1 5DY. Tel: 0273 727328; Fax: 0273 203754.**

Prices are subject to fluctuating exchange rates and publishers' revision. Please contact Steven Simpson before sending payment in advance. A full catalogue of ichthyological and herpetological books is also available on request. Please write stating interests.

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STUART TURNER KOI (BEST OF

Last month saw the announcement of the winners of the **Stuart Turner** pump competition and publication of the photographs of the two super top ponds. Congratulations again to **Derrick Francis** and **Graham Hall.** This month we have a selection of photographs which, while being of terrific Koi ponds, just failed to come top of the list in what was a very close-to-judge contest.

We really were impressed by the variety and quality of entries. It is obvious that Koi keepers go to great lengths (and depths!) to give their fish the best possible of homes. We hope that these pictures will stimulate those hibernating brain cells to start planning for the coming season. Well, we can all dream, can't we?

The photographs are not placed in any particular order of preference. I have, however, tried to place them by 'type'.

Ornamental In-ground Pools

Photo 1 **Mr M Reynolds** of Lancashire. Overall size 20 x 10 x 7ft (6 x 3 x 2.1m). Filtered with two bays of brushes, two bays of filter mat, a 20in (50cm) sand filter and twin 30W UV steriliser.

Photo 2 **Mr K O'Hara** of Lancashire. Overall size 16 x 10.5 x 3ft (4.9 x 3 x c 1m). Single bay filter and 30W UV steriliser.

Photo 3 **Mr C W Rose** of Essex. Filtered by Biozorb 5000 integrated with Cyprio UVC 6000. Total capacity 2,900 gallons (over 13,000 litres). Overall size not quoted.

Formal In-ground Pools

Photo 4 **Mr M J Smith** of Hampshire. Overall size 12.5 x 7.5 x 2ft (3.8 x 1.5 x 0.6m). Internal biological filter using mud clay pellets and Siporax.

Photo 5 **Allan Massey** of Wiltshire. Overall size not quoted. Filtered by Cyprio Biozorb and UV Clear 1250. Total capacity 1,000 gallons (4,500 litres).

Photo 6 **Mark Petersen** of Buckinghamshire. Overall size not quoted. In-ground filter system as per *Interpet Encyclopaedia of Koi.* Total capacity 4,750 gallons (c 21,600 litres).

Ornamental Out-of-ground Pools

Photo 7 **Mr & Mrs B Smith** of Devon. Overall size not quoted. Filtered by brushes, biological bay and vegetable filter. Total capacity 4,000 gallons (c 18,200 litres).

Photo 8 **Bernard Smith** of Cambridgeshire. Overall size not quoted. Filtered by brush chamber, gravel bed and UV steriliser. Total capacity 1,900 gallons (c 8,600 litres).

Photo 9 **Mr D J Kilshaw** of Clwyd. Overall size 16 x 8 x 4ft (4.9 x 2.6 x 1.2m). Filtered by brushes, pan scourers, Lytag and Cyprio UV Clarifier. Total capacity 2,500 gallons (nearly 11,400 litres).

Formal Out-of-ground Pools

Photo 10 **Mr C Dugaid** of Surrey. Overall size 14.5 x 6 x 5ft (4.4 x 1.8 x 1.5m) plus 6 x 6 x 3ft (1.8 x 1.8 x c 1m). Filtered by a 3-chambered unit containing brushes, Flocor and Lytag respectively and two 30W UV clarifiers. Total capacity is 3,800 gallons (nearly 17,300 litres).

Photo 11 **Steven Kemp** of London. Overall size not quoted. Filter size is 600 gallons (c 2,700 litres). Total capacity 2,350 gallons (c 10,700 litres).

Photo 12 **Mr D Ford** of Derbyshire. Overall size 16 x 10 x 4ft (4.9 x 3 x 1.2m). Filtered by brushes, matting, sand filter and Canterbury spa vegetable filter planted with lilies, irises and bulrushes. Total capacity not quoted.

ACKNOWLEDGEMENTS

We would like to extend our sincere thanks to all those who entered our competition. Sorry we couldn't print all the pictures! Thank you, too, to our sponsors, **Stuart Turner Pumps,** for their excellent support.

POOL COMPETITION THE REST)

By David Twigg

Paper Round

By Dr Ian Winfield

IN SEARCH OF PEACEFUL FIGHTERS

Commercial fish breeders have, for a long time, deliberately altered the number of chromosomes possessed by some fish species in order to make them more suited to their needs. The production of triploid individuals (which have more than the usual number of chromosomes) is often used to improve growth rate, induce sterility, or alter the natural sex ratio. **S Kavumpurath** and **T J Pandian** of the Madurai Kamaraj University in India, have recently discovered a novel benefit of triploidy in the Siamese Fighting Fish (*Betta splendens*).

A problem faced by commercial rearers of this species is the same as that experienced by aquarists, i.e. the extremely aggressive behaviour shown by mature males towards their own kind. The present solution to this problem is simply rearing the males in individual aquaria, which, as you can imagine, presents considerable logistical problems for anyone producing more than a few tens of fish.

Kavumpurath and Pandian artificially fertilised Fighter eggs at 24°C (75°F) and then subjected them to heat shock at 37-41°C (88-106°F) for two to three minutes, before returning them to 24°C (75°F) to continue their incubation. This procedure produced an acceptable number of triploid fish, although the success rate was not as high as previously reported for other species.

Triploid fish achieved the same body weight as their natural diploid relations, and even though the males could produce sperm, they did not construct bubblenests or try to attract females by the characteristic erection of fins and undulating movements. Posturing, such as erection of the gill cover and fins, and aggression towards fellow males, such as striking and biting, were virtually absent, allowing many males to be reared together.

The authors concluded that this fundamental change in the behaviour of male Fighters induced by triploidy will be of great value in the culture of Fighting Fish, although they were concerned that it may also

Fighters in characteristic pose . . . but, is their aggression about to be bred out?

make them less attractive to customers. This may be true of customers wanting fighting Fighters, but the aquarist simply wanting the addition of some colour to the community tank will not be disappointed.

(**Source:** *Aquaculture and Fisheries Management* **23**, 281-290.)

LIVEBEARER RESISTANCE TO WHITE SPOT

One of the most common fish diseases is Ichthyophthiriasis, or White Spot, caused by the ciliate protozoan *Ichthyophthirius multifiliis*. There is an obvious need within the aquaculture industry to understand the factors involved in the development of this particular problem.

G. M. Clayton and **D. J. Price** of the University of Plymouth, UK, have developed a standardised method of experimental infection and used it to study the extent of genetic variation in resistance to this parasite.

Experiments were conducted using four livebearer species, namely the goodeids *Ameca splendens* and *Ilyodon xantusi* (both provided by **J. Dawes**) and the better-known poeciliids, the Platy (*Xiphophorus maculatus*) and the Variegated Platy (*Xiphophorus variegatus*). In addition, four strains of Platy (Red, Red Wagtail, Yellow Comet Tail and Blue) were investigated.

The patterns of infection were complex, with many factors such as fish type, fish size, parasite isolate, temperature/tank effects and various interactions all affecting infection levels. Variation due to the sex of the fish was the only factor found to be not significant.

Between-species differences in resistance were recorded, with *A. splendens* being the most susceptible, although *I. xantusi* also had a low resistance. The most resistant fish were Blue and Variegated Platies, which, in contrast to the two goodeids, have a long history of domestication. The authors concluded that, intentionally or unintentionally, some degree of resistance to White Spot is likely to have been selected for during the domestication process, probably on the Singapore farms from where the platies originated.

(**Source:** *Journal of Fish Biology* **40**, 445-453).

DON'T TRY THIS AT HOME

Feeding fish on glass may seem a strange way to study their behaviour, but this unusual technique has been used by **I. D. McCarthy, C. G. Carter** and **D. F. Houlihan** of the University of Aberdeen, UK, to investigate the effects of hierarchies on the feeding of Rainbow Trout (*Oncorhynchus mykiss*).

This was no ordinary glass, but small amounts of ballotini glass beads of 0.40 to 0.52 mm in diameter added to normal trout food. Three groups of trout were maintained on different levels of food amounting to approximately 0.5, 1.0 and 2.0% their body weight per day. The amounts of food consumed by individual trout could then be repeatedly determined by 'photographing' them using X-rays. No mortalities were caused by this unusual, but very revealing, treatment.

The formation of feeding hierachies in salmonids and other fish in nature, in aquaculture and in aquaria is a well known phenomenon, typified by the most aggressive individuals obtaining the greater share of the available food.

McCarthy and his colleagues found that the hierarchy that developed among their trout resulted in significant differences in the variation in the amount of food obtained by different fish. Individuals at the top, while, by definition, consuming the most food, also enjoyed less day-to-day variation in the amount they obtained. The strength of the hierarchy decreased with increasing food ration available to the group as a whole, evidenced by those fish lower down the rankings enjoying a more consistent diet, even though they still received less than their dominant counterparts.

(**Source:** *Journal of Fish Biology* **41**, 257-263.)

DESERTING CONVICTS

As reported previously in this column, the parental care shown by the Convict Cichlid (*Cichlasoma nigrofasciatum*) has attracted the attention of numerous researchers interested in fish behaviour. In addition, **Miles H. A. Keenleyside** and **Robert W. Mackereth** of the University of Western Ontario in Canada have investigated what happens when this care breaks down.

As many aquarists are aware, the Convict Cichlid is a cavity-spawning, biparental (i.e. both mother and father provide care), substrate nester. Keenleyside and Mackereth followed the fates of young Convicts deserted by their fathers in experimental ponds stocked only with Convicts in southern Canada. The effects of desertion were remarkably clear and depended to a very large extent on the age of the young at the time when the father departed.

If desertion by the father occurred when the young were still embryos or free embryos, most broods disappeared within a few days, presumably eaten by older Convicts in the pond. However, if desertion occurred later, when the young had become free-swimming juveniles, most broods had some survivors. While the mothers of deserted embryos joined in the desertion, or may have even eaten their own offspring, the mothers of deserted one-week-old juveniles continued to defend them in most cases for at least a further two weeks.

(**Source:** *Environmental Biology of Fishes* **34**, 207-212).

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. **Discus,** Eberhard Schulze. **Marine,** Gordon Kay.

COLDWATER

RECURRING DEATHS

My problems started sometime ago when I accidentally over-dosed some fish which I thought were suffering from White Spot and they died. I re-set the tank with a Moor, a Fantail and a Shubunkin and, shortly after this, went on holiday, leaving the fish in capable hands.

When we returned, the Moor wasn't feeding and its fins were clamped up. Otherwise, it looked healthy. It didn't move much and showed no interest in food. Then it developed White Spot and, despite my treating it (being careful not to over-dose on this occasion), it died.

I had now moved the other fish to a new tank, so I bought a new fish and put a remedy in the tank. After about two weeks, the same symptoms developed and I lost my new fish. I've now cleaned the tank out completely.

What I am doing wrong? Please help.

First of all, we must bear in mind that many of the fish we see offered for sale are imports and, often, through stress caused by their transit to this country, need care and nursing before they regain their health and vitality.

Always keep the rule of proper quarantine. All fish must be kept away from your other stock for (in my opinion) at least six weeks. Break this rule and the problems can be endless, sometimes fatal, for all the fish stock.

Never add chemicals, cures, salt, etc, willy nilly to aquarium water, either as a preventive treatment, or an intended cure for an ailment you are not able to diagnose. Always keep to the dosage stated on any treatment you administer. Remember that fish must live in, and take into their gills, what is added to their aquarium water. Over-dosage may cure the first complaint, but cause so much damage to the fish's system that it may never recover.

Moors are, perhaps, not one of the most suitable subjects for beginners to fishkeeping. These fish are prone to eye ailments and very quickly succumb to health problems if the water in which they are kept is not in the very best of condition. Healthy Moors in good-quality water conditions will take on an almost blue-black colour, while poor water quality will cloud their skin, and they look grayish and will soon become unwell.

To maintain the water in the best condition, small frequent water changes must be made weekly. You did not tell me the size of your aquarium, but it really should not be less than 24 x 12 x 12in (60 x 30 x 30cm). Larger is, of course, much better, the reason being that small volumes of water are difficult to keep in good condition, especially for beginners, because small areas pollute very quickly. A filter should be used to help maintain the water at a quality capable of sustaining fish in good health. In fact, poor water quality is the major cause of most aquarium health troubles. I therefore suggest that you change about ¼ of the water in the tank three or four times each week.

When completely stripping down a tank and cleaning out, I personally think it too risky to use any sort of disinfectant. Much safer to give a good clean-out with the help of a washing up brush and warm water. Then completely dry out the tank before refilling; gravel should be washed in boiling water.

When doing routine maintenance, use a gravel cleaner which will remove waste and debris. This gadget is a plastic tube with a length of siphon tube attached; although some of the gravel is sucked up, it is unable to pass through into the siphon tube, but the other particles which cause pollution can and so are removed.

Moors are, perhaps, not ideal for beginners, since they can be susceptible to a number of health problems in the hands of inexperienced aquarists. LAURENCE E PERKINS

One word of warning about leaving fish in the hands of others; unless, of course, they are the hands of experienced fishkeepers, *don't!* Healthy, well nourished fish are quite safe left unfed while you are away, even if you are away for two weeks. Well-meaning people always over-feed, and food which the fish are not able to eat is then left to foul the water. The fish then become sick.

I am wondering if your fish did have White Spot because you gave me no details of their condition as to whether they had white spots on their finnage which later spread to their bodies. Of course, it is quite likely as this pest is often introduced into the aquarium with new stock and, in particular, with newly-imported fish. This is normally one pest we can quite easily rid our fish of and in today's fishkeeping is no longer a problem. There are several brands of cure but I have found that W.S.3. made by King British has never failed in my experience. At a water temperature of 70°F (21°C) the pests are killed in 24 hours.

As you gave me so little information regarding tank size, water change frequency, size of fish, etc, I am unable to pinpoint just where you are going wrong.

However, the suggestions I have been able to offer may have given you some ideas. Should you wish to ask further questions, please drop me a line enclosing a stamped addressed envelope and I will be delighted to help if I can.

GCSE PROJECT TANK

I have decided to build a tropical marine tank for my GCSE Technology project. It will be 30 x 24 x 24in (75 x 60 x 60cm) and will be a fish-only set-up.

I am planning to use a 'weif' filter under the tank, a protein skimmer as large as possible in a compartment in the filter (before the media) and, possibly, a trickle filter, either over or under the tank.*

I hope to use a siphon to supply water to the filter, with a cut-off hole in the top end and a pump (possibly a Maxijet) to return water to the tank.

The tank will be situated on a purpose-built cabinet. I was told that a 2 x 2in (5 x 5cm) wooden structure faced with wood would be sufficient.

My main problem concerns the lighting. I have seen so much conflicting information that I am totally lost! I have already bought a 2ft (60cm) Actinic Blue tube but I am sure it won't be enough.

I would welcome your comments on my proposed system.

[We could not quite make out the correct spelling of the type of filter, but it looked like 'weif'!* **Ed**].

SHERIDAN DAVEY

Special reflectors or light enhancers will greatly improve the output from aquarium 'tube-type' lights.

You are indeed a lucky lad. I never got to build a tropical marine tank when I was doing my 'O' levels! Your letter contained several questions, so I will answer them one by one.

① Your tank is of perfect dimensions for setting up a marine aquarium, holding something like 50 to 55 gallons (c 230-250 litres) of water by the time that you have it decorated; not too small for a stable environment, and yet not too big to handle.

② I'm afraid that your section on the filter has me somewhat baffled. I cannot read what type of filter you plan to use and can only assume that this is a 'Mini Reef' type of filter with several compartments for different media. This is, of course, fine.

However, you mention the use of a trickle filter either over or under your tank. This trickle filter, in my opinion, should be the final part of your compartmentalised filter underneath the tank. In other words, the water should pass through a pre-filter which is easily removable and cleanable — for this you could simply use filter wool — then through a compartment containing either bio-balls or coral chunks and then, finally, a bypass into a trickle filter, trickling say 20% of the water over a wet and dry filter containing something like Tunze Biogranules or coral gravel.

At either end of the compartments, you would need a further compartment to house the heater and protein skimmer and the final compartment to 'polish' the water with activated charcoal.

③ You mention that you would move the water though the filter with a Maxijet pump, but I would think that this might not be large enough. Don't forget that, as I said, your tank will hold something like 50 to 55 gallons of water which needs to pass through the filter at least twice an hour and, in addition, that the water will have to be pumped up to something like 4ft 6in (nearly 140cm) high (this is a simple calculation of a 2ft high aquarium added to a cabinet of something like 2ft 6in. high).

If I were you, I would look around at all the suitable pumps, having regard to the pumping capabilities at the required head. I do know that people have used all sorts of different types of pump for this purpose — just be sure that the pump that you choose is suitable for use in a seawater environment. It would be best for you to talk to dealers and other hobbyists.

④ The next part of your letter talks about a cabinet to stand the aquarium on. I am no Do-It-Yourself expert and would prefer to buy a ready-made cabinet, although I know that money might be problem for you as a student.

Years ago, I made my own cabinets and remember that I used a wooden structure faced with plywood. I also remember that the basic framework of the cabinet was made with 3 x 2in (7.6 x 5cm). Don't forget that 55 gallons of water alone are going to weigh 550lb (c 250kg)!

It is also advisable, if you can, to screw the framework to the wall in order to provide even more strength.

⑤ You say that your main problem is lighting. Let me assure you that *everybody* has a problem with lighting, but because you are starting a fish-only aquarium your problem is made so much simpler. With fish, the only reasons for lighting the aquarium are:

(a) so that the fish can see to swim about and feed, and

(b) so that you can sit and watch them.

Providing that you achieve these aims, the actual type and volume of lighting is totally immaterial. You say that you have already bought a 2ft Actinic tube, and it would be foolish to let that go to waste, so use it by all means. Remember though, that that 2ft long Actinic tube is a 40 watt (probably!) and that it will need a 40 watt starter. DO NOT USE A 20 WATT STARTER.

With an aquarium of the size you intend to set up, I would add one 'white' tube the length of the aquarium to see how that looked — you can always add another if it's not bright enough. Possibly the best tube to use would be the Interpet Triton tube.

You could also increase the intensity of the tube by using a purpose-made reflector at the same time. These increase the efficiency of the tubes by as much as 50%.

In closing, I would advise you to talk to as many people as you can — especially dealers — and find out how other established aquarists are doing it. Meanwhile, I wish you luck with your project and with your GCSEs. I would warn you, though, that your interest in marine aquatics will extend far beyond your course!

DR R M HANNAH

Fish TB sores can prove extremely persistent in humans . . . but not dangerous (see article by Mel Jones on this subject in the June 1991 issue of *A & P*).

HERPETOLOGY

FISH-FROG MIX

I have a 3ft (90cm) tropical aquarium in which I keep both fish and four Clawed Frogs.

I know that these frogs are totally aquatic but I would like to transform the aquarium into a paludarium housing other types of frogs and toads. What species would you recommend?

I would not recommend keeping amphibians and fish together in the same freshwater aquarium-terrarium. There are at least two important reasons for this:

① Most species of amphibian are primarily stimulated by movement when they feed, and not by the suitability of the live creature they try to catch.

For example, adult African Clawed Toads (*Xenopus laevis*) are relatively large aquatic amphibians and readily take moving prey, such as earthworms. They also grab the legs of other similar-sized toads if these move nearby. Therefore, I would recommend that you only keep toads of the same species and of the same size in any one tank — a small *Xenopus* could easily be swallowed by a bigger toad.

For the same reason, I would not recommend keeping small aquatic amphibians such as Dwarf Clawed Toads (*Hymenochirus boettgeri*) and fish in the same aquarium. You never know when the stimulus of movement by a fish will trigger a feeding response by an amphibian.

② Amphibians have glands in their skin which secrete a range of products. These secretions have a protective function and can poison other animals, including fish and other species of amphibian.

Mainly terrestrial amphibians such as tree-frogs and Cane Toads (*Bufo marinus*) release particularly strong secretions. For this reason, tree-frogs should not be kept in the same vivarium with other types of amphibians. Secretions from Cane Toads have even been known to poison dogs.

A further word of caution: as already stated, the secretions which are produced by glands in amphibian skin have a protective function. Irritation to human eyes will, therefore, result if unwashed hands which have previously handled amphibians, later touch your face.

HARRY GRIER

FLORIDA TROPICAL FISH FARMS ASSOCIATION

Fully aquatic amphibians such as this albino African Clawed Toad (*Xenopus laevis*) from Florida's Luster Aquatic Nurseries, should never be kept in the same aquarium as fish.

TROPICAL

TB . . . OR NOT TB . . .

I have been keeping Malawi Cichlids for about a year now. Some months ago, I noticed that several of my fish were becoming very slim, although they were feeding ravenously.

I took some live samples to Stirling University and the letter that came back says, among other things, that they are "suspicious of fish tuberculosis" and that "special staining to confirm this was not fully conclusive . . .".

Having tried some antibiotics without success, it seems that it would be better to cull my fish. However, as they have cost me roughly £200, I'm not too keen on the idea. I would therefore be most grateful for your opinion on the matter.

P.S. Is there a cure for Fish TB?

No, there is no cure yet for Fish TB. Note also (as Stirling said in their letter) that humans can catch the disease. It doesn't cause human Tuberculosis because the micro-organisms cannot live in our body heat. However, they can exist in surface wounds and so infect any lesions on your hands, giving sores that will not easily heal. Hence 'destroy and disinfect' is very good advice.

If you decide not to destroy your stock, take sensible precautions: wear rubber gloves and don't siphon tank water with your mouth!

Now the good news . . . the vet said that the lesions were not definitely TB and, usually, it is very obvious in histological examination, so your fish may not be suffering from this disease. Another cause of TB-like symptoms are gut parasites. Viviparous — the Livebearer Information Service, recently did some work with Guppies and found that many of the cases thought to be TB actually had intestinal worms. They tried anthelmintics (the remedies that remove such worms) with great success.

Ask your vet for a tiny sample of these compounds. Use half a pin-head amount wrapped in raw liver to get the fish to eat it. One dose is sufficient.

KOI

WINTER SURVIVAL

I have a 900-gallon (c 4,100 litres) pond holding some Koi and Golden Orfe. The water depth is 4ft 6in (c 140cm). There is also a fountain and waterfall which are operative between 8 am and 4 pm.

In the past, I have kept both the above going throughout the winter months except when the pond has frozen over. Am I on the right lines, or should I turn off both the fountain and waterfall for a period?

From the details provided of your pond, it would appear that while its depth is quite reasonable, a volume of 900 gal represents a fairly small surface area. Under such conditions, I would consider it extremely unwise to have pump and waterfall running during the winter owing to the cooling effect imposed upon your fish.

Running water in a closed system such as you describe would result in all levels of the pond bottoming out at the same temperature, i.e. air temperature; not a good idea as far as fish are concerned!

In still water, even at a depth of 4ft 6in, the temperature will be slightly warmer at the lower level where the fish will naturally settle during cold weather.

If you could provide a 100 Watt pond heater and provide some form of cover over the pond, so much the better. This would probably be as economical to run as your pump, and would certainly improve the winter life of your fish.

LOTUS

A pond heater will help maintain an ice-free hole even during the most severe weather conditions.

I would assume that the pond was cleaned out prior to the onset of winter and that all decaying leaves, etc, are removed periodically. If the above code is followed, I think you will find your fish to be in better condition following the winter.

Koi Calendar

By David Twigg

A Happy New Year to you all. With Christmas over, most people start thinking about their summer holidays. Koi keepers, however, are generally looking to the new season calendar. As you can see below, this is now beginning to take shape nicely. May I ask that if you spot an error or omission you get in touch at the earliest opportunity? Thanks.

JOBS FOR THE MONTH

Don't forget your Koi, though, this month! The weather will probably be lousy, but keeping an eye on one's Koi is a must. Catching a problem early can save a valued friend from the ravages of winter and the additional problems faced by a long UK spring.

Do you have an adequate facility into which to transfer a sick fish? If not, then, maybe this would be the time to consider all the options available. Remember that such a facility might well be able to double up as quarantine/acclimatisation quarters for new Koi, so it may be wise to include a good filter system in the design from the word go.

Talking of new Koi reminds me that this is the time of year when dealers are receiving their new stocks from Japan, so it is well worthwhile paying them a visit. Even if you will not be buying this time round, the experience of seeing the better, more expensive, Koi before they are sold is a very useful exercise. It is only by seeing and discussing the relative merits of the better-quality Koi, that our appreciation of these wonderful fish improves.

'NEW' SHOWS

A new form of winter Koi 'Show' is developing in the BKKS Sections! Recently, I attended the **Northampton Section** meeting where a competition was to be judged. The format was this: During the summer months, a couple of committee members, armed with cameras, visit the ponds of those wishing to enter fish into the 'Show'. Fish are bowled and photographed and then released to their home water, thus occasioning minimum stress to the specimens concerned.

This process takes several weeks and the next few are spent processing the slides and organising them into the varieties for judging by the membership. At the meeting, two slide projectors are used to compare the fish. Members are then invited to vote for a winner in each class.

This form of 'Show' has its advantages, as well as disadvantages. It is relatively easy to judge colour, pattern and body shape, but it is very difficult to tell skin quality from such slides. Probably the biggest bonus from such an evening is the learning process. Decisions (good or bad) cause debate and much discussion, which can only help to further the Koi keeper's knowledge. I had a thoroughly enjoyable evening, even if some of my decisions did differ slightly from those of the other members!

WHAT'S ON IN JANUARY

3 — **Worthing & District Section BKKS.** Preston Scout Hall, Bognor Regis, Sussex. Contact **Steve Willard** on 0243 267893.

4 — **East Riding Section BKKS.** 7.30 pm, Grovehill PH, Holme Church Lane, Beverley. *Appreciation of Koi.* Talk and Video by **Rod Young.** Contact **Brian Hebden** on 0428 711546.

Kennet Valley Section BKKS. 8 pm at Newbury Rugby Club, Pinchington Lane, Newbury, Berks. Contact **Bob Thompson** on 0734 713640.

5 — **Yorkshire Section BKKS.** The Holy Trinity Church Hall, Ossett. Nr Wakefield. Contact **Fred Harston** on 0226 722578.

6 — **Suffolk & North Essex Section BKKS.** 7.45 pm at the Prince of Wales PH, London Road, Marks Tey, Colchester. Speaker is **Richard Burton** of **Interpet** with talk on *Keeping Koi.* Contact **Dennis Preou** on 0371 856450.

7 — **Middlesex & Surrey Borders Section BKKS.** Hampton Football Club. Contact **Joy Fraser** on 0737 844338.

North Wales Koi Club. 7.45 pm, David Bryant Bowling Centre, Frith Beach, Prestatyn. Contact **Eileen Price** on 0745 591730.

The Potteries & District Koi Keepers Society. The Biddulph Arms, Biddulph, Stoke-on-Trent. Contact **Graham Platt** on 0782 396670.

9 — **Heart of England Koi Society.** Warwick. *Koi Keepers' Question time.* Contact **me** on 0926 495213.

Merseyside Section BKKS. Speaker is **Greg Peck** on *Varieties of Koi.* Millbrook Manor Restaurant, Knowsley Village. Contact **Phil Adamson** on 051 220 2970.

10 — **Mid-Somerset Section BKKS.** Speaker is **Tony Staden** on *Pond Plants.* contact **Alan Purnell** on 0458 72132.

Central Section BKKS. *A.G.M.* at T. P. Riley Community Centre, Bloxwich. Contact **Martin Lefevre** on 078571 5242.

Northern Section BKKS. St James Hall, Pendleton. Contact **Tony McCann** on 061 794 1958.

Scottish Section BKKS. Contact **Archie Dick** on 0786 832073.

Lea Valley and Harlow Section BKKS. Monthly meeting. Contact **Barry Ford** on 0279 419101.

11 — **Northants Section BKKS.** Contact **John Byles** on 0604 718648.

12 — **Nottingham Section BKKS.** Meeting at The Rose & Crown, Derby Road, Nottingham. Contact **Shirley Hind** on 0602 810923.

Chiltern Section BKKS. Contact **Ann Howard** on 0462 679315 or **Mike Reed** on 0525 375418.

13 — **South Hants Section BKKS.** Speaker is **Bill McGurk** of **Shirley Aquatics,** starting at 8 pm, Denmead Church Hall, Hambledon Road, Denmead, Hants. Contact **George Rooney** on 0420 473169.

14 — **East Pennine Section BKKS.** Monthly meeting. 8 pm at The Phoenix, Platts Common, Barnsley. Contact **John Timmis** on 0226 289507.

16 — **South Hants Section BKKS.** *Social Night.* Denmead Memorial Hall. Contact **George Rooney** on 0420 473169.

17 — **Yorkshire Koi Society.** Monthly meeting in Wetherby at 2.30 pm. Contact **Graham Baines** on 0423 864297.

18 — **Border Koi Club** meet at the Lanes Library, Carlisle. Contact **Amy Fisher** on 0228 513623.

20 — **Mid-Staffs Section BKKS.** RNA Club, Elmore Green Road, Bloxwich. 8 pm start. Contact **Don Dyche** on 0543 425178.

Crouch Valley Section BKKS. Laindon, Basildon. Contact **Alan Ward** on 0268 543600.

21 — **Wirral & District Section BKKS.** Lever Sports & Social Club at 8 pm. Contact **Jean Moffat** on 051 678 1769.

24 — **Essex Section BKKS.** North Stifford Village Hall. Contact **Bobbie Barton** on 0702 611750 or **Margaret Bishop** on 0702 522388.

South East of England Section BKKS. Monthly meeting. 2.30 pm at the Community Centre, Chelsfield, Kent. Contact **Mick Wright** on 0634 718943.

27 — **London Section BKKS.** Ruskin House, Coombe Road, Croydon, starting 8 pm. Contact **Keith Nind** on 081 673 3574.

Focus on: *Discus*

The Blue Diamond is the "bluest of the blue" varieties.

This unusually marked strain was dubbed the Snakeskin Turquoise Discus by its Malaysian breeder Tan Theam Kheng.

Discus for the Nineties

The pace of development of new Discus varieties continues unabated. **Marc Weiss** of World Wide Fish Farm in New York, traces the history of some of the best of the latest strains to appear.

Photographs by Lo Wing Yat

Discus Fever continues. Stemming from the sound cultural information that has become available over recent years, many aquarists are entering the Discus hobby and, happily, staying there. As people realise the merit of maintaining Discus under conditions that nature has 'designed' the fish to live in, cultural problems have been minimalised and breeding successes are commonplace. Thus, an even greater desire for new and different Discus morphs has developed among both amateur and professional Discus fanciers alike. This has created a keen competition among breeders to obtain and produce fish that are truly significant and unique.

Nowhere has the Discus breeder's art been expressed more than in Asia. It is from Hong Kong, Thailand and Malaysia that we see the current demand being met. A long history of fish culture, coupled with values placed upon Discus at several times that in the West, has yielded some extraordinary developments. As specimens filter to Europe and North America, it is likely that the next few years will be the most exciting we have seen, as breeders reshape their Discus to express their individual ideals.

DISCUS CATEGORIES

The Discus we keep can loosely be categorised as of being of blue, red, or wild strains. Combinations are by no means discounted and are often very desirable. The term 'Turquoise' is generally held to mean a captive-bred morph that has been bred for full body colour, or an extreme exaggeration of naturally-occurring patterns. Thus a 'Blue Turquoise' is predominantly that colour, preferably solid over the entire body. 'Red Turquoise' are patterned Discus. The areas that are not blue range from brown, reddish brown, or orange to a true red.

Wild strains are line-bred from naturally-occurring stock, often with attention to preserving a unique or desirable characteristic found in nature. It is from all these categories that we see remarkable Discus currently coming from the East.

I would like to present an overview of those I feel most significant and worthy of our attention that have recently been marketed in Europe and North America. These fish are *not* those manipulated by diet, or hormones (these 'treated' fish are usually obvious and hobbyists are too sophisticated nowadays to be fooled by a painted fish). They are, rather, those that are true genetic variants that breed true and can add a new dimension to our own Discus hobby in our quest for that perfect Discus in our own eyes.

This is a No Stripe Discus developed from the Super Brilliant which, in turn, was developed from Schmidt-Focke Brilliant turquoise stock.

RED STRAINS

Autumn of each year returns me to Asia. 1990 was no different, but I was not expecting the surprise waiting for me as I entered our hatchery. One tank was filled with orange Discus! Their eyes had black pupils and ruby-red irises. All the fins, including the pectorals and tail, were black. The black looked airbrushed around the perimeter of the fish, converging on the nose. Broad blood-red reticulations interspersed with blue, radiated from the centre of the body outward.

The managing director of my parent company, Lo Wing Yat "Sunny" spoke: "They are called *Pigeon Blood* (*Footnote). Several Thai breeders claim to have developed it. I am told the fish was bred originally by a man in Bangkok who breeds albino pigs. (Albino creatures of all kinds are revered by the Thai people.) Supposedly, in his efforts to realise

his dream of creating an albino Discus, he added hormones to the food being given to some typical Thai-style *Red Royal Blues*.

"A male with a yellow body was spawned from this group. It was crossed back to a normal *Red Royal Blue* and, instead of albinos, yellow fish with black fins were produced. Selective breeding of those supposedly produced what you see."

I loved this fish and saw great potential in it. Aside from the unique colour, the robust nature of the fish was highly appealing. The name *Pigeon Blood* though, was not! Perhaps these broad-breasted birds were a delicacy in Asia, but back in New York (where I come from) these scrawny scavengers are held in an altogether different light. The fish was called *Red Ruby* in Penang, but, to me, *Red Dragon* seemed more appropriate; feisty as they were! This fish is also known as the Red Panda (see cover picture).

And yes, they bred true, and their babies begat even more of the same charming Discus. This would not be so with a hormoned fish. The stories were just that . . . mere stories contrived to throw other breeders off track. A true mutation had been found.

As of now, we have pink, yellow and all sorts of *Dragons*. We have fry from pairings with *Red Spotted* and Tefe Green, Alenquer Reds, *Tiger Stripes* and *Snakeskins*, Heckel (*Symphysodon discus*) and most of our *Red Turquoise* strains. This fish is more forgiving than most Discus and very easy to breed. In my opinion, it will become a standard in the trade, as well as provide the backbone for many new and exciting things to come. Should one be looking for vigour, I cannot recommend this fish too highly.

BLUE STRAINS

It has been about a decade since **Dr Eduard Schmidt-Focke** astounded the Discus world with his high-fin *Brilliant Turquoise*. As I recall the 'The Doctor's' tale and gaze at the (albeit poor) photo he gave me, it was hard to imagine that this fish could be too much improved.

The depth and brilliance of the colour was incredible. The head was small with a mask of fine striations typical of most Discus. The nine vertical bars were mostly hidden by metallic blue. A crisp black band traversed the dorsal and anal fins framing the body. The iris of the eye was bright red, a nice contrast to the slender but deep build of the fish.

This was not a large Discus. My overall impression was that it was 'feminine' — a delicate, shining gem. Dr Schmidt-Focke was actively trading his stock with other breeders and it was not long before **Lo Wing Yat** "Sunny", a Hong Kong geneticist, was given some of these fish by the Doctor.

Lo's original intention was to preserve the appearance of the fish. By selection and outcrossing with related lines he produced his *Super Brilliant* which combined the attributes of the original strain with a larger, more robust, Discus.

It was when Mother Nature herself jumped into the game that it occurred to Mr Lo that this fish just may be refined even further. The *Super Brilliant* strain began to throw fry that lacked the nine vertical bars. The purity of blue in such examples was extraordinary, and the *No Stripe Blue*, till today, remains one of the most highly coveted Turquoise Discus morphs.

Mr Lo was still to find that the hand was not played out quite yet! As he line-bred the *No Stripe* Discus fry, some yellow ones appeared — perhaps albinos? Not unheard of, the pallid, somewhat delicate albino Discus was an oddity that had a limited following.

But these little yellow Discus, unlike the weak albinos, had black eyes and grew as fast as their siblings! By an inch long, they were dusted with blue and the only other colour to develop would be the red eye iris as they turned bluer by the day. No bars, no black at all — save for the pupil of the eye. The blue even extended into the tail.

Today, this *Blue Diamond* stands as the "bluest of the blue Discus", with an elegant round body form with expansive finnage. It has a fine scale structure, giving an appearance of being wrapped in blue foil. The face mask of its predecessors is gone as even the forehead and operculi are solid in colour. Its value is now rivalled only by the reddest of Dragon Fish (*Scelropages formosus*) or the most perfect of Koi.

The ultimate blue strain? Time will tell. Nature never reveals her whole hand, but for now, a Discus breeder looking for a solid blue fish can find none better.

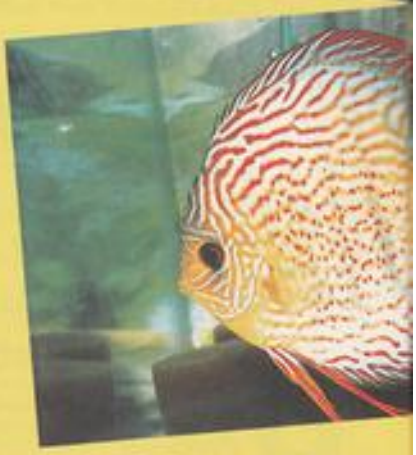
We now move to Penang, Malaysia, a resort island known for butterflies, orchids, beaches and for us — Discus! It is the home of **Mr Tan Thean Kheng**. Nicknamed "Beansprout", for before he became enamoured with Discus, he used the native soft, acid, pure rainforest water for growing this popular crop. Today, he also breeds *Turquoise Discus* of the blue strains which are very popular in Malaysia.

Brilliant Turquoise and *Snakeskin Discus* were his speciality until he, too, was dealt a wild card by Nature. This time it came from a pair of his *Brilliants*. Some of the fry were a pearly white, with only the black bar remaining, going through the eye and caudal peduncle; the eye was all-black. The dorsal and anal fins had varying amounts of black, while the ventral (pelvic) fins were usually solid black. The forehead had a golden hue which radiated across the body where blue highlights might appear as well. The overall effect was a subtle mother-of-pearl appearance very dissimilar to its *Blue Turquoise* progenitors.

Initially, these *Ghost*, *Golden Hue* or *Beansprout Discus* were culled from matings of *Brilliant Turquoise* siblings. Now that several people are working with this morph, it appears that true breeding colonies exist.

WILD STRAINS AND HYBRIDS

The Alenquer Red is a naturally occurring morph of the Brown Discus found in the river system in the area of the town Alenquer in Brazil. Wild-caught males typically look like Brown Discus, while females tend to be a burnt orange to brick red in colour. Some sport blood-red patches of varying size, usually in the central body area as well.



Blue striations are usually minimal, typical of the Brown Discus (*Symphysodon aequifasciata axelrodi*). Dr Eduard Schmidt-Focke was the first to breed this variety selectively, and the fish in Germany is occasionally referred to as the *Red Eddy* in his honour.

Certain things have limited the popularity of this fish in the West. Though a Discus' ability to express red is genetic, it will not display it well unless certain environmental requirements are met. The insistence of many, and negligence of some, who persist that Discus 'adapt' to hard and/or alkaline water will end up with brown fish when working with the Alenquer.

Thus, many have been disappointed when

Wild-caught Alenquer Red female with exceptional coloration.

This is a stunningly coloured pair of tank-bred Lago Coari Red-spotted Green Discus.

One of the very latest strains, the Red Diamond.

seeing it. Put in an environment where the acids in the water help it digest the pigments present in a good diet, and it can then deposit the red pigments in its skin. If the water is soft as well, this fish literally glows, and one may be able to breed it then — but not easily.

Another consideration is the typical shape of the fish. *Aequifasciata* morphs in nature are not round but elongated, with a rather large eye. This is not often attractive to most of us used to seeing the common *Turquoise* hybrids, while in Asia this is accepted as a natural occurrence. Thus, many of the German-bred, as well as wild-caught Alenquers, end up in the Orient.

Asian breeders are aware of these considerations and we see people such as Lo Wing Yat selecting for high body form, as well as colour, for line breeding. Though I have seen round Alenquers as red as a pack of Marlboro cigarettes, economics keep these fish in Asia. Still another limiting factor to their popularity is that few westerners will pay the asking price for the top-quality specimens, and those that do, are likely to get a better price sending them back to Asia when they breed them!

It also seems that any halfway decent Brown Discus on the market these days are sold as the Alenquer Red. Buyer, beware — a real one should be unmistakable. Crosses with exceptional Lago Coari Red-spotted Green Discus *(Symphysodon aequifasciata aequifasciata)* are among the most notable. An Orange Discus spotted and streaked with red is a feast for the eyes!

Another refinement is a *Blue Pearl* version where round blue markings adorn the orange body. We call these our *Tangerine Pearl*. First spawns of Alenquer with *Pigeon Blood/Red Dragon* are now taking place as well. We have fry and I believe this will be a significant contribution to the Discus gene pool, but it is several months premature to report accurate results. To combine the genetic ability of the Alenquer to express full red body colour with the fertility and zest for life of the *Red Dragon* could very well bring an almost solid-red Discus within the reach of many.

The most sought after of the naturally occurring wild forms of the Discus are the Red-spotted Green Discus from Lago Coari in Brazil. A turquoise-green Discus with large bright red spotting, it is rarely caught and few have seen them except in in books and magazines. It is considered the most beautiful of all wild Discus — Mother Nature's greatest tribute to the Discus 'tribe'. It is to the plainer, commoner Tefe-type Greens of Peru and Colombia, what a *Royal Blue* is to a Brown.

It was Dr Schmidt-Focke who first bred this fish, but he did not pursue the strain, as his attention turned mostly to the newer red fish from Alenquer. The young were given to Sunny Lo who was driven to perfect it. Hard to breed, he persisted in picking the best. These legendary Discus are now being seen outside the Asian market. Indeed, Dr Schmidt-Focke's protegé, **Manfred Göbel,** has brought them back to Germany from Mr Lo's hatchery.

Solid mint or pistachio bodies are adorned with blood-red spots. Sometimes, the red fuses into lines on the body and fins are blood-red. The breeder who obtains one has a living paintbrush of red genetic material to spread among his or her stock.

Its genes have intensified as well, as added red patterns to fish it has been crossed with. Solid-blue brilliant turquoise, peppered with red, are one notable example.

The Red-spotted Green is slow to grow and mature, so examples of such crosses will take time to be established. *Giant Red Turquoise* with large red spots on a heavily patterned fish, and 'flame' turquoise with streaks of blood-red, are examples of things to come, fueled by the Discus from Coari.

A strange twist of fate led to what is currently the most successful of strains bred from the Red-spotted Green Discus. Dr Schmidt -Focke had also sent Lo Wing Yat some of the remaining fish of his original red Turquoise strain as the Doctor wanted to devote his attention to the preservation of wild Discus.

He had distributed all his *Turquoise* types among friends as he did not wish to outcross any of his newly-acquired wild-caught fish and needed the tank space to do his work with them. His original *Red* strain was deteriorating due to many years of inbreeding. The body form was now poor, the colour a hint of past glory. It did, however, possess wide turquoise stripes on a red body, an attractive red eye and the genes of one of the finest *Red Turquoise* ever created.

Lo crossed it with the Red-spotted Green. Nature smiled! The fish was beautiful. The wide turquoise striations still traversed what was now a bright-red, carmine-spotted body with broad blood-red fins. The best news was that the fish was blessed with 'hybrid vigour'.

The *Red Diamond*, a robust fish with fertility that surpasses both parents, was the result. Many flew out of Hong Kong and still do to the delight of hobbyists around the world. One can breed this variety and select for features of either parent, or combinations thereof, or segregate unique specimens. One can do any, or all, e.g. outcross them or line-breed them. This is a most desirable fish to help you make your mark upon the Discus world.

CLOSING THOUGHTS

In reviewing what I have seen in the past couple of years I would be hard-pressed to find Discus with as much potential to create something new as the ones highlighted here. Do give some thought to the 'genesis' of these fish. Do not forget that the more Discus one breeds, the more 'lucky' one becomes.

Nature will continue randomly to deal its cards among us. For example, one would think the chapter closed on the Red-spotted Green. After almost ten years of line breeding, one would think they would look like peas in a pod. Yet, recently, a photo came from Sunny Lo: a pure-bred Red-spotted Green with green circles with red spots in the centre! Another mutation we hope.

True, a Leopard-skin Red-spotted Green is more likely to happen to you if you work with such extraordinary broodstock, but nature is unpredictable. It is all too happy to deal you a wild card if you do your part by keeping good Discus well. **AbP**

***Footnote.** To help distinguish 'artificial' varieties — including the very latest mentioned by Marc Weiss — from naturally-occurring species, the names of the former have been italicised, and the latter have not. For example, *Pigeon Blood* is a cultured variety, while the Alenquer Red is a naturally-occurring variety of the Brown Discus *(Symphysodon aequifasciata axelrodi)*. Scientific names have, of course, been retained in their conventional italicised form.

Focus on: *Discus*

Exploding the Myths

Part 1

Mary Bailey challenges some old-held beliefs and presents revealing and thought-provoking arguments to back up her views.

Photographs — unless otherwise indicated — by John Dawes

MARY BAILEY

A pair of 'man-made' Discus. They may look delicate . . . but are they really so?

I have to admit I am not entirely sure how the Discus mythos arose, although it started round about the time I took up fishkeeping and has developed to what I regard as a ridiculous degree during the ensuing 20 years. There is no indication that the few people able to afford the horrendously expensive first imports had any great problems keeping them alive, or even in spawning them.

The big difficulty came when the eggs were taken away for artificial hatching, possibly because of actual egg-eating, more likely to make sure there was no opportunity for cannibalism when the rewards for successful breeding were likely to be immense. The eggs hatched without difficulty, the fry became free-swimming . . . and died, every time!

Shy? Not a bit of it! This pair was photographed spawning in full view of a constant stream of admiring visitors to Cologne aquarium.

It was only when, eventually, a pair were left to do the job themselves that it was discovered that Discus fry feed on the mucus covering of their parents, and that this behaviour is not optional, but obligatory. And, although one or two enterprising souls have managed artificial rearing using plastic discs smeared with a mixture of gelatine and egg yolk, it remains a fact that if you want to breed Discus you have got to let the parents hatch the eggs.

FUNDAMENTAL QUESTIONS

Somehow this 'problem' (the parentheses are there because I cannot personally regard natural behaviour as an inherent difficulty!) has become transmuted into, not only difficult-to-breed, but also difficult-to-keep. How the average hobbyist reconciles this with the ability of Far Eastern fish farms to turn out Discus as readily as Guppies I know not. To do so seems quite illogical to me.

The thing that has always been foremost in my mind is *Discus are cichlids*. As many hobbyists will tell you, cichlids are greedy, destructive, aggressive fishes, which require skilled management to avoid excessive rape and pillage. Why, I ask, should Discus be any different, when, in my experience, if they are treated properly, they are not?

It strikes me as highly ironic, however, that by using highly artificial and unnatural conditions, supposedly in the interests of the physical health of their charges, many Discus keepers succeed in reducing their fishes to a state of such utter psychological misery that all the natural cichlid behaviour disappears. I find myself wondering if *"Cichlasoma" citrinellum*, the Red Devil, for example, could be emasculated in the same way!

Until recently I would probably not have phrased the above paragraph quite so strongly, but a few weeks ago a friend did me the signal honour (I think, though I also marvel at his cheek) of asking me to baby-sit four wild-caught Brown Discus while he went to Kenya for a holiday.

This has given me a wonderful opportunity to work with wild-caught material normally rather beyond my pocket, and even I have been astounded at some of the behaviour I have been able to observe. So let us take a look at some of the Discus myths in the light of these recent experiences, as well as my previously accumulated 'wisdom'(!?).

MYTH NO. 1

Discus need high temperatures

This idea became current as a result of misinterpretation of data on the natural habitat, and is STILL being promulgated by a lot of people who ought to know better by now, including, regrettably, some acknowledged Discus 'experts'.

The measurements on which the myth is based were made during the dry season, largely because the habitat is very difficult of access during the rainy season. Discus are not fishes of the mainstream rivers, but of backwaters, oxbow lakes and, after the rains, the flooded forest floor. During the dry season these waters are subject to considerable evaporation, and eventually some dry up completely.

The water in those pools remaining heats up very quickly in the tropical sun, and afternoon temperatures are in the 90's Fahrenheit (mid-30's C) but only for a short period. The rest of the time temperatures are those more normally associated with tropical waters, i.e. 75-80°F (24-27°C). When the rains arrive, and meltwater comes down from the Andes, there is a phenomenal temperature drop — and this heralds the breeding season. Cognoscenti Discus keepers do 50% (or greater!) water changes, topping up with COLD to trigger breeding.

It has nevertheless been observed that raising the temperature to the upper 80's F (around 30°C), or even higher, seems to help clear up any illness in Discus, in particular Hexamitiasis (Hole-in-Head disease). However, I believe that this is simply because an increased temperature speeds up the metabolic rate, enabling the fishes' own internal processes to deal with the problem more efficiently.

This does not mean that it is a good idea to maintain a continuous high temperature in order to maintain good health. Discus should not be unhealthy at lower temperatures, and, if they are, the cause should be sought out and dealt with. Besides, a continuous high temperature removes the option of a temperature increase if something does go wrong.

If one looks at the matter of temperature logically, then one will realise that if sympatric species such as Angels (*Pterophyllum scalare*), Uaru (*Uaru amphiacanthoides*), Severums (*Heros severus*), etc, live at temperatures in the upper 70's F (c 26°C), it is highly improbable that the temperatures are higher in the vicinity of Discus shoals in the same bodies of water!

MYTH NO 2

Discus require sterile conditions

This astonishing concept results in a myriad Discus being kept in bare aquaria with no hiding places and subjected to constant disturbance in the form of siphoning off of mulm. How this is reconciled with the conditions in Amazonian backwaters and oxbow lakes, I know not.

In my fairly extensive experience, bare tanks are wonderful breeding grounds for nitrite problems, as there is nothing much on which a population of beneficial bacteria can establish themselves. A common result of the bare tank environment is highly neurotic fishes which spend their time facing the back glass; this behaviour is clearly analogous to the ostrich burying its head in the sand so it cannot see danger.

I regard it as positively astonishing that Discus are actually bred in such conditions. Surely, this is a strong indication of their inherent resilience and how easy they are to breed?!

My 'lodgers' had been kept in a well-planted tank with, horrors, leaf litter and other such disgusting rubbish (which, of course, is present in abundance in the natural habitat). I had seen them in this environment and marked how contented and outgoing they were. The tank they stayed in here with me had been set up over three years with a slow-running undergravel filter and dense planting.

Prior to their arrival, I thinned the vegetation somewhat (to make room for them — Discus require more swimming space than Apistogrammas) and stirred up the bottom in the resulting open spaces. What came out was nobody's business. I assume that a similar accumulation of silt exists around the roots of the undisturbed plants.

I hasten to add that the owner of the fishes was aware of the trouble I was going to in providing such a natural environment and was quite happy about it. The Discus proved similarly content. They did hide behind the bogwood for a day, then realised that they were missing out at mealtimes while the Rams (*Papiliochromis ramirezi*) and *Apistogramma borellii* were enjoying double rations.

Some of the happiest and healthiest Discus I have seen have been housed in 'ordinary' community tanks or *Apistogramma* tanks where mulm is allowed to accumulate as a food source for the miniscule Apisto fry. Just like Angels, Severums, etc . . . .

MYTH NO 3

Discus should not be kept with other cichlids

Obviously, common sense is required in selecting cichlid tankmates, as the usual rules of compatibility of size, temperament and environmental requirements apply. But the rationale behind this particular myth seems to be that Discus are liable to catch 'nasties' from other cichlids, and in particular from Angels.

Well, there is an element of truth in this, but only insofar as any cichlid is liable to be infected by any other disease- or parasite-bearing cichlid. Angels may indeed carry *Capillaria* worms and pass them to Discus. But it is just as likely that the Discus will have them anyway, and give them to the Angels. The condition is, in any case, uncommon and easily treated where it does occur.

Sensibly selected cichlid tankmates are invaluable in promoting psychological well-being in Discus, especially in Discus which have been previously subjected to psychological torture of the bare tank kind.

Far Eastern breeders don't find Discus difficult to breed, following a few basic rules. As a result, 'fancy' varieties such as this very red specimen photographed at Aquarama '91 are produced in large numbers.

A newly-caught Blue-faced Heckel Discus from a lake off the Rio Negro — complete with what are believed to be Black Piranha bites on the fins.

Discus are shoaling fishes by nature, and if you cannot afford a shoal of them, the next best thing is to mix them with Angels, which have a similar behavioural pattern but are cheap and usually not suffering from any owner-induced hang-ups. Dwarf cichlids are also excellent, and good at cleaning up any food that actually gets past the happy Discus.

Which brings me to . . .

MYTH NO 4

Discus are picky feeders

Anyone who knew nothing about Discus, and had seen my 'lodgers' feeding would think this a joke. But it is true that the 'created nervous wreck' will pick half-heartedly at its food and be fussy about what it will take. Let me say, without further ado, that within five days, my 'lodgers', hitherto fed largely on frozen *Artemia*, bloodworm, etc, were guzzling ¾in (2cm) earthworms carefully picked out for them. Once they had the idea, the careful selection simply meant not expecting them to cope with 6in (15cm) lobworms whole.

I discovered, even to my astonishment, that a 4in (10cm) Brown Discus can ingest four or five whole 1-1.5in (2.5-3.8cm) earthworms one after the other, with a fantastic audible 'glop' noise. Even more astonishing, the jaw dentition is able, when the mouth is crammed already, to chop in half a partly ingested worm. I have had these Discus fighting over worms, one on each end. They are prone to grab the tweezers in their eagerness to get more, and I have feared for my fingers.

By the time they went home, they would eat anything I cared to throw into the tank, and would solicit madly every time I went near them. Their greed would put the average Mbuna to shame!

Footnote: In **Part 2**, I will be looking at further Discus myths and offer additional hints on successfully starting up with these beautiful cichlids.

TO BE CONTINUED ADP

Focus on: *Discus*

Attractively banded Red-spotted Thai Discus.

Far East Shift

Majestic Solid Cobalt Discus bred near Bangkok in Thailand.

According to **Eberhard Schulze,** the best Discus are no longer European in origin. The new focus of excellence is now half a world away.

Photographs — unless otherwise indicated — by the author

Discus used to be a European monopoly, or so it must have seemed to a non-participating outsider. When one thinks back, the great names associated with this beautiful fish were, with few exceptions, German: men like Dr Eduard Schmidt-Focke, by many considered the founding member and greatest advocate of an exclusive club, who popularised the keeping of these fish; Prof Dr Rolf Geisler, Hans Mayland, Pfarrer Schulten, Reinhold Kirth, Mr Conradi and many, many more.

Almost all the initial information about Discus, i.e. tips on keeping, breeding, water conditions, healthy feeding, etc, appeared in German fish magazines. Of course, there were breeders in other countries, such as America or the Far East, but their willingness to share information was nowhere as forthcoming as from these German hobbyists.

Today, the new generation of German Discus breeders seem to continue to live on the reputation of the old guard, but their outlook has become much more commercial, resulting, in my view, in a decline in the overall quality of Discus emanating from that country.

It's shame, but a fact of life.

Nowadays, a great number of quality Discus are being bred in the Far East and breeders like Lo Wing Yat from Hong Kong, the Gan brothers from Singapore, Mr Kree Thammongkol and Maoum from Thailand are household names among Discus enthusiasts.

There are also many breeders working in Penang, Malaysia, who consistently produce quality Discus. There are Discus being bred in Vietnam as well, which have already become available in Europe and it is currently rumoured that the biggest-ever Discus breeding installation is being built in China.

The Far Eastern breeders may have been greatly helped in starting their breeding programmes by German or American fish. They have, as a result, over recent years, produced and maintained a quality which has made the Far East the centre of Discus breeding of the world today.

The vociferouscomplaints of the past, that 'all Far Eastern Discus' were hormone-fed to achieve or intensify colours, that they had a bad body form, that they were diseased, that they never grew well, and that they were all sterilised, are today things of the past.

I have, over the last eight years or so, imported many thousands of Discus from Thailand, Malaysia, Hong Kong and Singapore. Although I have occasionally received a shipment, or part shipment, which was disappointing, on the whole the fish were of better quality than Discus obtained in recent years from Germany or any other of the

This attractively marked Red/Turquoise Discus was produced in Malaysia.

European Discus breeding countries.

In fact, I can say that the 'best' Discus I have received over the last few years all originated in the Far East, especially from Mr Kree Thammongkul, of Star Aquarium in Bangkok, Thailand. It is therefore with great sadness that I have learned that Mr Kree has had to curtail his breeding programme due to ill health (I wish him a speedy recovery).

SMALL-SCALE BREEDERS

I know many breeders of Discus in the Far East, especially in Thailand and Malaysia. Some of the smaller breeders do not export their own fish themselves but sell them on to exporters capable of handling large volumes.

These so-called, smaller breeders may not be well-known to the Discus fraternity worldwide, but they have achieved, and are maintaining, a standard equal to the better-known 'big' guys. And they have to maintain this high standard simply because if they supply bad specimens, the importers or exporters would cancel orders and the small breeders would lose their earnings, which, in many cases, is their sole income.

Many of the small breeders in Thailand and Malaysia are only considered small in the Far East because they can only produce several hundred of babies a month, every month. The big guys produce thousands of baby Discus every month. The small breeder may have only 40 or 50 aquaria, whereas the large breeders may have 400 to 500 aquaria, or even more.

FAR EAST 'EVOLUTION'

Why is it that Discus breeding has, over the last years, suddenly become such a big business in the Far East? The answer is very simple: many more hobbyists all over the world are attracted to this fish; there is also the insatiable demand for Discus from Japan. Anyone who has ever seen a Japanese fish magazine will have realised the standing or popularity of these fish in that country.

Hong Kong also produces its fair share of excellent fish: in this case, a strikingly marked Red/Turquoise pair.

However, the Far Eastern breeders have certain advantages over any breeders in Europe. They have the advantage of natural good-quality water, and they are able to obtain clean and disease free live foods like *Tubifex* worms, *Daphnia*, black mosquito larvae and fully-grown brine shrimps which are cultivated in enormous ponds, using seawater and the warmth of the sun to raise them to adulthood within four weeks. They also rarely need any additional heat to maintain the temperature of the water. The sun is a sufficient, stable, reliable and cheap source of energy.

To keep these great numbers of tanks and Discus in perfect healthy conditions, the whole family is usually involved, from small children to grandparents. Sometimes, there are even distant relatives and their children and grandparents involved in the operation; it's truly a family business. In Europe, the amount of wages one would have to find every week to keep this operation going would soon make the fish prohibitively expensive and would lead to certain bankruptcy.

EYE-OPENING EXPERIENCE

One of the largest breeders of Discus I know in Bangkok is also one of the least accessible, and it was by sheer luck that I had the fortune to meet him, meet his large family and see his enormous installation. Although I did not count the number of tanks, and he himself was unaware of the total number he had, some of the younger members of his family were willing to go around and count them. He didn't even know how many Discus he had at that moment. For me, it was a real eye-opener and obviously the 'only way' to breed Discus on a grand scale.

There must have been almost 1,000 tanks, placed in four-storey shophouses. There were tanks everywhere, including on the flat roof and in the garden. Only one or two rooms of these four houses were used as living accommodation.

The average size of the breeding tanks was 100 x 60 x 60cm (39 x 24 x 24in). There were many smaller tanks of 60 x 60 x 50cm (24 x 24 x 20in). And a great number of 2- or 3-metre tanks (6.5-9.8ft) in which a single brood was raised up to adulthood. In the garden, Discus were kept in concrete ponds measuring anything from 5-10 metres square (16.5-33ft) and having a depth of up to 60cm (24in). On the roof, the Discus were kept in plastic square water containers measuring 3 x 2 x 1 metre (9.8 x 6.4 x 3.2ft).

The space between every row of tanks may have been enough for Thai people, but for a somewhat larger European, it sometimes was difficult, to say the least. Every little space was filled with tanks and with all this great weight of water on every floor, I was surprised that the buildings were still standing upright!

The containers on the roof and the garden ponds were shaded with bamboo sheeting to keep the strong sun away from the water. The average temperature of the water fluctuated between 29-33°C (84-91°F). The high water temperature resulted in a faster-growing fish and kept them free of disease. I was told that no medications had been used in any tank for many years and I had no reason to doubt his words.

Even the new groundwater, used twice daily for water changes, had a temperature of 27-28°C (80.5-82°F). The waste water was pumped into a 30cm (12in) drain by a 10-12cm (4-4.7in) flexible hose. Any tank could be emptied within minutes. The tanks were also refilled using a 10-12cm pipe and no consideration was given to the fish in the water. The fish didn't seem to mind the pressure of the new water being pumped into their tanks.

No additives at all were used to condition the water in any way. The only water chemistry parameter actually known was the pH value. When I measured the hardness and conductivity of the water I was rather surprised. The dGH (General Hardness) was 6-7 degrees, the dKH (Carbonate Hardness) was almost zero and the conductivity was 180 micro-siemens, but the pH was almost 7.5.

I was told that there was no need for any elaborate filtration system, since the twice or even three times daily water changes kept the tanks in good condition. Air was pumped into some of the tanks with a noisy and old compressor.

SECRETS OF SUCCESS

It became obvious that Discus can be bred successfully — and there was proof — in many different kinds of water and installations. It isn't necessarily the water conditions alone which will make a good productive pair. Although it has always been said that a more suitable water will increase the possibilities of a good hatching, the much lower values of the waters generally used in Europe may, after all, not be the key to success.

I seem to remember that Dr Eduard Schmidt-Focke was a great advocate of feeding Discus live foods. Although live foods in Europe are generally diseased and very polluted, they may hold a key to success. Deep frozen foods which certainly are adequate to maintain a Discus in health may lack a certain something needed for 'reproductive' stimulation and propagation.

Although the fish that I saw were kept in what I considered to be an almost unsuitable water condition (a water greatly reduced in oxygen level because of the higher temperature), they looked alert, healthy and in good colour. All tanks seemed to contain a great deal of live food of various kinds and the fish were continuously munching away. The numbers of offspring every pair had, plus the general good health of all the fish, indicated that the live food alone was great compensa-

tion for the general water quality.

The baby Discus reach a saleable size of 3cm (1.2in) in only 6-7 weeks. Many of the youngsters are raised on to maturity and are able to spawn at 10-11 months. The breeding pairs are spawned continuously for the first year, and then the females are given a rest period of about 4-5 months. It seems that the greatest number of offspring are raised by young females and broods of over 200-plus seem to be the average. I have never seen as many breeding pairs, with as many youngsters, anywhere in the world.

SOME STRAINS

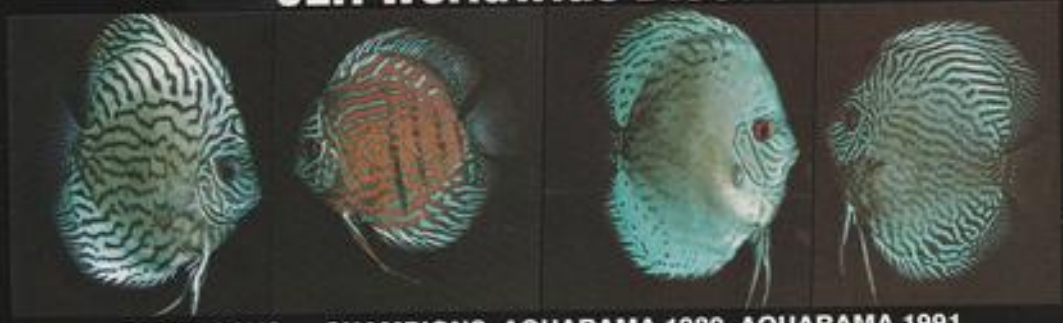
The Discus strains kept and bred at this establishment were a striped Red Turquoise, a spotted Red Turqouise and a solid coloured Turquoise. The red coloration in both the striped and spotted varieties was the most intense I have seen for a long time. Youngsters are fed initially with the eggs of the Blue Crayfish and even when this type of feeding stops, the fish maintain the intensity of this red coloration, which has been achieved by selected breeding over the last eight years.

The solid coloured Turquoise Discus had an almost purple hue and have never been exported to Europe. Almost all of the fish are being sent to Japan, where they fetch a high price. A few specimens were once sent to a breeder in the US but, unfortunately, I was unable to find out the name or whereabouts of the importer. It certainly was a beautiful strain of Discus, and I very much hope that a few will find their way to Europe.

Regrettably, I was prevented from taking photographs. The reasons for this were not made clear to me. However, I was given a free rein in all other respects, and I will always be grateful to the whole family who showed me, over almost two days, their installation, and the way they look after Discus. I will also always be grateful for having been allowed to enjoy many of the finest specimens of Discus that I have seen in a long time. **ADP**

Hi-fin Turquoise Discus such as these are now a fairly common sight in Singapore.

JLH Worldwide Discus



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Focus on: *Discus*

Discus Health Review

The epitomy of health — two beautiful Red Panda Discus in all their glory (see Marc Weiss' article elsewhere in this Focus for further details of the latest Discus varieties).

Veterinary surgeon **Lance Jepson** delves into the complex world of Discus health problems with expert advice on prevention, diagnosis and cures.

The health of Discus in aquaria is inextricably linked to their environment and the management techniques involved in their care. Numerous factors associated with environmental control and general management play a part, but of these, the most important underlying one in disease outbreaks is stress.

STRESS

Stress in this context can be defined as the effects upon the body resulting from the behavioural and physiological attempt to adapt to an inadequate or inappropriate environment.

Fish which are stressed produce excess amounts of natural steroids and other substances such as adrenalin and noradrenalin. In the short term, these may aid in the flight response from a predator, or prevent the fish from slipping into a fatal shock, but if present on a long term basis, secondary effects, such as suppression of the immune system, decreased external mucus production, weight loss and impaired wound healing, become undoubtedly significant.

The signs of stressed Discus vary from pallor of normal coloration, through loss of appetite, to a complete withdrawal from the environment, at which time the fish become immobile, with fins clamped, and assume a blackened coloration. In all cases, susceptibility to disease is increased.

Overt disease can arise as a result of incorrect environmental factors, such as poor water quality, inadequate nutrition, viruses, bacteria, parasites and fungi, plus neoplasia (tumours), hereditary factors and toxins.

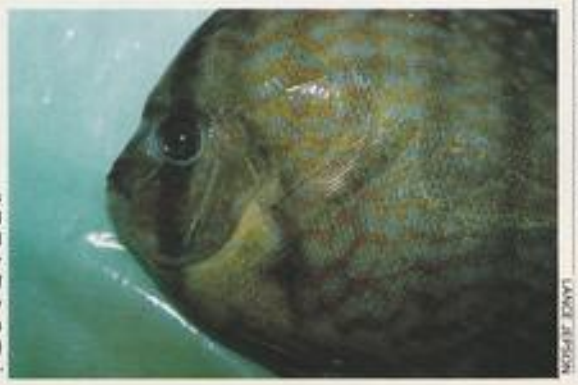
ENVIRONMENTAL FACTORS

Water Quality

① *Temperature*

Temperature requirements are species-specific and for Discus the range of 24-30°C (75-86°F) is considered optimum.

At temperatures below this range, certain metabolic functions may be retarded, such as immunologic function, digestion and drug absorption and utilisation.



Something none of us wants: a freshly dead Discus. This turned out to be another manifestation of *Hexamita*, with many flagellates present in the coelomic (body) cavity.

At temperatures above this range, Discus may become stressed, especially as oxygen levels are depleted.

② *Oxygen Levels*

Oxygen concentration in freshwater at 25°C (77°F) is around 6.0 parts per million (ppm), whereas at 30°C it has fallen to 5.6 ppm. A concentration of 5.0 ppm is regarded as the minimum safe concentration, so at 30°C there is very little safety margin. If, in addition to high temperatures, there is little or no circulation, poorly maintained filtration and excess organic material in the tank, oxygen levels can fall to dangerous levels.

Affected fish will be seen at the surface, head uppermost and with a high respiratory rate. The situation can be alleviated by improving gaseous exchange at the water surface by increasing aeration/circulation, removing mulm from the tank and improving filtration maintenance. The installation of trickle filters or 'wet-dry' filtration will also help prevent recurrences by reducing the demand on dissolved oxygen by the bacterial filter flora.

A heavily planted aquarium can be problematic. While the lights are on, photosynthesis occurs and, as a by-product, oxygen is liberated into the surrounding water. Therefore, during 'daylight' hours, more oxygen is produced by the plants, than is used during their respiration. However at night, no photosynthesis goes on and the plants compete with the fish and filters for available oxygen.

③ *pH*

The pH range considered suitable for Discus is 6.5-7.6. One of the main points to remember about the pH scale is that it is logarithmic, such that each point represents a ten-fold difference from that of the previous point. Therefore, a pH change from 5.0-7.0 is a 100-fold change.

Rapid pH changes can be very stressful, with effects on osmoregulation and respiration. In an established aquarium the pH will tend to fall due to a gradual accumulation of organic acids, plus carbon dioxide production from bacterial beds, fish and plants.

In Discus aquaria, often kept slightly acidic, this further fall in pH can have dire consequences, since at low pH values (less than 6.0), nitrification is inhibited and total ammonia concentrations can quickly become toxic. In addition, in extreme cases, the fish may show signs of acidosis — frantic movements, bleached coloration, skin haemorrhages and 'coughing'.

Treatment consists of correcting the pH with partial water changes and suitable buffers; the situation can be avoided by regular monitoring of pH.

④ ***Hardness***

This is a measure of the dissolved salts, especially those of calcium and magnesium, present in the aquarium water. Soft water has less salts than hard. Sudden changes in hardness can be stressful, especially to wild-caught Discus unused to high levels of dissolved minerals.

Discus kept at too high a hardness lose their vivid coloration, donning paler colours. A KH (carbonate hardness) of 1-6 dH is recommended. This is the equivalent of 17.9-107.4 ppm calcium carbonate. In very soft water, with a hardness below this range, calcium deficiencies may be seen. Fish absorb most of their calcium requirements directly from the water, but levels of at least 16-20 ppm are needed; should the diet also be deficient in calcium, e.g. as in an unsupplemented beef-heart diet, then signs such as skeletal deformities and abnormal operculi (gill covers) may be seen, particularly in young fish.

⑤ ***Nitrification***

Problems can arise with new or inadequate biological filtration, or in systems subjected to low pH or medication, both giving rise to significant levels of total ammonia.

Dissolved ammonia exists in two forms, the ionised form, NH_4^+, and the free, unionised NH_3. These two forms exist in equilibrium with each other, their relative proportions depending upon the pH and temperature.

A rising pH (greater than 7.0), or an increase in temperature, produce an increase in unionised NH_3. This is significant because this form is considered the more toxic. NH_3 is able to cross cell membranes, allowing it to build up to toxic levels in all tissues, including the brain and nervous tissues. It has also been suggested that free ammonia in the water inhibits fish from excreting their own waste ammonia, giving a further increase in tissue levels.

The ionised NH_4^+ cannot cross cell membranes, but its presence damages the delicate membranes of the gills, eventually leading to gill hyperplasia ('overgrowth'), and kidney damage. Affected fish show signs of gill irritation and excessive mucus production due to the irritant effect of the NH_4^+.

High levels of nitrite, over 1.0 ppm, can cause a significant oxidation of the haemoglobin present in the red blood cells to form methaemoglobin. This methaemoglobin is unable to bind and transport oxygen for the rest of the lifespan of the red cells. Affected fish become hypoxic and die if sufficient red cells are affected. Discus will often show signs of nitrite toxicity at levels as low as 0.5 ppm.

Nitrate is considered to be much less toxic than nitrite, but prolonged exposure to significant levels may be stressful.

Test kits for pH, ammonia, nitrite and nitrate are all readily available from aquatic retailers. There is no reason why the regular monitoring of these important water parameters should not be undertaken.

The appearance and history of this Discus suggest a congenital abnormality of the swimbladder. Although the photo is, unfortunately, not correctly focussed, the bulge of the abnormal swimbladder, plus the 'head standing' posture, are clearly visible.

Remedial Steps

Remedying problems of water quality must involve multiple partial water changes over a period of several days. Remember that rapid alterations in water composition can be stressful, even if in theory they are for the better.

Treating tapwater with water conditioners is to be recommended, as their potential benefits far outweigh any worries of adding extra chemicals to the water.

TRAUMA

The laterally compressed, disc shape of these cichlids does not lend itself to capture with the traditional rectangular nets.

Inexperienced handling and netting can therefore lead to damage of the protective mucus layer, scale loss, fin lesions and stress. So take great care whenever you handle Discus.

NUTRITIONAL FACTORS

If Discus are fed a good proprietary diet, then dietary deficiencies will be unlikely. However, if home-made diets only are fed, then a dietary analysis would be beneficial, with the use of vitamin and mineral supplements to make up any shortfalls.

A further complication with mammalian derived foods is that saturated fats may solidify in the fishes' intestines to give problems with blockages. Therefore, lean meats only should be used.

VIRAL DISEASES

Although, to my knowledge, there are no specific viral infections of Discus, many probably go undetected. Certainly, other cichlids are affected with viral infections; they have been recorded in the Ram (*Papiliochromis ramirezi*) and the Texas Cichlid (*Cichlasoma cyanoguttatum*).

Angelfish (*Pterophyllum*) have been found to harbour paramyxoviruses, herpesviruses, paroviruses and adenoviruses.

One obvious viral disease which may be seen is Lymphocystis, evidenced by white, almost pearl-like growths, usually on the fins. Ultra violet sterilisation will help control the spread of Lymphocystis.

BACTERIAL DISEASES

Discus are susceptible to the usual fish pathogens, including *Aeromonas* and *Pseudomonas*. These are a normal part of the bacterial flora present in aquaria and, in all cases of infection, an underlying stressor must be considered; these infections are usually secondary. Signs shown by affected fish are altered coloration, frayed fins, haemorrhages, weight loss and anorexia.

An important infection is Fish Tuberculosis, both because of its believed frequency of occurrence, and its potential for infecting the aquarist. Discus with Fish Tuberculosis may experience long-term weight loss, exophthalmia (Pop-eye), skin lesions and spinal deformities.

Flexibacter infections may cause the loss of broods, often striking as the fry become free-swimming.

Discus subject to prolonged low levels of ammonia and, possibly, other toxins, may suffer secondary bacterial and fungal infections of the gills. These bacterial and fungal colonies establish in areas of gill hyperplasia and are easily visible as whitish clumps among the gill tissues. The gill filaments are often so inflamed and swollen that the operculi (gill covers) are unable to close. The respiratory rate is very high at such times.

Treatment of bacterial disease involves the use of appropriate antibiotic therapy (following initial identification and drug sensitivity tests), plus correction of any predisposing factors.

PARASITES

Endoparasites

Nematodes (Roundworms), especially *Capillaria*, are a common problem with Discus. Suspect these if the fish have mucoid faeces and some weight loss. Diagnosis is on demonstration of eggs in the faeces with

microscopy. Other nematodes may also be encountered. Treatment is with Levamisole.

Cestodes (Tapeworms) are unlikely to be a problem in aquaria. Wild-caught Discus may carry adults in the intestine, or intermediate stages in the muscles or body cavities. Treatment is with Praxiquantel although, because of their complicated life cycles, infestations are unlikely to become established in captive Discus.

Now, we turn to the infamous *'Hexamita' (Octomitus)* — a Protozean (single-celled organism) believed to be the causative agent of Hole-in-the-Head Disease seen in cichlids. Normally an intestinal parasite, it can invade other tissues and, in Discus especially, targets the liver, gall bladder, heart and intestines.

Affected fish fail to thrive, become anorectic and lose weight, while in advanced cases, concave ulcerated lesions appear on the head, often following along the lateral line. These lesions may trail a string of mucus, these being occasionally mistaken for worms. Interestingly, such lesions are often free of *Hexamita*. The disease often crops up following a stressful incident, such as importation.

Further manifestations of the disease are high fry mortality, poor egg hatchability and reduced reproductive performance. Diagnosis is on demonstration of the organism in faeces or body fluids. Treatment is with Metronidazole or Dimetridazole (this latter drug may inhibit spawning).

Another flagellate isolated in Discus is *Protoopalina symphysodonis*, although it is not clear whether this is a normal gut commensal (i.e. living 'in harmony') or a possible pathogen (disease-causing organism). A related flagellate, *Spironucleus*, is known to cause problems in Angelfish *(Pterophyllum)* and may represent a threat if the two fish species are kept together.

Ectoparasites

Protozoa are numerically the most important external parasites. The most familiar and easily diagnosed infestation is White Spot Disease, caused by *Ichthyophthirius multifiliis*. It is the free-swimming stages of this parasite that are the most susceptible to treatment. Fortunately, at the temperatures Discus are normally kept at, the life cycle of the parasite is very short and is quickly eradicated by proprietary medications. Vaccination may be a future possibility.

Chilodonella, *Trichodina* and, to a lesser extent, *Tetrahymena* are ciliate parasites that, in large numbers, are irritant, stressing the fish and predisposing it to secondary infections. Commercially available medications for external parasites or glacial acetic acid dips should be effective.

Amyloodinium (Oodinium) is the cause of Velvet or Rust Disease. It has a complicated life-cycle and is parasitic for only part of it. In an aquarium, levels of infective stages can build up such that newly-acquired fish are killed within 12 hours. Infected fish show lethargy, loss of appetite, flashing, loss of normal coloration and unco-ordinated, darting movements. As the gills are preferentially attacked, respiratory distress will be seen.

Fish suffering from *Amyloodinium* often have a yellowish, dusty appearance, hence the common name for the disease. Metronidazole or quinine hydrochloride may work. Alternatively, use a proprietary copper-based medication. Copper can be toxic, therefore monitor copper levels closely. Fortunately, test kits are readily available.

Ichthyobodo (Costia) necatrix is considered to be a normal skin inhabitant helping to remove sloughed tissue and mucus. If the fish become stressed, the numbers of *Ichthyobodo* increase, affecting all areas of exposed skin and gill tissue.

Affected fish are depressed, with fins clamped, but will still continue to feed. Treatment is as for ciliate protozoa.

Mongenean Trematodes (Skin Flukes) *Gyrodactylus*, may be irritant in large numbers, but are rarely acutely life-threatening. *Dactylogyrus*, the Gill Flukes, in contrast, can cause serious damage to the gills, both directly, and by leaving the gill filaments susceptible to secondary infections. In addition, they are egg layers, which means that their eradication can be problematical.

Until recently, treatment involved the use of organophosphorus compounds such as Masoten, but increasing environmental concerns have led to severe restrictions on its use and availability. Fortunately, these trematodes seem to be responsive to Praziquantel and some of the Benzimidazole compounds.

FUNGAL DISEASES

Occasionally, fungal infections may be encountered in Discus. These are usually secondary invaders of wounds or infertile eggs, the commonest being *Saprolegnia*. *Branchiomyces* may cause gill disease and *Ichthyophonus* occasionally crops up, often mimicking Fish Tuberculosis as a progressive wasting disorder.

These latter infections are very difficult to treat and may require humane euthanasia of affected fish. Otherwise, fungal infections are often responsive to phenoxyethanol or methylene blue. Initial cleaning of infected wounds with dilute iodine may improve results.

NEOPLASIA

Tumours may be seen on occasion, usually in older fish. These should be distinguished from Lymphocystis and parasitic cysts.

HEALTH MANAGEMENT AND DISEASE PREVENTION

1. Regular equipment checks.
2. Regular monitoring of water quality parameters: temperature, pH, NH_3, NO_2, NO_3 and hardness. Oxygen, if thought necessary.
3. Adopt a standard routine of filter maintenance and water changes.
4. Decide upon a sensible stocking level, based upon eventual adult size, companion species, territorial needs and so on. STICK TO IT.
5. Feed a high-quality food. Try to avoid feeding live aquatic foods as these may introduce parasites into the aquarium.
6. Quarantine (acclimatise) all new fish for at least four weeks. Prophylactic (preventive) treatment, for instance, with Metronidazole against *Hexamita*, should be considered carefully. Any benefits may well be cancelled out by the stress of exposure to drugs. However, if this is decided upon, then now is the time for it.
7. Any dying or freshly dead Discus should be referred to a veterinary surgeon or fish biologist for a post-mortem examination. This may well give vital information on the health/disease status of your fish.
8. Bare, 'clinical' aquaria are recommended for quarantine (acclimatisation). They may be beneficial as breeding aquaria but may not provide the necessary security and environmental stimulation for the well-being of Discus. On the other hand, they are easier to clean and keep clean, and carry a lower bacterial population.

JOHN TAWES

An obviously unhealthy Young Discus. Tracing the primary cause can be difficult, but the presence of a hard/alkaline-water species in the same tank (the pink posterior section visible in this shot 'belongs' to a Blind Cave Characin) might well be significant in this case.

A beautiful autumn view of a near-perfect Koi pool.

Planning the Perfect Koi Pool

Part 1 Siting and Servicing

David Twigg uses his vast experience as an outstanding Koi keeper to guide you through the essential steps of providing the best possible conditions for your Koi.
Illustrations by the author

This article will not, and indeed is not, intended to design the perfect pond for you. After all, everyone has a different idea as to what constitutes the perfect pond. It will however, I hope, provide an insight into the thought processes that you should go through if you want to come somewhere near the 'perfect pond' first (or next) time round. I don't suggest for a minute that it is a definitive list of everything to be considered, but it should get you off to a good start.

Many people have had several attempts at achieving the perfect pond and still haven't managed it. Each new pool has designed into it something which its builder has found missing from, or lacking in efficiency in, the last. It does seem to be a chase which never ends, with the goalposts always being moved, and with the development of new ideas on an almost-daily basis.

When I, with friends, designed my pond in 1985, it was thought by those with whom I discussed the design to be 'the bees' knees', as they say. However, as time has passed, its shortcomings have become apparent and, by today's standards, although attractive and providing a good home for my Koi, it is most definitely not 'state-of-the-art'. Looked at on a sunny day, my pond does not show the many faults in design which, with today's knowledge, would not have been there.

MAIN CONSIDERATIONS

As I see it, there are four main areas of planning in a Koi pond. These are:

① Location
② Services
③ Design of Pond
④ Filtration Method

In this first part, I will consider the first two items and, next time, will conclude with the last two on the list.

Location

The four main points to consider with location are:

ⓐ Sunshine
ⓑ Proximity to house
ⓒ Viewing point
ⓓ Proximity of services

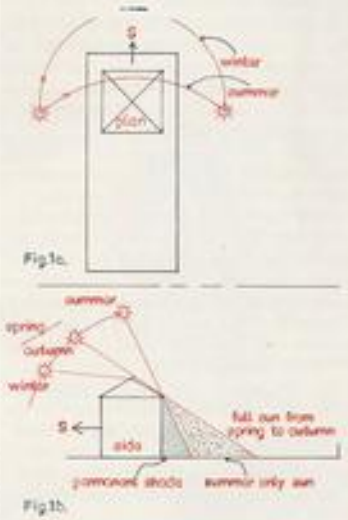
Considering each of these in turn:

Sunshine

This is a **must** which cannot be created. Shade, on the other hand, can be arranged, should that unlikely (in the UK!) need arise.

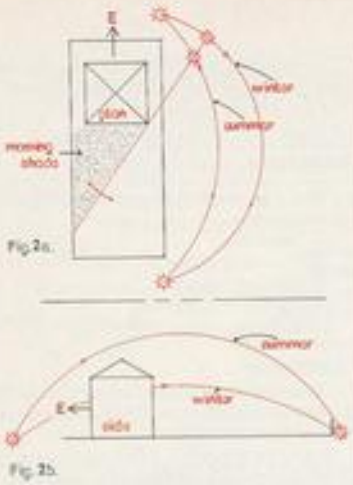
I say this because I didn't take sunshine seriously enough. Indeed, I was advised to put the pond in the shade. I now know that Koi are most definitely 'hot water' fish and love water temperatures above 70°F (20°C). They keep in far better health and, consequently, achieve greater growth rates at these temperatures.

My garden is north-facing and at the bottom of a hill as well, so sunshine is in short supply. This is probably the worst scenario for a Koi keeper.



North-facing garden. This is probably the worst case situation. During the winter months, the sun is a lot lower in the sky than in the summer (Fig 1a) and will be below and behind the house much of the day. Consequently, a great deal of shade is thrown upon the pond (Fig 1b), which will only be completely in full sun for a relatively short period of high summer. It should be possible to plot the shade movement in spring and autumn by going into the garden on bright mornings and evenings and making a sketch of where the shadows fall.

A south-facing garden presents the opposite situation and, subject to the position of adjacent properties, a pond will be in full sun all day along, all year round.



West-facing garden. Once again, during the winter months, the sun is a lot lower in the sky. It is not, however, so critical as the case in Fig 1 because the shade is only going to be noticed in the early morning, summer or winter. This means that a pond placed near the house will still get a large amount of warmth from the sun.

Proximity to House

A pond close to the house is good for security and good for viewing your fish. In the autumn and spring, you can benefit greatly from a pond just outside your lounge window. Koi can be viewed without venturing into the wind and rain!

It also probably means that you will require shorter runs of pipe and electricity cable, etc, to connect to mains services.

From the security point of view, we have to consider theft, not only by humans, but also through the attentions of our feathered friend, the heron. Movement behind, or close to, a pond window will almost certainly be seen by a bird with designs on your best Kohaku and, hopefully, send it on its way before any damage is done.

On the minus side, if, as mentioned earlier, you place the pond too close to the house, you may create too much shade. Proximity to the house, and shading which may be caused by such positioning, should be given very long and careful consideration at this time.

Viewing Point

In order that we may view our Koi to their best advantage, it is important that certain criteria be considered. Reflections can cause many problems and, therefore, pond design should take the possibility of these into account. There is nothing worse than looking into bright light, so the removal of reflections is most important.

The most detracting reflection to remove is the sun, the effect of which can be horrendous when 'vacc'ing' (cleaning the bottom of the pond with a 'vacuum' pump) or trying to net a fish for treatment. Much unnecessary damage is caused by people hitting other fish with the net while trying to catch a particular Koi.

It would be wise, therefore, to try to make the viewing area on the 'sun-side' of the pond. Standing with your back to the sun, gives very much improved viewing. If you plan a long side to the pond, then try to make this the south side.

If you have an existing pond which exhibits this phenomenon, or it is impossible to design your new pond in the way suggested, then one of the easiest ways (and a fairly effective one) of getting around the problem is by placing a screen of trees or a fence behind the pool to produce a dark reflection against which the Koi will stand out. Test for the likelihood of problems from reflections by setting up a vat on the spot where you plan your pond to go. You may find it a useful exercise.

Proximity of Services

Obviously, the less digging for drainage and other pipe laying, the better. If you have aspirations for a gas boiler, for example, you don't want too long a run of gas pipe which may cause a drop in pressure. Electricity cable is not cheap either.

A couple of additional points worth mentioning here are existing pipework and ground (soil) type. A friend of mine had a gas main running across the garden. He did not know of its existence until he had half-dug the pond.

Ground type might modify your decision about location and/or style of pond. Soil depth, above rock for example, could be different at different points of the garden. The water table can also have an effect on the position chosen. A test dig would therefore be best carried out if in doubt as to the lie of the land.

Services

There are four main services to consider:

ⓐ Gas
ⓑ Electricity
ⓒ Water
ⓓ Sewage (waste)

Gas

Gas boilers are becoming very popular these days. Several swimming pool types are available and some companies are now offering to fit stainless steel heat exchangers.

Gas boilers are very capable of maintaining temperatures in excess of 70°F (20°C), but often the thermostatic control can produce a wide swing of temperature. Two friends of mine had temperature swings in excess of 5.4°F (3°C) each time the boiler came on, and neither could get the temperature, using the supplied thermostat, below 65°F (18°C). A specialist thermostat had to be purchased to give greater control.

Apart from the cost savings made by greater control over the heat supplied to the water, the Koi will be far happier in a more stable environment. The extra expense of a good thermostat should be repaid in a relatively short space of time.

Electricity

Electricity can be used for powering swimming pool heaters. These may not be the cheapest form of heating when compared to gas boilers, but they can be used during the winter months on the Economy 7 rate, to hold temperature at about 55°F (12°C), enough to keep the immune system running, the fish feeding well and therefore in good health.

An electrical supply will be important for running circulation pumps and air stones, as well as the other miscellaneous items, such as vacuum pumps, UV sterilisers, lights, etc. A supply should be run from the mains and be terminated in your pump house with a suitable fuse box.

If a residual current circuit breaker (RCCB) is not used on the main house supply, then one should be fitted at the pump house to isolate the pond system should a problem arise. Even if an RCCB is fitted to the house, it could pay to install a second, slightly more sensitive, device dedicated to the pond circuit. Consult a qualified electrician if in doubt.

Water

A supply of fresh tapwater from the mains, preferably on its own ball valve, should be available for topping up purposes. If plumbed in permanently, perhaps with its own dedicated water filter, it will be far less obtrusive than having a hose pipe draped over the lawn, etc.

Domestic water filters are in common use now, particularly in areas where large amounts of additives such as chlorine and chloramines are used. There are many types of filter, but it is beyond the scope of this article to discuss them individually.

Several well-known suppliers of domestic water filters, suitable for use with Koi, travel the country giving talks to the Koi clubs. If you are not a member of a Koi society or BKKS Section I would strongly advise membership. There is almost certainly a club near your home. Check the **Koi Calendar** elsewhere in this issue for contact names and telephone numbers. Membership gives access to a lot of knowledge, much gained from the personal experiences of the members.

If you decide to purchase a water filter, then have some questions ready to ask. For instance, "How selective is the filter in what it removes?" and "Does it take basic minerals and vitamins from the water?" If so, this will make the use of good-quality food, with the correctly balanced content of relevant minerals and vitamins, essential.

It may also mean the use of an additive to your pond such as **Refresh**. Refresh is a powdered clay, *montmorillonite*, which, during manufacture, has extra vitamins and minerals added. Refresh is now available in rock form, which prevents clouding of the water that would otherwise provide poor visibility of Koi when in use.

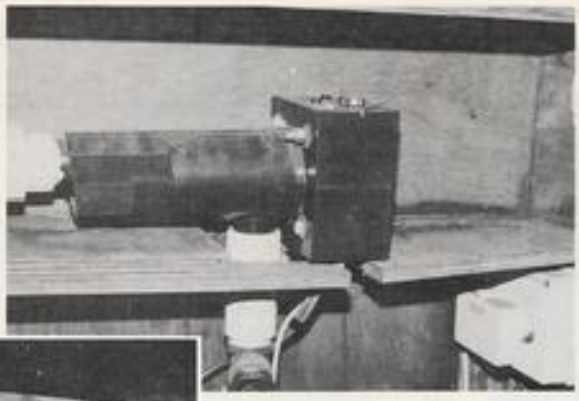
Sewage (Waste)

Many Koi keepers have the bottom drain of their pond plumbed straight to the sewer. Others have it piped to a distribution chamber so that they may decide whether or not they wish to dispense with any of the water in the system, or whether they wish to

recycle it through their filter system.

Recycling water, in these times of drought in certain parts of the country, and with water meters predicted to come before long, means that efficient water usage is paramount. I would suggest, therefore, that the ability to feed bottom water to both filters and sewer is a most important part of good pond design.

If starting with a virgin plot, there could be an advantage in plumbing waste water to a network of land drainage pipework around the garden. A 4in (100mm) pipe holds almost 8 litres (1.75gal) of water every metre (39in) length, so you can see that this could be a useful source of water supply to the roots of plants.



A typical electric swimming pool heater installation.

A typical gas boiler installation.

If you design a pond with a waterline above ground level, say 12in (30cm), to give a good head, then even a perforated pipe laid out on the ground surface, hidden behind the shrubs, could be a well worthwhile investment.

That, then, concludes this first part of **Planning the Perfect Koi Pool.** Next time, I will cover the remaining two items: Design and Filtration. In the meantime, please don't stop thinking of your "perfect pond", as I am sure to have missed something!

(TO BE CONTINUED)

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Patently speaking

By Anthony Edwards

This month's selection of patents includes quite diverse subjects. Lighting is always an important factor with aquaria, and the first patent describes light-emitting diodes which can be placed below the water's surface (**Patent No. 2239702**).

A means for progressively dissolving foods suitable, especially, for aquatic molluscs and crustacea, is described in the second patent. The food is composed principally of fish protein and is prepared in an aqueous solution of casein (**Patent No. 2237604**).

A method of drawing waste material out of the main chamber in an aquarium is described in the third patent. This is done by causing water to flow through a layer of gravel supported on a partition, before returning to the main tank (**Patent No. 2247600**).

The fourth (and final) patent is a Japanese invention which describes external filters through which water is forced by pumps. The arrangement also includes a layer of active carbon on which bacteria breed and from where they can effect biochemical purification of the water (**Patent No. 2248558**).

PATENT ABSTRACTS

Aquarium Lighting Units

In UK Patent 2239702, **Steven Philip Bell** describes a lighting unit intended to be positioned within an aquarium, below the water surface.

It comprises at least one light-emitting diode connected with a mounting for positioning it at a desired location within the aquarium. The connection between the cabling and the light emitting diode is water-proof.

Dissolving Foods

In UK Patent 2237604, **Dielen Laboratories** describe food products that dissolve progressively in aqueous medium.

These are composed principally of a mixture of fish protein hydrolysate enriched in lipids and nutriments, such as fish viscera concentrates, micronised crustacean shell powder, micro-organisms, algal powder, vitamins or mineral salts, the mixture being covered in casein.

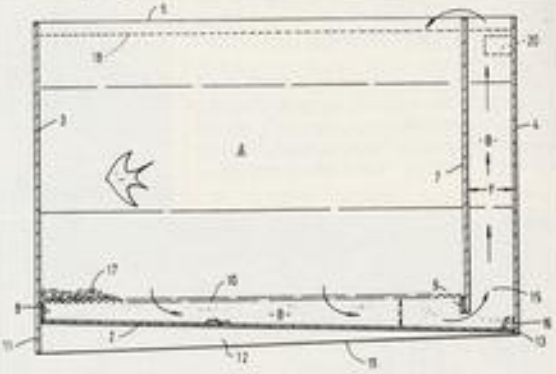
Dissolving Foods: Steps in the Process (Patent No. 2237604).

These products can be obtained by a process in which the protein hydrolysate is mixed with the nutriments. The whole is then kneaded with a previously prepared aqueous solution of casein.

The food is suitable for aquatic animals, in particular molluscs, crustaceans and echinoids.

Aquarium Waste Removal

In UK Patent 2247600, **David Llewellyn Nutt** describes an aquarium for aquatic animals and plants. It has an inclined floor (2) and a perforated partition (10) extending across the aquarium above the floor. A second partition (7) extends from a free edge of the perforate partition (10) to define a passage (15) extending upwardly in the aquarium.



Aquarium Waste Removal System (Patent No. 2247600).

In use, the aquarium is filled with water and gravel is supported on the partition (10). The water is then caused to flow through the gravel layer, up the passage (15) and then back to the main chamber (A) of the aquarium.

The water flow is effective to draw waste material out of the main chamber (A) and to deposit it in a second chamber (B) defined by the partitions (10, 7).

Aquarium Filter

In UK Patent 2248558, **Kabushiki Kaisha Tominaga Jyushi Kogyosho** describes an external filter for an aquarium.

It comprises a frame (1) which mounts on top of the tank and carries a pump unit (4) and a stack of two or more separate filter units (10, 11, 12) through which water from the pump filters downwards in series to an outlet (17).

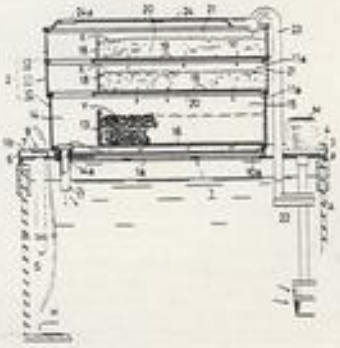
Each filter unit consists of an open rectangular vessel fitted on to the unit or frame beneath. The upper units contain cotton or glass wool, and the lowest unit (10) contains elements covered with active carbon on which bacteria breed and carry out biochemical purification.

The upper units remove solid impurities and are cleaned more frequently than the lower. Overflows (13, 18) are provided at each level. The lid (24) has a feeding hole (24a).

*** FOOTNOTE**

The illustrations published in **Patently Speaking** are duplicated from the original Patent diagrams submitted with the Patent Applications.

Therefore, unless otherwise indicated in the text, the numbers which appear in the figures are those that accompany the original Patent submissions.



Aquarium Filter (Patent No. 2248558).

Naturalist's notebook

By Eric Hardy

ORCHID EXPLOSION/ COVER-UP

What an explosion of Marsh Orchids marked last summer's heatwave and drought! Even at a disused gasworks in Garston, Liverpool a friend counted 4,513 Spotted Orchids, 1,650 Southern Marsh, 121 Bee and 36 Early Marsh, despite its contaminated soil. A nearby old coalyard had 143 Spotted Orchids, 500 more crammed Rocksavage reserve by the Weaver estuary.

Last year I was criticised for mentioning where I studied Britain's last Lady Slipper Orchid, up Dibscar Beck in Upper Wharfedale, because everyone has equal right to study plants. After we kept it totally secret for 28 years, we suddenly found the flower taken without permission in 1958 by a university botanist, ruining our years of studying its fertilisation.

He claimed his status gave him the right to take it. The apparent cover-up is now exposed. Bradford Museum sent me a photocopy of the Lady's Slipper sheet in the late W A Sledge's extensive private herbarium they acquired. The former lecturer in botany at Leeds University there records collecting it on June 16, 1958, "between Grassington and Conistone".

SNAKE SENSES

The angle of the sun's position has long been proved a guide to bird navigation and probably salmon at night near the surface at sea. At Victorian University, British Columbia, Lawson and Secoy have now shown this to guide the orientation of the Plains Garter Snake as well.

At the University of Colorado, Lee, Chiszar, Smith and Kandler have shown that Prairie Rattlesnakes select their prey-trails by chemical and orientational clues.

LAKES' CONSERVATION STATUS

Two Welsh lakes, rich in aquatic life, have been given the international conservation status of the Ramsar Convention. Llyn Tegid (Bala Lake) is the largest natural (and mesotrophic) lake in Wales, of glacial origin and noted for its Gwyniad or Whitefish, Grayling (which are usually river fish) and Floating Water Plantain, *Luronium natans*.

The other, Lyn Idwal, which one passes from Ogwen Cottage on one's way to the Devil's Kitchen in Snowdonia, is a shallow, oligotrophic corrie-lake on ancient Ordovician rocks at 1,250ft (380m) altitude, with rare water plants, like Pillwort and Quillwort.

MAMMAL NEWS

Brecknock naturalists recently introduced an otter haven at Cwm Crogau at the head of a tributary of the River Wye near Builth Wells, in Wales. There's been one for some years on the Teifi. Otters are no longer considered pests of fisheries and their conservation is encouraged by the National Rivers Authority.

Distribution maps in Paul Morrison's recently-published book *Mammals of Great Britain and Europe* fail to show any Salopian Otters, though in 1989 I mentioned their increased return down the upper Severn Valley to rivers Tern, Teme, Rea Brook, even to below Ludlow and the border to Bewdley.

This despite the presence of mink. In 1919(!) I wrote of them in lower Clun, Onny and Camlad and below Shrewsbury.

Not far from the otter's haunt on the lower Clwydog, in Coed y Fron Wyllt, above Nant Melin Dwr, behind Bontuchel, near Ruthin in North Wales, I gazed down from the new forestry hide into a green and sunlit valley crowed with trees in their leafy struggle to reach the light, where a tributary below has been dammed to lure otters.

With marine mammals Paul Morrison's book fails to map Grey Seals breeding at the Calf of Man and the large herd daily in the Welsh Dee off Hilbre Island, or Common Seals in Strangford Lough, which regularly cross the Irish Sea to the Duddon estuary in small numbers.

The feral Coypu is still mapped on East Anglian broads and dykes, but the Ministry of Agriculture announced its extinction by trapping last year, from all Britain.

SEA TROUT/SALMON SNIPPETS

A newly-discovered painting of a 68½lb (31kg) salmon, caught at Llantrissant near Usk in 1782, and auctioned recently for £5,800, is not the British record as claimed, but maybe the heaviest Welsh salmon, though near the top of the tables. It was caught in a net, as recorded in a book of 1857.

One of 103lb (46.7kg) was once netted in the Forth. A 52lb (23.6kg) salmon was caught on the Welsh Dee at Pickhill in 1779.

A salmon radio-tagged on the Dee at Chester last August surprised zoologists by turning up on the Lancashire Ribble in December.

There is much concern that the proposed Usk barrage would impede the run of salmon, and the Rivers Authority prefer a fish-lock to the traditional fish-ladder. It's one of the five most prolific Welsh salmon-rivers.

Adult salmon might be delayed (as prey to birds), in the impoundment lake created by the barrage upstream, while young salmon and Sea Trout would be subject to a fall of more than 16ft (c 5m) as they pass from river to estuary over the operating weir. Elvers entering the Usk would be reduced 30%, because of their limited swimming ability. There is also the Usk's importance in the migration of Twaite Shad.

The unique 70 metre (230ft) tunnel fish-pass, planned to take salmon above the Conway Falls near Betws-y-Coed, is now estimated to cost £375,000, more than funds earmarked. A different type of fish-pass is being considered.

Studying the great decline in Sea Trout in recent years, in Ireland as well as Wales, suggests that large numbers of 'fish lice' from salmon farms have attacked smolts in the transition from fresh to seawater.

The Sea Trout Action Group (STAC) considers there's enough evidence to show this caused the collapse of the Sea Trout migration in recent years.

Herpetology matters

By Julian Sims

MYSTERY FROG DEATHS

The **Frog Mortality Project** will continue during the spring of this year. This is an investigation into the mysterious 'multiple' deaths of Common Frogs (*Rana temporaria*) in ponds, in the gardens and countryside of southern England.

Since the start of the survey in the summer of 1992, a number of mass mortalities have been reported. In one extreme case, more than 80 frogs were found dead in a pond in Surrey. This level of fatality could have serious implications for the viability and longterm survival of the remaining frog population.

At the time of writing this item it is not known whether the death of these amphibians has been caused by a virus or by a bacterium. For example, rod-shaped bacteria (bacilli) called *Aeromonas hydrophila*, can be carried into ponds in water which drains from the surrounding soil.

These bacteria cause the disease usually referred to as 'Red-Leg' — one of the symptoms being a reddening or inflammation of the skin, particularly in the abdominal area and the muscular regions of the legs. The skin, especially the webbing between the toes, may also become ulcerated. Other symptoms include general sluggish behaviour of the amphibians. Finally, their bodies become swollen or oedematous. The frogs seldom recover from this state of deterioration.

The Frog Mortality Project is being carried out by the **Institute of Zoology** (based at the Zoological Society of London) and **Herpetofauna Consultants International** of Halesworth, Suffolk. The **RSPCA** is partly funding the project which will initially run for one year. Herpetofauna International are collecting relevant details of multiple frog deaths, including geographical location, number of amphibians which have died and any external symptoms such as abnormal coloration and/or 'bloating'.

Examples of such informa-

JULIAN SIMS

Common Frog *(Rana temporaria)*. Mystery deaths are being investigated — see text to see how you can help.

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tion should be sent to:

HCI Ltd,
PO Box 1,
Halesworth,
Suffolk IP19 9AW.
Tel: 098 684 518;
Fax: 098 684 579.

The Institute of Zoology are conducting post-mortems and pathological analyses on some of the dead amphibian bodies in order to identify the agent which has caused the frogs to die.

In past spring-time editions of **Herpetology Matters,** I have drawn attention to the importance of 'spawn exchange' schemes. The distribution of frog spawn from well established and over stocked ponds to new ponds or ponds where these amphibians do not naturally occur has been a very good practical method of ensuring the conservation of the Common Frog.

However, in the same way that spawn exchange results in the wider distribution of one of our native species of amphibian, it could also result in the spread of the agent causing multiple frog deaths. Therefore, in 1993, it would seem prudent **not** to move frog spawn from one pond to another.

SATELLITE FROGS

Research at the **University of the Witwatersrand,** Johannesburg has identified two different breeding strategies among male South African Leaf-folding Frogs, *Afrixalus delicatus*. The difference in behaviour relates to the method used by male frogs to attract (or obtain) females for amplexus.

One type, the 'calling' males, remain stationary at their chosen calling site and vocalise into the night between the hours of 9 pm and midnight. Female frogs are attracted to the calling males with whom **they** (the females) initiate amplexus.

However, a second group of males, the 'satellites', silently wait close by the callers and try to intercept any passing females. These satellite frogs literally adopt a very low profile, with head and body pressed flat against the substrate. In contrast, the callers do not try to conceal themselves, but sit in an upright position with their front legs outstretched and head raised well above the substrate.

Observations of frog behaviour were made in the field and in a vivarium measuring 2 x 3 x 2 metres. It was found that calling is the most common breeding strategy used by male Leaf-folding Frogs. Calling is also by far the most successful method of ensuring mating. During the investigation, no satellite male succeeded in pairing with a female frog. Why then, do some male frogs become satellites?

It is possible that some satellite males are incapable of calling. Smaller frogs, for example, might not have sufficient energy available for prolonged calling, or the vocal pouches of satellites might be under-developed, for example, in juvenile males. It is also possible that smaller males become satellites because they have been displaced from calling sites by larger males, or have been unable to secure a calling site because of their size. Adopting a satellite approach to mating might therefore be the only opportunity of obtaining a female!

But, it is certainly not all sad news. Being a satellite does have other advantages, especially to personal survival. Male frogs which don't call reduce the risk of advertising their presence to predators, and they also save energy (calling uses up a lot of energy and vociferous males have to feed more frequently).

The very existence of satellites in the Leaf-folding Frog population indicates some measure of success. For example, their quieter, less strenuous way of life probably ensures that they have a longer lifespan than the calling males.

Although no satellite was observed to mate during the research by the team of Witwatersrand, it is quite probable that these frogs do breed in, at least, some of the many breeding seasons they live through. Indeed, being a satellite must be advantageous because this way of life is demonstrated by some of the males of many species of Anuran, including Natterjack Toads (*Bufo calamita*) from Europe, and Bullfrogs (*Rana catesbeiana*), Cope's Grey Treefrogs (*Hyla chrysoscelis*) and Western Chorus Frogs (*Pseudacris triseriata*), all from North America.

ALL LETTERS FOR HERPETOLOGY MATTERS SHOULD BE ADDRESSED TO JULIAN SIMS, c/o *A & P.*

Trade Talk

OFI (UK) NEWS

1 Changes in EC Directive Negotiated

Modifications to the EC requirements of identity and clinical veterinary checks of ornamental fish consignments at the time of import have been agreed in consultation between the **Ministry of Agriculture Fisheries and Food (MAFF)** and **OFI (UK)**.

The original directive meant that each consignment of live animals entering the UK from non-EC member states should be subject to documentary, individual identity and individual clinical veterinary checks at the time of import. This would have required each box of imported ornamental fish to be opened and examined by both a fish identification expert and a vet, and the cost of making such checks would have been met by the importer.

Explained **Keith Davenport**, Executive Co-ordinator of OFI (UK): "A consignment was defined as 'any animals of the same species travelling together'. Thus, a shipment containing 50 species would have been treated as 50 consignments, each requiring the appropriate documentation, if the directive had been applied as originally written."

Keith continued, "Officials of MAFF, who were to implement the directive, were invited by OFI (UK) to visit importers' and wholesalers' facilities, and it was explained that, annually, the industry imports some millions of fish of 3,000 species transported in 8,000 shipments amounting to over 150,000 boxes. It was pointed out that marine shipments may contain as many as 100 species and would thus constitute 100 consignments, each requiring separate documentation.

"By visiting importers as fish arrived, we were also able to establish the extent of the logistics and costs of applying this directive and the chaos at major airports as the checks were to be made; while the deleterous effect of the consequent delays upon livestock was also established."

Subsequent representation by MAFF officials in Brussels were successful in modifying the original EC directive. While documentary checks at the time of import will remain, identity and clinical veterinary checks at the time of import will be performed on a spot-check basis.

"Identity checks will, in the main, be based on box labels and will not require that they be opened," continued Keith Davenport. "Clinical examinations will only be carried out where the country of origin is felt to pose fish health risks and then they would normally take place at the point of destination rather than, as originally envisaged, at the airport."

Prior notice of consignments have also been modified so that, in effect, all fish will be treated as one species. "Each shipment will be treated as one consignment requiring one set of checks, rather than one for each species. However, information on the species and the number of each imported will be required at the time of Customs clearance," Keith concluded.

2 New Board of Directors

A new Board of Directors was appointed at the recent Annual General Meeting of OFI (UK). **Richard Sankey** was appointed chairman, with the following directors appointed to the board: **Cynthia Baker**, Birstall Aquatics; **Keith Barraclough**, King British; **John Cook**, Shirley Aquatics; **Peter Golding**, Peter Golding Ltd; **Neil Hardy**, Neil Hardy Aquatica; **Gary Holland**, Benair Freight; **Dave Keeley**, Underworld Products; **Dr David Pool**, Tetra; **Sharon Roberts**, Oranda Imports; **Roy Scott**, The Water Zoo; **Mick Seaby**, Swallow Aquatics; **Martin Symonds**, Tewin Mill; **Peter Webb**, Interpet; **Peter Wheeler**, Independent Consultant.

Aquarama '93 Conference

The theme of the conference papers at this year's **Aquarama '93** (World Trade Centre, Singapore, 24-27 June) will be: **Global Perspectives on the Future of the Aquarium Industry — Present and Future.**

The full list of speakers is yet to be confirmed, and will be announced through these columns. However, papers for the five sessions of the three-day conference will cover a diverse range of topics under the general theme, and will be of specific interest, both to those within the ornamental aquatic trade around the world, and to hobbyists.

The first day of the conference will cover subjects under the general heading **New Market Opportunities: International Perspectives;** while day two will cover **International Legislation in the Aquatic Trade** and **Genetics, Breeding, Biodiversity and Nutrition.** The third day of the conference includes topics under the general headings of **Conservation and the Aquatic Trade,** and **Health Management, Packaging, Transportation and Distribution.**

For more information, contact **John Neo, Project Manager, Aquarama '93, Expoconsult Singapore, 46a Horne Road, Singapore 0820. Tel: 65 2999273; Fax: 65 2999782.**

Search for Show Sponsors

Organisers of **The Pet Show**, held last May at Earl's Court, London, are seeking a sponsor for the next event in the series, scheduled for 1994.

According to the organisers, the 1992 event attracted 154 exhibitors and high media profile for the sponsoring companies: "It was the first of its kind to being together into one event the five main categories of pets: birds, cats, dogs, fish and small mammals," remarked **June Barker**, Managing Director of **Barker Brown**. "The Pet Show is the ideal sponsorship opportunity for any company looking to attract a wide audience of families with a common interest in responsible pet care."

For further details contact **Frankie Burstin** or **Bronwen Andrews, PR Unlimited, 78 Ebury Street, London, SW1W 9QD. Tel: 071 730 7174; Fax: 071 730 8426.**

Profits Increase for King British

Fish food and water treatment manufacturer **King British** and **UNO**, manufacturer of pond heaters and thermostats, were instrumental in achieving increased turnover and profits for the ninth year in succession for holding company **William Sinclair Holdings plc** for their year ending October 1992.

Group managing director **Peter Barton** commented, "We are delighted with the progress of these two acquisitions, which now operate as our aquatic unit. King British continues to increase its sales, and we expect further progress in this current year.

"Against the background of a depressed economic climate, these results are a tribute to all who work in William Sinclair."

Group profits before tax improved by 3% to over £4.6m, compared with just under £4.5m in the previous year. Export sales expanded to a record level for the company of over £2.8m, compared with £1.7m last year.

Peter Barton continued, "The acquisitions during the year of aquatic companies King British and UNO, and of the petcare and household product company Secto, have been successfully integrated into the group, and all three companies have made satisfactory contributions to profit."

Coldwater jottings

By Stephen J. Smith

SCOTTISH SOCIETY SUCCESS

I was delighted to receive the first issue of the newsletter of the **West of Scotland Goldfish Society.** The society was formed just under 12 months ago to provide a much-needed forum for the Goldfish hobby in that part of the British Isles, and has proven to be quite a success.

It is so successful, in fact, that the society is planning its first Open Show, to be held on **Saturday 7 August 1993.** It is hoped that the event will incorporate trade stands and lectures, and your 'Coldwater Jotter' is also expected to present the trophies. The venue has yet to be decided, and the society is looking for sponsorship, especially for show tanks.

Any organisations and individuals who would like to be involved in what is planned to be the major aquatic event of the year 'north of the border', should contact: **Fergie Brown, PR Officer, West of Scotland Goldfish Society, 6 Invershiel Road, Summerston, Glasgow G23 5JG. Tel: 041 946 8019.**

SOAPBOX TIME

So, where are all the dedicated coldwater fishkeepers? If their presence at the recent, and highly-successful, **Supreme Festival of Fishkeeping** at Weston-super-Mare was any indication, they simply don't exist.

Coldwater hobbyists in the UK had the perfect opportunity to demonstrate that British can be best when the first-ever **European Open Show** was held at the beginning of November at the Supreme Festival of Fishkeeping, at Sand Bay near Weston-super-Mare.

Organised by **Interpet** in conjunction with the **Federation of British Aquatic Societies,** the European Open Show formed part of the highly-successful 48-hour programme of enjoyable fishkeeping and social events.

I can only say that I was disappointed, to say the least, that British Goldfish keepers in particular, were conspicuous by their absence on the show-bench.

Following, among others, successful coldwater shows in Bristol, London, and Altrincham recently, what a pity that the coldwater societies should choose to ignore the opportunity to promote the best of their hobby in the European arena. Let's hope that a similar opportunity will be provided by the organisers at next year's event, and that it will not be so cruelly ignored by those who purport to support the hobby.

A FIRST FOR DAVID

There is a first time for everything and, for **Coldwater Jottings** reader **David Fanshaw,** his first prize in a recent **Coldwater Jottings** competition (July 1992) was the first time he had ever won anything.

David, from Buxton, Derbyshire received a complete aquarium set-up from **'Aquarian',** presented to him by **Dr David Ford,** senior consultant to 'Aquarian'. David has been a fishkeeper for 15 years and already owns a tropical and coldwater aquarium, as well as a dog and a budgie.

CLEANING AND FEEDING RESOLUTIONS

By far the majority of problems related to me on my travels throughout the past year have been concerned with water quality, especially in the aquarium. Tales of milky water and slimy filters are among the worst horror stories I could possibly encounter. When will some fishkeepers realise that fish are *animals* and, just as with your pet rabbit, gerbil, or budgie, their quarters need to be cleaned — regularly!

Yes, I know the above are probably extreme exceptions, but let's make this year's New Year Resolution to undertake regular partial water changes.

Nature does this on a continuous basis in rivers and lakes, and to me and many others, it is one of the most essential items in the aquarium (or pond) maintenance routine.

So, every week or so, siphon out approximately 25% of the aquarium water, and retain some to half-fill a bucket. This retained water should then be used to rinse your filter medium. NEVER use cold water straight from the tap. NEVER use hot, or even lukewarm, water straight from the tap either. I tend to draw fresh water into buckets or suitable containers the night before my water change routine, which normally takes place on a Saturday morning.

The buckets are left near the aquarium overnight, by which time the temperature has equalised and any chlorine and other treatments have had a chance to dissipate. An aquarium conditioner can also be used to ensure that any additives are neutralised.

And a final word on keeping the aquarium clean — feeding. Water management problems are compounded by too much feed. The rule is: little, and NOT TOO OFTEN. I have never seen a hobbyist's fish starve to death!

During the spring and summer months, the fish in my indoor aquaria receive two or three feeds per day, and then only a small amount. During the winter, feeding is reduced to once a day, usually first thing in the morning; while I prefer also to fast the fish for one day a week (usually the day the partial water change takes place).

So, take heed. And, to all those who have had problems, take heart; take care of your fish, and they will provide you with a most pleasurable pursuit.

Have a happy and successful fishkeeping 1993.

A NEW 'WRINKLE'

They do say that one is never too old to learn. And this is borne out by a new 'wrinkle' which I had never previously encountered, and which has to be my 'word of the decade'.

While chatting with our esteemed editor, **John Dawes** [*Flatterer!* **Ed**] about the characteristics of the Black Lionhead pictured in **Your Questions Answered** in the November 1992 edition of *A & P,* he remarked of the transparency: "The scales are visible and the ***rugosity*** on the head is quite clear . . .".

The *what . . .?* Apparently, *rugose* means "wrinkled": a distinctive characteristic of the hood growth on the Oranda and Lionhead types of Goldfish.

So, I make no apologies for this word cropping up in **Jottings** and any future features on hooded Goldfish. You'd better be on the look-out now that you (and I) know what it means!

Alex Stephenson

TANKS FOR THE MEMORIES

Alex Stephenson recalls some of the crazy . . . and some of the not-so-crazy early days of his fishkeeping 'career'.
Illustration by the author

Forty-odd years as a fishkeeper doesn't mean I'm good at it, but it does mean I've seen a lot of fish and had a lot of fun. I became infected with fishkeeping when I was about eleven. It wasn't a case of diminished responsibility; it was an accident. Someone, I can't remember who, gave me a goldfish in a bowl. It only lived for a week or two. I realised, even at that age, that a dead fish wasn't a happy fish. With some pocket money saved, I resisted the temptation to replace the fish and bought a book instead. It was a very small book (pocket money was pennies in those days). With the wisdom from this book firmly implanted in my brain, the next step was to persuade reluctant parents that a large fish tank was needed. The result was a rabbit, but I persevered.

It was hard work earning that first tank. My father made it — a stainless steel frame and glass stuck in with putty. It measured about 16 × 10 × 12in (c40 × 25 × 30cm); still smaller than what I had in my mind, but a big improvement on the bowl. I still have this little tank. The new 'aquarium' supported two small Goldfish and the mandatory bunch of *Elodea* held down with a rock. Serious fishkeeping had begun. I became industrious, gained extra pocket money, and purchased more books.

It wasn't long before my parents' home sported several tanks in various rooms and a couple of small ponds in the garden. By now, we were into 'tropicals' as well.

Some obliging Shubunkins of uncertain parentage spawned in one of the ponds. I remember a few of the young survived, despite my efforts to rear them. Suddenly, I was a fish breeder. There was no holding me now!

The fish-house came next, followed shortly after by the electricity bill. There was a reassessment of the situation and some adjustments seemed prudent, the fish-house being closed down during the worst of the winter. This still left lots of scope. Attempts to keep and breed various things continued and, most of the time, my parents passively supported my efforts, although they did have reservations about Infusoria in the airing cupboard.

Some memories of this period are still quite vivid: things like — the look on my mother's face when she found bunches of Hornwort in the bath. I explained my intention to spawn Fantails and move the eggs later. She wasn't impressed.

I still remember the outrage of my sister when she discovered some dressing table effects in use as culture dishes. I told her micro-worms didn't seem to mind the smell of cosmetics, but she wouldn't listen!

The short-sighted attitude of the neighbours when they attributed all the mosquitos in the area to me also sticks in my mind. This turned out well, as I was appointed gnat larvae collector for the rain butts of several houses.

What about the look of concern when an aunt staying with us realised I had borrowed her stockings? She was only slightly relieved when she found out I had cut them up to make *Daphnia* nets. The same aunt, was the cause of a week's supply of *Tubifex* going "where no *Tubifex* had gone before". The event was announced by a shriek, followed by the sounds of something female, frantic and fast-moving. My mother was up to her elbows in pastry or something, so she sent me to investigate.

I met my aunt in the bathroom doorway. She appeared disturbed and proceeded to explain her anxiety. Apparently, she had been intrigued by the "red growth" in the jam jar hanging on one of the wash basin taps. She had taken the jar for closer examination and, during her studies, dropped it — into the bathwater. She had immediately tried to rescue "the creature" but it simply disintegrated. What should she do?

I just stood there, transfixed and quite speechless. It was at about this point that my aunt realised all she was wearing was a towel, and very pretty she looked, with it wrapped around her head. This super lady, who is now in her later years, still teases me about it. We had to throw the loofah away, you know.

things as going to local club competitions with fishes in jars inside a holdall were major challenges. Bus conductors (remember those?) would look suspiciously at this holdall held carefully across my knees, especially if it was dripping water. Once I fell asleep on a train while transporting my fish this way, waking up to find I'd missed my station, the result of my extended journey being worried parents and two unhappy Danios. My parents got over it, the Danios didn't.

When schooldays came to an end, fishkeeping suffered a few setbacks, such as my having to earn a living. In those days, growing Blanketweed was not considered a career, and you couldn't get a government grant for it. Other diversions also came along . . . things like girls. What a distraction they can be! Cleaning out filters can somehow lose its appeal when one is in a rutting mood, but we'll skip over this bit, as it is an entirely separate story. . . .

It's enough to say that fishkeeping continued, with varying enthusiasm, for several years. This period produced successes and failures in a number of areas. I have a sneaking suspicion my fish did rather better without my constant attention.

Eventually, after a good long run, I married. The stability of this institution lends itself very well to a revival of hobbies such as fishkeeping, an interest in Goldfish being considered less of a threat than an interest in belly-dancers. It helps, of course, when one's spouse provides support and encouragement.

Some, but not all, of the equipment and stock was transferred from my parents' home to my new address. This formed the basis for renewed activity on the fish front; tanks were set up and a pond was dug, then we moved house. This process has been repeated a couple of times since. Without the necessary urging from my wife, I might have given up on several occasions. There were even times when I secretly wished I'd chosen the belly-dancers! However, we again have a fish-house and ponds. Currently, there are no tropicals, just Fancy Goldfish. My fishkeeping friends know this, and I suspect some of them of hanging garlic in their windows when I visit them.

I've met a lot of wonderful people over the years. There was the man who kept a single White Cloud Mountain Minnow in a bowl and fed it a bag of *Daphnia* once a week — it was the biggest White Cloud I've ever seen! There's the breeder who produces thousands of high-quality fish every year. The work involved here is formidable, and the dedication beyond description. There is the lady who keeps assorted Goldfish in assorted tanks in assorted rooms, periodically switching them all around "just for a change". There is a well known writer who breeds fish for fun and *Daphnia* to make me jealous. In fact, he's the most successful *Daphnia* farmer I know. I could go on and on. . . .

The characters who keep fish are often as colourful as the fish they keep, so if you don't actually keep fish as yet, start immediately. A whole lifetime is just not long enough to

What's your opinion?

By Billy Whiteside, BA, ACP

'DISCO' FISH

Mrs Felicity Foreman resides at Whornes Cottage, 43 Rochester Road, Cuxton, Rochester, Kent. She writes: "In response to your comments about Disco Fish, **WYO?** October 1992, I saw some in a local shop. I told the staff I was horrified, and that in future I would shop elsewhere. I also phoned the RSPCA who apparently were unaware of the gross cruelty. I am appalled that any creature should be subjected to this abominable practice.

"Most of all I feel very sad that these fish are 'designed' to attract young, first-time fishkeepers who are unwittingly getting the worst possible start to our fascinating hobby. We all make mistakes, but hopefully we learn from them. Surely these fish are a deliberate mistake?

"Please carry on your good work through *A & P*. Maybe if enough fishkeepers boycott those dealers who trade in these fish, 'Disco Fish' will become extinct."

Alan O'Brien is a regular contributor to this column and his home is at 86 Blumfield Crescent, Burnham, Slough, Berks. He writes: "I thought it's about time I got around to writing again. I have been somewhat busy lately but am glad to see that *A & P* seems to be going from strength to strength.

"I was in a local aquatic shop recently when I saw some of the 'Disco Glassfish' you referred to in the October 1992 column. Quite frankly, I was appalled and made this quite clear to the bemused shop assistant! Let us hope that people will not buy these 'modified' fish and that, in future, they are sold only in their normal, clear state as nature intended."

O'BRIEN ON NITRATE FILTERS

Alan also has some very interesting thoughts on filters. "Turning to filtration in marine aquaria: you have touched on one of my favourite subjects. Most types of system are well documented these days. I favour a combination of reverse-flow UG powered with external canister filters, combined with another external canister filter used 'normally' to hold carbon and such-like. The reverse flow is ideal to keep the coral sand clear of any nasties, while the 'normal' canister filter picks up the nasties and is easily cleaned and maintained. This then constitutes a standard type of filter system.

"However, what really interests me is what should logically follow: a *nitrate* filter. I am informed from much reading that the principles of filtering this end-product of the nitrite cycle are well known. If this is the case, where are all the nitrate filters from the big manufacturers?

"I know of only one on the market — by Sera. . . . At this point I should like to congratulate Hagen for their marvellous design of the Biolife Filter — finally making trickle filters relatively affordable. Now, if they could only make an external version!

"I have myself tried to produce a nitrate filter for my marine system with varied success. (I am an engineering designer.) The only choice left then is to use one of the very expensive resins available to absorb/adsorb the nitrate. It really is about time the trade developed a decent nitrate filter! Until they do, I will keep experimenting with my own DIY filter."

O'BRIEN ON CO_2

Alan continues: "On a more jolly note, I have finally found a way of combining several of my hobbies, i.e. winemaking, fishkeeping and computing. 'What's the link' you ask.

"As you are well aware, many people cannot maintain a growth of plants in their tropical systems. I, too, suffered this syndrome, but refused to give in. Being inventive (and in desperation!) I began looking at Dupla CO_2 injection, etc. I didn't look too long as the prices are ridiculous.

"It then suddenly dawned on me one day, while winemaking, that the by-product of fermentation is CO_2; so, all I had to do was seal up an airlock with aquarium-grade silicone sealant, connect it via tubing, a non-return valve and airstone into the aquarium — and Hey, Presto! Instant and *free* CO_2 injection!

"You could even regulate the flow with a control valve, but I don't bother and it doesn't seem to hurt the fish, as I have been doing this for about a year now. It's also a good excuse to keep up the winemaking . . . and the plants at least seem to benefit."

O'BRIEN ON 'SHARE-WARE'

Alan's final topic: "The other link in the chain is that I run what is known as a share-ware library for computing. Recently, I have started a BBS — **Bulletin Board System** — an information exchange accessed via a computer and modem down a telephone line.

"This is called, appropriately, Atlantis BBS and, yes, you've guessed it: there is a fish forum. Access to the system is free and it is open 8 am Friday, to 10 pm on Sunday, on **06286 61960** and, to date, it has been well received, considering it has only been open for a few weeks."

Alan O'Brien has certainly put forward some interesting ideas and opinions. What do other **WYO?** readers think?

CAMERA-LESS AT ARTIS

A recent visit to Germany and Holland had a particular appeal for me, as I hoped to revisit the Amsterdam Zoo and Aquarium, Artis, and take some more fishy photographs to see how things had been evolving since I wrote my last piece about it. I took a lot of photographs and made a short video of Cologne's famous Dom — Cathedral — and hoped to do the same at the Artis Zoo and Aquarium.

Little did I know that two gentlemen in Amsterdam, near Central Station, and in broad daylight, would relieve me of my camera bag — complete with camera, three lenses, flash gun and leads, filters, accessories, a video camera, my cheque book, return airline ticket and passport, to mention but the major items!

I had not realised how addicted to photography I had become until I was faced with my first holiday — or partial holiday — with no camera. Every other person in Holland appeared to be a tourist with a camera — very frustrating for me.

FUTURE TOPICS

For next time, send me your opinions on: (a) fish prices in your area; (b) floating aquatic plants and their cultivation; (c) breeding large cichlids; (d) live foods for fish; (e) feeding aquarium plants; (f) selecting Koi for a pond; (g) your local aquarium club; (h) fluorescent lighting, versus tungsten bulb lighting, for plant growth; and (i) favourite aquarium filters — air or power-operated.

JOHN DAWES

'Disco' fish generate very strong feelings among some of our readers.

OUT AND ABOUT

GREAT NORTHEASTERN FISH FESTIVAL

By Dr David Ford
Photographs by the author

Chairman of Wansbeck District Council, Councillor Corrigan, and organiser George Liddle, present Ken and Barbara Robinson with the Mervyn Strange Memorial Plaque for their winning tableau.

Dawn Aitken, of Fife, winner of the Children's Petfish Section.

The Champion Fish — a Boesman's Rainbowfish *(Melanotaenia boesemani)* owned by Robert and Karen Kirkup.

The Best in Show award went to this *Synodontis angelicus* owned by William Kidd.

Ron Davison's prize-winning Black Snakehead swam away with the trophy in the Big and Ugly class.

The Three Rivers Show was held under NEFAS rules back in 1981 in Sunderland, Tyne & Wear. The same aquarist, **George Liddle,** who was the organiser of this show all those years ago, repeated the exhibition over the weekend of 3-4 October.

George organised the show as **The Great Northeastern Fish Festival** with sponsorship by the **Wansbeck Council,** local **Holiday Caravan Centre 'Sandy Bay'** and **'Aquarian'.**

The festival was staged as part of a Wansbeck District Council's month-long series of events, which included international artists and performers for street theatre, food and drink festivals and much more, for the **Ashington Eurofest** in Wansbeck. The fish show started the events and so was based in the Wansbeck Council-owned Leisure and Sports Centre at Newbiggin by the Sea.

The show had its problems! Just as all the plans were finalised the Leisure Centre burnt down and the venue had to be switched to the smaller Ashington Centre. At the eleventh hour, the Newbiggin Centre was refurbished and the show moved back, but not everyone knew, so traders and visitors turned up in the wrong town! Also, an important football match in Newcastle upon Tyne was played on the Sunday, with live TV coverage, which drastically reduced numbers of visitors.

Despite these setbacks, the show had several hundred visitors and included eight tableaux, with 50 classes of fish, six traders and finals of the **NEFAS Championship.** The Aquarian Advisory Service attended and the local radio broadcast from the Show. The prizes were handed out by the chairman of the Wansbeck Council, **Councillor Corrigan.**

Children were catered for with a bouncy castle and soft play area, and a drink and snack bar was open each day. Entrance was £2 for adults, £1 for children and seniors.

RESULTS:

Best Tableau was Thunderbirds by **Ken and Barbara Robinson** of Scorpion AS. They won the new Mervyn Strange Memorial Plaque.

Champion of Champion Fish was a *Melanotaenia boesemani* by **Robert and Karen Kirkup** of Rainbow Society.

The Best in Show was a *Synodontis angelicus* by **William Kidd** of Wansbeck.

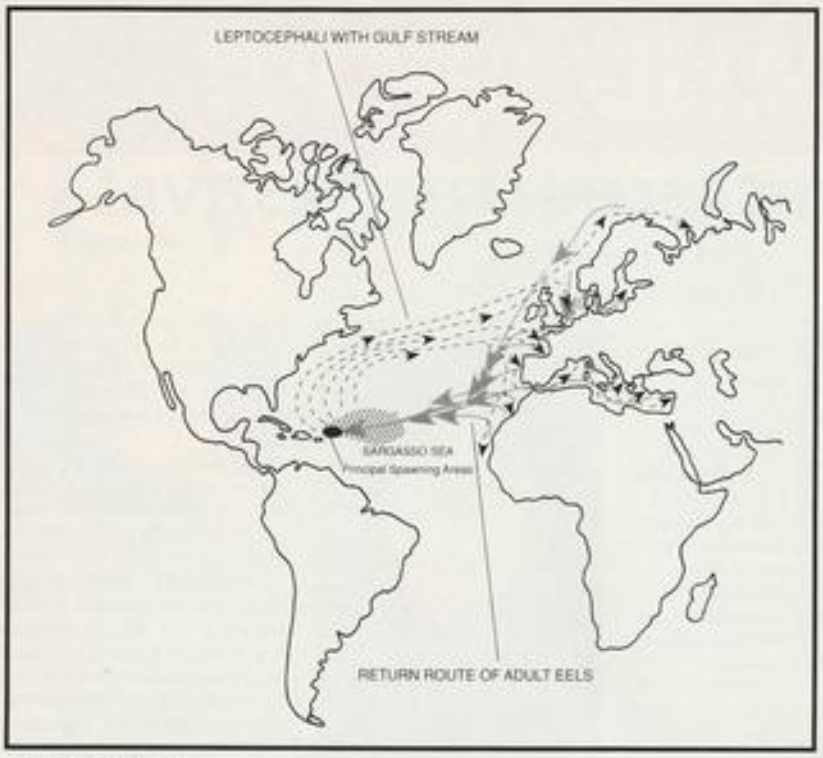
The winner of a **Big and Ugly** was a large Black Snakehead by **Ron Davison** of Blyth AS.

Highest Pointed Society was **Birtley AS** and **Highest Pointed Aquarists, Rob and Karen Kirkup.**

Firsts were achieved by **Mr and Mrs Rodway** of Darlington AS, **Miss C Carter** of Morpeth AS, **J Chapman** and **S King** of DHSS and **I Lester, K Green, E Flinn, R Flinn** and **W Bowles** of Birtley AS.

A special **Children's Petfish** prize was won by **Dawn Aitken** who brought her pet Goldfish all the way from Glenrothes, Fife.

Prizes were donated by **'Aquarian'** and the total number of entries (from eight societies) was 215.



Eel migration routes.

THE FANTASTIC VOYAGER

Recent studies of fossil eels and wandering continents have gone most of the way towards solving the mystery of why eels have such a bizarre life cycle. **Dr Andrew Allen** explains.

All the eels which will eventually turn up in the rivers and lakes of Britain are born in the great seaweed beds of the Sargasso Sea off the coast of Central America. The tiny transparent baby eels, or *leptocephali*, then drift across to Europe on the Gulf Stream, filtering plankton as they go. The journey takes three years and more than 99.9% of the little eels are eaten on the way.

The elvers that swarm into the estuaries of Europe grow into the familiar 'Yellow Eels' of freshwater rivers and lakes. These yellow eels are not really adult eels at all, but a specialised asexual feeding stage of larva corresponding to a caterpillar or blowfly larva.

Their life is devoted to feeding voraciously day and night for four or five . . . or up to fifty years, laying down layer after layer of fat until they have accumulated sufficient energy reserves to undertake the long and perilous three to four thousand mile (4,800-6,400km) journey across the Atlantic back to the place where they were born.

METAMORPHOSIS

The metamorphosis of the yellow eel into the migratory reproductive stage or 'Silver Eel' is as dramatic as the metamorphosis of a caterpillar into a butterfly or a tadpole into a frog. With its flexible serpentine body, the Yellow Eel is especially adapted for wriggling through and insinuating itself into mud and crevices, exploiting food sources which more active round fish cannot reach. But it is in no way equipped for a three to four thousand mile swim across the entire width of the Atlantic.

So the Yellow Eel metamorphoses into an entirely different kind of fish: from a mud-wriggling larva into a streamlined ocean cruiser. The Silver Eel has a rigid arrow shape and swims by short economical strokes of its tail, not by throwing its entire body into serpentine convulsions. It has the pointed pectoral fins of a deep-sea fish, huge silver eyes and a silver body to camouflage itself against the silver mirror of the sea's surface.

HEROIC VOYAGE

On moonless autumn nights, when heavy rains have swollen the rivers, the Silver Eels slip out to sea at the start of their heroic six- to nine- month migration back to the waters where they were born, where they will mate, spawn and immediately afterwards die.

The eel's brain is a marvel of miniaturisation and microelectronic wizardry. Within a brain no larger than a hazelnut, the eel has no less than four different compasses — a star compass, a sun compass, a magnetic compass and an electric compass — and two internal clocks (which work by means of biochemical cycles, not clockwork) coordinated and interlocked into a single system to give a set of navigational equipment of almost unparalleled sophistication (the navigational equipment of the eel is more sophisticated than that of an ocean liner or submarine). These different compasses and clocks control, correct and re-set one another, and provide a hierarchy of fail-safe systems which allow navigation to continue under the most aberrant atmospheric and magnetic conditions.

For the first three thousand miles (4,800km) or so of its great journey, the eel follows a compass bearing which takes it in the general direction of the Sargasso Sea, swimming sometimes near the surface to navigate by sun and stars, sometimes ten or fifteen thousand feet down (c 3,000-4,600m) in the abyssal depths to take advantage of deep cold currents which run below, and counter to, the Gulf Stream, from Europe towards America. But when it comes to within four or five hundred miles (some 640-800km) of its destination, the eel switches from compass navigation to homing, and uses its keen sense of smell to home in on the seaweed bed where it was born.

The eel, as this fact might suggest, has one of the best 'noses' in the animal kingdom (its only serious rivals are the leaf-nosed deep-sea eels and the barbel-mouthed European Catfish, *Silurus glanis*). A tracker dog such as a bloodhound has a sense of smell a million times keener than ours, a Goldfish two million times keener (see my article **The Olfactory World of the Goldfish** in *A&P* in

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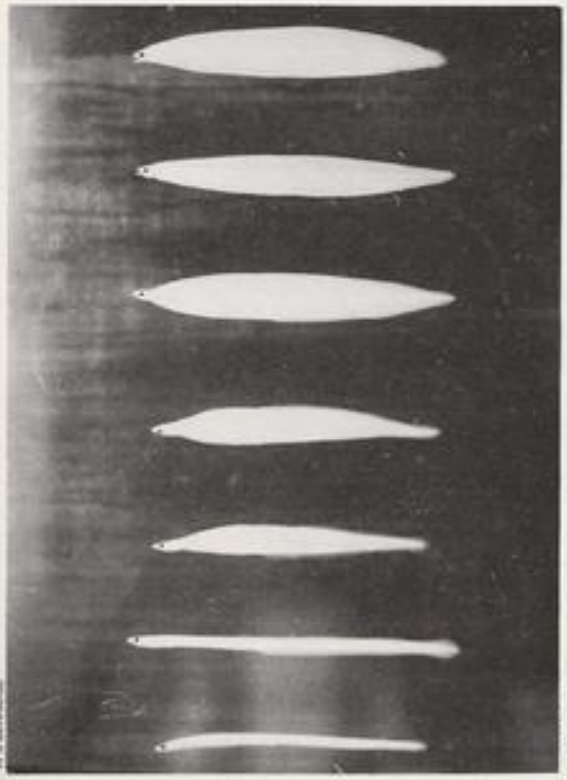


Leptocephalus to elver — stages in the early life history of a Common Eel.

June 1987). But the eel has a sense of smell a *hundred million times* keener than ours!

An eel can detect an extract of shrimp in water at a dilution of one part shrimp per three million million million parts water, which helps explain why even with the wind in his favour a man can only home on a pub from a few hundred yards, whereas an eel, after an absence of anything between seven and seventy years, can home on the spot where it was born from four or five hundred miles.

EVOLVING GAP

At the time when the ancestors of *Anguilla anguilla* first appear in the fossil record, North and South America had recently split away from Eurasia and Africa (anyone can see that the 'shoulder' of South America once fitted snugly into the 'armpit' of Africa) and the Atlantic Ocean was still a relatively narrow channel.

The eel's spawning grounds off America and its feeding grounds in the rivers and lakes of Europe were separated by no more than a few hundred miles of open sea. But during the 70 million years that have elapsed since then, America and Europe have drifted away from one another at a rate averaging 2cm/year, and the eel has had to evolve ways of coping with a longer swim as the Atlantic has stretched. Whichever way you look at it, though, the voyage of the eel is one of the most remarkable in the whole animal kingdom. AMP

PRODUCT ROUND-UP

BY DICK MILLS

Arcadia

What's the difference between the new ARCADIA LIGHTING SYSTEMS from **JERRARD BROS** and the Thunderbirds TV programme? You can see the wires in one of them — and I'm not talking about these lights!

There are three versions of these lighting pendants (all complete with bulbs and available in black or white). Designed to hang over an open aquarium, the MERCURY-VAPOUR PENDANT has the facility to switch between 80W and 125W and is especially suitable for use over freshwater tanks where luxuriant plant growth is required. Excellent colour rendition is assured due to special phosphors used in the lamp.

Marine aquariums will benefit from the HQI-MARINE PENDANT. The 150W metal-halide lamp has a colour temperature of 6500K — a first in availability. Because of the high content of the blue wavelength (often absorbed by the water) the result is a perfectly balanced spectrum with no need to buy extra actinic lamps.

The third version also uses a metal halide lamp but of a lower colour temperature (4300K) to give a more neutral light spectrum, ideal for both freshwater and marine tanks.

Details from: **JERRARD BROS plc, Arcadia House, Cairo New Road, Croydon, Surrey CR0 1XP. Tel: 081 688 8222; Fax: 081 681 3119.**

Eheim

It's always the way; just when you thought you'd got used to the new names of all the latest models, what do they do but bring out another one, very-similarly-named, just to confuse you!

The equipment in question is the EHEIM 2213 PLUS, from **JOHN ALLAN AQUARIUMS.** The confusion arose when, in the same Press Release, there was information on their other new filter, the Eheim Aqua *Puls*, but anyway back to the plot.

Described as the first external filter to be released with everything for a sensible first installation, you certainly have to admit that they've taken care to ensure that the filter does its bit in the cleaning process; and it's down to you to make sure it continues to perform that way.

Apart from the expected bits and pieces, you also get a complete set of filter media — EHFIMECH, Filter Pad, EHFISUBSTRAT and EHFISYNTH — designed to work in conjunction with each other in the most effective manner. Not only does this purify the aquarium water with better-than-average mechanical/biological cleaning, but it also prolongs the filter's service life.

Talking of service, even with Eheim's renowned product quality, you'll still need to clean out the filter, and here's where another plus comes in. Included, as well, are two isolating double-taps so that you can literally switch off the aquarium water supply and return, take the filter away for cleaning and just as easily re-connect it with minimal drips to spoil the carpet.

Details of the Plus and Puls filters (see what I mean?) from: **JOHN ALLAN AQUARIUMS LTD, Eastern Way, Bury St Edmunds, Suffolk. Tel: 0284 755051; Fax: 0284 750960.**

BVC-Bivac

Compared with the hobby, industry has similar needs, only larger! Brighton & Newhaven Fish Sales, of East Sussex, obviously need a lot of air, supplied on a reliable basis over long periods, to keep their pre-sale stocks of crabs and lobsters not only alive, but growing.

Faced with aerating two nine by four-*metre* tanks (c 30 x 13ft), they installed a YP3/115 BLOWER UNIT from **BVC-BIVAC.** Under the influence of non-pulsing, oil-free air, the livestock enjoys a healthy environment, especially during summer months when dissolved-oxygen levels are naturally low. YP3/100 units are also on hand to serve their ten smaller tanks, and all have proved to be cost-effective and reliable with the minimum of downtime required for maintenance.

Details of the YP3 range of Blower Units from: **BVC-BIVAC, DD Lamson plc, Harbour Road, Gosport, Hampshire PO12 1BG. Tel: 0705 584281; Fax: 0705 504648.**

Waterlife Research Industries

Someone has woken the Kraken. I must swiftly add that I am not comparing it to **Graham Cox** of **WATERLIFE RESEARCH INDUSTRIES,** because of any physical resemblance to the mythical monster, but merely to welcome him back, as the legendary figure he indeed is in the world of marines, to exhibitions once more.

Visitors to B.A.F. were especially delighted to meet him and re-live old times, and to discuss present and future developments in the particular aspect of the hobby which he did so much to pioneer and keep alive during those good (?) old days when things were so much more fun (?).

Oxygen is critical in all fishkeeping, but in the salt water aquarium it is at a premium, and so, a good reliable supply, coupled with a good delivery system, is vital.

Even allowing for 'only getting what you pay for', the range of GHOST AIR PUMPS represent exceptional value for money. Performance figures are often difficult to visualise as practicabilities, but just imagine a small airpump quietly pumping away 24 hours a day, 365 days a year, for at least 3 years, delivering air to an airstone at a water depth of 4ft (120cm), and you'll agree that's a pretty impressive feat by anybody's standards!

The Ghost range comprises three models, delivering 90, 210 and 420 litres (c 20, 46, 92 gal) an hour respectively; the two larger models are twin output types, and all are the least expensive when compared to 'like-with-like' European competitors.

To make use of such excellent performance, you obviously need a good output device, and the LONGLIFE AIR DIFFUSERS play an all-important part. The non-toxic, all-plastic construction ensures exceedingly long-life service, easily outlasting pumice-stone types. Eventually, even the best will slime-up, but an overnight soaking in vinegar will restore its former glories — but do rinse it well before using in the aquarium.

Although best working in tandem with Ghost pumps, the Longlife diffusers, offering virtually no back-pressure, will maximise the output from even very old or badly-designed pumps, but why not go for the best right from the start?

Details of all Waterlife Products from **WATERLIFE RESEARCH INDUSTRIES LTD, 476 Bath Road, Longford, West Drayton, Middlesex UB7 0ED. Tel: 0753 682487/685696; Fax: 0753 685437.**

JMC Aquatics

If a certain coffee manufacturer hadn't thought of it first, then the new frozen foods from **JMC AQUATICS** might well be called G - - d Bl - - d, as this is the colour of their packaging.

The eleven-flavour range includes Artemia, Bloodworm, Daphnia, Discus Food, Krill Pacifica, Lancefish, Mysis, Spinach, Tropical Mix, Tubifex and Whole Mussel. Of these, the Discus food (made *for* Discus not from them!) is further enriched with 30% *Artemia* for colour enhancement; the spinach diet is, claims JMC, the only fish vegetarian diet on the market. The Mussel and Lancefish foods (ideal for marine fish and freshwater fish with large mouths and appetites) are available in flat packs, while the others come in easy-to-use blister packs of 10 servings.

The freezing process (done as soon as possible after collection of the living ingredients) ensures little or no mineral or vitamin losses, so you can be sure of getting really 'fresh' foods for your fishes. Judged to be a growth area in fish nutrition, JMC are obviously leading the way. An easy guide to JMC products and their suitability for all types of fish (freshwater, coldwater or marine) is available from aquatic suppliers, or ring for your copy on the first telephone number given below.

JMC AQUATICS LTD, 59 Stubley Lane, Dronfield, Sheffield, Yorkshire S18 6PG. Tel: 0246 415275/410412; Fax: 0246 290486.

Underworld Products

The quality of one's surroundings has a great deal of influence on one's mood and stress levels. If it's true for us, it is equally important for the animals in our care if they are to thrive.

STICKS & STONES FROM **AQUARIUM SYSTEMS,** takes care of this by carefully re-creating (from living moulds) natural-looking decorations for the aquarium or vivarium. Made from totally-safe, easily-cleaned materials which won't rot, decompose or alter the water conditions, they will add to both the visual appeal of their container, and to the inmates' peace of mind.

Some can be used as planters, and all can be used with airstones (for extra effect) in fresh- or salt-water and as water dishes and refuges for reptiles. Sticks & Stones are available in five models: Mavi Wood, Cedar Wood, Kapok Tree, Hemlock Pond and Cypress Stump.

Many sub-gravel biological filtration systems have their drawbacks (no, not necessarily their supposedly adverse affect on plant growth) but the new API0 AQUA-PLATE system has been designed to eliminate most of them. Now, you are no longer restricted to having the uplift in either of the back corners or in the middle of the rear wall; each of the interlocking 'plates' consists of four smaller ones, *each* of which has the uplift tube fitting function, so that really opens up the possibilities, especially when, say, you have also invested in one of the above Sticks & Stones features and want to stand it in the corner of the tank right over where the uplift tube is situated in other systems.

OK, so your tank isn't quite the right dimensions for an exact number of plates? No matter, each plate is easily split-table into half (along thoughtfully-provided perforations) and there's no need for concern over a split-plate's rigidity either, for underneath the 'splitting zone, there is a double support. Even non-rectangular tanks present few problems as L- or triangular-shaped bases can be covered with a little basic planning.

Using with an airstone is straightforward; you can even run the airline under the plates to bring it up through the centre of the plate if required; both VISIJET and MAXIJET POWERHEADS fit it easily (adapters are available) and VISIJET INTERNAL FILTERS can also be used by shortening the uplift tube which, incidentally comes in very practical, telescopic two parts which can be secured into the required length by a unique two-ring locking device. The directional flow-deflector allows for returning water to be aimed at any point in the tank, depending on water circulation requirements.

Speaking of circulation needs, mention was made recently of the MINI-JET series of submersible pumps, but until I had occasion to examine one and its instruction leaflet I hadn't fully realised how handy they could be. They are designed to work down to 1.25in (3.2cm) of water (after that, the inlet is fully uncovered and won't 'suck'). This means that even a large deep tank can be almost fully emptied in a short space of time using, say, the 300 litres/hour (66 gal/hr) efficiency of the 300 model, especially as it will lift water to nearly three-quarters of a metre (c 29.5in).

I have a weakness for spotting things in instructions, and this one really made me laugh: to separate the pump for cleaning, one is advised to "remove front cover by *puffing* at the two indentations . . .'. I thought they were joking at first, as parting the two components did, for the first time, take some effort. Ah well, practice makes perfect!

Details of all Aquarium System products from: **UNDERWORLD PRODUCTS, Units 1 & 2, Belton Road West, Loughborough, Leicestershire LE11 0TR. Tel: 0509 610310; Fax: 0509 610304.**

"Derek, I think I have cracked their sonar speech patterns! Roughly translated, he is saying: Can I feed the Goldfish, Mum?"

Two open-water fish not found in the immediate vicinity of the lagoons, but widely used in Sri Lanka as food fishes. The long, slender species is the Narrow-barred Spanish Mackerel or Barracuta *(Scomberomorus commerson)*; the smaller one is the Little Tuna or False Albacore *(Euthynnis affinis)*.

The Red-tail or White Collar Butterfly *(Chaetodon collare)* was collected in dirty brackish water. This species normally lives in shoals and can be kept in this way in the aquarium.

Juvenile Batfishes (this is a young Orbiculate Batfish — *Platax orbicularis*) are found mainly in brackish conditions in lagoons and mangrove swamps.

In lagoons, such as this one, which are affected by the inflow of freshwater, there are many juvenile Butterflyfishes, Batfishes and other species mentioned in this article.

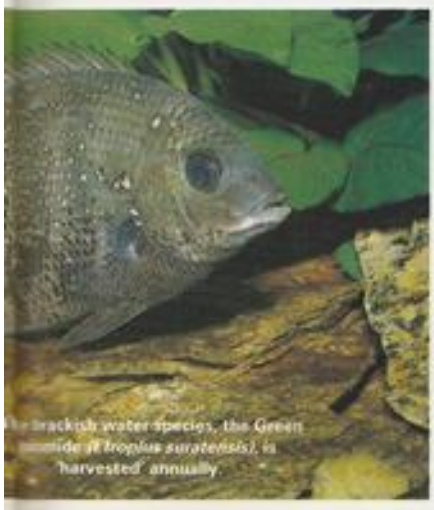
SRI LANKA

Part 2 Brackish and Long-Lived Marines

As **Frank de Graaf** discovered, Sri Lanka provides some fascinating and unexpected insights into the lives of coral reef fishes.

Photographs by Arend van den Nieuwenhuizen

The Yellowhead Butterfly *(Chaetodon xanthocephalus)* was one of over six species collected in brackish water lagoons (as juveniles) and in smelly polluted water in Colombo Harbour (as adults).



The brackish water species, the Green [illegible] *(Etroplus suratensis)*, is harvested annually.

The Yellow-lined or Two-banded Sweetlips *(Plectorhynchus albovittatus)*: a surprising find in one of the brackish lagoons.

In Sri Lanka, a totally different environment to that described in Part 1 (*A & P*, November, 1992) provides a second type of nursery for young fishes. At the end of September and beginning of October, we found numerous very small coral fishes in a few, very large lagoons which received considerable amounts of fresh water from streams and rivers. The water in these lagoons was brackish, with a total salinity of 15‰ (parts per thousand); that is, less than half the salinity found on the coral reefs!

Moreover, the water had another characteristic which, at least at first glance, should have precluded the presence of coral fishes: it was very dirty and murky as a result of the presence of fallen leaves and other dead plant material brought down by the rivers during the rainy season. As a result, the substrate consisted, in many places, of a thick layer of mud.

In the course of our investigations during the dry season, I established that the cloudiness of the water was the result of a dense bloom of both phyto- and zoo-plankton.

'BRACKISH' CORAL FISHES

It was a strange and surprising experience to catch young coral fishes in this dirty brackish water. These consisted mainly of young Butterfly Fishes. Among others, there were *Chaetodon collare* (Red-tail), *C. lunula* (Raccoon), *C. xanthocephalus* (Yellowhead), *C. auriga* (Threadfin) and *C. guttatissimus* (Peppered). We caught the first Butterflyfishes on 29 September. On average, they measured 2cm (0.8in). During our last fishing session in the lagoon on 8 October, we caught young Butterflyfishes which already had a length of 5cm (2in). Thus, the youngsters were growing astonishingly quickly, undoubtedly thanks to the rich plankton content in this environment.

As well as Butterflyfishes, other young coral fishes occur in the brackish water lagoons. Probably characteristic is the frequent occurrence of young Batfishes *(Platax pinnatus)* at sizes of 2-7cm (0.8-2.8in). Like the young Butterflyfishes, the Batfishes form small shoals of 5-10 individuals. They often swim very close to the surface and then resemble brown tree leaves floating in the water.

We also caught young Wimple Fishes *(Heniochus acuminatus)* in rather large numbers in the lagoon, either together with the Butterflyfishes, or in small groups of their own species. Less often, we found young Lionfishes *(Pterois)*, young Boxfishes *(Ostracion punctulatus)*, and young Sargussum Fish *(Histrio histrio)*.

An unusual capture was a small number of Two-Banded Sweetlips *(Plectorhynchus albovittatus)*. We were unable to find this species anywhere except the lagoons, or at least, no adult specimens. In the lagoons, we found exclusively young individuals. I do not know where the adults occur in Sri Lankan waters.

River-mouth Species

Having been alerted to the occurrence of young coral fishes in brackish water, we looked for them in the mouths of large rivers with no lagoons. Here, too, we found young coral fishes. Thus, we caught very large numbers of young Lionfishes, young Reef Perch or Rock Cod *(Epinephelus tauvina)*, and a few Butterflyfishes *(Chaetodon vagabundus* [Vagabond], *C. lunula* and *C. collare)* at the mouth of a river near Panadura (between Moratuwa and Kalutara, South of Colombo).

The salinity here was also, on average, 15‰. In both brackish water biotopes there are, as well as the young coral fishes, very large numbers of young Scats *(Scatophagus argus)* and Monos *(Monodactylus argenteus)* and young Puffers *(Tetraodon fluviatilis)*. Along the shores in this region, one also regularly finds Mudskippers *(Periophthalmus)* — they are not restricted to the mangrove swamps. We also found Mudskippers in biotopes with a total salinity of less than 2‰!

Remarkable Collection Site

We discovered a remarkable biotope, in which young coral fishes were living in amity with Scats, Monos, Puffers and Orange Chromides *(Etroplus maculatus)*, at

the mouth of a small river which, at the end of the dry season, was carrying almost no water and was separated from the sea by a high mud bank. Behind this bank lay a small brackish water lake, which was prevented from drying up by the trickle of water still supplied by the stream. The water here was almost black in colour, and immediately behind the mud bank, the salinity was 20 ‰, while closer to the land, it was 8‰.

We found young coral fishes even in this low salinity, although the majority were living where the salinity was above 10‰. The temperature in the completely still water reached almost 30°C (86°F). It seemed to us almost impossible that coral fish could survive under such conditions!

When we questioned the local inhabitants, we discovered that this brackish water lake was formed every year and that young coral fishes of certain species were always to be found there. This discovery became even more incomprehensible when we returned to the lake a few days later.

The rainy season had commenced in the meantime, and it had rained heavily for hours. The stream was swollen to a mighty torrent and had breached the bank shortly before our arrival. Much as when a dyke is breached, the entire lake had spilled into the sea at a stroke, so that it was now almost empty. The thick black layer of mud, which covered its bottom, was dried up and smelled dreadfully of hydrogen sulphide.

In the pools left in the deeper parts of the bottom, Green Chromides *(Etroplus suratensis)* were floating belly up, poisoned by the escaping sulphur compounds. The local inhabitants were busy with large nets, gathering in this annually recurring 'harvest'. There was no sign of the young coral fishes; they must have spilled into the sea. Had they survived this sudden environmental change?

ALTERING ENVIRONMENT

During the rainy season, the rain comes down in torrents, which results in the water composition along the coast being appreciably altered. After a few days of rain, the coastal waters are made very murky by the water running off the land and, within a few days, the salinity can drop from 34 to 29‰. Moreover, within a short time, the temperature falls from an average of 27°C (80.6°F) to 23 or 24°C (73-75°F).

Although, under such conditions, it is very difficult to make any observations, we were able to establish that some of the young coral fishes, which under normal circumstances live in the clear coastal waters, remain there with the onset of the rainy season — despite the temperature, drop in salinity and clouding of the water. But not all the young fishes of the species mentioned are found in the changing environment.

Beauty Among the Refuse

Adults, likewise, do not always live in the manner described in the textbooks. No matter what book on coral fishes one opens, one almost always reads that coral fishes are dependent on the ideal environment found on the reefs. Here, in Colombo harbour, in the dirty, smelly water, covered with an oil slick and constantly disturbed by the comings and goings of shipping, live many adult coral fishes, swimming among old car tyres, rusty bedsteads and bicycle wheels, jam jars and empty bottles! Can you imagine a more unusual environment for coral fishes?

We can see the same thing in the harbour at Aden. But it is also strange what species we can catch in the dirty harbour of Colombo — large and magnificent specimens of Emperor and Koran Angelfishes *(Pomacanthus imperator* and *P. semicirculatus)*, together with the Moorish Idol *(Zanclus cornutus)*, Wimple Fishes, large *Chaetodon collare*, *C. xanthocephalus*, and Lionfishes. Here we also netted our one and only Porcupine Fish *(Diodon hystrix)* and a few giant Lipstick Surgeons *(Naso lituratus)*.

Confusing Situation

Almost all these are considered difficult to keep in aquaria. So how does that fit in with their occurrence in Colombo harbour? It would hardly do to attempt to re-create the conditions there in order to keep coral fishes, as this would be the best way to lose them as quickly as possible!

The entire problem became even more complicated when we learnt that the fishes from the harbour were much more difficult to acclimatise than specimens of the same species caught in normal circumstances. Perhaps the fishes in the harbour had not been there long? Perhaps they had arrived there by chance and would die after a short time, poisoned by the dirty water?

That is not very likely as, in general, a fish is well able to distinguish a highly suitable from a totally unsuitable environment. It is probable that the coral fishes would not enter the harbour in the first place if the conditions there were life-threatening to them. It must be mentioned in this connection, that almost all the adult *Chaetodon* (Butterflies) in Colombo harbour had damage to their fins.

REEF FISH BIOLOGY REVEALED

With the discovery of the 'nurseries' of various species of coral fishes (reported in Part 1), the veil over the biology of these fishes has been lifted a little further.

It seems ever more probable that most (albeit not all) 'true' coral fishes breed on the reef, rather than undertaking periodic migrations to special spawning areas.

Butterflyfishes — as far as it is possible to generalise from a few observations of a limited number of species — spawn at dusk in open water above the reef, sometimes close to the water surface. Immediately after the emission of the sex products, the fishes return to the protection of the corals.

The eggs are round, transparent, and float as they contain a tiny drop of oil. At a water temperature of about 23°C (73°F) the larvae hatch after 28-30 hours, at 28°C (82°F) after 18-20 hours. They still have a large yolk sac at this stage, still with a drop of oil, and float passively in the water. Only after 70 hours is the yolk absorbed; at this stage, mouth and anus open. A number of thin, transparent, bony plates develop attached to the head of the larva, extending backwards into a spine over the back and belly.

This unique larval form, which occurs only among Butterflies, is termed a *'Tholichthys Larva'* and lives among plankton. It is thought that this stage lasts for several months. It is apparent that during this period the larvae are dispersed by currents over large areas of the ocean. Thus, they find their way into lagoons, where they find a better food supply than in the open sea.

In the lagoons, they apparently adapt, after a while, to an existence near the bottom and develop into small normal Butterflyfishes, which later on migrate to the reefs off the coast. A few Tholichthys larvae drift to the reefs and develop there, but their chances of survival are far poorer than in the plankton-rich lagoons.

AQUARIUM APPLICATIONS

Young coral fishes of many species live at temperatures varying between 25 and 30°C (77-86°F) i.e. very warm. By contrast, the adult fishes live at lower temperatures on the reefs, on average about 24°C (75°F) — at least, in Sri Lanka. Thus, the best temperature for aquarium culture of young coral fishes is 26-28°C (79-82°F) with 24-26°C (75-79°F) for adults.

Many species, however, do not care whether the temperature is 20 or 28°C (68 or 82°F). Thus, *Dascyllus carneus* (Cloudy Damsel), *D. trimaculatus* (Domino) and *D. aruanus* (Humbug) spawned several times at a temperature of 20-21°C (68-70°F) at the Artis Aquarium, and at these low temperatures, their behaviour was perfectly normal.

I cannot help but think that adult coral fishes are, in general, kept at temperatures which are too high. Possibly, this is the reason they tend to be short-lived. At the Artis Aquarium, we kept adult coral fishes between 22 and 26°C (72-79°F).

Under these conditions, tropical marine fishes attain a good age. I will give a few examples: *Paracanthurus hepatus* (Regal Tang) more than 10 years old; *Cienochaetus binotatus* (Bristletooth) more than nine years, *Centropyge flavicauda* (Royal Blue Pygmy Angel) more than seven years; *Pomacanthus annularis* (Blue Ring Angel) more than 10 years; *Premnas biaculeatus* (Maroon Clown) 12 years; *Melichthys indicus* (Indian Trigger) more than 24 (!) years; *Coris angulata* (Twinspot Wrasse) a good eight years; *Heniochus acuminatus* (Wimplefish) more than 20 (!) years; *Amphiprion ephippium* (Tomato Clown) 17 years, *A. clarkii* (Yellow-tailed Clown) more than eight years; *Adioryx spinifer* (Squirrelfish) 18 (!) years; *Pterois volitans* (Lionfish) a good 10 years and *Balistes vetula* (Queen Trigger) more than 15 years.

Moreover, numerous species spawned at an average temperature of 24°C (75°F); their eggs were not only fertilised, but developed normally. This is, indeed, proof that one should not keep adult coral fishes at extremely high temperatures. AAP

OUT AND ABOUT

WEST CORNWALL OPEN

By Dave Chappell

Photographs by the author

For Eddy Mabey, one of this year's prize winners, showing large fish is a truly 'moving' experience, requiring two trailers, insulated boxes and 600 gallons of water!

For any fish enthusiast, the West Cornwall Open was a delight to behold. It was not just the largest Open Show in the county, but the only Open Show west of the Tamar. This year's event was set off to a flying start with 260 entries in 42 classes, up on last year, both in standard and in numbers, making a glorious showcase for the aquatic hobby in Cornwall.

'Unofficially', one Welsh judge said, "These are some of the best fish I've seen west of Birmingham," a view echoed by some of the leading fishkeepers who visited the show.

Formed in 1976 with just two members, the West Cornwall Fishkeepers' Club has grown into a healthy and active club with a membership in excess of 100 members. This, their 8th Annual Show, attracted more entries from further afield than in previous years, a sure indicator of the state of the hobby in the county.

One intrepid enthusiast, **Roy Chapman,** travelled some 300 miles from Southend to show his fish. Roy took full advantage of Cornwall's weakness in the livebearer classes and, let's face it, the water down here turns your hair green if you live in the Camelford area, but to your average Swordtail, it leaves just a little to be desired.

Catfish, on the other hand, are — if you can excuse the pun — an entirely different kettle of fish, and 'big', 'tankbusting' cats thrive in the west of England. Few are better than those from the tanks of Mullan's **Eddy Mabey.**

Martin Simpson with his trophies and one of his excellent fish.

Eddy, who is a big cat enthusiast extraordinaire, runs a 10ft tank in his living room in which he keeps, among other things, a 30in (75cm) Shovelnose Catfish *(Brachyplatystoma)* and an *Auchenoglanis occidentalis* (Giraffe-nose Catfish) called Oswald which may be just a few inches longer.

Showing fish is a serious business in the Mabey house, and serious work it is too when preparing your fish means moving more than 600 gallons (over 2,700 litres) of water to each venue! Eddy has to be up at the crack of dawn just to achieve this mammoth task but, unfortunately for him, it's the crack of dawn some 48 hours before the show that he has to get started.

Entering 15 fish in the show, all of which would have trouble just turning around in your average community set-up, takes a good deal of work and determination, all of which was repaid when Eddy Mabey walked away with the **Best in Show** award, along with the **Most Points to a WCF Member** trophy. And, just to show that 'cats' aren't all that Eddy knows about, he also picked up the **Best Cichlid** award.

Food, Eddy says, is the secret to his success, and his 70-odd fish eat a total of 3lb of specially prepared food each day. "Correct feeding is paramount in producing show-stopping fish," he said.

Another success story at this year's show was the massive entry from Plymouth's **Martin Simpson.** Martin, who has been keeping fish for the past eight years, has a 30-tank fish house at his home. He is a lover of large barbs, but took the honour at this year's event for having more fish on the bench than any other fishkeeper. Martin took 12 firsts with a variety of different species, including Koi and Rainbow Dace in the coldwater section, and well-earned firsts for outstanding *Hemigrammus levis* (Golden Neon Tetra) and *Callophysus macropterus* (Callophysus Catfish). David breeds very few of his fish, preferring to condition and grow on specimens that he finds through his work at CG Aquatics in Plymouth.

A study in deep concentration: Dr David Price from the University of Plymouth checking out the size of a *Pterodoras lentiginosus* during judging.

As the packed hall emptied and fishkeepers and their fish headed home for another year, members and officials had a chance to take a breather and reflect upon the success of their 8th Annual Show.

Those who did not fare as well as they would have hoped, will now have set their sights on better results in the future, while those like Eddy Mabey and Martin Simpson who went home with trophies for their cabinets, will have left this year's event determined to stay at the top, ever-watchful of the up and coming youngsters who have them in their sights as "The men to beat in West Cornwall".

All in all, the West Cornwall Open proved to be an excellent show and a credit to the club members who helped with its origination. It was, as ever, a show-case for the fishkeepers of Cornwall and I, for one, shall be looking forward to visiting again next year when the standard should be higher than ever.

MAJOR RESULTS

Best in Show: E Mabey
Most Points in Show: M Simpson
Most Points to WCF Member: E Mabey
Best Coldwater Fish in Show: W Rundle
Best Characin: M Simpson
Best Cichlid: E Mabey
Best Livebearer: M Simpson
Best Barb: M Simpson

Show visitor six-year-old Paula Hampton measuring up to Eddy Mabey's super Giraffe-nosed Catfish.

Dominant coloration in an adult Pikehead male.

THE PIKEHEAD

Part 2

Michael Kokoscha rounds off his close-up on the Pikehead with a look at aquarium maintenance and breeding.

Photographs by the author. Text translated by Mary Bailey

(Part 1 was published in the July 1992 issue of *A & P*)

Mouthbrooding male hiding among the plants.

In nature, the Pikehead (*Luciocephalus pulcher*) is found mainly in acid water (pH lower than 5) with a barely measureable hardness. It shares this habitat with other typical white water species, such as the Clown Rasbora (*Rasbora kalochroma*), Chocolate Gouramis (*Sphaerichthys osphromenoides* and *Sp. acrostoma*) and the Fighting Fishes *Betta anabantoides*, and *B edithae* (Bader 1980; Korthaus 1978).

However, it may not be sensible to try to simulate such water conditions in the aquarium. Very soft water, for example, has little in the way of buffering material, and this can lead to dramatic swings in the pH, which *Luciocephalus* is not well equipped to tolerate.

[*The use of buffering agents as experienced by our translator, Mary Bailey (whose tapwater is very soft), and other aquarists, should help overcome this problem and allow you, as Mary says, "to get along quite happily with everything from Uaru (pH < 5) to Tanganyikans (pH 8+)* **Ed.**]

In all other respects the Pikehead is very tolerant. Gunther (1984) kept these fishes in Berlin tapwater (12 GH, 5KH, pH 6.8, temperature 25°C – 77°F) but because soft acid water has relatively low levels of bacteria and other pathogens, wild-caught *Luciocephalus*, which are accustomed to such conditions, may easily fall victim to infection in the aquarium.

With water quality and the size of the Pikehead (up to 18 cm – 7in) in mind, the volume of the aquarium should be at least 160 litres (35 gal). It should be planted as thickly as possible and the surface covered with floating plants as, without this cover, *Luciocephalus* will be constantly stressed.

DIET

The Pikeheads can then position themselves among the plants and lie in wait for their prey. Adult specimens feed almost exclusively on fish, but other live food of suitable size will also be taken. Ladiges (1978), for example, found freshwater shrimps in the stomachs of dissected Pikeheads. I regard the suggestion that the Pikehead feeds on flying insects, captured from above the surface whenever the opportunity arises (Sterba 1977), as extremely unlikely on account of the mouth form. Moreover, Arend van den Nieuwenhuizen (1974) was unable to adapt these fishes to a diet of flies and mealworms.

I feed adult *Luciocephalus* on Zebra Danios, Guppies, Swordtails, and small cold-water fishes. Naturally liberal feeding is important, even if the purchase of food fishes is hard on the pocket. The sale of any fry produced may barely cover the cost of the food requirements of several Pikeheads.

[*The feeding of live fish is a controversial/ethical issue which needs very careful consideration by aquarists who wish to keep piscivorous (fish-eating) species. The Pikehead is one such species. Publication of the foregoing dietary details do not, however, indicate endorsement of the practice.* **Ed.**]

HEALTH

Beware of some Asian-bred livebearing toothcarps which are often sold very cheaply. These fishes are generally infected with bacteria and may transmit these infections to the Pikehead. Infection via food fishes is, in fact, the main reason for the susceptibility to disease mentioned in the literature. As the cause of death can often be established only by dissection, many Pikehead owners are puzzled when their fish die without any external signs of disease.

Pikeheads which I have subjected to post-mortem examination showed mucus-covered gills (bacterial infection), turbidity of the bile, occasional skin eruptions on the head (Hole-in-the-Head Disease) and granuloma in the liver and heart (possibly caused

by *Ichthyophonus*). Moreover, I was able to observe areas, often mere specks, of subcutaneous haemorrhage in the region of the gills and operculum (gill cover) and these, too, sometimes erupted at a later stage.

With good tank maintenance, these wounds, which I attribute to worms or worm larvae, will heal by themselves. I would advise against treatment with Masoten, as the use of this medication is not without risk, and may lead to organ damage and sterility of fishes. I also regard it as bad practice to treat food fishes with medications, as residues of such chemicals can accumulate in the Pikeheads over a period of time.

Not surprisingly, Pikeheads may contract White Spot (*Ichthyophthirius*) and Velvet (*Oodinium*). These diseases can be treated effectively with aquarium remedies. In the case of *Oodinium*, it is my opinion that treatment with cooking salt (a heaped teaspoonful per 10 litres — 2.2 gal of water) is better tolerated.

PIKEHEAD SHOALS

Pikeheads are very sociable towards conspecifics and exhibit a degree of shoaling behaviour if kept in a larger group. They will often congregate in the same part of the aquarium and take in air at the same time. In nature, this reduces the danger of predation by birds by making it difficult to concentrate on a single individual.

If one keeps *Luciocephalus* in a group, then, generally, a dominant male will exhibit display coloration. The dark longitudinal bands break up into spots, which contrast boldly with the light background. The base of the anal fin becomes black. During display to a female, the buccal cavity, at this time decorated with black longitudinal stipes, is inflated and the pelvic (ventral) fins are moved rapidly backwards and forwards.

SPAWNING

But spawning did not take place within a group, in the case of my fish. My first successful spawning (probably the first in captivity) took place after I had separated off two Pikeheads on account of illness. These fishes, which measured 11 and 15cm (4.3 and 6in), were placed in a 120-cm (48in) long, thickly planted, tank and slowly recovered.

Mouthbrooding

One day, I noticed that the smaller fish was showing a breeding tube. By the next day, it was back to normal, but the larger specimen had a distended throat. Three days later, I found a few very large fungussed eggs. As the male still had eggs in his mouth, I removed the female after a few days.

Not until 33 days after the spawning did I see the first fry among the floating plants. Fry were subsequently spat out over a period of an entire week; the last of them were so weak that most of them died. For this reason I believe that the brooding period is not so long in nature.

The male eventually spat out a total of 40 fry, 21 of which survived past their first day.

The large eggs of this species can be fully appreciated in this shot of a dissected female.

After they are released from the male's mouth, baby Pikeheads remain near the surface.

The young fish grow rapidly if fed well.

There were no further losses after this time. Korthaus (1978) and Foersch caught a Pikehead which was brooding 90 young.

A second successful breeding took place in a 150-cm (60 in) tank in which I was keeping two pairs of Pikeheads. This time I netted the male out after seeing the first fry on the 28th day, and put him in a 60-litre (c13-gal) aquarium. This was a mistake. The Pikehead didn't swallow his fry, but he spat out only a few more. The rest probably died in his mouth. Unfortunately, both males died shortly after spitting out their fry. The long period of fasting had left them so weak that they fell victim to bacterial infection.

Eggs and Fry

The eggs of the Pikehead are very large. Freyhof (1984) found about 120 light yellow eggs, measuring 3.5mm (0.14in) in a dissected female. In another specimen, I counted 100 eggs with a size of barely 3 mm (0.12in).

The eggs are opaque and heavier than water, thus resembling those of other Labyrinths that produce sinking eggs. In spite of their size, it is astonishing that they hatch into fry which may measure up to 13.3mm (0.52in) when they leave the mouth of the male. The little Pikeheads are, however, very thin and have empty stomachs upon release. I regard it as unlikely that they will have taken in food before this time.

Right from the start the fry resemble their parents closely. The head is somewhat rounder, but the mouth is already enormous. Newly-hatched brine shrimp were hardly noticed; sifted water fleas (*Daphnia*) were more appropriate even at this early stage. As the young *Luciocephalus* spend their first few days just below the water surface, sifted black mosquito larvae and *Trichogaster* (Blue Gourami) larvae are their first foods.

I actually removed an entire Blue Gourami bubblenest complete with eggs, and placed it in the Pikehead aquarium and, as soon as the *Trichogaster* hatched and started to move, they were devoured by the baby Pikeheads. [*See earlier comments under Diet and Health.* **Ed.**]

A few days later, the little Pikeheads were swimming around all over the tank and were already eating water fleas, white mosquito larvae, and mayfly larvae. Bloodworms are best fed via a feeding ring with a net insert so that the fishes can seize them as they drop through. If they try to pick up mosquito larvae from the substrate, they often get pieces of gravel in their mouths, and then have considerable difficulty in expelling these again.

The above-mentioned foods can be used until the fishes are about 6 cm (c2.4in) long without any deficiency problems. But if only water fleas are fed, enlargement of the thyroid may result. Large *Luciocephalus* can be properly fed only with a diet of fish.

My fry are growing very well and seem better suited to aquarium life than their parents. I therefore hope to be able to create a strain of this interesting fish which will be amenable to aquarium culture. **AKP**

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RED SEA HOLIDAY COMPETITION RESULT

We have a winner! One lucky *A & P* reader and companion will be spending a super week-long holiday in the exotic Red Sea resort of Eilat, staying at a top hotel (on a B & B basis) courtesy of **Ocean Nutrition** and **Underworld Products.**

In addition, they'll be able to enjoy *three* separate prizes donated by **Coral World — Eilat:**

1. **Free passes** to the Aquarium and Observatory for the week.
2. **A guided behind-the-scenes tour** of Coral World.
3. **A guided snorkelling tour** of the Underwater Nature Reserve.

And to cap it all, there'll be a cheque for **£300** spending money from us at *Aquarist & Pondkeeper* to help make the prize a truly unforgettable experience.

We asked you ten questions. Here they are again, this time with the correct answers:

PART 1 — OCTOBER

1. How many species of sponge does the **Angel Formula** food from **Ocean Nutrition** contain?
   Answer: Two.
2. Are these species: **abundant, rare or endangered?**
   Answer: Abundant.
3. How many foods are there in the **Professional Signature Series?**
   Answer: Six..
4. What food in the **Aqua-Yums** range in particularly good for Triggerfish?
   Answer: Sea Urchin.
5. What is the name and full address we published in the advertisement in this (October) issue of *A & P* of the **Sole UK Agent** for **Ocean Nutrition?**
   Answer: Underworld Products, Units 1 and 2, Belton Road West, Loughborough, Leicestershire, England LE11 0TR.

PART 2 — NOVEMBER

6. In what famous Californian city is **Ocean Nutrition** based?
   Answer: San Diego.
7. What are the names of the two natural pigment enhancers used in **Ocean Nutrition** foods?
   Answer: Spirulina and Canthaxanthin.
8. What world-renowned Discus authority has collaborated with **Ocean Nutrition** in the creation of two **Professional Signature Series** formulae?
   Answer: Jack Whattley.
9. How many foods are there in the full **Aqua-Yums** range?
   Answer: Over 35.
10. What is the name of the well-known aquatic expert who leads **Underworld Products,** the **Sole Agent** for **Ocean Nutrition?**
    Answer: Dave Keeley.

And the lucky winner is:

MRS PAULINE HUTCHINSON
from Sheffield

Warmest congratulations, Pauline! We'll soon be in touch to sort out all the details. Commiserations to all those of you who tackled this exciting and challenging competition but didn't win. Next time could be *your* lucky break.

Sincere thanks to **Ocean Nutrition, Underworld Products** and **Coral World — Eilat** for their generous sponsorship, and to all those *A & P* readers who took part.

NEXT MONTH

When we launched our first Supplements some five years ago, we were pretty confident that they would prove successful. Clearly, *A & P* readers agreed, with the result that these unique and highly-sought-after 'mini-publications' have evolved into a very important bi-monthly part of our magazine.

So, for all those Supplement fans out there, we are pleased to announce that next month we'll be featuring the first of our 1993 collection, dealing specifically with all the Common Fish Diseases. Our team of experts will tackle how diseases develop, how they can be diagnosed, how they can be treated . . . and, of course, how they can be prevented.

Everything from White Spot to viral infections, and ulcers to Anchor Worms, will receive the close attention of fish vet Lance Jepson, Plymouth University's Dr Peter Burgess, Tetra's Dr David Pool, Interpet's Adrian Exell and Aquarian's Dr David Ford.

Turning to a few other highlights, we have:

- An intriguing feature from Finnish aquarist Tor Kreutzman who collected the Mystery fish of Macu on his recent expedition to Malaysia. This fish is so 'new' and different, that we still don't even know what it is!
- Following the recent launch of OFI (UK)'s Code of Conduct, *A & P* editor John Dawes begins a series of short articles introducing all the main aspects of this revolutionary development and the implications for aquarists, pondkeepers and members of the aquatic trade.
- For Koi keepers, David Twigg rounds off his guide to Planning the Perfect Koi Pool
- Mary Bailey has another eye-opening go at Exploding the Myths of Discus keeping.

We also, of course, have our usual crack team of regulars whose mail bags continue to grow every month, our now-customary special one-offs . . . and a few more treats besides. So, book your February copy now, or make sure of never missing out by taking out a great value-for-money annual subscription to *A & P.*