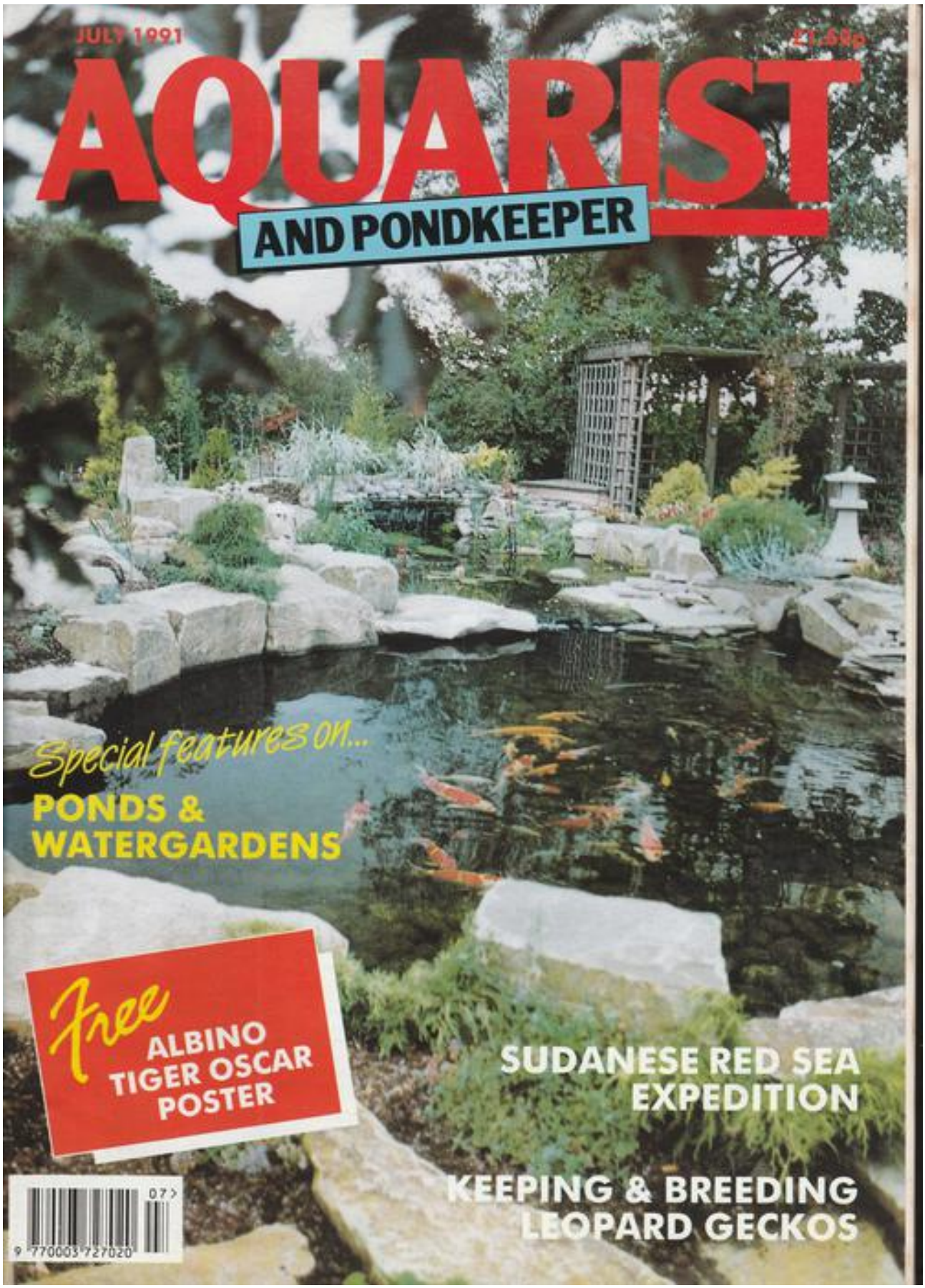
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EDITORIAL

FEEDER FLEAS HAVE FEELINGS TOO

Not long ago, I visited a fellow aquarist on one of my overseas trips to admire a superb prize Arowana he had in one of his tanks. The animal was magnificent; bright of eye, sleek of body and rippling with the pent up energy of a wound-up spring ready to unleash its awesome, explosive power at the push of a button.

Quite naturally, I asked, "What do you feed it on?" "These", said my host, pointing to a tankful of goldfish. Then, with a quick scoop, he netted the next unwitting meal and plonked it into the Arowana tank.

I'm sure the goldfish didn't know what hit it. At least, I keep telling myself that I'm sure. . . so the mere fact that I keep repeating this must belie a niggling doubt.

The whole affair was over in a flash. One second, the goldfish was there, the next, it was gone. So why is it that I can guiltlessly watch a lioness inflicting a long, painful death on a panic-stricken zebra and regard it as 'natural', and yet find the split-second apparently-painless dispatch of a goldfish so upsetting? And why do I feel guilty that, despite the loss of the goldfish, I was so rivetted by the sight of a perfectly honed predator like an Arowana doing what it does best?

Perhaps it's because, if you really love nature, then you will find beauty in all its manifestations. Feeding is just one of these, of course. . . . and I *do* love nature.

Perhaps the fact that the feeder goldfish had no chance of escape had something to do with my feelings of guilt. Perhaps this is why I don't keep fish that need to be fed on other live fish.

But who am I kidding? My pondfish spawn every year and I don't remove all the eggs, while my aquarium fish receive regular supplies of cultured livefoods. Is this so different?

Does the fact that a feeder fish is a vertebrate (and, presumably, possesses a relatively high level of sensory perception), while a waterflea is an invertebrate, have any bearing on the issue? Probably so. . . but perhaps 'feeder fleas' have feelings too!

John Dawes
Editor

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MORIARTY

THE METICULOUS MANTIS SHRIMP

Ever tried seeing the world through the eyes of a Mantis Shrimp? Well **Sarah Anne Ashwood** has. . . most successfully indeed.

Why do people hate me? Is it because I am so ugly? How can that be true when there are so many forms of life under the sea far uglier than I? I do have very dull colours of course, but I need them to provide me with the camouflage I require to merge into my surroundings so that I can observe without being observed.

I suppose I *am* an ugly shape. With my armoured carapace, I resemble a cockroach more than a shrimp. However, unlike a cockroach, my front legs have evolved into heavy muscular arms with club-like extensions giving me a range of fine movement for lifting piles of sand and the strength to manoeuvre large objects like shells and stones.

Persecution complex

Once spotted in a marine aquarium, I am likely to strike terror into the heart of the fishkeeper, resulting in persecution unequalled by Captain Ahab or Moby Dick. I do not understand why I have earned the reputation of ruthless predator, although to be fair, I am prepared to attack all forms of life, animal or human, if I'm in the mood.

It's not surprising I lead such a secretive existence. Once I'm identified, earthquakes and tidal waves follow as my ordered environment is torn apart in an effort to destroy me. The fishkeeper stands no chance, of course. I'm far too clever. But due to the ensuing havoc, I have to make new burrows and spend hours re-bloking my emergency exits with sand and stones, which can be time-consuming to say the least.

Most irritating of all is when my keeper decides I am his star performer and wantonly breaks open my exits, to prove to sceptical visitors that I actually exist. If this happens regularly, I limit my guest appearances to once a week, much to the frustration of the onlookers.

I wonder if humans realise how silly they look from this side of the glass? Most humans lack the necessary concentration to catch a glimpse of me as I go about my daily routine. Besides, every vibration is communicated to me via my watery environment, arming me with an early warning device.

Great sight

My eyes are probably the strangest and most bizarre in the animal kingdom. The central band in each eye is a complex colour analyser able to scan the ultra violet as well as polarised light, constantly searching for anything that may be alive.

Once a possible food source is located, the first analyser is swept across it; I then bring my second analyser into play, lining up the scanning lines like the cross wires on a gun. With such superb senses I never miss my target.

I have the ability to make my presence felt day or night as I break up stones to repair my damaged defences, usually after lights out, tapping continuously for long periods, unseen (adding to the keeper's frustration).

Unfounded reputation

My reputation for killing expensive fish is also relatively unfounded, although I have been known to take a bone-crushing swipe at any fish stupid enough to venture close to my burrow. Most fish have more sense and avoid me like the plague.

If I am fed regularly, I am quite well behaved; I am even prepared to take a prawn from the "fool's" fingers. However, should I have an off day, and we all do, I could easily cause an injury, since my clubbed arms are capable of striking an object with the speed of a .22 bullet, quite sufficient to split open a shellfish, crack glass, or human bone.

Rude removal

Until recently, I lived in relative seclusion in the dark recesses of the 40-gallon tank I called home. But suddenly my lifestyle was dramatically changed. It began with rock slides and tidal waves as the miniature reef was dismantled. The large rock where I lived was lifted out of the water and placed in a smaller container.

I was annoyed when a knitting needle was continuously rammed down my burrow and light flooded into my rabbit-warren-like domain. I was in no danger, as I was able to flatten myself against the walls of my burrow in one of my many emergency exits. To prove I wasn't intimidated by all this I struck the needle several times to show my disapproval. However, after two hours of persecution, I felt I'd had enough and decided to look for some peace and quiet.

I leapt out of the nearest exit only to find myself isolated, as the rock was lifted clear of the water. Within seconds I was netted, to loud cheers, and transported to a small hexagonal tank, containing two gallons of water. To say the filtration system was primitive is an over-statement. In fact, there was no filtration other than an airstone and the mature bacteria in the coral sand to avoid a toxic environment.

The low level of lighting suited me far better than the halogen lighting in the large

tank. I felt able really to explore and satisfy my natural curiosity.

The fishkeeper's 'mate' seemed to be in control of me now. She had thoughtfully provided me with an old barnacle shell. The many chambers delighted me, saving hours of exhausting burrowing. Together with my barnacle shell, had been added a *Spirobranchus*, *Tubastrea* and dead organ pipe coral, plus various algae and a colonial anemone. The last of these gave me no cause for irritation because it did not encroach on my territory, being almost static; it therefore did not need a smack to keep it in order.

Watertight security

My engineering activities seemed to fascinate the 'mate', and I enjoyed demonstrating my expertise as I collected small selected stones in my arms and arranged them meticulously so that they fitted perfectly in the barnacle shell like a complicated jigsaw. I filled tiny gaps with sand carefully carried between my clubs, rarely losing a single grain in transit. When convinced my security system was water-tight (if you will pardon the pun) I retired for the night, secure in the knowledge that my defences were invulnerable except, of course, to human interference.

The next morning, even before the lights were switched on, I had broken down my carefully constructed wall and was waiting at the entrance to the burrow to take full advantage of the first movements of the morning. A very useful trick when hungry, because most living creatures are particularly vulnerable when disorientated by the sudden flood of light.

I had been living in the new tank two days when I was snapped into action by a sharp tapping on the glass. It sounded like a clap of thunder to my sensitive hearing. I decided to take a cautious look out of my burrow. A pink object was tapping on the glass and I guessed it belonged to the 'mate'. What puzzled me was that it kept disappearing below the level of the glass and my overwhelming curiosity forced me to slide further and further out of my burrow in order to keep the object in sight.

Boring game

Being clever, I guessed why we were playing this game. 'She' wanted to see just how long I was when fully extended. I soon tired of this game, as there was no reward in it for me, so I turned my back on her in my burrow and ignored all further attempts to coax me out.

Two hours later the tapping was accompanied by a shining stick descending from above. In its forked end was wedged a small dead fish. I was ravenous by now, but my natural instincts did not override my caution. I decided to observe from the safety of my burrow, only allowing my stalked eyes to appear outside the rim of the shell.

After a few minutes of consideration and assessment as to whether I could safely retreat into the burrow carrying the fish, I decided it was a chance too good to miss.

In a flash, almost faster than the human eye could follow, I had wrenched the fish from the forks of the stick with my clubbed arms and somersaulted backwards into my burrow, leaving only a swirl of sand to show where I had been.

Friendly 'mate'

In the days that followed, I knew I was being closely observed as I moved freely around the tank, showing off my great strength and agility, making burrows and decorating them with algae and rocks. I knew my observer was growing fond of me, always checking to make sure I was alive and well before leaving for work in the morning and checking again on her return.

I even performed for her many friends and obligingly struck the stick quite forcibly when it was placed carefully next to my home, much to the amazement of the onlookers. The 'mate' knew I meant her no harm and she, in return, did not tease me or disrupt my otherwise peaceful existence.

We often had a battle of will when she would arrange the tank to suit her artistic eye and I, for reasons of my own, would reorganise it while she was out; but there was no battle really, because I always won. I am a constant source of amusement and interest to 'my mate'. In return she provides me with food and shelter in an atmosphere of mutual respect. Live and let live is what we Mantis Shrimps say. How about you?

Reflections

By David Sands

THE TRIALS OF TC (Guernsey, Guernsey, here we come)

Under the heading of **Who Wants Custody of TC?** in the May edition of **Reflections**, I wrote about the plight of Top Cat, that magnificent Red-tailed Catfish which starred in the TV programme **Fish People.**

Well, the very good news is that the three-foot plus TC will fly out to Guernsey (under my supervission) to live in a massive aquarium — six times his length — four foot deep and wide (120 x 120cm) — open to be viewed by the public.

So, formerly of the Amazon and Basildon, TC, the catfish Sue Holmes has loved for nearly ten years, will now live out the rest of his long days in a real aquarium.

Sue was so relieved that she cried when I telephoned to give her the brilliant news. I know the 130-odd current members of the Red-tailed Catfish Club/ Survey Group will be equally overjoyed at the prospects for TC because all of them realise the true responsibilities of keeping a *Phractocephalus*.

I haven't quite worked out the full details of transferring TC from his tank to his new home on the small island of Guernsey. I'm looking to filming and writing about TC's journey. "Whatever the weather" — as they say here up North. I'm sure there will be a fascinating story to tell.

I would like to take this opportunity to thank all the people who telephoned me because they were concerned about TC's welfare. It's heartening to know our hobby has such a great number of people who care deeply about animals in captivity.

BOOKS, BOOKS AND MORE BOOKS

Some readers might remember my earlier notes on the abundance of fish books on the market these days.

Just as I thought all that could be done has almost been done, another unique book has hit the bookstalls.

The new book, published by **Dorling Kindersley,** is entitled *The Complete Aquarium*, and is written by Peter Scott (reviewed in *A & P* last month). I aided the author, who is a good friend of mine and a vet with ideal fish knowledge (the official vet for the Red-tailed Catfish Club to boot) and a Northerner, and am proud to have done so!

You might think, then, that I am biased when I say that I *adore* this book. I would certainly not admit my friendship with the author if I wanted to conceal some bias . . .

Many great ideas can fall very flat in production. Even, in this case, the high ideal aimed at by both publisher and author could *never* be attained, but sometimes a new eye produces something original. I must admit to assisting with this book, which is loosely based on illustrating a series of basic and specialised fish communities, but the final excellent production and Peter's ideas have produced a cracker.

'Big Red' happy again . . . and on his way to Guernsey

The Complete Aquarium shows that we (the UK) can produce brilliant books; the text is realistic, the pictures are imaginatively presented and the book makes a great companion to more specialised texts.

In complete contrast, an idea (for a book relating to keeping large fishes) that I once discussed with a publisher was published recently. While I didn't suggest the original book, I *did* suggest which species could be covered. This was one book the fishkeeping world needed . . . many an 'Oscar' keeper has wanted to consult such a tome.

The book takes up a great deal of space on the mundane description of certain fish. In my opinion, many cichlid species which have been included should not have been, while in the case of a certain "very large and popular catfish", the book could have provided an insight into the problems fishkeepers might encounter while keeping such species.

UK FISH BREEDING

Thank you also for the many letters I received relating to my request to hear from commercial and private fish breeders through my **Reflections** column. I must firstly apologise for my delay in replying to the many letters I received but, in my defence, literally, my mail bag is currently overwhelmed and, at the time, I was waiting for the 'address' news relating to the **British Aquatic Breeders Society.**

I still haven't got an address for BABS to give you and, really, my thoughts on this matter are separate from the formation of this new group. My news could be more easily aired to such a 'collective', but, for the moment, you will have to look elsewhere in this magazine for information relating to BABS (see **News from the Societies**).

I am hoping to establish, at some time in the foreseeable future, some type of sponsorship to UK breeders. Also, if possible, I would like to help organise a special convention/ symposium for 1992 which could bring together similar minded people who, perhaps with the help of a major manufacturer, could promote the sort of captive breeding programme our hobby will certainly need for its future.

If I have not reached those who have written to me on fish breeding by the time this article is published, please give me a call.

FOREVER FRIENDS

So far, during 1991, my lecture year (I had a well deserved rest for a couple of years), I've met up with many friends. Some sadly, like the ever smiling Mervyn Strange and 'Catfish' John, are now gone forever.

Through the 'Aquarian' Advisory stand at shows and my various lectures, I have met fishkeeping people for the first time and, as in the sad case of Mervyn and John, for the last.

Mervyn often fondly used to tell the story of a 'green' catfish enthusiast, formerly from *up North* (Mervyn did not show prejudice, as all his Northern friends will testify) who came to visit his home. It was way back in the 1970's when Mervyn showed this catfish enthusiast (me) through is ramshackled greenhouses-cum-aquatic-retreat and said softly, with a sweep of an old net through a greenhouse pond, "I do have some catfish, and I can't stop 'em breeding . . ."

Mervyn's net contained mud and a few beautifully bronzed and golden *Corydoras*.

With a kind light in his eyes, Mervyn smiled when the young Northerner announced how brightly coloured the *Corydoras aeneus* appeared under daylight.

"Must be something to do with natural light," I enthused. "Maybe, I've never really put a great deal of thought to it . . ." Mervyn replied.

That was one conversation that could have run for years . . .

The Association of Aquarists' Sandown show this year was one of many memorials to Mervyn, and, while I'm thinking about him, I only wish that I *could* finish our conversation that started in the 1970's and was never completed.

On a happy note, it is fine to remember people; that way they live on, regardless of time.

Koi Calendar

By David Twigg

I have recently been involved in discussion on placement of a new pond in a friend's garden. As sun warms water, and Koi love 'hot water', I believe a pond should, subject to other considerations, be placed in the sunniest spot in the garden, my philosophy being that it is relatively easy to create shade, should it be required, but impossible to make sun.

The other main considerations for positions are the proximity of house, security and availability of services. I have a north-facing garden which puts my pond in the shade of the house until the sun gets higher in the sky in late spring; further, it is back in shade very early in the autumn, thus making for cooler water and larger heating bills.

Talking of water temperature, for those of you not heating your ponds, it will be at about its maximum during this month and next and your feeding rate will be at its highest. Water quality may be falling with this increased feeding rate.

Not being fortunate enough to own an automatic feeder, I use the volume method of giving my Koi roughly the same amount of food each day. I do this so that the filter does not have to cope with varying levels of pollution. A cup is used as a measure and I have only to ask my wife (or neighbour) to feed a cupful of prepared food at the appropriate time should I be unavailable. This eliminates the need to weigh out doses on the kitchen table.

Koi spawnings are allowed to 'happen' naturally in my pond. I do not take any action to isolate out females and males by placing them in separate ponds for a period prior to spawning; the resultant fry can be just as good, and equally interesting.

The final preparation I make is the nets into which I place the eggs. These are constructed from domestic curtain netting on a frame of ¾in overflow pipe. The netting I use has a fairly fine mesh so that the newly-hatched fry cannot swim through the holes. These nets (I have several of them) are floated on the surface of both my header pool and the main pond once spawning is complete. The blanketweed/spawning ropes are transferred into these nets for hatching which, depending upon water temperature, will be from 2 to 5 days.

So, as you can see, Blanketweed has *some* use; that of food and cover for the new hatchlings. Just give a handful of Blanketweed a shake in a clean bowl of water, lift it out and amaze yourself at the quantity of live food that has been left behind!

KOI VIDEO NEWS

The Northern Section of the BKKS have been busy recently making Part 1 of a video series which shows injection techniques, post mortem procedures (this bit is not for the queasy) and how to take skin scrapings for examination by microscope.

These items are presented very clearly by **Tim Grantham,** a well known Koi-keeping vet and, by the time you read this, Part 2, which covers anaesthetics and topical and pond treatments, will have been completed. Part 1 sells at £6 and Part 2 for £7, P & P £1.25 on top.

BRIT-KOI JULY OPENING

Another long-established company, I understand it was the second in the country to import Koi from Japan, has now opened at its new location and is well worth a visit.

Bob, Tony and **Andrew** of **Brit-Koi** will welcome you at their new premises in Syon Park, which is no more than a couple of miles off Junction 2 of the M4. A visit here would be made well worthwhile by the additional attraction of a large car park, the London Butterfly House (next door), a large garden centre and the stately home, Syon House. The formal opening ceremony is on **12 July.** Brit-Koi can be contacted on 081 847 4730.

WHAT'S ON IN JULY

1 Shows

Six shows advised again this month; at least one each weekend and, once again, spoilt for choice!

6/7 — Central Section BKKS Closed Show. Walsall Arboretum.

7 — Midland Koi Association 'English Style' Open Show at Baginton Village Hall, Baginton, Coventry, just off A45, near Coventry Airport. Contact Dave Smith on 021 779 2001.

14 — Mid-Staffs Section BKKS 'English Style' Closed Show at Hollybush Garden Centre & Aquarium, Warstones Road, Saredon, Wolverhampton. 11 am 'til 5 pm. Entrance 50p, with children free. Four Koi dealers are supplemented by Bonzai, model aircraft (including a model helicopter flying display), children's amusements, raffle, refreshments, etc. Contact Keith Titchen on 021 308 8605 or 0831 157171.

14 — Suffolk and North Essex BKKS 'English Style' Closed Show at Free Roberts, Great Sampford, near Saffron Walden, Essex. Various stands, including craft, together with a good raffle, refreshments and FREE parking. Open to public at 1 pm. Contact Mary Malyon on 0787 78400.

21 — Essex Section BKKS Open Show at the Avely Sports Ground, Avely. This is a section show which has come a long way since the first one held in 1979. Essex have moved from two tents and a coconut shy to today's event, in which every Koi entrant has his/her own vat and the aim is a family day out. To this end, there are craft stalls, lots of fish and dealers, and entertainment for the children. Oxygen and bags are provided for debenching. Further details and entry forms from Mrs Bobbie Barton on 0702 611750.

28 — Norwich Section BKKS Closed Show at the Grove Cheshire Home, East Carleton, Norfolk. An interesting day out seems promised here, as this show is sharing the day with a Bygone Rally and Country Fayre. Contact Doug Raby on 0603 32654.

2 Meetings, etc

1 — Kennet Valley Section BKKS. Guest speaker is Peter Waddington on *Koi Appreciation.* 7.30 pm, Newbury Rugby Club, Pinchington Lane, Newbury. Contact Bob Thompson on 0734 713640.

4 — Middlesex and Surrey Borders Section BKKS. Guest speaker is John Woodall on *DJ Koi expedition to Japan.* Contact Steve Gould on 0932 848147.

10 — South Hants Section BKKS monthly meeting at the Denmead Church Hall, Hambledon Road, Denmead, Hants, at 8 pm. Contact Tony Price on 0705 261085.

14 — Northern Section BKKS monthly meeting at St James Hall, Pendleton. Contact Tony McCann on 061 794 1958.

17 — Mid-Staffs Section BKKS. Monthly meeting, 8 pm, at RNA Club, Elmore Green Road, Bloxwich. For details of what's on, contact Joan Rutter on 0543 876699.

17 — Crouch Valley Section BKKS monthly meeting at Laindon, Basildon. Basic Koi-keeping and Beginners' questions, led by Dave Last. Contact Allan Ward on 0268 543600.

What's your opinion?

Billy Whiteside, BA, ACP

Welcome to this month's feature and to the news that our Editor, John Dawes, has asked me to resume the production of **WYO?** as a monthly feature — as it was for many years, To be able to produce a feature each month, I'll have to receive enough letters from you, the readers. I'd be particularly interested in receiving letters from younger readers. Lots of teenagers keep tropical fish and many of them have lots of useful things to say about how to keep them successfully. Now that science is part of the national curriculum for everyone, younger readers should all soon have the additional benefits of being able to apply their scientific knowledge to their hobby, rather than just accept information they read in books.

Incidentally, my teenage nephew recently asked me where letters for **WYO?** should be sent and I realised that I should perhaps include the address at the end of each feature. As well as letters in response to the topics I raise in the feature each month, I should be pleased to receive suggestions for topics for discussion in future months. **WYO?** is a forum open to anyone — trader or home aquarist. Everyone's opinion is valid — even if most other people disagree!

LILIES, MONKEYS ET AL

Recently I had a look at some water lillies on sale in a pet shop. The quality of the plants was as depressing as the sight of a large monkey, locked alone in its cage, and two smaller monkeys locked in their barred prison. A notice stating that a certain brand of pet food was a sponsor of the large monkey certainly did nothing to enhance the brand-name in my opinion.

One of my photographs shows a healthy yellow water lily I photographed in a beautiful pond near the Jefferson Memorial in Washington D.C. The other is of an attractive display tank of *Hygrophila* and *Cryptocoryne* species on display at Amsterdam's Aquarium.

For next time please send me your opinions on the best species of *Hygrophila* and *Cryptocoryne* for, and how best to cultivate them in, the home tropical aquarium. I'd also like to hear of your experiences with the cultivation of water lilies and other pond plants in your garden pond. What are average prices for pond plants in your area?

Send me details please of your favourite aquarium books — including specialist books on specific fishes, or plants. How necessary are water test kits for the average aquarist who just keeps a tank or two in his living room? I'd also be pleased to hear of your most recent experiences of breeding specific species of fish. How many young did you raise — and what did you do with the young? I recently bought a pair of Chocolate Gouramis. They are delightful little fish. Have you kept them?

BILLY WHITESIDE

A beautiful lily, photographed during my visit to Washington DC.

BILLY WHITESIDE

Luxuriant *Cryptocoryne* and *Hygrophila* specimens at Amsterdam Aquarium.

COST EFFECTIVE DETAILS REQUIRED

Ian Colquhoun lives at Flat 3, 10 Grove Avenue, Tunbridge Wells, and he writes: "May I say that I've had enough of the boring filter debate — trickle filter v undergravel (see **Letters** page in this issue of *A & P*). I suspect that they all work equally well and every aquarist will swear by one or the other. I would welcome more information on cost-effectiveness of the various systems — even particular products.

"I think that submersible pumps are notoriously inefficient. So, too, are fluorescent tubes without reflectors. What are the capital and running costs — money and time — involved with the various pump and lighting systems? What life expectancy is involved? Are spare parts readily available?

"Something along the lines of a *Which?* report would be welcome. I recall from my dim, distant past: 'An engineer designs for £10.00 what any old fool can design for £50.00'!"

Availability of spares is an important point. I have an excellent Zoobeko pump — a Kurier Alu, if I recall correctly — but it was manufactured in Germany and I have been unable to trace a source for spares in Britain after the departure of a previous distributor. Can anyone help? Also, where can I obtain spares for Nuova power filters? The previous supplier from whom I obtained them also seems to have moved.

Ian Colquhoun asked about the cost of buying and running lighting systems. I bought aluminium hoods for my fish tanks over 40 years ago and gave them a coat of gloss paint on the outside only to match the painted (metal) frame of the tanks — which were also aluminium.

I'm pleased to be able to talk about tanks and hoods in the present tense. I've touched up the paint a few times since and resealed the tanks a few times, but the tanks remain in service to this day. The hoods have required no maintenance whatsoever, the touch of paint being purely for cosmetic purposes.

I've had to replace a cracked plastic bulb holder now and again at a small cost. I have yet to find a better source of aquarium lighting than ordinary light bulbs — which can still be bought in packets of three or four for about £1.00.

I find that such bulbs light the aquarium well to enable one to see the fishes; plants thrive under them; and fishes breed happily under them. In my opinion, the aquarist who wants to grow plants and breed fishes cannot get a better bargain than an aluminium hood and a couple of bulb-holders and tungsten bulbs. I'm reasonably sure that my hoods will be going strong when I have passed on myself.

Perhaps I should make the point that I use cover-glasses on top of my tanks so the condensation does not get into the hood and cause corrosion — or condense and run back into the tank.

EXCHANGE OF IDEAS

Dave Kershaw is secretary of the West Yorkshire Marine Aquarist Group, and his address is 12 Miller Avenue, Sandal, Wakefield, West Yorkshire. He writes: "Welcome back. I have been keeping fish for 33 years — marines for 30 of these — and still find most useful information is gained by an exchange of ideas. Columns like yours give any fishkeeper who would not normally get into print an opportunity to pass on tips and experiences that may be useful to others.

"Now to the subject of starting with marines. As a group, we meet many beginners. Some succeed; some fail and stop keeping marines. The commonest cause of failure is not poor equipment, overfeeding or even lack of knowledge. It's impatience. The real secret of marine fishkeeping is patience. Proceed slowly. Let the filter-bed mature. Stock the tank slowly.

"We always recommend beginners to start with cheap, hardy fish. Damsels are an ideal example. We always recommend a stocking ratio of not more than one fish per month, this giving the system time to mature.

"We also always recommend that beginners keep away from invertebrates for at least a year. This gives beginners time to learn about water quality. In addition, we advise a weekly partial water change of about 5% — which allows for the poor quality of tapwater these days and saves stressing the fish — as would happen with larger changes.

"I know that some systems claim that no water changes are required, but this has not proved to be our experience. We always advise beginners to find a local, knowledgeable pet shop and give them his/her support. Keep away from shops that have dead fish in the tanks, that stress the need for more and more expensive equipment, and that lead you to believe that you can introduce fish too quickly or in quantity.

"It's quality of service, not quality of choice, that may prove important. We always recommend that the beginner reads about a fish before (s)he buys it, and asks the shop to let him/her see it feed. Finally, join your local group and the B.M.A.A. This way leads to knowledge and success. All it takes to be a successful marine fishkeeper is time, knowledge and a lot of patience.

"Sorry if this seems to be overly dogmatic. All I hope to do is to encourage aquarists to give marines a chance. After all, it's the most fascinating branch of our hobby."

Dave Kershaw has certainly provided food for thought here. Incidentally, if you want to see some absolutely superb photographs of marine fishes and creatures in their natural habitats have a look at the book *Coral Reefs — Nature's Richest Realm*, by Roger Steene, published by **Charles Letts & Co Ltd,** London. It costs £32.00, so it's not the sort of book you buy with your pocket money. Perhaps your local library will obtain a copy — as mine did for me. The photography is so good that the book should appeal to anyone with an interest in natural history. I doubt if you'll ever see better photographs of marine fishes and creatures and their habitats.

I look forward to hearing from you. Please send your letters to me — **Billy Whiteside,** ***Aquarist & Pondkeeper,*** **9 Tufton Street, Ashford, Kent TN23 1QN.** Goodbye until next month.

WHO'S WHO AT HAMPTON

By John Dawes
(Photographs by Chris Skilton)

A view from the Long Water taken at last year's highly successful inaugural show.

As mentioned in our **Next Month** panel last month, the second **Hampton Court Palace International Flower Show** will be taking place in the incomparably beautiful grounds of Hampton Court between **11-14 July** (with a Preview Day on 10 July). Sponsored by **Network Southeast,** this year's show will feature a much larger aquatic component housed in the 'Aquatic Village' next to the Long Water entrance to the showground.

We'll be there too, of course, offering all our usual services, including our magazine (current and past issues), posters and books. We also hope to be able to invite a number of well-known experts from the world of aquatics to be on hand to assist and answer visitors' queries.

You won't be able to miss us — we are the first stand on the right hand side as you come across the bridge spanning the Long Water.

The other aquatic exhibitors with whom we'll have the pleasure of sharing the 'Aquatic Village' are as follows:

ANGLO AQUARIUM PLANT COMPANY

Anglo Aquarium Plant Company is a family-run business. They are the largest growers of aquatic plants in the United Kingdom. Anglo Aquarium have been established for 25 years, during which time they have constantly improved their range of aquatic plants and associated products. By introducing modular display systems for both coldwater and tropical aquarium plants, the company has brought aquatics into the limelight in Garden Centres. 'Point of sale' material, aquatic compost and, probably the most important recent innovation in aquatics, the **Finofil** range of aquatic planting baskets, are part of Anglo's range of accessories developed to promote aquatics.

The Anglo Aquarium Plant Company's 'Water Hole' at Hampton will give both the amateur and professional an opportunity to see an extremely wide range of aquatic plants, including aquarium plants, tropical marginals, *Nymphaea*, pond plants, etc. Also on display will be the range of **Finofil** baskets previously mentioned.

Anglo Aquarium's 'Water Hole' should prove as much of an attraction this year as it did last.

Often neglected and even overlooked by the landscaper and water gardener, are the moisture and shade-loving plants such as *Astilbe*, *Hosta* and the beautiful native ferns of this country. A selection of these plants will also be on show at the 'Water Hole'.

WORLD OF WATER

World of Water's **Aquatic Design Centre** has evolved over its eight years into a company offering high-quality aquatic displays, as well as a supply of home-bred exotic tropical fish and plants from the company's own farm, along with top quality imports of coldwater and marine livestock.

The Aquatic Design Centre is currently working with two of London's top lighting companies and several top interior and furniture design companies, offering a range of made-to-order aquaria by first class craftsmen, from unique one-off designs and displays, to high-quality standard aquaria for the home market, backed by a caring after sales service.

The 'Garden Under the Sea' — the company's Hampton exhibit — will display all aspects of tropical marine life.

ARCHITECTURAL CERAMICS LTD

Architectural Ceramics is a small firm of craftsmen involved in the design and making of decorative products for architecture, interiors and landscaping.

For some years, the company has worked with the garden designer Robin Williams, providing decorative features for Help the Aged show gardens. As well as the products on display at Hampton Court, the company works to commission on-site specific designs, and one-off projects.

In addition to the popular Gothic Arch fountain, a simple-to-install and completely self-contained unit, Architectural Ceramics are showing, for the first time, two new designs for wall mounted fountains, one incorporating a rich leaf pattern with cherubs forming the arch, the other featuring classical architectural forms and an ingenious inverted stairway that allows the water to cascade into the bowl.

Hampton Court is also going to be used as the launchpad for an exciting new addition of colour to the range. By blending white and red clays, Architectural Ceramics have long produced a subtle red terra cotta colour that is now complemented by the addition of three more colour options (natural buff or stone coloured clay is just one alternative to the traditional red terra cotta). More specta-

cularly, all the company's products, fountains and plaques, are now available in a choice of rich glaze colours.

RENAISSANCE CASTING

During the Renaissance, craftsmen from Holland arrived in Great Britain, bringing with them their skills for designing and making lead garden ornaments.

Among the famous names from this period were John van Nost (1688-1729) and his son who operated a foundry at Hyde Park Corner, London, until 1739. Today, Renaissance Casting continue to produce a beautiful range of craftsmen-made lead statuary, planters, fountains and 'architecturals'. The company prides itself on its craftmanship and quality of service.

As well as "supplying the stately homes of Britain, Renaissance Casting have brought the art of royalty and the landed gentry to the homes and gardens of discerning art lovers the world over".

A J HOWELLS WATER GARDENS

"Born in Hackney, London, in 1945, makes me a 46-year-old, water-loving Piscean". So says Tony Howells, proprietor of **A J Howells Water Gardens.**

"I built my first pond in my own garden in 1983, with a waterfall and complementary rockery, finally dressing it with plants and trees. Friends and relatives sought my help in designing and building ponds in their gardens, something that encouraged me to start my own business in 1987. Since then, I have designed and built many ponds, waterfalls, fountains, rockeries and complicated filter systems and lighting effects on golf courses, public places and domestic gardens of all sizes. I have also built one of the largest waterfalls in Essex, measuring 10 feet high and 57 feet long, with an adjoining fall of 47 feet in length on a lake at 'Quietwaters' Golf Course near Colchester in Essex".

For the Hampton Show, Tony will be constructing a 'Wild Water Garden', following on from last year's great interest in this type of system.

THE VIVARIUM

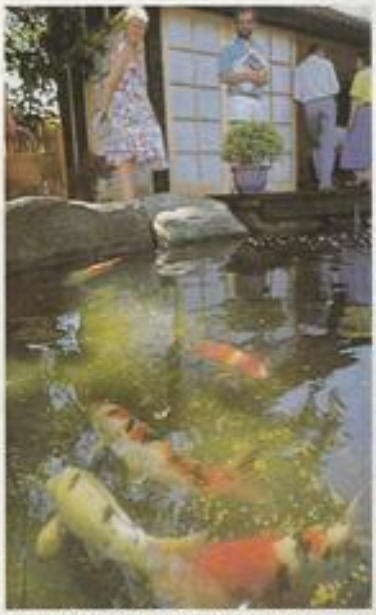
Founded in 1981, **The Vivarium** remains one of the leading specialist shops supplying herpetofauna (reptiles, amphibians and invertebrates), as well as the equipment and foods for their maintenance.

The Vivarium was founded, and is still run, by experts in the field of keeping snakes, lizards, frogs, tortoises and tarantulas and their ilk, with an overall view to encouraging their owners to study their behaviour and attempt to breed these animals in captivity. This has met with an ever-increasing amount of success, thereby augmenting our general and scientific pool of knowledge of these fascinating creatures and also reducing the demands upon wild populations. To this end, the Vivarium have embarked on a captive breeding programme on site, and are able to supply all the needs of any of these animals, from the incubation of eggs, through birth, to old age.

After a successful exhibition at last year's inaugural Hampton Court Flower Show, The Vivarium are honoured to be invited back in 1991 where, under new proprietorship, they hope to put on an even more breathtaking display of animals in captive surroundings, and will be on hand to offer expert advice and provide a 'motile link' between flora and fauna.

KENT KOI

Kent Koi was founded in 1983 to promote the Japanese hobby of Koi-keeping. This quickly led to authentic Japanese and English styled ponds and gardens being designed and constructed by the company's specialist team.



Part of Kent Koi's prizewinning exhibit last year.

Last year, Kent Koi won the 'Aquatic Trophy' at Hampton Court with their beautiful pond and spectacular fish display, a feat that they will be attempting to repeat this time round.

'The Koi Pool' — this year's display — will, once more, attract visitors to the Kent Koi exhibit, where filtration and aquaculture specialists will be available throughout the show.

DORKING AQUATICS

Dorking Aquatics started off as a general petshop some eight years ago. Within a short time, however, the aquatics section completely took over, culminating, this spring, in the installation of a new 5000-gallon coldwater section.

The company has its own aquatic plant nursery and will be exhibiting some of its home-produced plants in a large coldwater tank that will form the centrepiece of the Hampton display. A 'different' and most interesting aspect of this tank is that it will also contain a wide range of vertebrate and invertebrate pondlife.

Other exhibits will incorporate a range of temperate and tropical fish and plant species, including some unusual fish, in a number of contrasting settings.

FEDERATION OF BRITISH AQUATIC SOCIETIES

At the time of going to press, the **FBAS** were hoping to set up an information marquee.

Along with its extensive range of publications, the Federation is planning to mount a display that "will attempt to show the attractions of some aspects of the hobby, ranging from furnished aquaria, to practical demonstrations on how to install a pond or set up an indoor aquarium".

Although the Hampton Show will dictate that most interest (and questions) will centre around ponds and water gardening, the FBAS will also be dispensing information about the locations of member societies and on all aspects of aquatics.

THE ORGANISER

Organising the many complex aspects of mounting the 'Aquatic Village' is no mean feat. Our most sincere thanks therefore go to **Chris Skilton (C J Skilton Aquarist)** for his infectious enthusiasm and bravery(!) in attempting to get us all doing approximately the right things, at approximately the right time, and in approximately the right order!

The *A&P* stand — ready for action in 1990.

Herpetology matters

By Julian Sims

OLIPHANT JACKSON

Very sadly, Oliphant Jackson died on 26 February, 1991. Dr Jackson will be remembered by hundreds of herpetologists for his unique style — not least, from the anecdotes he recited in his lectures, and also from his own inimitable way of chairing symposia! For those who attended these events, the topic of snakes shedding their skin **always** promoted the projection of some very unusual slides.

Out of his numerous publications, Oliphant F Jackson will be especially remembered for the classic two-volume work, *Diseases of the Reptilia*, published by Academic Press in 1981. These two books, co-edited with another veterinary colleague, are still in print and will continue to serve as a reminder of the many contributions Dr Jackson made to herpetology, particularly in the field of reptile medicine.

Oliphant's interest in tortoises led him to formulate the **Jackson Ratio** in 1980. This ratio is one of the criteria which can be used to indicate the state of health of Spur-thighed and Hermann's Tortoises (*Testudo graeca* and *T. hermanni*) maintained in the United Kingdom. By comparing the length of the carapace with the weight of a tortoise, the resulting point on a graph can indicate whether or not a particular tortoise is healthy.

Latterly, from 1987 until his untimely death, Oliphant Jackson was Chairman of the British Chelonia Group. He will be sadly missed.

CHELONIA EGGS

During egg laying, female chelonia use their back legs to spread the eggs in the nest before filling it in. European tortoises lay eggs which don't touch each other in a nest. Although they are in very close proximity, careful examination will show that there are tiny gaps, often only a few millimetres wide, between individual eggs. Spaces between the eggs reduce the risk of bacterial infection and decay spreading from one infertile egg to the rest of the clutch.

The eggs of *Testudo hermanni* tend to be elongated in shape and number between four and six in an average sized clutch. *T. graeca* eggs are spherical, slightly smaller, but more numerous — nine, ten or more being laid at a time. The eggs of *T. marginata* are also spherical in shape.

Most species of freshwater turtle lay eggs which have a different shell structure compared to land-living tortoises. Freshwater turtle eggs are also laid in rather different environmental conditions compared to tortoise eggs.

JULIAN SIMS

A clutch of eggs laid by a female Hermann's Tortoise. The eggs do not touch each other in the nest.

Many species of freshwater turtle lay eggs which have flexible shells, a type of shell structure which allows the eggs to expand during incubation. However, to expand fully, the eggs must absorb water from their surroundings during incubation. Female freshwater turtles ensure that the soil which forms the walls of the nest is very moist. Extra liquid is often released into the nest by the female during digging and after she has completed her excavation.

Unlike European tortoise eggs, the eggs of freshwater turtles usually touch each other in the nest. Such contact ensures that water can pass from one egg to another during incubation. Indeed, if environmental conditions dry up, then the inner eggs in a clutch absorb water from the outermost eggs. These become dented as they are sacrificed to ensure that the inner eggs complete their development.

In captivity conditions, emergence of the fully developed hatchlings at the end of the incubation period can be promoted by increasing the moisture content of the incubating medium. **Vermiculite** is a good material to use to incubate eggs in.

Water around the shell can alter the amount of oxygen which diffuses inwards, and this acts as a stimulus to the young reptile, causing it to break out of its shell. In the wild, an increase in moisture would be caused by autumn rains and/or an associated rise in the water table after a hot, dry summer. Such an increase in ground water is particularly beneficial to hatchling freshwater turtles, since it can help them to reach a lake or stream by reducing the risk of desiccation en route.

AMERICAN SOCIETIES

North America has a very rich indigenous herpetofauna, with 221 species of amphibian and 275 species of reptile discovered to date. In view of these comparatively large numbers, it is not surprising that the USA is also home to a good many herpetological societies. Indeed, most states have spawned their own particular society, and sometimes two or three. Due to the quality of the publications which the majority of these produce, it is well worth joining one (or more) of these American organisations. This is especially the case if you keep North American reptiles or amphibians and want to obtain more information about their habitat requirements and natural behaviour.

With regard to national herpetological societies, two of the leading organisations are briefly described below, together with a state-based society. A contact address is also given for each one.

1 Northern California Herpetological Society (NCHS)

This is one of the best known societies organised within a state. The NCHS, ten years old this year, publishes a very informative monthly magazine promoting conservation, education and research. The NCHS also produces occasional *Special Publications* and *Care Sheets* giving details about commonly kept species.

Further details about the NCHS, together with a membership application form, can be obtained from: **Northern California Herpetological Society, PO Box 1363, Davis, California 95617-1363, USA.**

One final point. Subscription to any of these societies **must** be paid in **US dollars ($)**. This can easily be achieved by using an International Money Order, obtainable from any of the High Street banks. As different banks impose different handling charges, it pays to shop around!

Alternatively, the SSAR accepts payments by MasterCard or VISA credit cards, a cheaper and even easier method of cash transfer. At a time when the pound is relatively strong against the US dollar, membership of an American society represents even greater value.

(DETAILS OF TWO MORE AMERICAN SOCIETIES NEXT MONTH).

VIDEO NEWS

A selection of videos on reptiles and amphibians, produced by ASPC Petvision, is available by post from *Aquarist and Pondkeeper* **9 Tufton Street, Ashford, Kent TN23 1QN.** Tel: 0233 621877; Fax: 0223 645669. Access and Visa cards accepted. Please quote your card number and expiry date. The cost of each video is £17.99, including postage and packing. Allow 28 days for delivery.

WALL TO WALL

Catfish and cichlid specialist **Anton Cass,** of Aquaflight, got an unexpected, but thoroughly pleasant, shock when he went in search of a new supplier of quality Discus *(Photographs by the author)*

Through the years, I have made many 'expeditions' to numerous aquatic establishments in an effort to locate species of quality and unusual variety. Some of my recent trips have been to look for quality Discus, both cultivated and wild imports. Sadly, a lot of these fish have not been up to expectations, so it was with such thoughts in my mind that I drove through Germany, following up another lead, as they say. I was on my way to meet one of the largest breeders of Turquoise Discus in Germany, so the correspondence had informed me. Therefore, my expectations were high, although somewhat reserved, as I had been to 'big' places before, only to be disappointed.

TURQUOISE SHOCK

I have to confess, however, that despite my many years of aquatic association (my father has kept fish for over 42 years, so I grew up with the hobby virtually from birth) I was about to receive one of the biggest shocks of my aquatic career.

After introductions were over, Heinz Stendker and his son Jörg showed me around their breeding set-up. To the rear of the garage was a large room packed with tanks of around 50-60 gallons (225-270 litres) absolutely full of Discus, Turquoise Discus to be exact. A large cellar was similarly stocked. The amazing thing was that the quality of these fish was unbelievable.

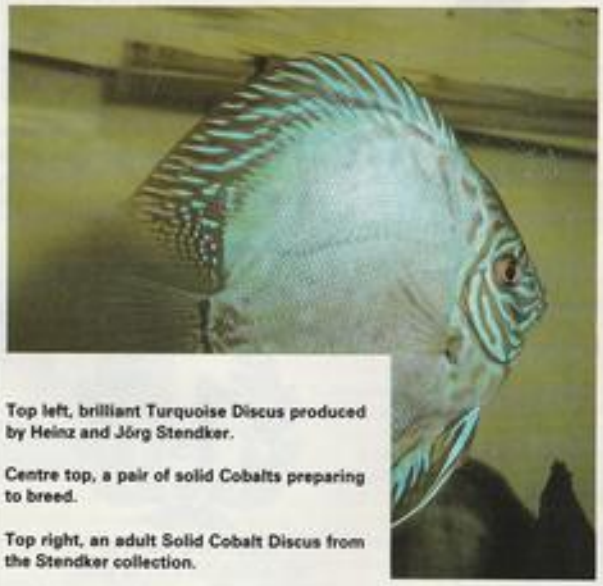
All were eagerly awaiting food, fins erect, not a dark one (unhealthy) among them, and each one was showing superb colour. In fact, the tanks appeared to be packed solid with them. Sizes ranged from less than little fingernail size, held in small rearing tanks connected to the main filter system by a drip feed, to fish that were being brought on for breeding purposes, measuring some 6-8 inches (15-20cm) across.

EXCEPTIONAL BREEDERS

Then there were the breeding pairs. They were in another world, both as far as filtering and anything else I had ever seen. It has been said that German Discus lack size. In some cases this may be true, but not here. The parents I saw in various stages of breeding, ranging from eggs, through to free-swimming young, were huge. In truth, they were bigger than many wild-caught specimens, measuring a minimum of 8 inches (20cm), probably bigger. I did not know which way to turn, there were so many fish.

More was to come, although I did not realise it. Over coffee I was asked if I wished to see the other 'haus'. Agreeing, but thinking I was going to someone's home, I was further shattered when, after a 10-minute drive, we arrived at a large industrial unit and, yes, it was full of Discus. In fact, it was a much larger version of the first two. Discus were, literally, everywhere. There were so many, I actually became sick of seeing Discus!

To alleviate the problem I was shown the



Top left, brilliant Turquoise Discus produced by Heinz and Jörg Stendker.

Centre top, a pair of solid Cobalts preparing to breed.

Top right, an adult Solid Cobalt Discus from the Stendker collection.

Above, this is a new strain of Red Hi-fin Solid Turquoise Discus. The fish in the photograph is quite young and has not yet developed its colours fully.

Centre, the Angel breeding house is kept as meticulously clean as the Discus houses.

Centre right, part of one of the Stendker's smaller fish houses.

Far right, a tankful of young new Red Hi-fin Solids — always hungry.

DISCUS

Angel set-up. Yes, Heinz and Jörg also breed Angels and, yes, on the same scale as they breed Discus. Thousands of them, of all varieties: Golds, Marbles, Blacks and, of course, normal Angels. All these, like the Discus, were in various sizes, with their own central filter system, one for breeding parents, the other connected to the rearing tanks for growing on. I also saw that one or two dwarf cichlids were being lined up for the same treatment.

After recovering from a severe case of aquatic shock, I actually began to ask questions instead of wandering round with my mouth open. The answers ranged from what I already knew from my own breeding experiences, to some which I could not have guessed or believed until now.

TURQUOISE TYPES

Heinz and his son firmly believe that there are only three types of Turquoise Discus, the Solid Turquoise known as 'Flaching' or 'Metallic' or 'Solid Cobalt', the Brilliant Turquoise, a striated fish with golden brown and turquoise markings, and the Turquoise Red, again a striated fish with red in place of golden brown for the base colour.

Anything else they feel is a variation on one of these themes. All their fish are high-finned, short-finned ones being discarded as they are regarded to be below standard. They do not cross back with any wild fish, as they see no reason for this. They have the required size, and the colour would suffer, as it has taken them many years to perfect their fish. In fact, this was the only time I had seen so many Turquoise Red Discus which possessed scarlet red in between the turquoise lines. I had seen odd specimens, prized possessions in collections, but never so many in one place. It was also true of the Solid and Brilliant strains.

FEEDING AND FILTRATION

Feeding was another topic discussed at length. The Stendkers use a preparation of ox heart, with added vitamins, plus some crushed pellets, similar to trout pellets, with a small amount of green food, lettuce or similar, added. This, apparently, is a major task, as they use 50 ox hearts in a week. They have to buy them already diced up and then prepare their food mix. No other food is given, as the expense would be phenomenal.

Filtration is carried out by two central systems, one used for the breeding systems, connecting them together, and then fed through large aquariums containing sponge walls. The outlet pipes are also covered with a sponge to prevent young being lost. An Ultra Violet steriliser is connected to this system but not used continually.

The second system is based on the same principle as the first, but on a much larger scale. In the breeding system the water is passed through a de-ioniser to soften it, the pH being taken to neutral and then lowered with peat to pH6 and the hardness being around 1DH.

In the rearing system, the young are raised in standard tapwater, pH7.3, 14DH. The water is the same in Germany no matter the location; it has to be by law. A large water reservoir was also seen containing water for the frequent partial changes necessary with so many fish.

Discussion could have carried on until the next morning, but I was due to return to the UK the next day, and I had some Discus to collect early next morning, which I duly did.

Once my fish were boxed, Heinz and Jörg had another order to complete. A small one they said. It was only 2000 Discus for shipment to one of their many German clients. This was just one of many weekly orders that were fulfilled by this incredible team. Driving back to catch the ferry after saying good-bye, I reflected on my experience. What I had just visited was not a breeding set-up, but a factory, complete with its production lines, not assembling cars or producing cakes, but producing life.

The whole enterprise had been started by one man, Heinz Stendker, 25 years ago. It was he who decided to take up the challenge and move into the fray on a full-time basis. His goal was to produce perfect quality fish, something which he still strives to do. All his fish are culled for faults. No missing gill covers or small eyes. In short, Discus have been his life, as they have been for other great German aquarists. Together with Jörg, Heinz has set a standard in Discus production that is a hard act to follow. In conclusion, this aquatic master may be equalled on isolated occasions, but he will never, in my opinion, be bettered.

aquaria in the UK, both species of *Otocinclus* seemed to irritate their respective *Corydoras* species by sucking onto any available body (the slower the 'host', the better). The afflicted *Corydoras* would jump off the substrate, suggesting that this action wasn't beneficial to both parties.

I have theorised in many mimicry articles that this particular colour pattern sharing might not be accidental (very few, if any, interesting bits of Nature are!) and that some degree of parasitism may have evolved over the years; but this requires field and captive research.

All these smaller loricariids may well quietly go about their business in South American rivers and streams eating greens etc. They do appear to shoal in thousands, sometimes alongside shoals of *Corydoras* and, I suspect, this special development in mucus feeding on other fishes, may be something of a sideline when food is scarce and the going gets tough.

In aquaria, *Otocinclus* have been bred, albeit rather rarely, and adults and fry play havoc with living plants, even when offered lettuce and other green foods. Nonetheless, these small catfishes are excellent algae eaters and can keep the healthy green algae at bay in modest sized community aquaria.

OTHER GENERA

The other fairly well known genus is *Parotocinclus* which groups 14 small species from Venezuela, Guyana and Brazil. They are very similar in appearance to *Otocinclus* but *almost* all known species possess an adipose fin (not considered an absolute and distinguishing 'character' by Dr Garavello) and visually appear to be longer and marginally thinner in the body.

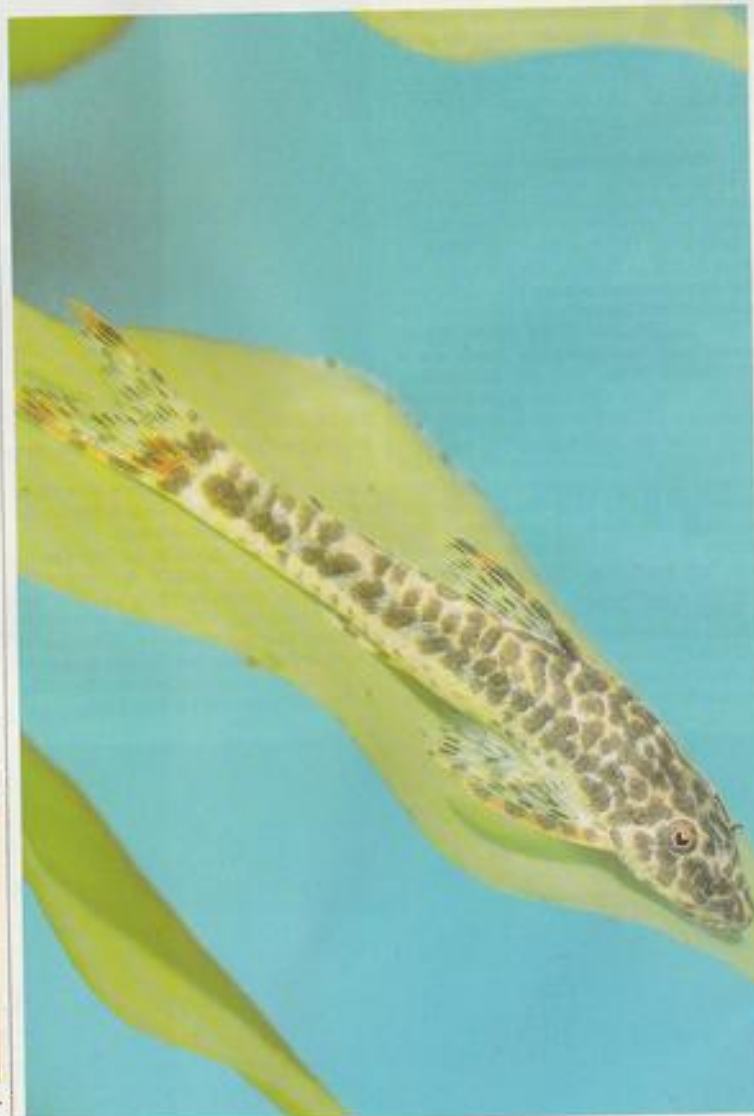
The most commonly imported species from Southern Brazil is *Parotocinclus maculicauda*, a darkly-marked catfish which has been spawned in aquaria. Like *Otocinclus*, they will spawn on the leaves of plants or on the aquarium glass. Raising them in mixed fish communities is most difficult, as other fishes see *Parotocinclus* eggs as food.

The genus *Microlepidogaster* is hardly ever seen by fishkeepers and groups 7 to 8 species, all restricted to the freshwater coastal rivers of Southern Brazil. They are superficially an elongate *Otocinclus*-like species with longer body and a more rounded head.

While in Brazil, Steve and I planned to

***Hypoptopoma* species imported from Paraguay — larger than *Otocinclus* (the laterally placed eyes give a clue to its identity).**

***Pseudotothyris* species are rarely seen in captivity.**



***Parotocinclus maculicauda* is the most widespread species in the genus.**

visit the small island of Sao Sebastian where *Microlepidogaster* had been originally recorded after the turn of the century. Dr Britski and Dr Garavello explained that they, or others, had visited the island ten years or so prior to our visit, and had discovered that, since the use of DDT to eradicate mosquito, most fishes had disappeared. We looked forward to collecting and, but for the tragic loss of my valuables, passport and funds while collecting *Corydoras*, we would have made it to the island. Now, I will never know if the catfish survived.

The three monotypic genera, *Otothyris canaliferus*, *Pseudotocinclus tietensis* (laterally striped), *Schizolecis guntheri* (a small speckled patterned species) are also all from Southern Brazil (collected by the renowned editor of this magazine during his visit to Rio de Janeiro). *(Flatterer! Ed).* All three species within these genera appear delicate on export/import and many fall by the wayside due to poor transport conditions.

The genus *Pseudotothyris* links two comparatively small species from Southern Brazil which are externally miniature *Otocinclus* in appearance, recognised by their dark lateral stripe. I collected one species, *Pseudotothyris obtusa*, described by Dr Julio Garavello, alongside *Corydoras barbatus* and *Corydoras macropterus* in flooded sand creeks of the Rio Itanhaem, although this species was known to science as an *Otocinclus* then.

The genus *Hypoptopoma* groups about 12 species form Peru, Surinam and Brazil, all of which have laterally-placed eyes, a long snout (by comparison with other genera in this subfamily) and are generally larger than *Otocinclus* when adult.

Several species have been imported for aquaria, including *Hypoptopoma inexpectatum*, *H. guentheri*, *H. carinatum* and *H. thoracatum*. All have proved slightly more robust in aquaria than their smaller cousins, and can be recommended for community aquaria.

CLOSING THOUGHTS ON THE SUBFAMILY

Of all the loricariid groups, it is the subfamily Hypoptopomatinae that suggests to me a very natural bringing together of similar genera. They look similar, behave similarly in that they shoal, feed and breed in the same way. In Nature, in swift-moving South American streams, they swarm, insect-like, across river beds in search of food. Stomach contents analysis shows they take in algae and particles of sand. To obtain enough protein they must therefore have to eat a great deal in relation to their small body size.

It is worth noting that all the loricariids are the aquatic equivalent of cattle in the meadow — browsing away at grass/algae all day long. In aquaria they could easily be starved of the necessary green part to their diet. It is, therefore, important to offer them, not only greens and a herbivore flake, but other protein foods, such as pieces of shrimp and earthworm. This range of protein/roughage will make up for a less frequent feeding regime, and will ensure they thrive, rather than simply survive captivity.

With the correct water quality and diet, this group of small catfishes will certainly prove active community fishes. And who knows, with enough kept together, they might even try to raise a family!

***Otocinclus flexilis* hanging onto the front of my aquarium.**

PROJECT 16
(Part 2)

Swedish marine aquarist **Thore Kjellberg** embarks on the second stage of his mammoth aquarium-building project.
(Illustrations by the author)

While the moulded interior of the aquarium was hardening, I had plenty of time to think about technical equipment.

Is it necessary to use technical equipment? The answer is yes, and right from the start you must buy equipment that is suitable, in terms of performance, for the job in hand.

To illustrate this point, let me invite you on a trip round the world to study how water flows. Let's start in the mountains. A fast-flowing stream doesn't contain many nutrients. It is almost sterile because the water hasn't dissolved too many minerals and there are no plants to enrich the water with nutrients.

When the stream gets closer to the sea it becomes wider and flows more slowly, and then it can become so nutrient-rich that a 'jungle' can grow. The organic load makes the water extremely 'dirty'. After the river meets the sea, any nutrients that have not been used drop, as sediments, to the ocean floor. The nutrient content is now greatly reduced.

It is this nutrient-free water that we have to try to imitate in the microcosm we call the marine aquarium.

NUTRIENT-FREE SYSTEM

To create such water quality we have to use an open system; in other words, we have to get rid of almost all the nutrients we add.

Nutrients must be removed as soon as possible from the water. Under no circumstances should they be allowed to accumulate in the water system.

There are two methods that can be used to achieve this:

— large frequent water changes;
— protein skimming and small water changes.

I prefer the protein skimming method, as the water quality values attained are more stable.

Aquarists have to learn how to imitate the sea accurately. Life in the sea is millions of years old, so we must follow Nature's laws and use technical equipment to simulate nature.

In other words, we can use:

— a circulation pump, instead of currents;
— an ioniser, instead of thunderstorms;
— skimming, instead of sedimentation;
— water changing, instead of evaporation and precipitation;
— halogen lamps, instead of sunlight.

This technique has been used in Europe for several years, and I have used it successfully for seven years. I haven't mentioned such equipment as bacterial filtration or charcoal — obviously neither occurs in the sea — but that is irrelevant as long as the equipment creates water quality the same as that in the sea and the maintenance requirement is low. The latter is the reason why I don't use this type of equipment.

CHOICE OF PUMP FOR WATER CIRCULATION

There are lots of pumps on the market nowadays; their turnover varies from 200 to 5000 litres/hour. The reason for water circulation is to assist absorbtion of atmospheric oxygen and to drive off waste gases. As my aquarium is 2.2 metres (over 7·2ft) long and one deep (39in) I need a powerful pump which will circulate all the water, even that at the bottom. My ambition is to find a pump which will produce low pressure and a low flow rate, but as this pump has not yet been invented, I have to make do with what is available.

Despite its profusion of life, the water that bathes coral reefs contains few nutrients.

PHOTO: CHARLES MARSHALL

External Pumps

These are not my first choice. They are not 100% foolproof because of their hoses and valves, and there is, in my view, a risk — however small — that they will leak at some stage.

Despite this, I made a theoretical evaluation of how to use such a pump with a turnover of 100 litres/hour (c 22gal/hr). The pump would be positioned outside the aquarium and be on the pressure side of the system. Seven electromagnetic valves would be fitted to seven outlets, with a cylinder timer operating the valves at intervals. In the end, I didn't build this system because of the high cost, the noise that would be created by the valves, difficulty in finding non-toxic valves, and, above all, the fact that using a single pump is putting all your eggs in one basket.

Submersible (Internal) Pumps

It is difficult to find pumps with adequate performance for a tank as large as mine. In addition, I don't like putting electrical leads into salt water. Also, this type of pump adds heat to the water which may prove disastrous during a hot summer.

Dishwasher & Washing Machine Pumps

The advantages of these are lower price than aquarium pumps, and higher turnover, but they consume four times as much electrical power. Further, the pipework is a little more complicated and the pumps themselves are not designed for use 24 hours a day. So, not even this sort of pump fitted my needs.

Air-cooled Pumps

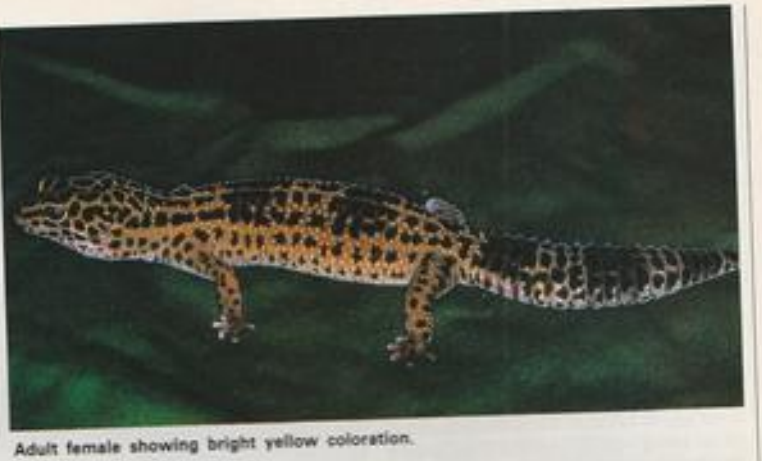
In Sweden, two German pumps of this type are available, Tunze and Fischer. Which should I use? My requirement was that the pump should act as a low-performance circulation pump, moving 1200 litres/hour (c 270 gal/hr) into my home-made 50 litre (11 gal) capacity skimmer, whose water surface is 0·3 metre (c 12in) above that of the aquarium.

To evaluate which was the better pump for my personal needs I used a 60 litre (c 13 gal) tank; the test pump was placed in this tank and the pressure drop simulated by a 0·5 metre (c 1·6ft) long pipe and four 90-degree bends. Tests were performed using two sizes of pipe, 16 and 28mm (0·63 and 1·1in) internal diameter. After a given time, I could calculate the water flow in litres/hour.

Despite a good performance, I didn't choose the Tunze pump because I intended, as mentioned above, to design my own skimmer — more of that later on. I found that the Fischer 3500 pump gave a moderate water flow around the invertebrates so they could move and behave in a natural way. Four such pumps, one in each corner, were eventually used in conjunction with timers to create a sort of internal circulation.

I made two adaptations to my Fischer pumps:

Close-up of a fully adult male.



Adult female showing bright yellow coloration.

LOVABLE LEOPARDS

Val Davies introduces one of her favourite lizards — the desert-living Leopard Gecko.
(Illustrations by the author)

When looking at our collection of herptiles, some enthusiasts are surprised to see that, alongside some of the rarer and more difficult species, a place has been given to *Eublepharus macularius* — the Leopard Gecko. These lizards are not rare; indeed, for the past few years, many have been regularly bred in captivity. So what is their appeal? It is hoped that the following article will explain the attraction which these creatures hold for us.

APPEARANCE

The Leopard Gecko is rather aptly named, according to its pattern and coloration. The background colour on the dorsal surface is usually yellowish and white on the tail. In addition, the head, back and legs are marked with small, dark spots or blotches. The ventral surface is whitish. Instead of having smooth scales, the back is covered with small, evenly spaced tubercles which give it a wart-like or 'knobbly' appearance. Since the surface of the lizard is not shiny, the skin looks like velvet, something that only adds further to its attractiveness. The markings on the tail tend to give a banded effect.

Leopard Geckos differ from some other gecko species in that they do not possess adhesive toe-pads (lamellae) and are therefore unable to climb up very smooth surfaces, such as glass. They do, however, possess claws which enable them to climb rocks and logs. The Leopard is one of the few geckos which possesses eyelids, but, in common with many other geckos, it cleans its eyes with its tongue. Average length for a Leopard Gecko is about 20cm to 25cm (c8-10 in), almost half of this being tail. A well-fed specimen will have quite a plump tail as this is used for fat storage in times of plenty. When handled, some specimens will squeak rather like a mouse.

HOUSING

Very undemanding! The Leopard Gecko is a native of the Middle East and Asia, from Iran to Pakistan and India, inhabiting rocky outcrops in desert regions. This means that a warm, dry vivarium is needed. Such conditions can be provided in two ways — one which is functional, the other more natural and aesthetic. Whichever method is adopted, the vivarium, which can be all-glass or wood with a glass front, should be a minimum of 60 x 30 x 30cm (24 x 12 x 12in) to house a pair, larger for a trio. Leopard Geckos are ground-dwellers, so there is no need for a tall vivarium.

Functional set-up

In a functional set-up, the floor can be covered with newspaper or paper towelling, with pieces of cork bark or clay pots for shelter and a rock for climbing on. The advantage of this is that cleaning is very

A juvenile specimen still exhibiting some of the blue tinges found in youngsters, plus sub-adult patterning.

quick and easy.

If this method is used, a container of damp sand must also be provided for deposition of eggs.

'Natural' set-up

I prefer to house my specimens in a glass-fronted wooden vivarium with ventilation panels. Coarse, gritty sand is used as a substrate, the depth of which ranges from 5cm (2in) to 10cm (4in). A number of large rocks and slate are provided and arranged so that 'caves' are formed for shelter. The rocks need to be of sufficient weight and stability to withstand the excavations of the geckos in their 'caves', otherwise accidents could occur if they are dislodged.

Statice and other dried plants are stapled to the rear and sides of the vivarium to break up the background. For added effect, one or two strands of artificial plants, or a small, dry log, or piece of bogwood, can be placed in the sand, but these will obviously get dislodged.

Another reason for 'decorations' is that it is now thought to be beneficial to reptiles if their view of the limits of the vivarium is not continuously apparent. Rocks, logs, plants etc temporarily disrupt the view, and the lizard does not 'know' at the moment just how small its vivarium is. This idea cannot be tested scientifically, but lizards do seem to benefit.

As with the functional set-up, for egg-laying, a container of moist sand or peat and sand is provided, but in my vivarium it is buried until the top is level with the surface of the substrate. Light and heat are supplied by a thermostatically-controlled spot bulb so that the temperatures range between 24°C (75°F) and 28°C (82°F), although on hot days, without the light on, the temperature has risen much higher without any ill effects. The temperature is allowed to drop to about 20°C (68°F) at night.

UV light does not seem to be vital to this crespuscular (active at dusk) species. But, since my specimens come out to bask during the day, a True-lite fluorescent tube is peovided, as this can only be beneficial in aiding calcium/phosphorus metabolism. A water dish is always available and I have occasionally seen the geckos drink from this. In addition, the Leopards will lap droplets of water when part of the vivarium is lightly sprayed each morning.

Leopard Geckos tend to select one spot in which to defecate. As with most desert animals, the droppings are quite dry, so it is easy to 'spot-clean', which means that the sand does not need to be changed frequently.

DIET

A small earthenware dish with a thin layer of both powdered and lumps of cuttlefish bone and multi-vitamin powder is peovided. Into this, the food items are dipped and stirred slightly so that some of the mixture adheres to them. With most of my specimens, liquid multi-vitamins are administered with a dropper and, allowing a few drops to fall onto the lips, these are lapped up.

This young adult female bears the characteristic leopard markings which are responsible for the common name of the species.

Leopard Geckos will thrive on a diet of crickets, mealworms, locusts, waxmoth larvae, morios and blue-bottles (blow-flies). Gentles are not used as they are seldom if ever digested properly. As with all lizards, a varied diet is necessary. Spiders and centipedes, if available, make an occasional treat.

I feed the Leopards in the early evening when they are most active.

BREEDING

It is possible to keep Leopard Geckos, either in pairs, or in a colony of one male and several females. Since they are highly territorial, two males will fight.

Sexing mature geckos is fairly easy. The male is more heavily built and has a broader head. In addition, the male has a V-shaped row of pre-anal pores and, just behind the vent, two small hemi-penile swellings (see drawing).

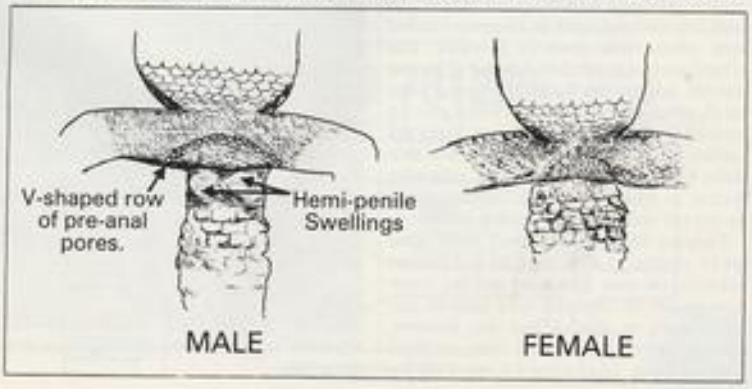
The breeding season usually begins about March and this can be triggered by lowering the temperature from November to January/February by two or three degrees centigrade. In spring, the male will chase the females and may mount from either side. This mating often results in the females sustaining bites on the abdomen and tail, but these soon heal.

Egg-laying

The eggs are laid in pairs about six weeks after mating, with some females producing as many as six pairs in a season. Well-formed eggs are actually visible through the female's skin. Egg-laying usually takes place at night, with the female excavating a hole in the damp sand provided and depositing the eggs, which are then covered. When the eggs are laid, they are sticky, so some of the sand will adhere to them, but this is not detrimental and should be left.

Incubation

The eggs are oval, leathery and about 2cm to 2·5cm (c0·8 — 1in) in length. They should be carefully removed to be incubated in a plastic tub with a transparent lid which has a few fine perforations. The medium can be



Hatching just about to commence.

Hatching underway.

Nearly there!

Newly hatched Leopard Gecko.

sand, a mixture of sand and peat, vermiculite or paper towelling. At no stage must the eggs be turned from the position in which they were laid.

During their incubation, the eggs actually absorb some moisture. If the humidity falls too low, they will dry out and wither. The desired humidity is 80-95%, which is achieved by moistening the incubation medium. However, a daily change of air also seems to be necessary, so every day the lids can be removed for an egg inspection; the moisture content can be increased at this point if needed. Eggs which develop mould must be removed.

Temperature/sex relationship

The incubation temperature can range from 26°C (79°F) to 33°C (91·5°F). Some time ago, it was found that there is a correlation between incubation temperature and the sex of the hatchlings.

Those incubated at 27°-29°C are predominantly females, while those incubated at 32°-33°C are mostly males. Obviously, incubation time is affected by which temperature is used, but ranges from 55 to 60 days.

Hatching

Although laid in pairs, the eggs do not usually hatch at the same time, but within about 30 to 36 hours of each other, the babies taking between 2 to 4 hours to emerge.

Hatchling Leopards differ somewhat from the adults in their markings, being banded with yellow and black/mauve bars. Some have faint bluish or pink tinges to them. When they are about one week old, the tubercles begin to grow. As they mature, the bar pattern changes to the spots or blotches of the adults.

For the first two or three days, the young Leopards live off the remainder of the yolk and then accept small insect fare. To avoid accidents, such as tail tips being bitten off at feeding time (tails will re-grow), for the first few weeks, I keep the young geckos in separate, small containers with air vents and use paper towelling as a substrate.

They are also kept slightly damper than the adults. This enables me to check growth, that they are able to slough old skin properly, and that all specimens are feeding well. A further advantage is that all the Leopards are handled frequently and are soon very tame. Leopard Geckos mature at 2 to 3 years of age.

CONCLUSION

Hopefully, the appeal of the Leopard Gecko has now become apparent. To sum up, it is an attractive, undemanding lizard and, provided one obtains healthy stock from a reputable source, there should be no problem in keeping and breeding this species.

With regular handling, Leopards become exceedingly tame and, if properly cared for, may well live in excess of twenty years. They are, obviously, an excellent vivarium subject for anyone, particularly those taking their first steps in reptile-keeping.

THE AQUARIUM MARINES REVIEW

(Part 2 — Crustaceans: Crabs, Lobsters and Friends)

Andy Horton discusses the group of animals known as the Crustacea, which include the familiar crabs, lobsters, prawns, and a host of smaller creatures, including Copepods and the well-known Brine Shrimp, *Artemia*.

ANDY HORTON

The Spiny Spider Club *(Maja squinado)* is frequently seen in Sea Life Centres. Its natural habitat is offshore, with a widespread distribution off all British Coasts.

Of the million plus species of animals living on this planet, a full two-thirds are members of the Phylum of creatures known as Arthropoda (joint-limbed animals). The three major groups (sub-phyla) of this animal division are the Uniramia — a very numerous terrestrial group including the insects, the chelicerata — including spiders (Arachnida), and the Crustacea — sometimes known as the insects of the sea, because of their tremendous abundance. In fact, they are so numerous that 90% of the zooplankton swarms consist of crustaceans, which therefore form the most numerous group of animals on earth.

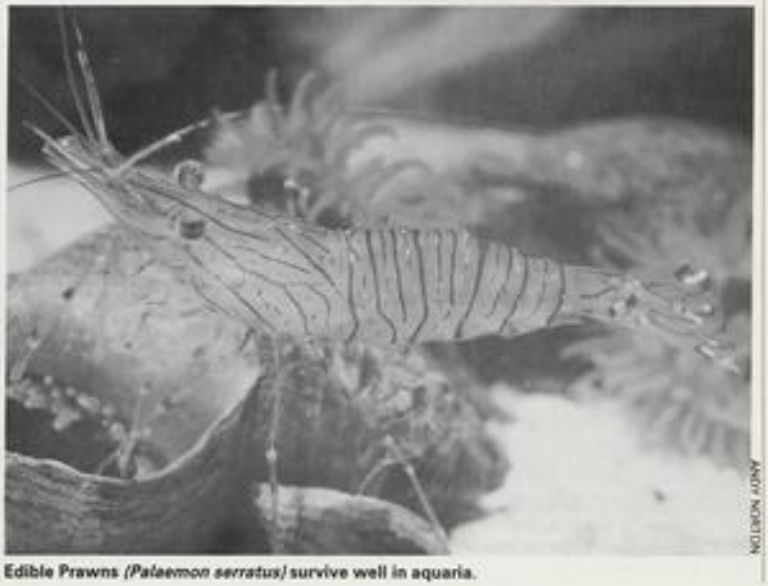
MORPHOLOGY

All Arthropods are distinguished by the presence of a protective exoskeleton. This hard external shell (which does not grow) is clearly observed on crabs. Because of its inability to grow, it is necessary for the crustacean to shed its casing periodically. This process is called 'moulting' and involves several stages, of which the most important is the 'ecdysis' stage when the crustacean leaves the old skeleton. At this time, the shell is soft and the animal vulnerable to attack. Crabs will therefore try to find a refuge, buried in sand under a rock, until they are able to absorb sufficient minerals, including salts of calcium, to harden the carapace.

Arthropods are animals with jointed legs which will break if forced, rather than bend. If a crab is engaged in a fight with a rival of its own species, or manages to trap a leg or a claw under a rock, the leg will break off at the joint in a process called 'autotomy'. The claw will grow again at the next moult, but it will be smaller than previously.

THE DECAPODS

It is the large Decapods (ten-legged) crustaceans that are of most interest to the aquarist and general naturalist. The ten legs include the two major claws (or chelae) that are characteristic weapons of offence and defence. In most species they play an important function in tearing up and extracting



ANDY HORTON

Edible Prawns *(Palaemon serratus)* survive well in aquaria.

JOHN DAVIES

An American Blue Crab *(Callinectes sapidus)* — an attractive, but destructive species when it comes to home aquaria.

CORAL WORLD/EXAT

Clam-eating Lobsters *(Scyllarides tridacnofoides)* — interesting, but totally unsuitable for aquaria.

prey. They are also important in courtship and other behavioural functions that make the crabs and their ilk such fascinating creatures.

Crustaceans are to be found in all the oceans of the world, although crabs are noticeably absent from Antarctica, where their normal ecological niche is filled by giant Isopod crustaceans that belong to the same order of animals as the Woodlouse.

Crusty monsters

The large armour exoskeleton (external skeleton) carried round by all Arthropods restricts the size to which they can grow. Nevertheless, Crustacea can grow quite large, certainly larger than insects, because of the buoyancy of seawater.

MAX GRIS – GOLDFISH BOWL, OXFORD

The Painted or Cleaner Shrimp *(Lysmata amboinensis)* is quite hardy, industrious . . . and readily available.

The largest species of Crustacean recorded is the Japanese Spider Crab, *Macrocheira kaempferi*, a specimen of which weighed over 90kg (40lb). This crab has long legs with a span of over 4metres (c13.1ft) and a relatively small carapace. The American Lobster, *Homarus americanus*, of heavier weights has been reported. It is found in the western North Atlantic. On the British side, the European lobster, *Homarus gammarus*, has the potential to grow to be the largest crustacean.

From deep water, the largest crab that ventures into British seas on rare occasions is the Box Crab, *Paromola cuvieri*, with a carapace length of 21cm (c8.3in). This species has very long legs, so it will appear substantially larger than the biggest lobster.

Measurement of the length of the carapace is taken from between the eyes, across the shell to where the rear legs adjoin. Many crabs, including the Shore Crab *Carcinus maenas*, the ubiquitous species on British

TAXONS (GROUPS) OF CRUSTACEA

(Simplified chart to include only the major orders which are of direct interest to aquarists)

CLASS		ORDER
1 Branchiopoda	Cladocera —	Waterfleas, *Daphnia*
	Anostraca —	Fairy Shrimps, including *Artemia*
2 Branchiura —	Parasitic louse eg *Argulus*	
3 Cirripedia —	barnacles	
4 Ostracoda —	Small Mussel Shrimps	
5 Copepoda —	planktonts	
6 Malacostraca	Stomatopoda —	Mantis Shrimps
	Mysidacea —	Opossum (Mysid) Shrimps
	Cumacea —	Small sand-dwellers
	Isopoda —	Woodlouse types
	Amphipoda —	Small flattened types
	Euphausiacea —	Krill
	Decapoda —	Prawns, crabs, lobsters etc

Notes

① The sessile barnacles (Cirripedia) are, at first impression, an unlikely form of crustacean. However, examination of the planktonic larval stage clearly shows resemblances with other crustaceans, with Acorn Barnacles undergoing five moults before the survivors settle on an intertidal rock or the bottom of a boat. Other barnacles are parasitic on crabs.

② The abundant Copepods are an important food for the larger fish and other animals of the sea. They range in size from 1 to 7 mm. A few of the 3,500 plus species are parasites of fish.

③ Krill (Euphausiacea) are well known as abundant in the polar oceans and because they are the prey of the large 'baleen' whales.

shores, and the crab commonly seen on the fishmonger's slab, the Edible Crab, *Cancer pagurus*, are almost twice as wide as they are long, as measured conventionally. In the United States, the Blue Crab, *Callinectes sapidus*, is the most important commercial species of crab for human consumption.

AQUARIUM SPECIES

Crustaceans on sale at aquarium retailers have been selected because of their attractive colours and suitability for marine aquaria. Watch out, though, the larger crabs can wreak havoc!

Colourful shrimps and prawns are found in the tropics. The Banded Shrimp, *Stenopus hispidus* is striking in red and white bands, as is the Cleaner Shrimp, *Lysmata amboinensis*, with a white stripe down its red body. Both these species are imported from the Indo-Pacific regions, and are found in the seas around the Great Barrier Reef.

Prawns are omnivorous, eating almost everything, including flake foods. They are easy to keep. Predation by larger fish, or some of the sea anemones at the ecdysis moult stage, is the greatest danger. Some aquarium retailers will sell British species of prawns of the *Palaemon (= Leander)* genus as live food for tropical marines.

Hermit Crabs have acquired a reputation for being grossly destructive. They are generally omnivorous feeders, with a clumsy-looking mode of locomotion as they clamber over the rocks, in their adopted Gastropod shell, smashing weaker creatures, delicate worms and hydroids. Studies with the common British species, *Pagurus bernhardus*, and the offshore species, *Pagurus prideauxi*, indicate that they are not as easy to keep as it is often maintained. Their average lifespan of less than 7 months means that they are actually one of the least successful of the British species. They are also the most popular: 93% of British sea life aquarists have kept Hermit Crabs.

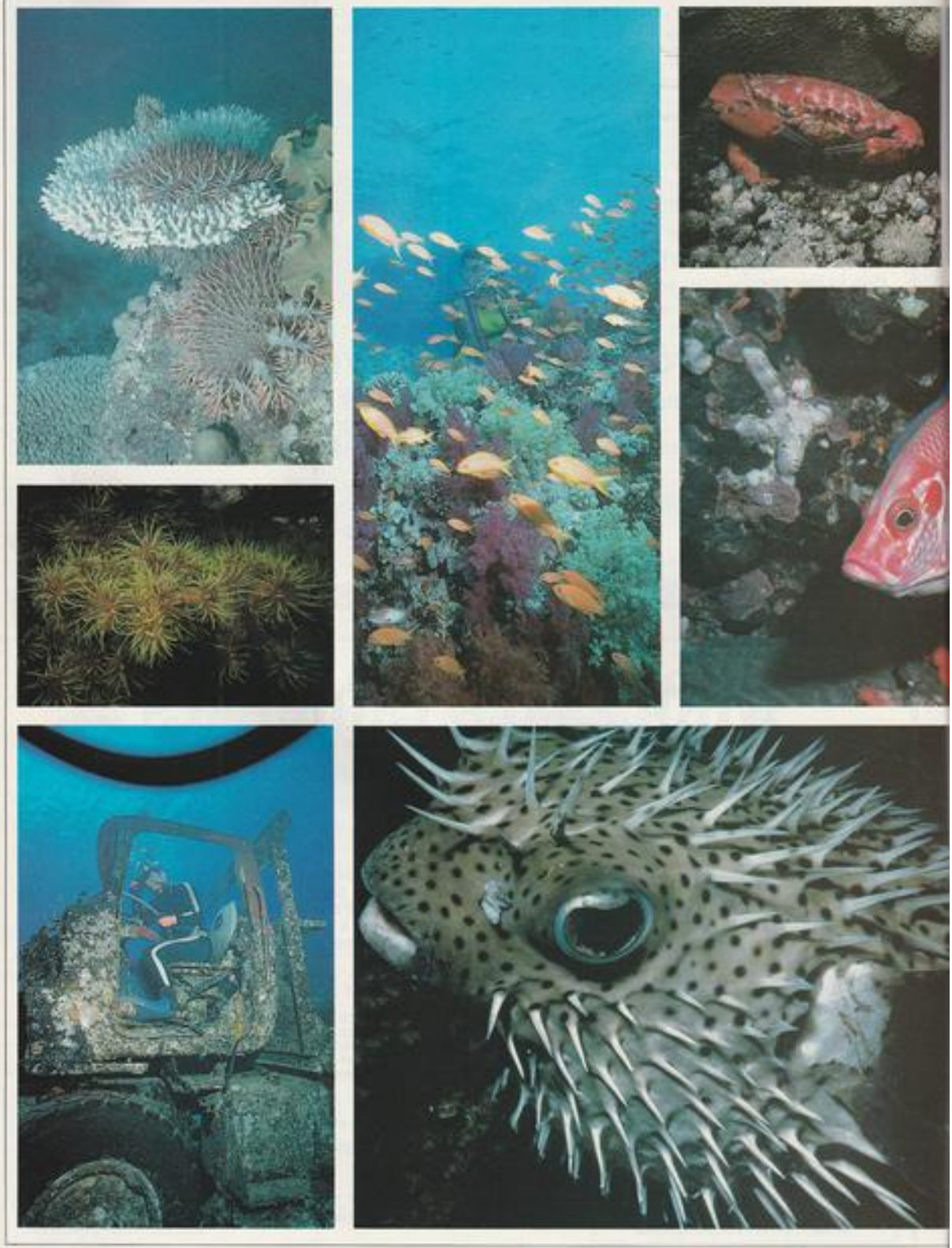
ANDY HORTON

At first sight, Common Acorn Barnacles *(Balanus balanoides)* don't look like crustaceans at all.

FOOTNOTE

In the second article on Crustacea, Andy Horton will explain the growth cycle of these creatures, using crabs as an example. He will also discuss various aspects of keeping crustaceans in captivity.

References: For a full list, please write to **Andy Horton,** British Marine Life Study Society, specifying your interest.
Definitive reference: *Invertebrate Zoology* by Robert D Barnes — 5th edition **(CBS College 1987).**



SUDAN

SUDANESE RED SEA EXPEDITION

Diver, author, photographer and adventurer, **Jack Jackson,** reveals some of the magic of the Sudanese coral reef and its inhabitants.
(Photographs by the author)

Top left (facing page), the notorious Crown of Thorns Starfish *(Acanthaster planci)* feeding on coral.

Middle left (facing page), Coral polyps *(Tubastrea micrantha)* feeding at night.

Top centre (facing page), luxuriant coral growths, gorgeous *Anthias* shoals and sparkling clear water are characteristic of large tracks of the Sudanese coast.

Top right (facing page), Sudanese Red Crab *(Etisus splendidus)* sheltering in a rock crevice.

Top, Grey Reef Sharks *(Carcharhinus amblyrhynchos)* — just one of numerous species of shark found in the Sudanese Red Sea.

Above, Soldierfish *(Holocentrus spinifer)* photographed at Sanganeb.

Far left, Alf Rock 'driving' one of the trucks on the Blue Belt wreck, locally known as the Toyota Wreck.

Left, night shot of a Porcupine Puffer *(Diodon hystrix)*

As I entered the water, several large groupers scurried to the safety of their holes. Circled by a large shoal of barracudas, I descended to the sand, swam warily around Titan Triggerfishes defending their nests and on to the point. Here, there were larger shoals of fishes, two Hammerhead Sharks and several Grey Reef Sharks. There was also a strong current, so I returned early.

Back at the coral wall, I ascended slowly and finished my dive among the colourful reef fishes and corals, with a safety stop at five metres. The sun went out as a Manta Ray flew overhead. Two Reef Stingrays rippled by, a moray eel bared its teeth, surgeonfishes guarded their territory and clownfishes their anemone. Parrotfishes fed noisily on the coral, Pennantfishes were congregating; various angelfishes and butterflyfishes, Slingjaw and Rainbow Wrasses were browsing. Shoals of Unicornfishes, Fusiliers and Black Surgeonfishes dashed around. Soldierfishes, squirrelfishes and lionfishes hung motionless, hundreds of sweetlips and cardinalfishes filled the caves, while the shallow coral was covered in *Chromis* and *Anthias* species.

This is the Sudanese Red Sea, where the action peaks in May and June when the fishes are shoaling. In the Red Sea, the offshore reefs of central Sudan have the greatest fish density, species diversity and water clarity. The marine life is prolific and larger fish abound where there are points and currents. The best diving is north of Port Sudan. There are thousands of shallow water dive sites there, but the best visibility is over deep water, beside steep walls.

WRECK DIVES

We flew to Port Sudan via Cairo and boarded the motor yacht Felicidad — our base for the expedition.

As any fisherman will confirm, shipwrecks are a haven for marine life, so our first dive was on the Umbria. Only 40 minutes from Port Sudan, this Italian 10,076 ton cargo ship, scuttled in June 1940, now lying in 28 metres (92 ft) of water, with its davits breaking the surface, is one of the world's finest wrecks. We were soon absorbed with fish feeding and photography.

Despite many nasty chemicals leaching out of holds full of munitions and battery packs, the Umbria is teeming with healthy marine life. There were several large groupers, Bumphead Parrotfishes and Blackspotted Puffers. Most of the Red Sea coral reef fishes were evident but the triggerfish family, Yellowtail Surgeonfishes, Royal, Yellowbar and Emperor Angelfishes, Orangeface Butterflyfishes and Sergeant Majors, were particularly abundant. Three batfishes and a Hawksbill Turtle passed by, while dolphins circled on the edge of visibility.

Being in the shelter of Wingate reefs, we were able to stay overnight on the Umbria, night diving before dinner.

SANGANEB

Next morning we set off early for Sanganeb, trolling en route for barracuda and tuna as shark bait.

Sanganeb is a large atoll 17 miles (c 27km) north east of Port Sudan, famous for a profusion of marine life. The mile long south wall is sheltered from the prevailing north winds and drops vertically to 70 metres (230 ft) before shelving off. An excellent dive at any point, it is also one of the world's best night dives, with Spanish Dancers (nudibranchs — see Max Gibbs' excellent feature in the March '91 issue of *A & P*) guaranteed.

The south west point has a sandy platform at 26 metres (c 85 ft), above which large schools of barracudas and shirwis shoal. Grey Reef and Hammerhead Sharks cruise the edge of this platform, with Silky, Silvertip, Tiger and Whitetip Reef Sharks occasionally seen.

The east wall, some 5 miles (8 km) long, drops vertically to 90 metres (295 ft). There are two wrecks along it, but it is difficult to anchor, so we treated it as a drift dive.

The north point drops off in steps, a clean and healthy reef table at 5 metres (c 16.5 ft), a sandy platform at 20 metres (c 65.5 ft) and a further sandy platform at 50/60 metres (c164 — 197 ft), with large schools of fishes, Hammerhead Sharks and sleeping Grey Reef Sharks. There are two wrecks, but both are below 70 metres (230 ft).

Once anchored on Sanganeb's south west point, I gathered the bait and swam down to a coral head at 26 metres (c 58 ft). Fending off

two sharks who were nudging at my ankles, I set up the bait and cameras. The next 25 minutes were high speed action. Two dozen Grey Reef Sharks and three Silvertip Sharks vied for the bait, before a Silky Shark appeared and snatched it. Two Hammerhead Sharks cruised the reef edge, aloof to our presence.

Back on board we meticulously prepared underwater cameras and videos for the afternoon dive.

Early afternoon saw us diving the south east corner, with its brightly coloured soft corals, reef fishes and nudibranchs. This wall dropped down to 70 metres (230 ft), but decompression tables dictated that we remain shallow. Diversions included a stonefish, a Torpedo Ray, a turtle, a Manta Ray and a shoal of Bumphead Parrotfishes.

Most of us were back in the water after dark, photographing Spanish Dancers, crabs and crawfish.

SHA'AB RUMI

After several days at Sanganeb we dived the spectacular north point. Then, satiated by the sight of a shoal of Hammerhead Sharks and another Manta Ray, we sailed 14 miles (22.5 km) north to the atoll of Sha'ab Rumi, lunching, compressing and being entertained by dolphins and Pilot Whales en route.

Anchoring in Sha'ab Rumi lagoon, we took the inflatables back through the entrance, to dive the site of Cousteau's Conshelf II, underwater living experiments of 1963. The Habitats were removed, but the submersible's garage and some fish pens remain on the sand at 9 metres (29.5 ft).

On our return, we marked the lagoon entrance with a flashing light, so that we could find it easily after dark in the inflatables for a night dive.

The south point of Sha'ab Rumi was similar to the south west point of Sanganeb. It had even larger numbers of shoaling fishes, but there were strong currents. Many sharks cruised off the sandy platform.

We spent most of our expedition at Sha'ab Rumi, highlighted by feeding sharks every morning. On one such dive, 32 sharks were counted.

Then we headed north again for the wreck of the Blue belt at Sha'ab Suadi locally called the Toyota Wreck, because of its deck cargo of trucks and cars). After this, with our expedition drawing to a close, we cruised back for two final dives on the Umbria, before heading home.

STATE OF THE SUDANESE RED SEA

The Egyptian and Saudi Arabian Red Sea have suffered pollution from industrial discharge, oil rigs, oil terminals, blasting for construction and the widening of the Suez Canal, with a concomitant increase in shipping and bunkering at sea. In contrast, the Sudanese Red Sea lacks industry or large settlements outside Port Sudan. From an ecological perspective, the Sudanese civil war and a fall-out with western governments over civil rights issues, has had the advantage of delaying the construction of a new oil terminal and the expansion of the old port of Suakin.

Some water pollution has occurred, producing a slight deterioration in water clarity and an increase in the amount of dead coral. No local causes are obvious. There was a short period of experimental deep dredging for manganese nodules, which pumped the silt back onto the surface, and several shipwrecks are discharging fuel oil, but it seems likely that most problems come down from the north with the prevailing currents.

The area is replete with reefs, many of them poorly marked or uncharted, some of which protrude a metre above water and

SUDANESE RED SEA FISH AND OTHER CREATURES

1 LARGER FISH
Some of the more famous larger fish of the outer reefs include:
SHARKS (Carcharhinidae) — Grey, Whitetip, Blacktip, Silky, Silvertip, Tiger and Hammerhead (Sphyrnidae).
BARRACUDA (Sphyraenidae).
GIANT WRASSE *(Cheilinus undulatus* — also called Napoleon or Humphead Wrasse).
GROUPERS (Serranidae).
EAGLE RAYS (Aetobatidae).
MARLIN and **SAILFISH** (Istiophoridae).
MILKFISH *(Chanos chanos).*
SWORDFISH (Xiphiidae).
TUNA (Thunnidae).
Shoals of more than a thousand barracudas and more than forty Hammerhead Sharks, are common.

2 SMALLER FISH
Smaller reef fishes are too numerous to list, but among the commonest, are:
ANGELFISHES (Pomacanthidae) — Royal, Emperor, Pennant, and Yellowbar.
ANTHIAS *(Anthias* sp.)
BATFISHES (Ephippidae).
BLENNIES (Blenniidae).
BUTTERFLYFISHES (Chaetodontidae) — Threadfin, Striped, Lined, Paleface, Masked, Chevron and Orangeface.
CARDINALFISHES (Apogonidae).
CHROMIS *(Chromis* sp).
CLOWNFISH *(Amphiprion bicinctus* — Two-bar Anemonefish).
CROCODILEFISH (Platycephalidae).
DAMSELFISHES (Pomacentridae).
EMPERORS (Lethrinidae — Bigeye, Blackspot, and Yellowlip).
FILEFISHES (Monacanthidae).
FLASHLIGHT FISH *(Photoblepharon palpebratus).*
FUSILIERS (Caesionidae).
GARFISHES (Hemiramphidae — Halfbeaks).
GRUNTS (Haemulidae — Gatereninae — Sweetlips).
GOATFISHES (Mullidae).
GROUPERS (Serranidae — Peacock, Redmouth, Lunartail, Marbled, and Coral).
GOBIES (Gobiidae).
HAWKFISHES (Cirrhitidae).
JACKS and **TREVALLIES** (Carangidae).
LIONFISHES *(Pterois* sp. — Turkeyfishes).
LIZARDFISHES (Synodontidae).
PARROTFISHES (Scaridae — including Bumphead).
PENNANTFISHES *(Heniochus* sp.).
PIPEFISHES (Syngnathidae).
PORCUPINEFISHES (Diodontidae).
PUFFERS (Tetraodontidae — Masked, Bristly, Blackspot, and Porcupine).
RABBITFISHES (Siganidae).
REMORA *(Echeneis naucrates* Linnaeus — shark suckers).
SARDINES (Clupeidae).
SCORPIONFISHES (Scorpaenidae).
SERGEANTS *(Abudefduf* sp.).
SNAPPERS (Lutjanidae — Onespot, Dory, Bluestripe, Humpback, and Twinspot).
SOLDIERFISHES (Myripistinae).
SOLES (Soleidae).
SQUIRRELFISHES (Holocentridae).
STONEFISH *(Synanceia verrucosa).*
SURGEONFISHES (Acanthuridae — Sailfin, Yellowtail, Bristletooth, Black, Brown and Sohal).
TRIGGERFISHES (Balistidae — Orangestriped, Bluethroat, Picasso, Blue, Yellowmargin and Titan).
TRUNKFISHES (Ostraciidae — Boxfishes).
UNICORNFISHES *(Naso* sp — Orangespine, Bluespin, and Spotted).
WRASSES (Labridae — Slingjaw, Clown Coris, Rainbow, Checkerboard, Cleaner and Bird).

3 OTHER SPECIES
Also commonly found are:
HAWKSBILL TURTLES *(Eretmochelys imbricata).*
ELECTRIC RAYS (Torpedinidae — *Torpedo sinusperci).*
MORAYS (Muraenidae).
STINGRAYS (Dasyatididae — *Taeniura lymma).*

Less common are Manta Rays (*Manta birostris*), which can gather in large numbers off Sanganeb and Wingate reefs in December, and a variety of sea mammals. These include Shortfin Pilot Whales (*Globicephala macrorhynchus*), which occur in large migrating schools in September. Bottlenose Dolphins (*Tursiops truncatus*), which can be found in small schools of six to eight at Sanganeb, Sha'ab Rumi, and occasionally Wingate reefs, as well as Dugongs (*Dugong dugong*), which have been seen off Mohammad Qol. There are also large schools of Common Dolphins (*Delphinus delphis*), off the south ends of Sanganeb and Sha'ab Rumi reefs; these shelter inside the lagoons in rough weather.

thereby constitute islands, providing havens for smugglers as well as nesting birds and turtles.

Port Sudan harbour is an example of nature surviving, despite man. The Red Sea is very narrow east to west, so there is no appreciable tide. Covered with oil, the harbour is only cleaned in times of south winds in August, or occasional rains in October. Despite this, it is full of immature angelfishes and butterflyfishes, sardines, damselfishes and Sergeant Majors. I have also seen groupers, barracudas, Spiny Lobsters and a small Manta Ray. Tiger Sharks and Common Dolphins frequent the harbour entrance.

South of Suakin, the nearby Ethiopian highlands produce cooler, wetter weather, with poor water clarity; there are even whales here. North of Suakin are the exceptionally clear waters most frequently visited by divers and researchers.

The inner fringing reefs sustain immature pelagic species and those that feed in shallow sandy waters or on sea grasses, including Sand Sharks, Crocodilefishes, soles and, occasionally, Dugongs (Sea Cows). The outer reefs, in deep water, with strong currents carrying more food support a greater variety of larger species. (Refer to Table).

Beside corals and fishes there are nudibranchs, flatworms, Spiny Lobsters (crawfishes), prawns, sea cucumbers, crabs, clams, sponges and starfishes. The Crown of Thorns Starfishes, which eat and kill coral, are increasing in number, but not drastically.

Shellfishes are conspicuously low in number. The reasons are not clear, though some are constantly collected by specialist fishermen for button manufacture and, to a lesser extent, for Dufra perfume, but this does not account for the small numbers of other shellfishes. Oyster and pearl cultures conducted by the British ODA at Dungunab Bay near to Mohammad Qol, has now ceased.

Little commercial fishing occurred in the area before the mid 80's. British ODA ran a small programme, but its success was limited; Sudanese fishermen realised that catching more fish lowered the selling price and they reacted accordingly! Furthermore, when two shrimp boats were brought in from Bahrain, the success of the large catches of excellent king prawns was counteracted by their gross wastage. Locals refused to eat them, "because they look like cockroaches" and international hotels in Khartoum could utilise only a fraction of the catches. Neither refrigeration nor suitable packaging facilities were available.

Similar, more recent, attempts by Italian and Norwegian trawlers failed owing to complications with the Customs' authorities. Only Egyptian fishing boats which heavily fished the area (and, illegally, the area around Sanganeb — a designated marine park) benefitted, but this fishing has now ceased.

FURTHER READING

Red Sea Reef Fishes by Dr John Randall
Red Sea Invertebrates by Dr Peter Vine — both published by **Immel.**

VIDEO NEWS

A music video entitled **Reefs of the World,** produced by ASPC Petvision, is available by post from **Aquarist & Pondkeeper, 9 Tufton Street, Ashford, Kent, TN23 1QN. Tel: 0233 621877; Fax. 0233 645669.** Access and Visa cards accepted. Please quote your card number and expiry date. The cost of each video is **£17.99,** including postage and packing. Allow 28 days for delivery.

Seaview

By Gordon Kay

SEXUAL UPDATE

I shall begin this month with a little more about the sexual assault made on Freddy, the Bottle-nosed Dolphin who lives in the bay at Amble in Northumberland.

Would you believe that the man being charged with the offence is a thirty-nine-year-old member of Zoocheck?! I couldn't get my breath when I read it but, apparently, it's true. Zoocheck need that sort of publicity like they need a hole in the head!

I'll be going to visit Freddy myself sometime, so I'll be able to tell you if the attack has had any effect on him.

'FRESHWATER' DOLPHINS

Still on the subject of dolphins, I had a letter from **Mr D S Gilliam,** who is Water Garden Manager of Medina World on the Isle of Wight. Mr Gilliam says, "Dolphins are naturally creatures of the saline oceans, yet, in captivity, are kept in fresh water. Do they naturally inhabit freshwater systems, or is this, in itself, another difficulty to be borne by captive dolphins".

Good one, Mr Gilliam. So good, in fact, that I shall not answer it. To add a little spice to **Seaview,** I am going to hold a little competition. There is a nitrite test kit for the first letter I receive which correctly tells me whether or not living in freshwater is stressful or harmful to dolphins. Remember though — we are not talking about those which live in freshwater in the wild!

HUMANE DISPOSAL

One of the many questions I get asked when I'm giving talks is how, successfully, yet humanely, to put a sick fish out of its misery.

There are several ways to do it. One is to put it in a container of tank water and stick it in the fridge. This will lower its metabolism to such an extent that it will just die in its sleep.

Another way is to put it in a solution made of a quarter of a cup of baking soda mixed well into a litre of water. The excess carbon dioxide produced in the solution will knock the fish out, while the lack of oxygen will quickly kill it.

The best way, however, will always be to just knock it on the head, just behind the eyes, with something reasonably heavy. It's quick, clean and the poor thing will know absolutely nothing about it. Just one thing, though. A bloody great lump hammer does not — in this instance — constitute something "reasonably heavy"!

GREAT BARRIER SNIPPETS

1. Australia's Great Barrier Reef, whose waters were first charted by Captain Cook in 1770, and which has been called the eighth wonder of the world, is home to around fifteen hundred species of fish. Spearfishing with scuba gear is totally prohibited, yet sport fishing accounts for more fish than does commercial fishing, according to Dr Don Kinsey of the Great Barrier Reef Marine Park Authority.

2. Tourism on the Great Barrier Reef has never been heavier, and yet the Marine Park Authority has only twenty-four rangers to monitor the effects on reef life and water quality throughout its whole length.

3. There are three hundred and thirty species of reef-building coral on the aforementioned reef, but Staghorn Coral is the most common, accounting for some 80% of all coral in the area.

4. The G.B.R. is home to a great number of beautiful and colourful clams. The shell of the Giant Clam (*Tridacna gigantus*) can measure up to a metre in length and can weigh up to two hundred kilos.

5. Seaperch, Snappers and Bass do not often noticeably change colour as they grow, but there are two exceptions living on the Great Barrier Reef. One is the Red Emperor, which is generally reddish-pink all over, but bright red and white as a juvenile.

   The other is the Black and White Sea Perch (*Macolor niger*). The juvenile is smartly dressed in black and white, which is replaced in the adult by a speckled grey and white pattern. This becomes almost sooty grey when the fish becomes either afraid or angry.

6. A common sight over the Great Barrier Reef is the Lemon-peel Angel (*Centropyge flavissimus*). False eyes are common among juvenile fishes (and, of course, butterflyfishes) as a form of defence. The reason for this is supposed to be to direct a predator's attack towards the fish's rear end, where it thinks the head is, thus allowing the fish to make a getaway, with probably no more than just a few torn tail filaments.

   However, the juvenile Lemon-peel sports its false eye in the middle of its body. So far, there is no satisfactory explanation for this paradox.

7. Five of the 'big' angelfish species live on the Great Barrier Reef, all of which have juveniles of similar colour and pattern. The adult colour patterns, however, are not only different from the juveniles, but are also very different from each other. Quite surprisingly, two of the five species are of a different genus to the others (*Pomacanthus imperator* and *P. semicirculatus* and *Euxiphipops sexstriatus, E. xanthometapon* and *E. navarchus*).

   There can be two explanations for this — either their taxonomy is incorrect and they all share a common ancestor and are closely related, or they have evolved to look alike and have 'found' that there is an advantage in such a colour pattern for the juveniles, though what this could be is unclear.

8. As well as the groups of islands and cays produced by coral growth along the whole length of the Great Barrier Reef, there are also continental islands which have their own fringing reefs. Corals will colonise any suitable hard substance, providing that conditions are right for them, and these islands dotted along the continental shelf are ideal.

   Nearer to the mainland than the outer reefs and cays, these islands can be affected by sedimentation and freshwater run-off from the mainland in the rainy season, something that has a tendency to inhibit coral growth to a greater or lesser degree.

MAX GIBBS — THE GOLDFISH BOWL, OXFORD

***Euxiphipops xanthometapon*, the Blue Faced Angel. Its adult colours differ significantly from those of other 'Great Barrier' Angels. The juveniles are something else, though!**

AND FINALLY . . .

And finally, don't forget my little competition. The first to send me the correct answer wins a nitrite test kit. I hope nobody gets it — I've got to buy the damn thing myself.

Anyway, I'll be with you again next month.

I AM A FRIEND OF THE EARTH . . . AREN'T I?

(PART 5)

Dave Keeley, of Underworld, concludes his far-ranging personal debate on the aquatic trade and hobby. *(This series has been based on a paper, presented by the author at the British Marine Aquarists' Association autumn 1990 seminar)*

In Part 4, I ended up by referring to three responsibilities which, I feel, hobbyists should take on, namely:

① Education;
② Monitoring;
③ Breeding.

I would like to elaborate on these and formulate some closing thoughts on the series.

EDUCATION

I would like to suggest five rules for hobbyists to follow:

① Never buy a fish without prior knowledge of its habits and requirements, however appealing it is, whatever the price.
② Never buy fish that have not been in the country for at least two weeks, whatever the price.
③ Never buy fish with the slightest mark, spot, deformity, sunken belly or suspect manner, whatever the price.
④ Never buy a fish until you are sure that it is feeding.
⑤ Every time you buy a fish, ask yourself the question: is there a good chance it will survive in my tank for at least 6 months? If the answer is no, back off.

Let me expand a bit on each point in turn.

① Never buy a fish without prior knowledge of its habits and requirements, however appealing, whatever the price.

There are sure to be occasions when you see fish which you do not recognise, or see a fish which is so rare that you have never seen one before, and you *know* that you *must* have it.

But step back a minute and ask yourself why the fish is so rare. Research it thoroughly before buying it. Remember, however rare the species, if it's dead, it is worth less than a Guppy!

② Never buy fish that have not been in the country for at least two weeks, whatever the price.

I think that the phrase 'whatever the price' is the most relevant. Amazingly, there are still a few shops who sell fish direct to their customers from the transportation bag. Anybody who subscribes to this practice, whether buyer or seller, is irresponsible and down right stupid. There are also shops which do not yet have quarantine facilities or procedures.

If you see a fish that you want, but which has only been in the country for a short period, and you do not want to take the risk of somebody else buying it, put a deposit on it. If the fish is healthy when you return for it a few days later, you are under an obligation to buy it, or forfeit your deposit. If the fish dies or is clearly unwell, then you should get your money back.

Many of the procedural trade practices as outlined in this series will either be enshrined in law, or will form part of a voluntary code of practice, at least as far as the EEC is concerned. I am currently on the committee of Ornamental Fish Industry (UK), which has been invited by the Ministry of Agriculture to draw up proposals for a workable scheme for the trade. Whereas the law would obviously be totally out of place in this instance, some sort of voluntary code of practice for hobbyists would be far more appropriate.

And that is why this section is labelled 'education.' If the code of practice, in whatever form it took, was only adhered to by members of, say, the BMAA, then its effect would be negligible. Somehow, and again I am perhaps living in cloud cuckoo land here, ALL marine keepers have got to be educated into applying self discipline, and into buying sensibly and for the longterm. If everybody can be persuaded to follow the five rules being discussed, or similar, not only would fish mortalities directly diminish as a direct result, but also any undesirable retailers that might exist, would be unable to do so. Such people have either to change their ways dramatically or their occupation. In either case, marine life would be the winner.

③ Never buy fish with the slightest mark, spot, deformity, sunken belly or suspect manner, whatever the price.

This one is so obvious, that I am embarassed to mention it. But if I have to repeat it until I am blue in the face, you must not support anybody who sells suspect stock.

④ Never buy a fish until you are sure that it is feeding.

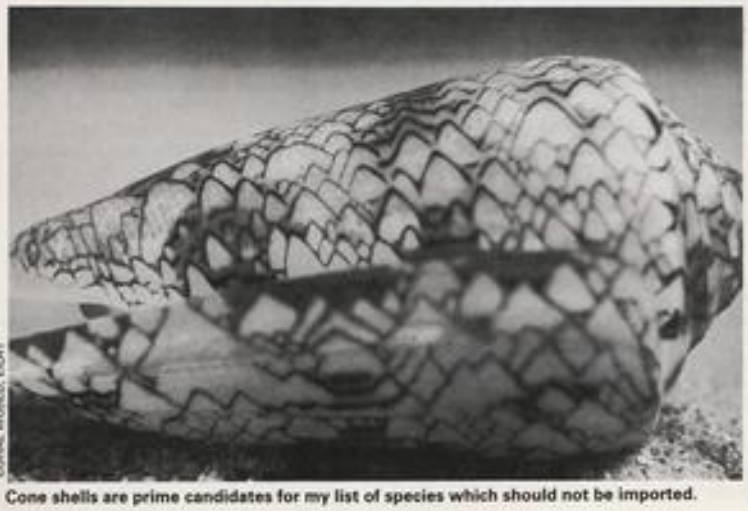
This one is another obvious point, but is not always easy to manage. Most shops have set feeding times, usually, but not necessarily, during opening hours, and if you cannot be around during that time, then checking an individual fish can be difficult.

It is certainly unfair to ask a shopkeeper to feed a fish for your benefit, and I certainly would not want to transport a fish which has just fed anyway. So, you will have to rely on

a) the look of the fish — and the longer it is in the shop, the easier this is to judge; and
b) you will have to trust your shopkeeper.

⑤ Every time you buy a fish, ask yourself the question: is there a good chance it will survive in my tank for at least 6 months? If the answer is no, back off.

You will need to know what the fish in question needs to sustain it, and if you can



CORAL WORLD, ELAT

Cone shells are prime candidates for my list of species which should not be imported.

supply that on a longterm basis, what other fish it will likely attack or be attacked by, if it is likely to meet any of those in your tank, what its growth rate and potential are, and if your tank and its filtration system can accommodate these. You will also need to know how fussy the fish is as regards water conditions, and whether you have the time, money, resources and will to provide these requirements.

MONITORING

As I have explained already, there are moves afoot to bring about a code of practice for the whole trade. At this stage it is not certain whether it will be entirely voluntary, or whether all or part of the code will be linked to a licensing system. In either case, I can foresee the major problem being enforcement. If a shopkeeper offers for sale a fish which (s)he should not, then either (s)he is ignorant of the fact, or (s)he is ignorant of the species, or (s)he is flouting the code.

Knowledgeable hobbyists should not be either ignorant nor uncaring, and it should not be beyond the scope of bodies such as the BMAA to institute some sort of monitoring procedure to help eliminate bad practices.

CORAL WORLD, E.A.T

So far, the vast majority of commercial spawning successes have been achieved with various species of Clowns.

CORAL WORLD, E.A.T

***Pygoplites diacanthus* (Regal Angel) appears on my list of species that, in my opinion, are best not kept in aquaria and yet, Nancy Aquarium have kept a specimen alive for at least 14.5 years!**

It is almost certainly beyond the capabilities of the relevant authorities, ie HM Customs and Excise, to be able to recognise and pinpoint individual species. An unenforceable law is a bad law, and so the only way I see it having a chance is if sufficient numbers of public-minded aquarists take it upon themselves to monitor such situations.

I think now is as good a time as any to suggest a list of fish, and invertebrates, which, in my opinion, the trade and the hobby should leave in the wild. I earlier mentioned three categories (see the June instalment):

① endangered or threatened species;
② dangerous organisms;
③ animals that do not survive in captivity owing to dietary or other limitations.

I do not feel qualified to list any species in category number one, and would far rather leave that to a responsible body, not necessarily one such as CITES or the World Wide Fund for Nature, but one which has direct access to, and liaison with, divers and biologists out in the field, who are far more likely to have a clear idea of those species which should not be collected. I do not profess to have this knowledge, and would therefore rather not make any suggestions here.

List number two is, perhaps, the smallest of the lists, and may be the easiest, though, as with the others, it is open to a lot of debate. For example, do you include *Pterois volitans* and other Lionfish? But here is a start, and a few suggestions (Table 1).

Although there will never be total agreement on category three, I feel on safer ground, purely through experience, and because there is considerable documentation and proof. I have arranged some of my suggestions in the form of Table 2 for easy reference.

BREEDING

It cannot be sufficiently stressed how important it is to the saltwater hobby that research is continued into making it as self-supporting as is the freshwater side. As little as 40 years ago, over 90% of freshwater aquarium fish were supplied from the wild, and keeping alive a freshwater Angel was almost as difficult for the post war amateur as is keeping alive some marine Angels today. The destruction of freshwater habitats has been no less intense than the threats to the reefs, and the introduction of non-native freshwater species is far more catastrophic, with the result that, since the spread of most individual freshwater species is far more localised than for many of the marine species, some species of freshwater fish are now only to be found in aquaria.

I think that the positive sides of our hobby in this regard must not be ignored. Not only do some species of freshwater fish owe their very existence to aquarists, but it is also true to say that public aquaria in particular have been instrumental in maintaining public awareness of the inheritance which we are in danger of losing.

But back to breeding. Most of the marine hatcheries so far have been US based, and have concentrated on Clownfish. The result of this is that tank-raised marines on sale in the UK are limited almost exclusively to one family, and they still have to be air freighted here, with the problems and costs which air travel seem to engender. So tank-bred fish are at the moment an almost insignificant percentage of the total UK trade.

Moves are afoot in this country to supplement the amateur breeding programme already in place — at the Aquatic Trade Seminar held at Sparsholt College last June, I was privileged to listen to one of the most uplifting presentations I have ever heard. Paul West, who at present runs a turbot hatchery on the Isle of Man, is laying the groundwork for a UK based hatchery in what, to me, is an unbelievably professional manner, and I can only look forward to the results of his endeavours with the keenest anticipation.

Over the next decade or two, the way forward must be the development of breeding programmes for other marine fish, and for marine invertebrates. In his book *Reproduction in Reef Fishes*, admittedly now a little out of date, Dr Thresher lists many species of marine fish which have been spawned in aquaria, but very few whose young have been raised to maturity. Apart from the obvious Clownfish, the only commercial successes in rearing seem to be Neon Gobies and one or two species of Caribbean Angels. But the following species or families

Ponds & Watergardens

Spotlight Special:

WATER GARDEN QUEENS

Follow some simple rules, and select your varieties carefully, and, as **Gordon McKay** shows, everyone can enjoy the splendour of water lilies.

GORDON MCKAY

Albatross — a stunning white lily for the medium sized pond.

The water lily is considered to be the most beautiful of all aquatic plants. It is also regarded as being very useful in the water garden, as it will help to maintain clarity and flowers will usually appear from May to October, producing gorgeous waxen blooms that justify the title 'Queen of the Water Garden'.

Lilies come in all sizes, smaller plants being suitable for the marginal shelf, and the giants being large enough to accommodate children sitting on their pads. The pads of the water lily are the leaves of the plant, usually a rich green in colour. The flowers come in various colours, from brilliant white to the deepest red. Flower heads on the average lily are approximately 2 to 3in (5-7.5cm) in diameter and very smooth and waxy to the touch. The only disappointment is that the blooms will only be at their peak for a couple of days, three at the most.

In maximum sunlight, the flowers will be fully open and at their best. In early evening, they will gradually close and, at nightfall, they will be completely closed, to re-open the next day. On dull cloudy or rainy days, the blooms will open only slightly.

POSITIONING

It is advisable to position the plants in calm water; the last place for a lily is under an ornamental fountain or waterfall. Therefore, bearing in mind they will not appreciate this movement of water, it is suggested that lilies be planted out of strong currents, preferably on the other side of the pond to a pump or filter outlet, waterfall, cascade or fountain.

PLANTING

Ordinary garden soil can be used to plant the tubers, although we must avoid soil with added fertilisers, as these will cause abundant algal growth. Planting crates are advisable for the tubers, in preference to rooting them into a layer of soil on the bottom of the pond. (Polythene crates are specially designed, with lattice sides to accommodate growing roots. Crate liners are advised to prevent soil escaping.)

Using ordinary garden soil, fill the planting crate to approximately 2in (5cm) from the rim; a layer of pebbles should then be put onto the top 2in (5cm) of the crate, thus preventing fish from foraging in the soil and creating cloudy water.

WATER DEPTH

The depth requirement varies from type to type. Planting depth is measured from the top of the planting crate, to the water's surface.

Immature plants should have their planting crates on blocks raised to approximately 6in (15cm) from the surface. As the plants grow, they can be lowered gradually to the bottom of the pond, or to their recommended depth.

Vigorous varieties require 25 sq ft of surface area (c.2⅓ sqm) per plant and a depth of approximately 36in (90cm). These varieties are obviously much too large for the average garden pond. Most ponds, on average, are 18-24in (45-60cm) deep, so, when buying water lilies, look for varieties that require this planting depth as a maximum.

MAINTENANCE

Maintaining the beauty of lilies is quite simple, compared to the average plant in the garden, as, being submerged in water, they will not require watering in drought periods.

GORDON MCKAY

Pink Sensation has blooms of variable colour.

As the tubers start to grow in April, planting crates should be removed from the pond. If there are any roots showing on the outside of the crate, these should be trimmed back to just inside. If left, the more vigorous roots of the water lily can sometimes penetrate thin non-butyl type liners, but, if the crates themselves have liners, this problem is minimised.

A special aquatic plant fertiliser can also be added at this time of year. The fertiliser is purchased in sachets and is simply put in the planting crate next to the root. It is not advisable to use ordinary plant fertiliser, though, as it dissolves too quickly and will cause an abundant growth of algae.

When in full bloom, the pads of the water lily are green in colour but, within a few weeks, some of the pads will turn from green to brown. The pad and stem should then be removed from the base of the plant.

The flowers of the water lily will only bloom for a very short time, three days at the most, so these should also be removed from the base of the plant once they have died down. The removal of flowers and pads will be beneficial at this time and therefore encourage new growth.

As the plants mature after a few years, it is possible to split the tubers into two or three different plants. Avoid excessive overcrowding as this tends to choke up the pond and will have an adverse effect on the fish in the pond. Effects of extreme overstocking can be disastrous to the fish population.

An abundance of plant life, including algae, can, by their oxygenating activity, support a large number of fish during daylight hours. However, this activity (the synthesis of organic compounds from carbon dioxide and water, with the release of oxygen, using light energy absorbed by chlorophyll) ceases at night. Nevertheless, the respiration process which has been going on all day, continues after sunset. Therefore, if fish are found dead early in the morning without any obvious signs or marks of disease, it is possible that the cause of death is oxygen deficiency. Clearly, it is, both with plants and fish, always better to understock, rather than overstock.

The pads of the water lily spread across the surface of the pond, thus cutting off sunlight, and without the shading that the pads of the lily provide, undesirable green water is almost inevitable. Green water is caused by very small plants, called algae, that live on nutrients in the water and thrive in warmth from sunlight. Some nutrients are abundant in domestic tapwater, while others will be added by the biological activity that takes place in every pond.

On warm sunny days, pondwater evaporates and should be topped up, on average, once a week in mid-summer. Therefore, green water is more common at this time of year. Each time this happens, the algae in the pond thrive and give the appearance of pea soup.

The shading provided by the lily pads are also beneficial to fish, as in the long, hot days of summer, water temperature rises and the cool shaded parts of the pond are a welcome retreat, where the fish can 'cool down' if necessary.

VARIETIES

There are numerous varieties of water lilies suitable for garden ponds. I am listing five which can, with a little maintenance once a year, give excellent results.

Albatross

A white variety with brilliant white petals and yellow centre, with apple green pads. This plant is quite suitable for the average garden pond. Planting depth: 6-18in (15-45cm). This variety has a medium growth rate.

Pink Sensation

A strong variety with pink flowers which bloom freely once established. Suitable for an average garden pond. Planting depth: 6-18cm (15-45cm). Pink Sensation is of medium growth rate.

Marliacea Chromatella

Large primrose-yellow flowers which bloom freely throughout the season. Medium growth rate with a planting depth of 6-18in (15-45cm).

PHILIP SWINGLER

Fulgens is one of the deepest reds available.

Laydekeri Fulgens

One of the Laydekeri hybrids, a very useful group of hybrids with crimson blossoms and with reddish stamens. Planting depth is 6in to 2ft (15-60cm) of water.

With a little care and attention these five varieties of water lilies should give years of pleasure and satisfaction.

GORDON MCKAY

Chromatella — yellow blooms with attractive mottled pads.

William Falconer

Dark red in colour; grows well in the average pond. Planting depth: 6-18in (15-45cm). This variety is also of medium growth rate.

GORDON MCKAY

William Falconer — a spectacular dark red variety.

Spotlight Special: Ponds & Watergardens

ALEC & VAL SCARESBROOK

***Nymphaea alba*, our native water lily, needs a lot of space. *Typha* sp. in the foreground, has to be kept under control, otherwise it will fill up any available space.**

POOLS FOR WILDLIFE

As our natural wetlands disappear, the need for wildlife havens in our gardens increases. Garden consultants **Alec** and **Val Scaresbrook** show how this can be achieved without having to convert our gardens into unkempt wildernesses.

Pools for wildlife are becoming increasingly necessary as wetland is drained and farm ponds are filled, in reducing the population of plants and animals that depend on these areas. While any garden pool will benefit some wildlife, a few modifications to a conventional design will greatly increase its usefulness to a variety of creatures.

Birds will drink from the pool and bathe in the shallow end, whatever the weather. Bees will drop in for a drink too, and hedgehogs (although usually at night). Many invertebeates will use the pool and its plants for egg-laying sites and, in turn, will attract dragon and damselflies and birds after a tasty snack. Plants around the pool will provide cover for some creatures and the nectar of flowering plants will attract butterflies, bees and hoverflies. Later on, berries will attract certain birds. Frogs, toads and newts, all diminishing in the wild owing to loss of habitat, will thrive in the pool and garden, where they will eat slugs and other garden pests. They will appreciate cover under vegetation, logs and rocks provided so that they do not dry out on sunny days.

The pool will act like a magnet to wildlife, soon becoming a hive of activity. If it is a large pool, you may even attract a moorhen or mallard duck, and these will bring other life attached to their feet, such as fish and amphibian eggs and bits of vegetation. But if you want a pool to be a really good home for amphibians, you should avoid fish which eat the eggs and young. If you decide to add fish, there are suppliers of native species.

CREATING A WILDLIFE POOL

As with any pool, one has to think about siting, design, aims and amount of time and expertise when it comes to maintaining a wildlife pool and its surrounds.

Siting

The pool should be in full sun for most of the day and be away from underground services and tree roots, both of which cause problems when excavating.

To enjoy the pool to the full it should be in full view of the house, so that you can appreciate it in winter from the warmth of the indoors. Think about any problems that flooding could cause, too. Leaves will blow into the water even if the pool is sited away from trees, but this is only a problem if masses of leaves decay in the water, when all the oxygen is used up and gases toxic to fish and invertebrates are produced. You can net the pool during leaf-fall, but do check each day for hedgehogs and birds that can become trapped.

Pools always look better if they blend in with a garden. Try and place them where they would occur naturally, at the foot of a slope or in a hollow part-way down a slope. You can use the soil you have dug out to create a slope behind the pool and add to the height with a rockery. Shrubs to the back of the pool also help it blend in.

Shape and profile

While wildlife pools are usually irregularly shaped, there is no reason why they can't have a more formal shape — circular or rectangular. An irregular outline provides more pool edge in ratio to the pool area, which makes the pool of more value to wildlife, but any shape pool is better than none.

More important than the outline is the profile. At least one gently sloping side is important, to act as a ramp for creatures to enter and leave the water and choose the depth that they require. A deep section, at

ALEC & VAL SCARFSBROOK

A natural-looking pool with ferns around the edge . . . and even some (artificial) wildlife!

least 2ft (60cm), will protect creatures during hard winters, and gradually changing depths allow you to plant vegetation that requires submerging to different degrees.

Bog gardens

A bog garden increases the pool's value to wildlife, the wet soil supporting plants and animals that have lost their homes in the countryside. Aim for a bog garden around a third to two-thirds of the pool edge, leaving one side clear to enable you to walk to the water's edge and to view the pool from a distance.

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This combining of rockery and pool is very suitable for wildlife.

On the open side, a lawned approach is attractive, but will have to be left uncut when froglets emerge, otherwise they could be mown along with the grass. You only have to leave a strip uncut nearest the water and could trim it with one-handed trimming shears or even hedging shears if you don't like the idea of long grass. It won't take long to trim by hand, and while you are down there, you will be surprised at the wildlife under your nose. Leave the grass a couple of inches high (around 5cm) to give the creatures some cover.

Edging

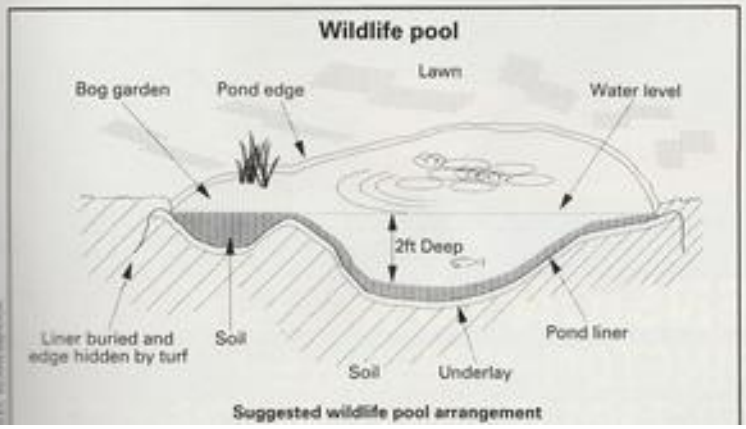
The difference between any garden pool and one designed for wildlife is the edging material. Paving creates problems because it overhangs the edge by a small amount to hide the liner and shield it from the sun in case the water level drops. But imagine the prospect of a smooth paving overhang if you are a froglet trying to leave! If the animal succeeds in leaving, it can easily dry out and die on the paving itself. If you have to pave the edge all round, then do plant up some of the edges with water plants to provide a bridge to dry land.

Even a turf or bog garden edging will need some plants to act as a bridge across the slippy edge of the liner.

Electricity

Think about installing an electricity supply too. If you do have fish in the pool, a pump can drive either a waterfall or a bubbling spring-type fountain jet in order to aerate the water in summer.

In winter, the connection can be used for a pool heater to keep some of the surface ice-free for gaseous exchange and also for bathing and drinking birds.



Suggested wildlife pool arrangement

Pond liners

Wildlife pools are easier to construct from flexible sheet liners than other materials. All the pre-formed ponds have vertical sides but with a sheet liner, you can dictate the shape and profile more easily and can have a larger pool for your money.

If you are lucky enough to live on clay soil and have a high water table, you could scoop out a hole and wait for it to fill naturally. But most of us have to use artificial liners, and although stretchy enough to mould to the shape of the hole once under the weight of the water, they are not elastic enough to buy only half the size for the hole and hope it will fit! You will need to buy enough to drape over the sides and base of the hole, with sufficient left at the edge to create a bog garden and some spare to tuck into the ground to anchor it.

ALEC & VAL SCARFSBROOK

To be suitable for wildlife, a pool does not have to look like a wilderness!

Liners vary in price according to quality — a good guide is the guarantee period. A heavy duty type is worthwhile, and remember that a liner stretched to its limit is more vulnerable to punctures, so don't skimp on the amount bought. Also worth buying is special underlay to protect the liner from any sharp stones that you may miss when preparing the hole. You can use newspapers, opened-out cardboard boxes (remove the staples though), old carpet or sand to line the hole, but underlay is probably the easiest, quickest and most effective layer.

Installation

It is important that the liner is not unevenly exposed above water level, so you must ensure that the rim of the pool is at the same level all round. You can do this with a spirit level on a straight piece of wood positioned across the hole.

Major changes of level, such as when digging into sloping ground, will need some careful grading of the soil to make the pool look right. You will have to cut a shelf into the slope to install the pool and use up the excavated soil below the pool so that the ground does not fall away too steeply

Embedding substantial rockery stones in the slope above and below the pool can also create a realistic effect.

The ideal wildlife pool will have a thick layer of soil on the base (and sides if not too steep). Whether you add the soil before or after the water, you will still end up with a murky pond for a while, until the particles settle. You can still use planting crates for your water plants if you want, or weight down plants with stones so that they anchor themselves in the soil layer.

Another way of lining the pool with soil is to place upturned turves (saved from when you cut out the hole from a lawned area) along the base and sides. This could contribute to the pea-soup effect in spring, but you'll have that anyway, especially in the first year of the pool's life. The green water is caused by single-celled algae multiplying quickly in the warm water, feeding on nutrients and thriving in the sunlight.

The solution is to leave well alone, because the algal growth burns itself out each year once the nutrients are exhausted. But to minimise the algal bloom, aim to grow floating-leaved plants, which cut down the light to the water, plus submerged oxygenating plants which mop up excess nutrients.

PLANTS

Fairy Moss (*Azolla caroliniana*) is a small floating fern which can take over a pool, but is easy to scoop out, and Frogbit (*Hydrocharis morsus ranae*) is like a miniature floating lily with white flowers. Both of these are native plants and suitable for a wildlife pool.

Deep marginal plants (which root into the pool soil or are grown in crates) also block light, and native ones include the Water Violet (*Hottonia palustris*) and *Villarsia benshemi*, which is another water-lily type, this time with yellow flowers.

The true water lilies are available in many shapes and sizes and you have to choose carefully in order to grow one suited to the size and depth of your pond. Both *Nymphaea alba* (with a white flower) and *N. lutea* (with a yellow flower) are native water lilies, but very vigorous and require 9-36in (23-90cm) water above their crowns and will spread to 5ft across (1·5m). If you have a small pool and want to keep to native plants, which are the most beneficial to our native insects and, hence, the creatures that feed on them, choose the water lily look-alikes mentioned above.

Tench *(Tinca tinca)* are true 'natives' often housed in wildlife pools. They stir up the bottom, though.

Oxygenating plants are not very exciting, as they are out of sight for most of the time, but should still be chosen carefully. Some are best avoided because they take over, but the following are all suitable and native too. *Callitriche autumnalis* (one of the starworts), *Ceratophyllum demersum* (Hornwort), *Eleocharis acicularis* (Hair Grass), *Myriophyllum verticillatum* (Milfoil), *Potamogeton crispus* and *Ranunculus aquatilis*.

You don't have to restrict yourself to native plants, but a good proportion of them, in and around the pool, will help the wildlife tremendously, because both plants and animals have evolved together and benefit each other.

Some British plants are invasive and will fill up, not only your pool, but, in some cases, the garden too, if you're not careful, so only choose these troublemakers if you like gardening and have a large pool. *Iris pseudacorus* (the yellow-flowered Flag Iris) is one which can get out of hand. Two other 'thugs' are the Reedmaces (*Typha* spp), mistakenly referred to as Bulrushes, and Water Mint (*Mentha aquatica*). Fortunately, the latter two are, at least, restricted to wet soil.

Frogs and other amphibians will soon be attracted to a wildlife pool.

There are many attractive and restrained native plants to choose from. Some have perennial roots and produce new top growth each year, while others are annuals which grow from seed and then self-seed. This means careful weeding, otherwise you can destroy next year's plants. If you grow your own annuals in the first year, at least you will know what seedlings look like for future reference.

Some attractive perennials suitable for the wildlife pool include Flowering Rush (*Butomus umbellatus*), Marsh Marigold (*Caltha palustris*), Brooklime (*Veronica beccabunga*), Water Forget-me-not (*Myosotis scorpioides*), Meadowsweet (*Filipendula ulmaria*), Ragged Robin (*Lychnis flos-cuculi*) and Water Avens (*Geum rivale*). Different types of *Primula* and *Astilbe* also look attractive near water and like damp soil. *Mimulus* and *Limnanthes douglasii* are good annuals which self-seed and are easily pulled up where not wanted.

WILDLIFE

If you have a good field guide to invertebrates, you will be able to identify the many creatures which home in on the new pond.

Among the many visitors will be large *Aeschna* dragonflies.

Beetles and bugs, damsel and dragonflies, butterflies, moths, bees and hoverflies all fly long distances to look for food and drink and will discover your pool quite quickly.

Birds will be around immediately (unless you have cats, of course), especially if there are plenty of trees and shrubs around to perch in.

If you want to introduce animal life to the pool, see if you can scoop some water and/or sludge from another garden pool. This will introduce microscopic life, eggs and so on into the water. If you know of a garden pool with frog or toad spawn in, you can scoop some of that too, but don't take any from the wild.

SUPPLIERS

Stapeley Water Gardens, nr Nantwich, Cheshire — materials, plants, fish, information catalogue. Tel: 0270 628111.

Old Hall Wildflowers, Warrington WA5 5PB Tel: 0925 52594.

John Chambers' Wild Flower Seeds, 15 Westleigh Rd, Barton Seagrave, Kettering, Northants NN15 5AJ Tel: 0933 652562 bulbs, plants and seeds of wildflowers.

SOME NATIVE FISH SUITABLE FOR POOLS

Fish	Comments
Loach	Carnivorous
Minnow	Omnivorous. Requires well - aerated water
Rudd	Omnivorous. Golden form available
Stickleback	Carnivorous
Tench	Partly vegetarian. Golden form available, but being a bottom feeder / scavenger of dead and decaying matter, is rarely seen.
Trout	Carnivorous. Non-migratory (lake) forms of trout suitable for very well aerated pools only.

N.B. Restrict yourself to predominantly vegetarian fish if you want your pool to be a haven for amphibians and invertebrates.

provide excellent protection to the liner and make the walls of the pond very smooth. The purpose of the concrete ring beam is two-fold: to keep a neat edge at the top of the pond, and to prevent any crumbling.

One thing to be careful of, though, is the possible intrusion of roots. While the above method of pond construction is very good, it offers little resistance to the force of roots. Therefore, if you have some trees fairly close to the pond, it is worth considering concrete or brick construction.

If you have crumbly soil, or trees close by, or if you want to have the most solid pond construction of all, concrete blocks will provide the best results. If the pond will be 1,000 gallons (4,500 litres) or less, then 4in (10cm) solid blocks will be best, but if it is larger, then 9in x 9in (c23 x 23cm) hollow blocks should be used to build the walls. The former need to be laid with mortar, whereas the latter can be dry laid and the hollow columns then filled with concrete to form an extremely strong structure.

Whichever method you choose, be sure to put the walls on a firm concrete footing, otherwise they will become stressed and cracks may appear. Once the walls are complete, the base can then be concreted to the required shape.

USEFUL TIPS

Do bear in mind that, once you have used concrete blocks to construct a medium sized or large pond, it then seems a pity to seal it with a liner, when an applied coating will give a more pleasing effect (such as fibreglass or Fibromix and pond paint). If you decide to put a liner in a concrete pond, you have to be extra careful that the liner is protected from sharp edges and grit.

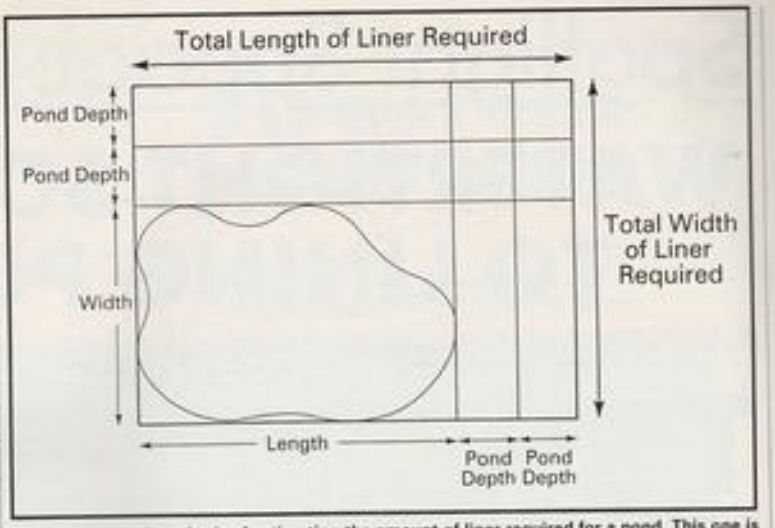
If you are constructing a very large pond, it would be wise to consider enlisting the help of a structural engineer to check that pond walls are properly designed. This may seem to be an unnecessary expense, but after you have seen as many amateur attempts that have failed as I have, you will realise that their help is cheap at the price!

If your project is to be on a grand scale, then do check that you are not contravening planning regulations. In some parts of the country, the requirement for planning approval is a very grey area, but it is better to be on the safe side anyway.

CHOOSING AND INSTALLING THE LINER

When the time comes to choose a liner, be very careful, because the difference in price, quality, and guarantee periods is considerable. The very cheap liners are best avoided, unless you are setting up a temporary pond, because they will have a short lifespan. Only a few years ago butyl rubber liners were the only quality liners available, but modern technology is producing materials that rival butyl in strength and longevity such as stabilised P.V.C. Shop around!

To calculate the size of liner you need, the easiest way is to get a long tape measure and lay it from the top of the pond at one edge, down the side, along the bottom, and up the other side. Read the measurement and add at least two feet (60cm). If you do this at the longest and widest points of the pond, you will have enough liner to line the pond and have some left over at the perimeter so that the edge can be trapped under rocks or coping stones.



There are several methods of estimating the amount of liner required for a pond. This one is suitable for ponds of any shape. An even easier method is described in the text. (Diagram based on John Dawes's Book of Water Gardens, published by TFH Publications).

When installing the liner, it is important that it is not stretched, since this will weaken it. If possible, the liner should be wrinkle-free in the bottom of the pond, and any folds should be as near to vertical as possible and pointing in the direction of the water flow. This prevents debris being trapped and also causes less interruption to the water flow.

If any pipework connections are to be made through the liner, the pond must first be filled to maximum level and then the holes can be marked. If this is not done you could end up with stretch marks radiating from each connection.

If properly installed, a good liner will last for many years, so it is worth taking special care while installing it and then look after it. Do not allow dogs to get into your pond; they may tear the liner as they try to escape. If you ever need to walk on the liner, socks or bare feet are a must. Be very careful when lowering objects such as submersible pumps into the water because some are quite heavy and have sharp edges. Liners are quite tough, but still require a little bit of care, just like the paintwork on your car!

I'm not playing him with that Archer fish thing. . . six bulls in a row last week and me fifteen quid lighter!

Adding the finishing touches to the pond.

goodness we bought too much for the lounge!) Alternatively, old carpet may be used, or you may choose to buy a proprietary brand sold in rolls.

Once the underlay was in place, the excess at the wall top was trimmed off cutting to the outer edge of the brick. It was found that wetting the underlay enabled it to be pushed firmly into any corner to achieve a better fit. This also made cutting easier.

The liner was draped loosely over the pond and anchored by bricks at the corners. As water was run in by hose, the weight bedded the liner snugly into place as it was gradually allowed to move inwards and downwards. Obviously, this is more easily done by two people adjusting the bricks as the water pressure/weight drags the liner down. When the water was approximately 4in (10cm) from the top, we removed the hose and trimmed the liner to the outer edge of the bricks.

Laying the slabs

Kevin then cemented the slab pieces in position in numerical order (clever, eh?) with a generous bed of cement, taking care not to drop too much into the water. The slabs adhered well to the cement because of a dimpled pattern on the bottom side. As with the bricks, pointing up between the slab pieces was necessary and, with the slabs overhanging the bricks by approximately 2in (5cm) either side, Kevin used a stiffer mix of cement to make it easier to bridge the occasional wider gap.

Once the cement had set, the pond was topped up with water to within 1 or 2 in (2.5-5cm) of the top of the liner. A pump was going to be installed, so Kevin left a channel uncemented between two slab pieces nearest to where the power supply would come in.

The electrics

We added patio double insulated globe post lights diagonally opposite each side of the pond, running the wiring in hosepiping for protection. This was buried before concreting or slabbing over. A spotlight mounted on the house wall also cuts through the water for night-time illumination.

At ground level, where the channel has been left in the pond top, an underground power supply has been buried as before. This runs from a circuit breaker socket in the garage to the pondside, where it emerges and is connected with a waterproof socket. This enables a water pump for a fountain to be installed during the summer, the cable with a waterproof plug attached running up to the pond side and through the channel left on the top into the water; this is also protected from the sun by a piece of hosepipe.

In winter, the pump can be removed by unplugging from the socket and a pond heater then plugged into the same socket. This keeps an area free of ice to allow poisonous gases to escape. It also stops the ice expanding and cracking the pond walls. The circuit breaker mentioned earlier is important as it protects, not only me, but my fish as well, from electrocution.

Finishing off

With all the wiring in place, the remaining areas required slabbing or concreting. We added a step to raise the level of the patio with the gradual sweep of the lawn. An area at the back and side of the pond was concreted, with stones pushed in for pleasing relief. A small wall surround was then added to the patio, with a conifer/heather bed at the rear of the pond.

PLANTING THE POND

Before we introduced any plants to the pond, we left the water for two days to allow any harmful chemicals present in the tapwater to disperse. Treatments are, however, available which when added, neutralise harmful tapwater ready for immediate planting.

Plants are important, as they provide oxygen and shelter for the fish and help prevent the water turning green with algae. We used plastic baskets lined with hessian and filled with pond soil for the plants, with a top layer of pea gravel to stop the fish stirring up the soil.

Oxygenating plants were put in first; unrooted cuttings, placed on the shelves until established and then moved to deeper water. Planted in groups in large baskets, they will help to provide the right water conditions for the fish and shelter for any fry.

Marginal plants were added steadily, some

grouped together in long baskets, or planted in individual pots. They were placed on the shelves, where they are more decorative than anything, although, once again, they can provide shelter and the occasional insect meal for the fish.

Deep water plants, mainly lilies, were planted in quite large baskets in the deepest area of the pond. These plants provide excellent shelter for the fish with their coverage of leaves, but, most importantly, they cover the water, shielding some of the surface from the sun's rays which algae need to thrive on.

Floating plants, like the Water Hyacinth or *Azolla*, are also effective in controlling the amount of sunlight reaching the water, so both were introduced into the pond.

INTRODUCING THE FISH

Normally, fish are introduced into a new pond 2/3 weeks after planting, so two fish were added to start with to see if the water conditions were tolerable. The fish thrived and, gradually, over the summer months, more fish and plants were added until, after the first season, there were:

3 small Koi
3 medium Comets
3 medium Shubunkins
3 small Sarasa Comets
3 small Golden Tench
4 small Golden Orfe.

Some of the above actually bred within two days of introduction(!) so there are now a number of young fish of varying sizes in our pond.

It should also be mentioned that transporting and introducing fish into a pond should be carried out carefully. Transportation is best carried out with the fish in a dark bag. Before releasing the fish into the pond, float the unopened bag on the surface for ten minutes to balance the water temperature, occasionally adding pond water to the bag.

LATEST ADDITION

As the first anniversary of the pond draws near, an addition has been an air pump. The unit is sited in the garage and the airline runs along a fence to the pond, where it joins the power cable being fed into the pond. There, it is split and provides two bubble columns, one at each end of the pond. These provide continuous aeration during the summer and also help prevent ice formation during the winter months at very low running costs.

During the winter, the plants are cut back and the pond looks quite sparse. The fish slow down, hardly ever requiring feeding. However, on the warmer days, they want food and go in search of it, a reminder of the warmer days to come.

I was sorry to lose the cedar tree, but am delighted to see the result of an idea I have long had in mind, and am grateful to Kevin for all his hard work.

The pond is peaceful, therapeutic and always interesting, as we observe the varied life that abounds within its confines.

The finished product.

VIDEO NEWS

A video entitled **Garden Ponds** produced by ASPC Petvision, is available by post from **Aquarist & Pondkeeper, 9 Tufton Street, Ashford, Kent, TN23 1QN.** Access and Visa cards accepted. Please quote your card number and expiry date. The cost of each video is **£17.99** including postage and packing. Allow 28 days for delivery

POND STATISTICS

Length — max 9ft 6in (2.9m)
Width — max 6ft 6in (c 2m)
Depth — max 24in (60cm)
Water capacity —
approx 300 gals (1,350 litres)

The close proximity of the pond to the house shows just how dangerous the cedar tree was . . . and how perfect a solution the pond provided.

CULTURING MICROSLIPPERS

Culture Infusoria — the initial food for newly hatched fry — the modern way, with **Bill Tomey's** expert assistance.
(Photographs by the author)

Any kind of bottle can be used for culturing *Paramecium*, white, greenish or brown glass. In this case, the bottles are clear so as to show the drops of milk colouring the water. Never fill a bottle up to the mouth, but leave some space empty for gas exchange, however little it may be. Use one drop of coffee milk in 10cc of water. At this concentration, the water will show a cloudy whitish-blue colour.

The common name of these one-celled aquatic organisms on the continent is 'microslipper'. In the UK and other countries, they are usually referred to as Infusoria. Either way they have been known for a very long time as an excellent food for first-day swimming fry of delicate aquarium fishes.

BACKGROUND

The name 'microslippers' refers to overall shape of *Paramecium* which closely resembles this type of footwear in appearance. Since time immemorial, aquarium hobbyists, as well as professional breeders, have searched for the most tiny micro-food available to feed to ornamental fish fry. Armed with a so-called infusoria net, it was possible, in the early days, to catch many different small aquatic organisms as amoeboid protozoans, rotifers, ciliate protozoans and organisms of vegetable origin.

Usually, their food value was excellent and the raising of fry was not difficult in those days. However — and unfortunately — in the course of the years, environmental conditions have changed considerably, as a result of which many infusorians have either declined in availability or have totally disappeared. Nowadays, only in springtime will one find some infusorians as the day length and sunlight increase and the temperature of the water rises.

Quite logically, of course, breeders of ornamental fishes have long been looking for methods which would make them independent — in terms of fry food production — from the natural supplies found in ponds and ditches. Because 'microslippers' (*Paramecium*) were generally known as a high-value nutrient for newly hatched fry, and because they are small enough to be suitable for almost every species, the old-time aquarists developed several culture methods.

LIFECYCLE OF PARAMECIUM

For successful cultivation, it is crucial to know at least the basics of the lifecycle of *Paramecium*. The various species are found in freshwaters everywhere, in all sort of conditions, feeding on bacteria, flagellates, microscopic algae, rotifers, starch, fat and proteinaceous particles suspended in the water. This is why these micro-organisms

Add some water to a bottle containing a ripe culture of microslippers up to the *bottom of the neck*. Insert a nylon filterwool plug, pushing the bottom down into the culture medium. Fill the space left on top of the plug with clear tapwater of the same temperature. The microslippers will now pass through the plug in an upward direction and concentrate in the top space occupied by clear water.

are so useful for cultivation in specially prepared media containing the source of food they need and through which so-called pure cultures can be established.

Movement in the water is through quick undulated strokes of the outer surface of the body which bears cilia (bristles) which are capable of reversing the action to move backwards, circling and turning. Doing so, they are able to utilise the food medium most effectively, continuously searching for small edible particles.

This 'microslipper' reproduces mainly by dividing, but this cannot be maintained throughout their short lifespan which is estimated to last seven days. At the end, they seem to lose vitality, through which they are forced to conjugate, during which individuals unite and exchange parts of their nuclei.

Remove the desired concentration of microslippers out of 'free' water space with a disposable injection syringe and transfer the required amount into the fresh water/milk medium.

After separation, both individuals seem surprisingly rejuvenated and are then ready to reproduce again by dividing. If an optimum temperature is maintained and sufficient nutrients are provided in the food medium, their numbers increase very quickly. This is why *Paramecium* is plentiful in waters where decaying leaves or vegetable matter accumulate.

The main species which occur in European waters differ somewhat in shape and size:

(1) *Paramecium trichium* — Grey Microslipper — 50-140µ — in heavily polluted water.

(2) *Paramecium bursaria* — Green Microslipper — 90-150µ — in stagnant food-rich waters.

(3) *Paramecium aurelia* — Golden Microslipper — 120-180µ — in water with rotten vegetable matter.

(4) *Paramecium caudatum* — Tailed Microslipper — 180-300µ — in organic polluted waters.

(5) *Paramecium putrinum* — Rotten Microslipper — 180-300µ — in water with decomposed animal matter.

The indicated colours are related only to their existence in nature. This, however, is prone to changes, dependent on the food source, in a culture medium.
Note: 1μ = one one thousandth of a millimetre.

FOOD UTILISATION

Simple single creatures, such as *Paramecium*, usually have large expandable spaces called contractile vacuoles, in the midst of their protoplasm, for water regulation in the body. Furthermore, there is a food vacuole in which the food particles are digested with the aid of enzymes produced by the cytoplasm. The nourishing material then becomes reabsorbed by the inner body membranes.

Obviously, dependent of maintenance and care, some strains of *Paramecium* are hardy and reliable and survive well in aquaria. It is these microslippers that have therefore been used by aquarists for cultivation purposes. All microslippers are so small that their shape and structure can only be observed using a microscope, but they are sufficiently large to be seen as greyish streaks moving vertically in the water.

OBSOLETE CULTURE METHODS

It is amazing to observe that aquarium hobbyists, as well as professional fish-breeders, still persist with obsolete and particularly unreliable culture methods which have long since been superceded.

The old procedure consisted of siphoning water out of an aquarium at bottom level or out of a seasoned (mature) filter layer. After this had been left in a large pot for one day at room temperature, a dried piece of banana peel or a small and sun-dried piece of Swedish turnip (swede) was usually added. After about two or three days, the turbidity of the medium usually increased, at which point one needed to remove the source of the cloudiness, this being the banana peel or turnip. Most times, a mouldy film developed on the surface of the medium — a sign of bacterial development, which was not to be disturbed. Leaving this film intact, oxygen could not easily penetrate the liquid, as a result of which the bacterial colonies died, but the microslippers survived.

Some days later the water would be clear again, with only *Paramecium* being left gathering just below the medium surface from which they could be poured out into a raising tank.

As mentioned above, this method is obsolete and inadequate, but it must be said that, sometimes, the results were staggering. Often, this was much more by chance than by solid knowledge. In short, this method has the following disadvantages:

(a) There is no certainty that microslippers will be present in sufficient quantities.

(b) There is also uncertainty in the time factor regarding development, through which the microslippers may not appear in time.

(c) The presence of many other fouling organisms is always a possibility.

(d) It is an unreliable production method, with inadequate quantities of *Paramecium*, or even over-production, through which the mass of microslippers die prematurely.

(e) The food value of the stocks is uncertain or unpredictable.

MODERN METHOD

After reading about these drawbacks of the old methods, one could logically ask how cultures could be produced efficiently. There is, of course, a better way. This involves the setting up of P.P.C.'s (which stands for Productive Pure Cultures — as it is called in laboratory language) with the aid of simple expedients.

Requirements

1. Dechlorinated tapwater (24 hours filtration over activated carbon), temperature 24°C (75°F).
2. A number of long-necked and, preferably, clear transparent bottles (green coloured bottles are O.K., but they give less visibility, hampering easy control of the culture), containing at least 70cc (centilitres) of liquid.
3. A plastic piston of a syringe (without needle) with a volume scale on it, by means of which the food medium can be accurately dosed.
4. Fresh milk, or processed milk products like canned coffee milk, sterilised milk, coffee cream or condensed milk. Of course, one would use less than stated here, if only concentrated milk products are obtainable.
5. Some wads of nylon filterwool.
6. A portion of a productive and healthy strain of *Paramecium* to inoculate into a fresh medium.

A Setting-up P.P.C.'s

A thoroughly cleaned breeding tank, for instance with a capacity of 5 or 10 litres (c1-2.25 gal), is filled with normal tapwater, which is usually chlorinated to make it suitable for human usage. Because microslippers don't tolerate the added 'chloroproducts', the water must be filtered over activated carbon with the aid of a small airpump. It is best to keep the temperature between 21-24°C (c70-75°F) and the outlet approximately one inch (2.5cm) under the water surface. Doing so, the de-chlorination of the water is achieved through the combined activity of the water's contact with the activated carbon and its aeration.

After the long-necked bottles have been thoroughly cleaned, they are ¾ filled. This leaves a relatively large surface area needed for gaseous exchange during development of the culture. By way of the piston (see 3, above), a quantity of one centilitre of fresh milk is added to every bottle. Via the same piston, a portion of a healthy strain of microslippers can be drawn in and then pushed out into the culture medium.

To start a fresh culture, about ⅛ of the production of *Paramecium* from a single bottle (collected in the bottle's neck above the wad of nylon filterwool [see also under C]) is considered sufficient.

B Temperature as related to culture time and culture continuity

It seems that the temperature, not only defines the time needed to activate the culture, but also the time needed to reach peak production. At a medium temperature of 24°C (75°F) peak production will be reached in three days. For every degree less — until a minimum of 20°C (68°C) is reached — it takes a full day longer.

Knowing this, it is possible to match harvesting and peak production precisely with the time that the newly hatched and free-swimming fry need this smallest of all living foods. Of course, one must know the time needed for the development of the eggs of the specific species of fish being bred and take this into account by setting up the *Paramecium* cultures at appropriate intervals.

At a temperature of about 24°C (75°F), the microslippers will multiply very rapidly by division of their cell nucleus. Given a temperature between 24°C and 26°C (75-78°F), the culture will 'ripen' fully in about 24 hours, leaving the medium with millions of microslippers, eating away and rapidly clearing the medium in the process. In clear medium, streaks of *Paramecium* move slowly up and down in search of food. This is the time for harvesting and feeding delicate new-born fish, as long as they are free-swimming, of course.

C Productivity and harvesting

As we have seen, the maturing time of the cultures depends on the temperature.

The degree of turbidity of the medium can serve to assess maximum production. In other words: if an initially rather turbid medium slowly clear up, one is able to observe streaks of, mostly, vertically moving *Paramecium* in a good matured culture. These small organisms are, by then, present in gigantic numbers, swimming through the medium in search of the food that, during development, will have progressively reduced.

Now, the long necks of the bottles really come into their own. Pour clear water into

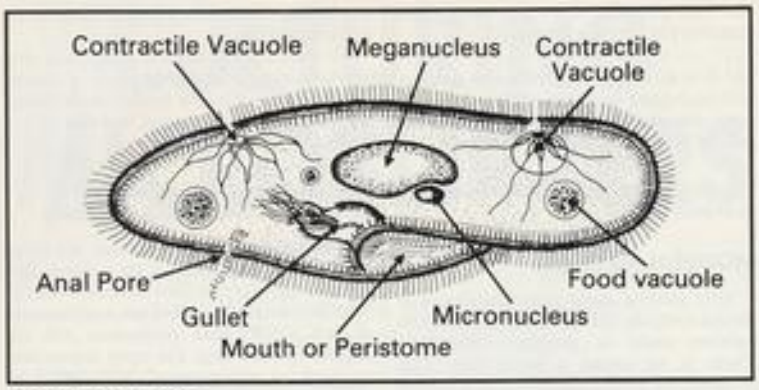


Diagram of *Paramecium*.

the culture bottle until the bottom of the neck is reached. At this point a wad of nylon filter wool is pressed in until it rests on the surface of the culture medium. In doing so, be careful that no air bubbles are formed under the wad; this will hamper the passage of the *Paramecium* colony.

The space above the wad of filter wool is also topped up with crystal clear and dechlorinated water until it reaches the mouth of the bottle. Within a few hours the full production of microslippers will move upwards right across the wad into the clear water, where they concentrate.

With the piston (see 3 — under **Requirements**) one can now draw out approximately ¼ of the production in order to start a new culture, while the remaining ¾ is siphoned off as the first food for free-swimming fry. Working in this way, the fish breeder can have a continual flow-production of *Paramecium* available, a food which is professionally considered as incomparable.

The size of *Paramecium* is so small that the fry of almost every delicate species of ornamental fish is able to eat this food. Further, as a result of using a medium made with milk as a food source, the food value of the cultures is high. It is rich with proteins and is easily digestible, so the fry quickly outgrow their breeding tank. It is also possible to increase the nutritious value of the medium even more by adding one drop of water-soluble vitamins per culture, about two hours before harvesting.

There is, further, every indication that one can influence the size of *Paramecium* a bit by using only ⅓ of the production, instead of ⅓, or using processed or more concentrated milk products to start a new culture.

D Maintaining the cultures

If a pure culture of *Paramecium* has reached its potential peak, it is possible to extend the total production for 3 or 4 days more by feeding the cultures with 1 or 2 drops of fresh milk per day, per bottle. This is a perfect method of retaining full production when, for example, a breeder has wrongly estimated the hatching time of the eggs or the first free-swimming stage of the fry.

Reading this article, you might think that setting up *Paramecium* cultures takes a lot of time. The truth is that it demands approximately 5 minutes a day. Observing of the cultures and judging the right moment of peak production requires some experience, of course, but this will come with practice. By setting up pure cultures (as described above), the unreliability and other drawbacks mentioned in connection with the old methods, will be eliminated. An extra bonus is that the nutritional value of this superb first food is considerably enhanced in the process.

News from the societies

British Aquarist Breeders Society

Following an item published in the Letters page of *A & P* in March of this year, Peter Muchamore reports that his proposed society aimed at setting up a co-ordinated UK-based group to specialise in the captive breeding of aquarium fish, is now set up and will be in operation as from 1 June 1991.

There is no subscription fee and a special plea is made for fish breeders from all over the country, and of all ages, to contact the society, one of whose main objectives is "to find an output for all the country's untapped breeding resources."

In addition to free membership, BABS will also offer a free Newsletter and Registration Forms to members. The society is particularly keen to hear from people who would be willing to chair regional meetings.

For further details contact Peter Muchamore (enclosing a large SAE), 16 Grasmere Close, North Watford, Hertfordshire WD2 7JH.

Northern Goldfish & Pondkeepers Society

President and retiring secretary of the NGPS, Bill Ramsden, was presented with a clock at the society's recent AGM, in recognition of his 30 years of dedicated service.

The presentation was made by the NGPS Chairman, Trevor Platt (see on the right of the photograph) after a short speech.

The new secretary of the society is Alan Evans to whom all enquiries should be directed: 15 Blenheim Close, Hollins, Bury, Lancs BL9 8BY Tel: 061 796 6563.

Meetings of the NGPS are held on the second Tuesday of every month at the Sports Centre, Silverwell Street, Bolton, starting at 7.45 pm. All are welcome and can be assured that no pressure to join the society will be exerted. Space is also available in the NGPS' Newsletter for other societies to advertise their shows or place notices of equipment, etc for sale.

'Aquarian' recognise Top Aquarists

For many years, top aquarists have been recommending 'Aquarian' flaked fish foods, especially the major award winners at the national shows. As a 'Thank you' for the many hours these aquarists have given supporting the fishkeeping hobby, a certificate has been prepared by 'Aquarian' for the top 50 winners at each of the major shows. These are presented at the same time as the trophies and, if signed and taken to the 'Aquarian' Advisory Service stand at the show, each winner receives a special parcel of gifts.

The parcel for the top ten winners includes an 'Aquarian' pure silk tie for men, or a silk scarf for a lady, and all 50 receive a selection of 'Aquarian' foods, plus their new 'Aquarian' Remedy test kits, an 'Aquarian' towel and pen and a form, plus a stamped addressed envelope, to register as a Top Aquarist with 'Aquarian' for future mailings of new products or publications.

These top aquarists' gifts are in addition to the traditional 'Aquarian Show Pack' that has been sent to all the major Fish Clubs for their Open Shows for the past 15 years. 'Aquarian' have also confirmed that the Show Parcel allocation will continue at 150 per year.

The 'Aquarian' Thank you gifts for the firsts in every class at the national shows.

Diary dates

South East London Aquatic Society

The 14th SELAS Open Show will take place on **Sunday 7 July** at Greenwich House, 141 Greenwich High Road, Greenwich, SE10. For show schedules etc., 'phone Robbie Somers on 081 859 5957.

Scarborough District Aquarist Society

There has been a change in venue for the Scarborough 1991 Open Show due to be held on 7 **July**. The new venue is the T.A. Centre, Coldyhill Lane, Newby, Scarborough. Benching: 11.00 am — 1.30 pm. Auction: 1.00 pm. Further information from S Barber, Show Secretary, 11 Linden Road, Newby, Scarborough, YO12 5SN.

Sandgrounders' Aquatic Society

The 21st SAS Annual Open Show will be held at Meols Cop School, Meols Cop Road, Southport, on **Sunday 28 July**. Benching: 11.00 am — 1.15 pm. Auction/Judging: 1.30 pm. Show enquiries to B Baldwin, 10 Olive Grove, Southport. Tel. 0704 543384.

Port Talbot Aquarist Society

The 21st Port Talbot Open Show will be held on **Saturday 13 July** at Taibach Youth Centre, Port Talbot (leave M4 at Junction 40 and follow signs for Port Talbot). Full details available from the Show Secretary, P Rabaiotti, 1 Dunraven Street, Port Talbot, West Glamorgan, SA12 6EG. Tel. 0639 899186.

OUT AND ABOUT

GETTING WET IN THAILAND

by Billy Whiteside

(Photographs by the author)

When I left Hong Kong on my visit to Asia (spring, 1990), and headed south-west for the 2½-hour flight to Thailand's Don Muang Airport at Bangkok, I expected to find some dry, warm weather in the City of Angels, after two out of three nights of thunder and lightning in Hong Kong. I was due for a surprise. When I stepped out of the airport the heat hit me: high summer and the temperatures heading for 100°F. It took only minutes for me to realise that I hadn't before really realised how hot hot weather can be. But, at least, it was bone dry; but not for long!

What I didn't know about was Songkran, the old Thai New Year Festival, or Fest, beginning on Friday 13 April and lasting for three days. The festival begins with scented water being poured over statues of the Buddha to ensure plenty of rain for the rice crops — and it quickly moves on to non-stop water-throwing sessions, where anyone and everyone is lashed with water. During my stay I was soaked countless times daily — from hoses, water pistols, plastic saucepans, buckets and water bombs made out of cellophane and polythene bags. Sporting an old pair of shorts and summer shirt, in roasting temperatures, made the experience rather amusing and quite cooling after the initial shocks; but I had gone to Thailand to photograph aquatic subjects, and my camera certainly would not respond to the soakings as well as I did!

The 'cichlid' pond at the Ambassador Hotel. If only such a pond were possible in our climate!

Worst trip of all was a half day on the klongs (canals), where every bridge, bank and canal boat hosted dozens of youngsters loaded with enough water to sink a boat — and soak a camera. Fortunately, by staying alert, I managed to keep my camera dry during the trip; I always managed to get my body between the water and the camera, and of course got soaked in the process. The only drawback was that I missed quite a number of the shots I'd hoped to take to illustrate this article, eg the splendid aquatic plants growing along the canals in the tropical water temperatures. However, the friendliness, charm and helpfulness of the Thai people, with their vocabulary of about ten English words, more than made up for the missed shots; and I managed to get lots of aquatic photographs eventually.

Some of the giant Koi kept at my hotel in Bangkok.

When I set off for Asia, my mind had aquatics divided into coldwater, tropical and marine; but 10 minutes in the open air in Bangkok in summer soon lets one know that the term coldwater is inappropriate. Everything outside is tropical!

I took a tuk-tuk — three-wheeler motor-bike taxi ideally built for getting soaked by a bucket of water every so often in passing — to Lumpini Park to watch the dozens of kites being flown during the holiday period. Glancing into the large boating lake I was amazed to see the water near a bridge swarming with a species of cichlid I could not identify (but were probably *Orochromis mossambicus)* from that distance; and that was outdoors in a public park! The only comparable thing I'd previously seen were hordes of Guppies milling in the ponds in the greenhouses at London's Kew Gardens. The water was thick with cichlids.

I stayed in the Ambassador Hotel, which is something of a palace itself and, indeed, somewhat beyond the style of accommodation I can afford, and there were lots of interesting animals kept in the grounds. While admiring some pink flamingoes I spied a delightful little pool, surrounded by plants, and housing some cichlids. A few steps further along I discovered a man-made pond, suitably shaded from the sun and filtered and aerated from underground, housing the finest collection of giant Koi I have ever seen — and that includes a visit to a Koi farm in England. The giant fishes were a blaze of strong colours and lazed happily around in the warm water. They would have fetched a fortune back home in the UK.

A handful of pellets was thrown in by an attendant and the water surface was soon swarming with the prize specimens. It was a sight to behold! I headed off for my camera, loaded it with 1000 ASA Ektar film, reluctantly fitted a polarizing filter to help cut down the reflections from the water surface, and had a splendid time, with the sweat running off me, photographing the Koi.

Crocodile wrestling — well, sort of — at the Samutprakarn Crocodile Farm and zoo.

For the following day I booked a half-day tour to a crocodile farm — Samutprakarn Crocodile Farm and Zoo, to be exact, situated 10 kilometres from Bangkok. It turned out to be an absolutely amazing place housing a host of various animals. I crossed a bridge and, looking down, saw some of the 20,000 catfish that live in the water. Amazing!

Next stop was a group of elephants performing tricks with their trainers, with a

chimp entertaining the crowd in the background. Elephant rides and camel rides were available, but I was more interested in photographing the animals than in riding on them. I soon spotted a beautiful tiger, with several little girls crouching down beside it to be photographed. I wondered about the danger, as it was in the open air on a chain with its keeper. The tiger seemed to be more interested in sleeping than in anything or anyone else, and it crossed my mind that perhaps the magnificent beast was tranquillised — a thought that depressed me somewhat.

Somewhere else, kids were being photographed with a gigantic python slung round their neck; but the highlight of the visit was the crocodile-wrestling show. As the photograph shows, a theatre-like arena housed a show that was repeated at intervals. As in Hong Kong's Ocean Park, I went early to get a good seat out of the blazing sun. Two men sporting red costumes soon appeared in the crocodile pond and prodded some of the dozing crocodiles into life with stout bamboo canes. Again, I wondered if the old crocs had had a tablet or two to keep them sedated. I heard and saw one crocodile snap its jaws closed a time or two and I can tell you I'd have been running as hard as I could had I been any closer!

The crocodile-wrestlers prodded the appropriate crocodiles into life and performed a strange wrestling sequence in which they appeared to wrestle the crocs, while the crocs showed a minimum of interest in their activities. Perhaps they were either doped or just plain bored by the proceedings.

Lumpini Park, Bangkok on a high-summer evening. The lake is full of fish.

Highlights occurred when the occasional banknote wafted down into the water and the elder trainer quickly grabbed it, flattened it and placed it in the open mouth of a crocodile. The pile of notes was quite considerable by the end of the show!

There were lots of other animals around which I did not have time to visit, but I did go into the shop on the site and saw vast arrays of belts, bags, shoes, etc made from the skins of crocodiles bred on the farm. Perhaps those in the show pond had been lucky.

Other outdoor ponds housed gigantic crocs by the dozen; and I left the place amazed by the thought of over 3,000 crocodiles in one place. That's a lot!

"Uno maret toucher?" asked a local as I headed for the bus.

"Pardon?" I asked, wondering why I'd learned French at school and not Thai or some form of Chinese.

"Ou know maret toucher? Prime Minister: Maret Toucher. Ou know her?" he asked again.

"Oh, Margaret Thatcher," I laughed.

"Gleat lady, he said. "Ou know her?"

"Not exactly," I admitted; "but I did see her at *Phantom of the Opera* one night in London's West End, when she and I chose the same night to go." There's nothing like a bit of name-dropping.

"Gleat lady!" he said again — and many of the people I met in Bangkok said the same thing. Unlike me, they didn't have to get to grips with the Gleat Lady's National Curriculum (I'm a schoolteather)!

If you are ever in Thailand do keep an eye open for all the fishes that abound — and do visit the amazing crocodile farm. You'll probably not come across many people more charming than the smiling Thais, nor many countries more fascinating than Thailand. I'll certainly go back to Thailand — if I ever win the pools.

THE SEARCH IS ON !!!

AT THE BRITISH AQUARISTS' FESTIVAL 1991

For the 25th winner of the "Champion of Champions" contest

by Alan Darby

Almost every weekend, someone in the UK becomes eligible to enter for the most coveted award in the world of fishkeeping.

All aquarist societies holding Annual Open Shows can, by selection, apply for the *Aquarist & Pondkeeper* Gold Pin and entry form for the **Champion of Champions** class at the British Aquarists' Festival. The gold plated pin for Best Fish in Show in the shape of the *Aquarist & Pondkeeper* badge is awarded only to the 'best fish' at selected Open Shows, and is a coveted prize in its own right.

Since the inception of the Gold Pin in 1967, only fifty or so societies each year have applied for the honour of presenting the prize, so one can appreciate the rarity of the award. Having won this award, the exhibit then becomes eligible for entry in the **Champion of Champions** class.

The competing fish in the **Champion of Champions** are judged by leading judges invited from all over the country. The outright winner of the contest is awarded the splendid hall-marked gold lapel pin, in the shape of the *Aquarist & Pondkeeper* badge supported by laurels and inscribed **Champion of Champions**, together with a cash prize of £75 and a beautiful commemorative plaque.

The plaque is made of oxidised silver-plate and is mounted on a handmade Indian Rosewood back, inscribed with the coveted title **Champion of Champions.** Similar commemorative plaques are presented to second and third successful contestants, with cash prizes of £50 and £30 respectively. All entries to the **Champion of Champions** will, this year, receive a commemorative pin which I am delighted to sponsor.

The British Aquarists' Festival of 1991 is being held at **Bowlers Exhibition Halls, Longbridge Road, Trafford Park, Manchester** and will be open to the public on **26 and 27 October.**

The fish are judged on the Friday and have to be benched by midnight on **Thursday 24 October.**

For further details of the awards and entry forms, societies should write to *Aquarist & Pondkeeper.*

Details of the British Aquarists Festival can be obtained from **Arnold Chadwick, 9 Bronville Close, Chadderton, Oldham OL2 2RH.** If you cannot enter in this competition, why not come along and see these magnificent specimens for yourself instead?

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,** Graham Cox.

KOI

PUMPING PROBLEMS

My old pump has packed up and cannot be repaired. I cannot afford a new one and have therefore been wondering if I could use a domestic central heating pump. My pond is about 14 ft x 9 ft (c4.25 x 2.7m) and has a waterfall which is about 3 ft (c 1 m) high.
A central heating circulator as a replacement for your burned out pump, would certainly be both cheaper to buy and run but, as usual, there are snags involved.

This type of pump is only capable of 'pushing' water and, as such, must be provided with a constant inlet head or pressure, necessitating it to be also installed at a depth below that of the water being pumped. This means that this type of pump is not self-priming.

What it boils down to is that the central heating pump is only useful where the filter is positioned at the same level as the pool ie gravity-fed, the pump then being positioned to pump water back to the pool following filtration, via a venturi or, perhaps, a waterfall. This means that the pump needs to be installed in a watertight compartment, but one having ventilation.

If you are at all doubtful about the above, may I recommend you obtain a copy of *The Interpet Encyclopedia of Koi* in which all this is carefully explained and illustrated.

KOI POOL DEPTH

I've just moved into a house which has a large concrete pool (14 foot — c 4.25 m) diameter by some 3 feet (90 cm) deep at the centre, with an ornamental fountain. The pool is sound and in good repair, so I wondered if it would be suitable to keep, perhaps, half a dozen Koi in it. I've had no previous experience with pondkeeping but have always rather fancied the idea.
The surface area of the pool you describe would certainly be suitable to keep Koi in, but I have reservations regarding the depth, 4 feet (120 cm) generally being considered a minimum for successful Koi-keeping. Having said that, the area in which you live (West Cornwall) can be regarded as one of the more kindly parts of the country in terms of extremes of weather, so you could conceivably get away with it.


To keep Koi as healthy as those in this pond obviously are, on a longterm basis, a water depth of around 4 ft (120 cm) should be regarded as minimum.

In order to appreciate Koi to their full, you would need to filter the water and this, I fear, could be a problem in your situation. I imagine that this pool is situated in a lawn, which means that a retro-fitted filter would be unsightly, unless you fitted one of the commercially available foam filters to the pump which drives the fountain. This would need frequent cleaning, possibly twice daily during a hot summer, not a very welcome chore.

My advice would be to leave the existing pool as just ornamental and go the whole hog by building yourself another pool for Koi. I can assure you, you won't regret it!

TROPICAL

KISSER SURPRISE

Some time ago I noticed what seemed to be a yellow jelly substance floating on the surface of the water in my Kissing Gourami tank. Later, my wife noticed lots of tiny small round 'bits' among the plants and on the bottom of the tank. Shortly after this, there were baby fish everywhere! Is it unusual for Kissing Gouramis to spawn in an aquarium?
It is, indeed, most unusual for Kissers, or Kissing Gouramis (*Helostoma temminckii*), to breed in the home aquarium. As you discovered, they do not really build a bubblenest like other Labyrinth fishes.

Keep the pair alone in a breeding tank and, if more eggs are laid, have algae and infusoria ready as a first food. The fry can be weaned onto crushed flake quite quickly. A vegetable flake is best because these fish are partly herbivorous (although they do not destroy plants).


Pink Kissing Gouramis living up to their name. In reality, the fish are engaged in a trial of strength, rather than in an affectionate display.

Make a note of the water conditions and, especially, how the fish behave, because there are no obvious sex differences. Some photos would help too! Your report could then be published for others to attempt to follow suit and breed these interesting fish.

COARSE ENTERTAINMENT?

I have been keeping a selection of coarse fish for some 18 months now in a four-foot (120 cm) tank and have found them infinitely more interesting than the Heinz 57 varieties of goldfish that seem to make up the entire coldwater stocks of most shops in my area.

I am fortunate to have been involved in the stocking of a private lake and was able to liberate a pair of Crucian Carp, a Tench, and a fully scaled Mirror Carp. I then added an Orfe for some extra colour, a Koi which I think is a Doitsu Ogon (virtually no scales and looks like a Leather Carp) and a Blue Channel Cat. The tank is full of little hidey-holes made up of bogwood and plastic drainpipe which keeps the Tench and the Cat happy. All the fish have grown on quite a bit, but seem to get on OK. The Tench and the cat have the occasional head-to-head over territories, but it soon settles down.

It's quite amusing watching these squabbles — they are normally over their favourite piece of drainpipe in one corner of the tank. While they are facing up to each other, the Koi nips in, turns upside down and starts grazing on the algae on the roof of the pipe. Then, when the winner returns, (normally the Cat) all hell breaks loose. The Cat charges into the pipe behind the Koi, which then shoots out. If you've never seen a high speed, upside-down Koi, it really is something!

I found two main problems when I tried to introduce a small Perch to the tank this summer. Firstly, it was not happy with the water temperature which is static at around 68°F (20°C) and refused to feed unless I lowered the temperature to just under 60°F (15.5°C) using ice. Secondly, although no threat to the other fish due to its size, the Mirror Carp immediately became agitated when the Perch went in and actually attacked it! It could do no real damage, but the Perch died within a week, I believe, owing to stress caused by constant harassment from the Carp.

As I said above, the fish are growing on well, but if I am to keep them, I am going to need a bigger tank — something of the order of 5ft x 2ft x 2ft (150 x 60 x 60cm) should do. However, I don't know whether to use internal or external filters. I have found coarse fish to be very messy. Can you suggest an appropriate filter system for the new set-up I am planning?

I can certainly understand why you find your mixed batch of fish more entertaining than the peaceful subjects of the goldfish varieties but, as curators of the fish we choose to keep in captivity, should we not then be duty bound to make sure that their health and welfare come before our own entertainment?

What we must bear in mind is that the tank we provide will become their world, with all its restrictions and limitations. In the wild, where these species of fish come from, be it river, lake, pond or canal, they have space to live their lives. They have their own territory and carnivorous species are normally found in far fewer numbers and, because these waters are not overcrowded, all species are able to survive.

In the confines of an aquarium, things are very different. The stress caused by introducing aggressive, carnivorous species with gentle, peaceful varieties, such as Carp and Tench must surely be compared to keeping a lion in our own house; fun for the period when it is small and immature, but dangerous when fully grown and hungry!

My interpretation of the incident with your Perch and the Carp was rather different to your own. I can understand, I think, just what the Carp's reactions must have been to recognise a future predator in its domain. While small carnivorous fish are unable to make meals of other fish larger than themselves, once grown to full size, I feel sure that most, probably all, other tank inmates would eventually become meals after living in a constant state of stress.

This, to me, is not an acceptable part of fishkeeping. Deliberately introducing incompatible living creatures together in the knowledge that they must constantly quarrel, many of them suffering premature deaths through their ordeals, is not on. We must also take on the responsibility for providing our charges with conditions as suitable and as near to those found in nature as we are able. That includes water temperatures and, as you have discovered, coarse fish are not able to tolerate high temperatures.

Let us now consider the eventual size of those fish which you have chosen to keep in your aquarium. The Crucian Carp, under its natural conditions, may attain a size of 20 inches (c 50 cm), while Mirror Carp grow to about the same. Therefore, only juveniles are suitable for aquariums, and only the largest of ponds with a depth of no less than 4-5 feet (120-150 cm) can be considered suitable homes for these subjects of the carp family (and that also includes Koi).

Again, Orfe are quite unsuitable fish for tanks. These are fast swimmers, active and only really happy when kept in numbers because they are shoaling fish. They like cool temperatures, well oxygenated water, live foods and, again, can easily attain a size of 20 inches.

Now, the Blue Channel Cat is another thing; they also like cool temperatures, are territorial creatures and are aggressive when adult. They also grow very large, and so will harass other fish, particularly those that are gentle, peaceful fish.

So, the eventual size of the fish must be considered when we decide to keep them. If we continue to keep them in aquaria, their growth will be stunted and, surely, no-one would choose to do such a thing intentionally. If we decide to rehouse them so that they may grow properly, then we can only, as hobbyists, go so far with the size of tanks we can provide. It is therefore plain to see that a tank measuring 5 feet (such as you plan) will only be a suitable home for a short time.

There are many powerful filter systems now on the market. Probably the best plan would be to run an undergravel system in conjunction with a power filter, with frequent tank maintenance, such as cleaning the gravel bed with the aid of a gravel cleaner. As power filters have a powerful return, a spray bar should be installed to disperse the flow more evenly as members of the Carp family do not like to swim constantly against strong currents.

Perch *(Perca fluviatilis)* — hardly an ideal choice for an aquarium, particularly one housing Koi!

HERPETOLOGY

LOW-DOWN ON AMERICAN BULLFROGS

I would like to find out as much as possible about American Bullfrogs, including the diet of both tadpoles and adults. Can you help?

Tadpoles of the North American Bullfrog (*Rana catesbeiana*) are initially **herbivorous** (although for the first two or three days after hatching from their frog spawn, they use up the remains of the egg yolk in their abdomen). To cope with their plant diet, Bullfrog tadpoles develop a pair of horny jaws. They use these to rasp off algae from the rocks in the ponds and streams where they naturally live (and from the glass of the aquarium in which they are maintained in captivity).

As the tadpoles grow, their gut shortens and they lose their horny jaws. Their diet also changes. They no longer eat plant material, but become **carnivorous**. The tadpoles feed on small invertebrates, including *Daphnia*, red, wriggling *Chironomus* larvae, mosquito larvae and tiny earthworms.

During their early months, Bullfrog tadpoles are totally aquatic and can be kept in a glass aquarium containing water plants such as Water Milfoil (*Myriophyllum spicatum*) and Canadian Pondweed (*Elodea canadensis*).

Even after the tadpoles have grown their hind legs, they still remain in the water all of the time. At this stage, they also develop a pair of lungs and frequently rise to the surface of the water to gulp in air. Tadpoles at this point in their development often support themselves on the leaves of water plants in the aquarium.

As the front legs develop, a rock (or half a brick) must be provided in the aquarium so that the tadpoles can haul themselves out of the water. At this stage in their development, just prior to metamorphosis, all juvenile amphibians are at serious risk of drowning.

Speed of development of the tadpole from hatching of the spawn to metamorphosis into a froglet, depends on the prevailing temperature of the water and the availability of suitable food. On average, development from egg to froglet takes about two years for this species.

After metamorphosis, the terrestrial froglets feed on a variety of small invertebrates, including mealworms (*Tenebrio molitor*), tiny crickets, small earthworms and flies.

They are active amphibians, and need a relatively tall vivarium in which they can jump without injuring themselves. A secure (and ventilated) lid must be fitted over the vivarium to prevent the escape of these agile amphibians **and** their live invertebrate food.

Adult North American Bullfrogs can survive in and around garden ponds all year round, at least in southern and central England. However, these introduced amphibians can have a deleterious effect on the native wildlife — refer to **Herpetology Matters** in the January 1991 edition of *Aquarist & Pondkeeper*. Under the Wildlife and Countryside Act, 1982, it is illegal deliberately to introduce or allow to escape any non-native species of animal (including Bullfrogs) into the wild.

LAWRENCE PERKINS

The American Bullfrog is a beautiful, and very active, amphibian. It is illegal to release it, or allow it to escape, into the wild.

MARINE

LIGHT CHOICE

I would like to set up a 60 x 24 x 24in (180 x 60 x 60cm) tropical marine aquarium. How much, and what sort of, lighting should I use?

If you intend the tank for use as a fish-only aquarium, then three 5-foot (150 cm) long fluorescent tubes would be adequate. Use something like one Gro-Lux and two Northlight tubes.

If you are using an aluminium hood, please remember that aluminium is extremely toxic to all forms of aquatic life — and particularly toxic to marine life. You must therefore fit very close-fitting cover glasses. To be really certain that there is no risk whatsoever of toxic aluminium salts going into the tank, I always paint the inside of aluminium hoods white with gloss before use.

As an alternative — though more expensive — you could avoid a hood altogether and use three Floraset colour-corrected fluorescent spotlights suspended 2 — 3 in (5 — 7.5 cm) above the cover glasses.

In order to succeed with invertebrates in a tank as vertically deep as this one, I suggest that you use at least two Metal Halide Lights — though again, three units would be better if you wish to spread photophilic invertebrates such as corals, hydroid polyps and anemones evenly over the full area of the aquarium.

CORAL WORLD PLAT

Corals and their relatives need high levels of illumination for survival.

VARIABLE KRIBS
(Part 2)

Didier Granet completes his review of these popular and colourful cichlids.
(Photographs by the author — unless otherwise indicated. Text translated by Mary Bailey)

A pair of Form A Kribs with their spawn. Note the lack of a distinct longitudinal body line and the absence of ocelli ('eyes') in the fins.

Having taken a look at the confusing history regarding the scientific name of *Pelvicachromis pulcher*, plus its aquarium requirements, feeding and suitable tankmates in Part 1, I would now like to concentrate on breeding, and the various colour forms of this species that are currently known to exist.

BREEDING

When one introduces a group of Kribs into a community tank, a pair will form (if both sexes are present) and enter into hostilities with the other conspecifics. The aggression within the group will normally be manifested as intimidation, and, as long as an escape route is available, will not result in injuries. Once the relationships between dominating and dominated individuals are established, they appear to be stable, as long as no new factor disturbs this equilibrium (eg the addition of a new individual, or the removal and subsequent reintroduction of a fish). After this period of hierarchy formation, the pair occupy themselves with spawning and then the care of the fry.

In order to give the best description of the method of reproduction, it is preferable to detail the different stages when a pair are kept by themselves (single-species aquarium); this avoids having to take into consideration a whole series of side issues, and it is sufficient to extrapolate from, and adapt, what follows to maintenance in a community.

The breeding tank

Setting up a breeding tank is very simple; the main objective is ease of access (for maintenance, netting, siphoning . . .) and everything which is not absolutely necessary is superfluous, if not actually forbidden.

The decor is composed of items which are easy to remove or clean (flower pots, broken

UNDESCRIBED KRIB

A species, which has not yet been described, but which is morphologically very close to *P. pulcher*, is sometimes found in the trade under this name, and this is provisionally named *Pelvicachromis* species affinis *pulcher*. The head is slightly more concave than that of *P. pulcher*.

There are two forms: **Form A** resembles the red variety, but is distinguished from it by the blue-torquoise wavy lines beneath the eye and on the cheek. In **Form B** these markings and blue spotting are more distinctly marked than in the other form, but the overall coloration approaches that of the yellow variety. Neither of these forms has ocelli.

KRIB COLOUR FORMS

Because of the great diversity within the *P. pulcher* group, it is sensible to describe the basic patern, and then to give the details of the differences for each variety.

The body is moderately elongated, with the head representing about ⅓ of body length (not including the caudal fin). A mask, composed of two light bars, crosses the forehead from one eye to the other, and the mouth position is terminal. The first dorsal spines are situated above the gill openings, and the fin continues almost as far as the caudal (this is a cichlid), its tip being rounded in females and elongated in males. In general, males have ocelli ('eyes') on the caudal fin, while in females these appear on the rounded posterior extremity of the dorsal. The male may attain a length of 10cm (4in), while the female grows to barely 7cm (2.75in).

P. pulcher, Form A
Body beige, pink on the ventral region. The lateral band is not visible (or only barely distinguishable). The caudal fin is rounded and has no ocelli; its upper part is bordered in red. The female has no ocelli in the dorsal.

P. pulcher, Form B
The males of this form always exhibit a dark longitudinal band running through the eye and extending to the caudal peduncle. The caudal fin is slightly lanceolate (but that of the female is rounded). Four varieties have been distinguished, differentiated by the colour of the male.

P. pulcher, Form B, Red Variety
The upper part of the dorsal fin is bordered in red, but there are no ocelli. The anal fin is violet and the pelvics are red, with the two anterior spines blue. Finally, the throat and belly are red.

P. pulcher, Form B, Green Variety
There are at least two ocelli in the upper part of the caudal fin and the posterior part of the dorsal. The lower part of the caudal is green. The throat is blue-torquoise and the belly pink.

P. pulcher, Form B, Yellow Variety
The upper part of the caudal fin is usually decorated with a single ocellus, the lower part of the fin being light. The throat is yellow. The body is beige with a very distinct longitudianl band. The dorsal has a dark red edging.

P. pulcher, Form B, Blue Variety
The longitudinal band is not well defined, and separates the yellow-olive upper part of the body from the lower, which, together with the throat and pelvic fins, is blue. The lower part of the caudal fin is green-yellow and the upper part is bordered with orange.

In Form B (Red Variety) there are no ocelli, but the dark longitudinal body stripe is distinct.

flower pots) should be positioned a little way from the heating cables and one should take the trouble to block up the entrances with sand. The female will choose her hiding place and open up the entrance to suit herself. The temperature should be between 26 and 29°C (c79–84°F) and the water should be soft, with an acid pH, as we will see later. Filtration should be by means of a small interior power filter positioned well away from the spawning site (to avoid sucking in the alevins (larvae) before they become free-swimming).

If the pair is well-mated, then the tank can

Form G Green males are spectacularly marked with ocelli.

bricks, coconut shells); they are only to act as spawning substrates and hiding places. The vegetation should be restricted to Java Moss (*Vesicularia dubyana*), which has the advantage of providing an element of security and a degree of oxygenation, while also trapping food for the fish to peck at.

Sand should have a grain size of 2-3 mm. If the sand is too coarse, it will hinder the parents during the digging phase. Heating can be via a cable-type heater in the substratum, which will ensure circulation of the water and avoid a proliferation of bacteria which might be detrimental to the development of the larvae. This tank will, in no way, be aesthetically pleasing, but this consideration has no place here.

Two spawning sites (coconut shells, half

be small (1500–2000 sq cm surface area — c230–300 sq in; depth is of no importance). It is interesting to note that the introduction of an unmated male and female into this type of aquarium often also results in success, although failures have been recorded, but these have usually resulted because of too great a disparity in size between the two fishes. All the evidence suggests that it is difficult to persuade a fish that has already bred to accept a new partner.

Courtship and mating

When the female has chosen her cave and arranged the entrance to her liking, she attracts the male with characteristic display movements and enhanced coloration. She adopts a C-shape, curving towards the male, with her pelvic fins pressed tight against her belly, but spread out so as to increase its apparent size — the fins are the same colour as the belly. This posturing is completed by a series of quiverings, and she then swims alluringly, curving first to one side and then to the other, leading her future partner towards the chosen nest.

The latter responds to the movements of the female, and the two then set about removing sand from the area around the spawning site. They then take turns at entering the cave, the one to lay eggs on the ceiling, the other to fertilise them with his milt. After about an hour, the spawning is finished, and the 100–200 eggs, suspended on the ceiling, are fanned by the female; her partner remains in the immediate vicinity of the cave, waiting to assume his role as father several days later.

After two days (this period becomes shorter as the temperature is raised) the larvae come free from the spawning substrate, assisted in this by their mother. After five days, they have absorbed their yolk sacs and make their first sorties into the outside world under the strict supervision of their parents.

In Form B (Blue Variety) the body line is less distinct than in the other colour morphs and the caudal and dorsal fins are bordered in orange.

It is important to provide food suited to their size (5mm–0.2in). *Artemia* nauplii and small pond foods can be fed freely immediately. The fry can be left with their parents for about a month, or siphoned out and raised in a small aquarium filled with water from the spawning tank. *Planorbis* snails will help keep the tank clean and clear up the surplus food which cannot be avoided when one feeds with *Artemia* nauplii, even though these will survive for several hours in fresh water.

The final point to mention is the effect of the pH of the water on the ratio of the sexes produced from a spawning. If the water is too acid (pH < 6.2) there will be a predominance of males, and below pH 6 there will be no females at all. By contrast, if the water is neutral, the opposite occurs. A balanced ratio of males and females can be achieved using a pH between 6.2 and 6.5.

If one wishes to breed this species in a community tank it will suffice to refer to the above and adapt it to the circumstances of the aquarium in question.

Few ocelli occur on From B Yellow males. The cheeks and throats are, however, brilliant yellow.

Coldwater jottings

By Stephen J. Smith

DARIUS . . . THE LEGEND CONTINUES

There was a heartwarming reception for the first published account of the championship Goldfish, Darius, created by correspondent **Alex Stephenson.**

The second part of this four-part series follows last month's intriguing fish-eye view of Darius' visit to the showbench. . .

Darius was on his way home in the capsule. At least he hoped that that was where he was going. The day had been long and exhausting, but he couldn't 'let down' yet. The stimulants his body had produced to get him through the ordeal had not yet dispersed. He was going through an irritable stage. This would pass shortly as his chemistry slowly returned to normal.

The day's events had been predictable. Too high a temperature and too little space, but he had paced himself well. He knew, despite all the odds, that he had given a good performance. The outsider who had judged him had given off agreeable signals.

Studying outsiders was one of his hobbies; in fact, his peers considered him something of an authority. Long discussions often took place, during which his views were respectfully considered.

As subjects, these large animals had always fascinated Darius. It was difficult to understand how they functioned at all. Their senses were so few and so limited. He suspected that the key to their existence must be high intelligence. They had little else at their disposal.

The idea of 'intelligence as we know it' was revolutionary, of course, and hotly disputed. He was, however, quite convinced that these unlikely beings controlled the lives of his race, and even held the power of life and death.

He was feeling more relaxed now. The transporter rumbled on steadily. Although he couldn't visually see through the walls of the sealed capsule, he knew it was dark outside. He just knew. He started running some final checks before going into 'rest mode'. Using 'panoramic sight' he felt all around the capsule to check his position then, sinking gently, he grounded lightly on the capsule floor.

That was something else outsiders didn't appear to do. To 'touch' they had to make actual physical contact: rather like bumping into something to determine what it felt like. Darius had a little giggle.

The journey was likely to take some time yet, so he began shutting down some of his equipment, leaving himself on life support, plus a little conscious level. This would help restore some of the energy recently spent. Not much, it was true; complete recharge took many days; but it would prevent vital reserves being compromised further.

His thoughts returned to the subject of outsiders. Perhaps they would always remain a mystery. There was also the question of ownership. Much as his kind disliked the idea of being 'owned', they all realised that their very existence relied directly upon this system. Today's events were an example. He, and many others like him, had been competing on behalf of their owners.

Had he at last proved his worth? he thought. After so many of these campaigns, during which he had always given of his best, would he now receive the reward he most wanted — to be part of the breeding programme? The lifestyle offered could be very good indeed: no more ordeals in the transporter; no more exhausting competitions; and an end to his celibacy!

The thought of good quarters, good food and females as well, inadvertently started up some of his circuits. He controlled the situation and calmed down again.

His sensors indicated that home was not very far away. On arrival, he would be transferred to a rest tank for the night, to be left alone. Tomorrow, he would be put back with his colleagues, largely ignored until he was required again.

Suppose this time was different? What if, after a night in the rest tank, he was transferred to the breeders' quarters? He wouldn't have female company all the time, of course, only when it mattered. He was getting excited again and, maybe, for nothing. After all, there was no indication that he was even being considered as a breeder. He could always dream, and usually did after these events.

Often, the price of failure was expulsion. What followed disappearance no-one could be sure. He had even heard of some of his kind changing owners several times.

After a short period of chaos and a pause, Darius underwent the unloading and transfer procedure, finally finishing up in the rest tank. The scents were unreadable: this wasn't the usual rest tank. Had he changed owners, after all? No, this was definitely home.

Morning came too soon for Darius, but he was hungry. He wondered how long he would have to wait for food. Outsiders were not noted for early attendance; it was quite usual for the day to be several hours before they appeared. Sometimes they did not show up at all.

Darius switched his attention to the unfamiliar surroundings. He was certain he had never been in this tank before. The smell reminded him of a time when he had been ill. That was it, the smell, blotting out everything. It was some kind of medication. Strange, he didn't feel ill — just hungry.

Eventually, an outsider came and studied Darius for a long time. Then it dropped him some food and went away. Several days went by during which the ritual was repeated many times. Darius was puzzled and found the blanketing smell of the medication tiresome. Obviously, he was being prepared for something.

The answer to his questions came one evening, when he was ushered into a small container and transferred into another tank. As soon as he was released, powerful scents washed over him. He recognised them immediately, of course, but they had never been so strong and so exciting.

There were other occupants in this large tank, giving off harmonious signals. It did not take Darius long to sort himself out. He had joined a number of other males, most of them larger and older than himself.

These were not just males, they were the aristocracy of his race. He knew he was related to some of them, one in particular had vibrations almost identical to his own.

He could smell females too, not in this tank, but close, in the adjoining large tank. They were magnificent, the kind of creatures dreams are made of, and his tubercles began to itch. Some of the more curious females came to look him over. Their signals were favourable and they teased him a little.

The other males were watching him with amusement. They exchanged thoughts, telling him the breeding season was not for some time yet. Darius didn't care; he was among the elite and could afford to wait for spring.

Next Month: **Reflections at Summer's End.**

FOOL'S GOLD

Many thanks to all those who responded to the April Fool feature on Color -Skope pellets in April's **Coldwater Jottings.** Most of the replies were humorous: some were quite serious. And special thanks really must go to the production department at *A&P* who were able to contrive an illustration of a 'Blue Kohaku' to help carry off the spoof.

As ever with such a spoof, they can sometimes backfire and, although fellow coldwater enthusiast **Larry Brown** had a good laugh when he read the piece, he was almost (only almost) able to cause this 'Coldwater Jotter' some embarrassment the following week.

Larry, a member of South Park Aquatic Study Society (SPASS) and a leading light of Middlesex and Surrey Border Section of BKKS, happened to be visiting his local Koi establishment soon after receiving his April issue of *A&P*. He had great pleasure in explaining to

JOHN DAVIS

April's 'Bluhaku' created quite a lot of interest!

me: "I was amazed to see a very nice looking ten-inch Kohaku with a two-step pattern — in black!" (*Isn't that a Shiro Bekko?* **Stephen.**) "Knowing that black will sometimes fade to a blue (blue is only black pigment deep within the skin of the fish) I was very much tempted to buy the fish to turn the joke on its head!"

NORTHERN DELIGHT

It was a delight to visit the annual open show of the Northern Goldfish and Pondkeepers Society towards the end of last year (October), held in Altrincham, near Manchester. As is often the case in the UK, the north is often overshadowed by the efforts of Southern counterparts, and the Goldfish scene appears to be no exception.

However, in an effort to redress the balance, I am grateful to club president Bill Ramsden for providing me with information about NGPS.

The first meeting of Northern Goldfish and Pondkeepers Society took place in the summer of 1959 between a group of enthusiastic coldwater fishkeepers in the Manchester area and, from these beginnings, the society has grown to a current membership in excess of 70 people, with enquiries arriving every week from interested hobbyists.

I am always impressed by the dedication shown by hobbyists in pursuing their interest, and the members of the newly-formed society were no exception. At the inception of NGPS there were, apparently, no Fancy Goldfish available in the area, so members visited the major shows which, at that time, were at Bristol and Birmingham. Explained Bill: "In 1960, very few people could afford their own transport, so this left us with no other option but to catch the midnight train from Manchester to arrive in Bristol in the early morning."

He continued: "We arrived home at midnight, very tired, but still clutching our newly-acquired and highly treasured possessions."

The society staged its first show in 1977, and this has grown in stature to become one of the three major shows in the UK Goldfish-keeping scene (along with the Goldfish Society of Great Britain and Bristol Aquarists' Society), with over 37 classes covering all the major varieties of Fancy Goldfish.

For further information about **Northern Goldfish and Pondkeepers Society,** contact president **Bill Ramsden** at **18 Ainsdale Road, Bolton, Lancashire BL3 3BY (Tel: 0204 654676.**

News

Name Change For Ash Holt

As from the 1 April Ash Holt Aquatics became part of the Golden Phoenix Fisheries Co., of Hong Kong.

Golden Phoenix fisheries are breeders and worldwide exporters of Fancy Goldfish which are bred on the company's own farms in China. The head office is based in Tuen Mun, New Terrotories, Hong Kong, together with the main export centre. During the next month or so, two new export centres in Shanghai and Beijing are to be opened, together with a new breeding farm to produce all types of Fancy Goldfish in the size range 5-6cm (2-2.4in) to 7-8cm (2.75-3in) — the most popular size throughout the world — giving year-round availability.

All fish are fully conditioned prior to being shipped, a special blend of water treatments — formulated by the company's export centre in Hong Kong — being added to shipping water to ensure fish arrive in the best possible health. Golden Phoenix always expect 100% live arrival.

Fancy Goldfish are available in three grades — Selected, Premium and Show. The UK holding centre is still under development. Newly imported fish are held in a totally separate tank/filtration system, where they are medicated/rested before being transferred to the 'selling tanks' to avoid any transfer of disease.

All enquiries to **Golden Phoenix Fisheries Co. (UK), UK Sales/Holding Centre, Bank End Road, Finningley, Doncaster, DN9 3NT, Tel: 0302 771667 & 772358; Fax: 0302 770877.**

Tetra Winner at London Zoo

The ability to identify Koi colour patterns and match them correctly to their Japanese names, coupled with a successful tie-breaking slogan, won for **Lesley Woolf** a specially painted portrait with a difference — a stunning pen and wash study of her favourite Koi.

The commission was undertaken by the eminent artist **John Oliver**, of Newcastle-under-Lyme. John specialises exclusively in 'piscine portraits' but covers all fish subjects from angling to aquarium and pondkeeping. His works are much sought after, with many (including Lesley's) in the £1000 bracket. John is quite happy to work from photographs and will provide the finished article in any of the normal artistic materials — oils, water-colours, acrylic, guache etc.

The presentation was made at London Zoo, by **Cliff Nash** of Tetra, with John Oliver and **Dr David Pool,** Head of the Tetra Information Centre in close attendance. Obviously, the venue made the sharing of the experience necessary, so Lesley brought along her husband and two children to lend some family support. Equally mandatory, considering the occasion, was a visit to the Zoo Aquarium — something John Oliver had also been keenly anticipating, being always on the look-out for new subject matter. The Aquarium's **Brian Harris,** perhaps left holding the fort since Chris Andrews' recent departure for Baltimore, provided a splendidly informative tour behind the scenes, explaining many of the exhibits, day to day running and updating the new procedures now underway, both on the public display and filter system fronts.

An excellent lunch rounded off the formalities before the children took Mum and Dad around the rest of the Zoo.

OBITUARY

MERVYN STRANGE

It is with the deepest sorrow that we announce the sudden death on Sunday 2 June of our Vice-Chairman, Mervyn Strange.

We could quite easily go into a lengthy eulogy regarding Mervyn's many outstanding contributions to the hobby, particularly to the field of livebearers, or run through his activities as a foremost member of the Association of Aquarists. However, that would not serve any great purpose other than underline our deep sense of loss.

As President of the Southern Livebearers' Aquatic Group, I offer our society's most heartfelt sympathies to Mervyn's family. As a society, SLAG mourns the irreplaceable loss of one of its major driving forces, founder members and leading lights. As friends, we will all miss the warmth, sincerity and downright good sense that Mervyn brought to everything he touched.

The hobby is much poorer today through his sad loss.

JOHN DAWES
President — Southern Livebearers' Aquatic Group

Pisces/Tewin's Re-circulating Wholesale Dept.

New wholesale fish-handling facilities which were being built at **Pisces Aquaculture Tewin Ltd** at the beginning of the coldwater season, were duly brought into service in April (as reported in **Out & About** that month). Since then, the already substantial existing acclimatisation/holding department has been further refined and expanded and is now operating at full capacity.

Roped off from the retail area at the company's Tewin Mill site, the wholesale section consists, basically, of three units: a holding/packing area in which acclimatised fish are held in tanks, troughs and floating cages; an acclimatisation area consisting of two large ponds housed under poly-tunnels, in which new arrivals from the company's own breeding/rearing establishment at Kfar Ruppin in Israel and its holding facilities in Hong Kong and Japan are gradually introduced to UK water condition; and a further pond filled with over 100 tons of shingle which acts as a massive biological filter for the two other units, and from which a powerful pump circulates biologically purified water throughout the now self-contained wholesale department.

Pisces Aquaculture Tewin Ltd is currently supplying coldwater fish, including Koi, Goldfish (Comets, Shubunkins and a range of Fancies) and Orfe (Blue and Gold) in large numbers to the trade throughout the UK and most of Europe. For further details, contact **Martin Symonds** or **Adrian Barnes, Pisces Aquaculture Tewin Ltd, Tewin Mill Fish Farm, Kingsbridge, Tewin, Nr Welwyn, Herts. AL6 0LJ. Tel. 0438 718558; Fax. 0438 840096.**

Riverfield Open For Business Despite Break-in

The Koi rustlers are at it again. The latest victims — Riverfield Koi Farm of Marden in Kent — are recovering from the attentions of these most unwelcome visitors who broke into the company's premises a few weeks ago and stole thousands of pounds worth of Koi and fish farming equipment.

Despite the break-in, Riverfield would like to assure customers that 'it's 'business as usual' at Marden.

Koi-keepers and farmers be warned!

HOOPING
FOR SPECIMENS

Ever wondered how to collect specimens from difficult-to-get-to nooks and crannies in streams or rock pools? If so, **Bill Simister** may have the perfect solution — a hoop net

(Drawings by Ford West)

There are many instances when the collecting of good specimens from either canal, pond, stream, or the sea, is almost impossible for one reason or another; often because what you want most is too deep or out of reach. In some circumstances a long-handled net might work — if only you could see what you were after. Also, there are some places where you suspect a creature to be lurking, but cannot find it by normal methods. Again, you might be wishing to know just what is hidden down there. Well, perhaps a hoop net is what you are looking for.

THE HOOP NET

A hoop net is a circle of strong hoop iron, a metre or less across, from which dangles a deep basin-shaped net. A tripod of thin rope rises to a central rope for hauling or lowering it. Across the hoop is stretched a length of doubled string, with two relatively tight separate loops of string holding the doubled string together. To bait it, the two loops are slid apart, a piece of meat or fish is placed between them, and the moving together of the two sliding loops of string will trap it safely between the doubled string. The bait ensures its success.

A bowl-shaped hoop net — effective but difficult to make.

The net is lowered gently until you feel the loop is on the bottom, with the net crumpled below the bait. You then feed out a little slack to allow for water movements. Then you must wait patiently. Normally, it is not possible to see the bottom at all clearly, so you wait for at least five minutes before hauling the net up — constantly and without any jerking, so that the regular pressure of water down through the net firmly holds anything you have trapped. Some of the rarest creatures are caught this way.

Obtaining hoop nets

Where does one find such a net? You make it yourself. There may be some on sale somewhere, for thousands of fisher folk use them, but I have never found one.

In the old days, when children played with hoops, it was simple to get one of those, and form a net on it. Now, providing you can get a hoop from somewhere — and there are many artisans who could make one from an iron rod for you — it is relatively easy to get nylon netting with a sufficiently wide mesh to allow the water through freely, and form a net from that.

If you wanted the net to catch big things, then one inch mesh would be fine, but since the creatures we want are usually small, the mesh must be correspondingly smaller. You must decide that mesh size yourself.

Making hoop nets

Shaping a net into a bowl is not easy, for there must be no folds in which creatures can get caught and die. It is possible to cut six or eight triangles that will form a bowl when fastened together, but it entails a lot of trial and error stitching. My solution is to obtain two identical iron hoops from a welder and fasten pieces of netting on these to form a net as deep as it is wide.

Any size from 50 centimetres (c 20in) across the hoop to a metre (c 39in) or so will do; if you are collecting small creatures, then a smaller size might suit you better. Make sure the depth is approximately the same as the width, though, for a shallower one can allow some creatures to escape.

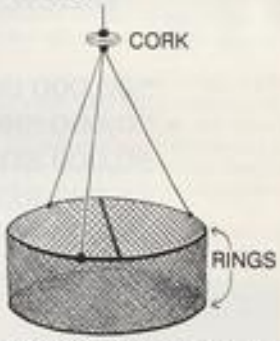
To judge the size: suppose your loops were a metre across, and the netting you obtained was in metre widths; you would first cut out a circle to the full width of the netting (for the bottom), then you would need 3¼ metres (just over 10ft 6in) of the netting for the side.

The distance around the net is equal to 3.14 times the radius (half the distance across the loop), so a length of 3¼ metres would make some allowance for the seam.

Fasten the netting to the iron hoops with nylon string, and if you are using two loops, then fasten the bottom first, by carrying the netting over the hoop and under it (in relation to the completed net), and when that is fairly taut, use two crossed pieces of nylon cord underneath it to support the base when in use. Then fasten the straight sides to the bottom hoop, and finally to the upper hoop, finishing off with the tripod of cords (about as long as the width of the top hoop) surmounted by a cork and fastened to the main lowering and hauling-up rope. The cork will hold the tripod out of the way of creatures near the bait.

Using a hoop net

There remains the problem of getting directly over the area from which you think you will get results. This, from the beach, or a towpath, or the side of a pond or stream, is not simple. In the sea, you can use a boat, or try from a pier or from some rocks; but a pond is not so easy.



A flat-bottomed hoop net is just as effective and considerably easier to shape.

It can be done, though, with the aid of a long pole — provided you are not using too heavy a net, for that would be quite a weight at the end of a pole when it is full of weeds. Use thick bamboo if possible, and so long as the stream is not too deep, the net can be lowered just where you want it.

Then, after waiting at least five minutes, the pole can be swiftly and smoothly raised. Once you have the top rim out of the water you can then rest a little, and gently pull in your catch. You will be surprised at the variety of weird and wonderful creatures to be caught that way.

THE SPELL OF THE PEPPERED CAT

Like so many other unsuspecting aquarists before her, **Linda Lewis** was irrevocably captivated by this charming, hardy and easy-to-breed catfish.

About three years ago, when I'd only just begun to keep tropical fish, a colleague told me he had more than fifty fish, twenty seven of which were assorted *Corydoras* catfish.

At the time, I thought he was quite mad. With the enormous variety of shapes and colours available, why would anyone want to keep so many catfish? From what I heard they spent most of the time just sitting on the bottom waiting for nightfall, and most of them are hardly what you would call colourful. Now, of course, I know better.

Like many beginners, I bought some *Corydoras* for my first tank. The books recommended either Peppered or Bronze Corydoras as they were easiest to keep. Catfish were needed, I read, to eat left-over food and to keep the tank tidy, not for any merit of their own.

DEREK LAMBOURNE

A magnificent wild-caught male Peppered Corydoras

It didn't take long, however, before I was under their spell because of the way they swim, seeming to scoot over the gravel, and the way they 'hoover' leaves of plants at the oddest and most improbable angles. And then, of course, they wink at you — I know they're just cleaning their eyes, but it's still captivating!

BAD COMPANY

When I bought my three Peppered Corydoras *(Corydoras paleatus)* they were about ¾in long (c 2·0cm). since then, they've hardly grown at all, and are still about 1in long, (c 2·5cm), not including tail. The reason seems to have been the company they kept!

They used to share their tank with six Platies and eleven Harlequins.

The latter are possibly the most peaceful, well behaved fish I know; they keep themselves to themselves and never indulge in petty squabbles. The Platies, on the other hand, are nothing less than greedy bullies. No matter what type of food I used, the Platies always managed to grab the lion's share. Even special catfish pellets were pounced on with relish, and the tiny Peppered Corydoras for whom they were intended, got pushed out of the way.

WELCOME SURPRISE

Despite their lack of growth, the tiny catfish were strong and healthy. Six months ago, I noticed one of them was getting.

I noticed one of them was getting decidedly plump; so fat, that she looked exactly like a miniature beer barrel with fins. I wondered, was she ill, or could she be filling up with eggs?

To my relief, and great joy, it was the latter. It seemed that, purely by the luck of the petshop's net, I had two males and one female: an apparently ideal combination. The male fish have longer and more pointed dorsal fins, which are greater in length than the depth of their bodies, but I wasn't aware of the difference between the sexes when I purchased them.

They started to spawn one evening at about 10.00 pm, when the tank lighting was still on. The males stuck close to the female as she swam excitedly round the tank, caressing the back of her head with their barbels until one of them took up position across her head forming a T-shape, with the female's barbels touching the male's body. He then clamped one of his pectoral fins over the female's barbels, so that she was held in position.

The two fish remained attached like this for half a minute or more, during which time the male's body arched like a bow and he quivered. After they broke apart, the female casually dropped some eggs which she caught, and held, between her pelvic fins. The number of eggs varied between one and three.

She then swam about the tank searching for somewhere to place the eggs. Once a suitable surface was found — anything from a leaf to the side of the tank — she cleaned the area with her mouth and stuck the eggs into place.

I could never see the male taking part at this stage, which leads me to wonder if the male's milt is transferred to the female during the earlier mouth to body coupling. If this is the case, the female could fertilise the eggs herself as she stuck them into position, but I don't know.

The whole process was repeated over and over again, with the males taking turns to

LINDA LEWIS

One of the males blocks the female's path in typical T-shape fashion while the other one looks on. The female is carrying a few eggs in her pelvic fin 'pocket'.

consort with the female and then taking a well-earned rest. It was still going on when I retired to bed, more than an hour later.

HATCHING AND REARING

Before then, however, I managed to remove four eggs from the front glass of the tank. This I did with the aid of a plastic algae scraper. By carefully sliding the scraper up from beneath the eggs, I was able to transfer some eggs to the plastic, and so remove them from the tank as, at this stage, they are quite sticky. I then gently stroked the eggs off onto a plant leaf and put them in a separate small tank (10 x 8 x 8in — 25 x 20 x 20cm) which I keep for quarantine, treatment or breeding purposes.

According to the books, the eggs take between seventy two and ninety six hours to hatch. I couldn't check this for myself, as until the babies were a few days old, they were impossible to see. For the first couple of weeks they resembled tiny black tadpoles as they wriggled about among the gravel. They then began to develop their distinctive peppered markings, but were still very dark.

To start with, I fed them on Liquifry baby fish food, then went on to catfish pellets as these break into very small, easily eaten particles. The three baby Peppereds grew at an enormous rate, and reached half an inch (c 1·3cm) in length in a matter of weeks.

After two months I transferred them into my second tank which then contained Neon Tetras, Glass Catfish and a few Bronze Corydoras.

AQUARIUM CONDITIONS

Meanwhile, the adults repeated their spawning just 10 days later. Each time, I had made no special efforts to induce them to breed; after all, I thought they were still much too tiny. Conditions within the tank remained constant with a temperature of 24° (75°F) and a pH around 7·0. The tank itself was 24 x 12 x 12in (60 x 30 x 30cm), quite well planted, and with plenty of additional cover provided by one and a half flower pots. Aeration was provided by both a small underwater filter and an airstone.

It was situated in an alcove out of direct sunlight, and lit by a 15 watt Grolux tube from 1 pm to 10.45 pm each day. I seldom bothered with a partial water change as there seemed to be no need, although I now carry out 10% water changes every week in all my tanks, just to be on the safe side. Any replacement water comes from a supply of mature tapwater/rainwater held in a container that was once used for fermenting home made beer, and which is now kept in the garden.

I recently had a general swap round, prompted by the purchase of a new aquarium, so that the shoal of five Peppered Corydoras share a small tank with my treasured Glass Catfish *(Kryptopterus bicirrhis)*.

I say five because I lost the mother Peppered thanks to my own stupidity. I had a plant pot in the tank in which the drainage hole was intact. There were no problems until one day, due to her increased girth, the female became firmly stuck in the hole. I managed to free her eventually, but the shock must have upset her badly as she died not many days later. I am now very careful either to enlarge or block any such holes so that the same thing cannot happen again, and I warn you to do the same.

The female, watched by a male, opens her 'pocket' and sticks her eggs against the aquarium glass.

I vary the food as much as I can, using two different kinds of flake food, two sorts of pellets, plus frozen bloodworm (a favourite with all my fish), *Tubifex*, *Daphnia* and brine shrimp. I stopped feeding 'real' live food recently after finding a number of undesirables, such as dragonfly nymphs and leeches, among the food. Any livefood is now 'home grown' like mosquito larvae skimmed from a rain butt, greenfly brushed from an unsprayed lupin plant, or newly-hatched brine shrimp which are great for fry of all kinds and very easy to produce.

The pelvic fin 'pocket' is clearly visible in this shot.

All you need do is carefully sprinkle a very few eggs on the surface of a shallow bowl of brine (instructions supplied with the eggs). Cover this with a sheet of glass and put in a warm place for a day or two. The tiny shrimp will swim free of the eggs which are left floating on the surface and can be gently siphoned off. The brine shrimp will live for several days with no additional care. There are even shell-less eggs available now to make things even easier!

REPEAT PERFORMANCES

Now that the Peppereds are no longer in competition with the Platies for food, it will be interesting to see whether they grow any bigger. After six months, one of the babies — a female — is almost as big as her 'fathers', and her two brothers are not far behind.

About a week ago, I was amazed to see that the fish were spawning (this time in the middle of the afternoon) even though the solitary female is so young. This time the process was far less organised, with all four males chasing after the female. Although all the males took a turn, the two older fish succeeded in winning the female's attention most often.

As before, I managed to remove a few eggs, as several were placed on the tank glass within easy access. This time, I was a bit too eager. I found that if I tried to take them out too soon, the eggs just collapsed, but this didn't happen if they were left for at least an hour before removal. I put the eggs into a breeding trap within my quarantine tank (which was housing yet more *Corydoras* catfish!) and waited to see if anything happened. After the quoted 72-96 hours nothing had, and I began to suppose that the eggs were not fertile.

The fish spawned again after another three days and, once more, I collected some eggs and put them in a separate container, again within the quarantine tank. Maybe these would hatch. Then, more than five days after they were laid, the first batch of eggs hatched, producing eight tiny babies. I cannot be sure of the exact number of hours they took to hatch, but it was in the range of 120-140. I have no idea why they took so long as the water was kept at a minimum of 24°C (75°F).

I've just removed a third batch of eggs and will keep a careful note of how long both these, and the complete second set, take to hatch. From what I've seen so far, it's advisable to wait an extra few days, just in case.

CLOSING PLEA

I appeal to you on behalf of the catfish: if you have one, solitary *Corydoras*, why not buy two or three more? Peppereds, particularly, are by nature, gregarious and you'll be rewarded when you see them gambol about together like spring lambs.

They're not expensive and, as they can live up to nine years, represent great value for money. They're also very easy to breed and will, very soon, have you under their spell.

Letters

Distressing lesson

On returning home from work one day, I found my cockatiel, Budgie, sitting happily on his perch listening, as usual, to the chart countdown. All seemed peaceful and serene on this golden Sunday evening. Children's voices and a battering on the back door announced the arrival of Debbie, Gemma, Sarah and Claire.

On my way to answer the back door, I noticed my octopus splattered across the front of the aquarium, its tentacles waving wildly as if in a desperate bid to attract attention. Glancing at the thermometer, I noticed the temperature had risen to 120°F!

MASS PANIC! The thermostat had blown — every fishkeeper's nightmare come true — even worse than the nightmares you get on Elm Street. With my aquarium being a tropical marine set-up, I could not replace any of the water with ordinary tapwater to lower the temperature — this would have proved fatal for my already-expiring octopus. We all scattered in various directions with one thought in mind — ice cubes! Fifty ice cubes later, I threw open all the doors and windows in a vain attempt to create a draught. The ice cubes were hurriedly thrown into plastic bags, sealed and floated in the aquarium. Not five minutes later, they had all melted! Delving into the freezer, I threw everything I could lay my hands on into the tank — frozen peas, sweetcorn, fish fingers — you name it — I found it. The children returned after raiding other freezers for ice cubes; even so the temperature was still in the 90s.

For the next few hours, ice cubes were bagged up and floated in the aquarium continuously. The children were wonderful and kept finding ice cubes from friends, neighbours, relatives and shops. Visions of cannibals cooking humans in pots kept floating through my mind as I watched my octopus battling for life. My two seahorses and anemones hadn't made it and I was determined to move heaven and earth to keep the octopus alive.

LAURENCE E. PERKINS

Innocent victim of an unfortunate oversight.

By about 8 pm, the temperature had finally dropped to 79°F and we all breathed a huge sigh of relief. The octopus, obviously feeling better, had retreated into a barnacle shell — its tentacles waving a grateful goodbye. It was well after midnight before I decided fate would choose if the octopus would live to see another day, so my sadly neglected dog and I retired to bed.

Monday morning, 9 am, found me sitting in our office in our fish wholesale department relating the adventures of the previous night to the members of staff — all keen marine fish enthusiasts. They applauded my success — some even came to my house in the evening after work where, to my horror, intense disappointment and sorrow, we found my octopus dead! After the burial ceremony, I felt like throwing a hammer through the front of the tank — only the thought of my expensive carpet prevented this. So much effort and time wasted — not to mention the life of a very precious and loveable little octopus.

To conclude this tale of woe, my message to all fishkeepers, whether amateur or professional — is that these accidents can happen to the best of us. Don't ever be lax like I was, check your heater/stat EVERY DAY. Follow the manufacturer's instructions for fitting the appliance correctly, and consider buying a spare heater/stat in case of accidents and, most important of all, NEVER GIVE UP FISHKEEPING!

Elizabeth Foden,
B. T. Foden (Aquarist),
Huddersfield.

Aquarium Centre closure

I would like, through your magazine, to express my sadness of the closing of an excellent aquarium shop in Liverpool.

The Aquarium Centre, in Brodie Avenue, has been run by Ken and Vera Parks for more than twenty years. I have got to know them through going into the shop for around the last three-four years. They've always treated you more as a friend than a customer, always having a chat, or giving advice if you had any problems, even if they were busy. The fish that were for sale were always in good health, as they were cared for as though they were in their own tank at home.

There aren't many shops in this area who are in the same league as the above-mentioned. I was, therefore, very saddened when I heard of their closing. I would just like to say thanks to Ken and Vera. I hope that they have a long and happy earlier-than-expected retirement.

Paul Robertson,
Liverpool.

Bubbling solution to pond icing

I have a pond of some 1,500 gallons with several Koi and other types of fish. In addition to the usual circulating pump system (with settling tanks, rather than filters) I have installed an air supply from a simple aquarium bubbler for extra aeration, and a floating heater for winter use.

The bleak weather of last winter resulted in thick ice and made it necessary to stop the circulating pump. The heater kept a small circle clear abut the bubbler (placed in winter, no deeper than six inches to avoid disturbing the themocline) kept a far larger area free of ice.

The relative cost of installation of each of these pieces of equipment is very similar, but running costs are vastly different for a 100 watt heater compared to a six watt pump. What is more, the bubbler does not call for a mains electrical supply stretching from house to pond as the pump is indoors and the air is piped to the pond.

To avoid the problem of moisture condensing in the pipework I have installed a plastic bottle in the air line as near the house as possible. Air is passed into and out of the bottle by pipes cemented into the top and moisture from our warm kitchen air condenses on the inside (a good source of car battery water).

I can strongly recommend this system as simple, cheap and effective.

P. N. Riddle,
Rickmansworth,
Herefordshire.

Welcome OFI (UK) initiative

Following my letter in May's *A&P* expressing concerns over the importation debate and Ornamental Fish Industry — OFI (UK) — I am pleased to learn that OFI have recruited Keith Davenport as full-time executive co-ordinator (see **Editorial** and **Letters** in the June issue). I understand that part of Keith's job will be to address the problems currently facing the industry which were referred to in my letter.

Keith is well known to aquarists and professional traders in his capacity as course tutor for the successful aquaculture and ornamental fish management courses at Sparsholt College, Hampshire. He is also an experienced biologist with a degree in marine biology and zoology, followed by four years of scientific research. His prac-

tical knowledge of fish is equally impressive, with three years' fish farming experience before taking the post at Sparsholt.

Keith's scientific background, together with his thorough understanding of the ornamental fish industry, makes him the ideal person for the job; he is well qualified to tackle problems, such as the threat of importation restrictions and conservation matters. I welcome the initiative of OFI (UK) to create this much needed post which I believe will greatly improve, both the management, and image, of the industry to the benefit of traders and hobbyists alike. I wish Keith every success in his new venture.

Peter Burgess, BSc, MSc, MPhil, CBiol, MIBiol, Research Fish Biologist and Aquarist, Plymouth, Devon.

Fight for our hobby

First of all, I would like to congratulate you on your editorial for May. At last we seem to be waking up to the very real threats hanging over our hobby and fighting back! Recent malaise in all areas of the hobby has caused the legislators to be influenced by one view, and there is much work to be done . . . and soon!

I am not ashamed of my fishkeeping activities, marine or freshwater, and I see no ethical conflict. We have bent over backwards to make sure our hobby is beyond reproach and openly invite conservationist/pressure groups to view our work, even to the extent of adopting their suggestions (the Eco-labelling scheme). Are we now to find that this is a Trojan Horse strategy designed to plan the end of fishkeeping as we know it? I ask the question and, curiously, I find denials very hard to elicit.

I am not declaring open war on all those who disagree with fishkeeping, as they have a right to their views, but so do I. And it would appear that certain continental agencies are determined to proceed **despite** the views of others.

If legislation of the 'negative' kind is introduced into Germany, then it is strongly likely that, come 1992, we will follow suit, UNLESS we make our views known LOUD AND CLEAR!!

And it is no good saying, "Oh, this is all about marines. I keep tropicals/coldwater; I won't be affected". EVERYONE will be affected. These pressure groups believe that it is ethically wrong to keep ALL fish in captivity. So, marine or otherwise, it is in the interests of everyone to let the legislators in this country know just where we stand.

A great many people keep fish in this country. Unfortunately, most of them do not read the aquatic press. If legislation is introduced, the first they will know of it is when it is too late. Do them a favour, alert them to the fact that their opinion will not be sought by the faceless men in the grey suits.

Write to your MP and ask just where he/she stands on this subject. If you're lucky, you might get a straight answer!

Nick Dakin, Camberley, Surrey.

JOHN DAWES

According to some pressure groups no fish of any kind — be they marine, coldwater or tropical — and be they 'fancy' or not — should be kept in captivity.

Trickle Debate

I would like to tackle the points raised by Mr G Cox, on the subject of wet/dry filters v reverse flow (**Letters**, April, '91).

We, as retailers of marine fish, find it unbelievable that a man of Mr Cox's reputation can come up with the points he made in April's *Aquarist & Pondkeeper*. Surely any advancement for the good of the hobby should be welcomed, rather than disregarded with a viewpoint that obviously does not understand the basic advantages of a system that, at a basic state, can and does support a 9ft x 3ft x 3ft reef in our shop. I would like to put a few points to Mr Cox, but before I do, I must say that the afore-mentioned tank has, and still does promote coral growth, in our opinion, unreachable in an undergravel reverse flow set-up.

The points I would like to make are:

① Reverse flow requires more maintenance than a wet and dry filter (a very important point of view to any fishkeeper). Using filter wool in external filters can, if left for long periods, cause the filter to run at greatly reduced flow rates. This reduced flow rate can, if left unchecked, cause the filter to turn anaerobic and produce hydrogen sulphide. This, of course, is the worst scenario, but, at best, it will reduce oxygen levels dramatically.

Mr Cox also refers to the use of coral gravel in the canister filter. It has been established that this material, over a period of time, has a tendency to lower the pH to 7.6-7.8. References for this process include Guido Huecksedt and Stephen Spotte.

② Mr Cox states that he, and other fellow aquarists around the world, successfully grew *Goniopora* spp and other corals in the natural system. Surely this is totally irrelevant with today's aquarists wanting high levels of both fish, soft and hard corals, plus sea weed growth. Mr Cox also mentioned partial water changes to take out nitrates when using the natural method, but with no mention of phosphates which are probably as much of a problem as nitrates due to their connections with micro-algae blooms which kill our beloved coral.

③ I think Mr Cox is missing the point that it does not matter if the submerged filter bed is 4in or 24in — the bacteria that colonise that filter still consume precious oxygen. Surely, if there is another way to do this, it must be beneficial to the aquarium inhabitants.

④ Reef tanks operated with trickle filters do not require aeration other than the biological filter area itself, ie, air being blown directly into the ammonia tower. When using trickle wet/dry filters, it's not uncommon to see oxygen levels reach saturation point or supersaturation. This has always been very hard to achieve using W/F RF/UG and canister filters.

Bubbling air stones into aquaria has, in addition, two drawbacks:

① They cause salt spray and unsightly salt creep.

② More importantly, they chase dissolved gases, ie, CO_2, out of the water. We want to avoid this because the symbiotic algae harboured by corals and some inverts require carbon dioxide while photosynthesising. I think Mr Cox's figure of 82 sq metres is misleading due to adhesion of protein to the bubbles which restrain CO_2/O_2 exchange. In addition, to reach his figure using his calculations, the pump and the air stones would have to be working at optimum efficiency, ie, in our centralised filter on our premises, we have to renew the wooden diffusers weekly because of the increase in size of the bubbles. As trickle wet/dry filters do not raise CO_2 in the aquaria, there is no need for as large a CO_2/O_2 surface interface and, therefore, no need for a wardrobe full of bioballs.

In summary, trickle wet/dry filters are the future of the marine reef keeper. What's the point of driving a Lada when you can drive a Rolls Royce for the same price (which our wet/dry filters are, compared with the price of u/g reverse flow)?

I have only been talking of basic trickle filters without the addition of O_2 reactors, ozone reactors, carbonate hardness reactors, carbon dioxide reactors or nitrate filters, all of which greatly add to water quality.

So, come on Mr Cox, drag yourself into the '90s. If you don't, you will be left behind in what is probably the most exciting era awaiting our hobby.

Ray Ringross, Tropical Marine World, Parkhead, Glasgow.

Note from Graham Cox

I have already answered all four main points raised in Mr Ringross' letter in my April, '91, response and would, therefore, refer *A & P* readers to that issue.

Note from the Editor

Correspondence on this subject is now closed.

John Dawes

PRODUCT ROUND-UP

BY DICK MILLS

Aquarian

Following on from the recent news of treatment product expansion and repackaging on foods, **AQUARIAN** have now released a completely new range of AQUARIUM HEATER/THERMOSTAT UNITS which are quite unlike others on the market in that there is an external 'control box' by which the aquarist makes any necessary temperature adjustments.

"Nothing too peculiar about that", you might be saying, but this is not quite the same as having separate heater and thermostat units (as used to be the fashion), nor is it the same as having an external micro-chip thermostat with the temperature - sensing probe hanging in the water. The new designs have amalgamated the best of everything — the temperature sensing probe is fitted within the submerged heater unit, while, for reliable temperature control, mechanical/electrical systems have given way to micro-chip control.

Since the controller does not contain any temperature-sensing devices, there is no need to attach it to the side of the aquarium, and the omission of any supplied double-sided sticky-pads strengthens this concept. However, it may be a good idea to secure it in a fixed place, rather than leave it just lying alongside the tank, as any disturbance from its original position would automatically put a strain on the connecting cable and maybe dislodge the heater unit itself. The comprehensive instructions include the sensible recommendation to make a 'drip-loop' in the cables either side of the unit to prevent water (or condensation) seeping into the unit.

Three sizes of units are available — **Model 100** for tanks up to 60cm (24in) long; **Model 200** for tanks up to 90cm (36in) long; **Model 300** for tanks up to 120cm (48in) long. Model numbers are indicators of the electrical consumption (in watts), and the sophisticated circuitry allows reaction to temperature fluctuations as low as 0.2°C. By lining up two dots on the temperature adjustment knob, a 'standard' temperature of 25°C (77°F) is set. As it lacks any thermostatic circuitry or 'mechanics', the heater unit is quite compact, around 25cm (10in) long; it takes up less tank space (two built-in sucker feet make for easy fixing), has an indicator light (on when 'ON') and is perfectly at home in fresh- or saltwater. Both units carry Aquarian's two-year guarantee.

DICK MILLS

The new range of Aquarian's heater/thermostat units include 100, 200 and 300 wattage models suitable for tanks of 60, 90 and 120 cms lengths (2ft, 3ft and 4ft) respectively. The control box can be sited remotely from the aquarium.

Details from: **AQUARIAN ADVISORY SERVICE, PO Box 67, Elland, West Yorkshire.**

Avid

Traceable dog tags and bar-coded collars may be OK for terrestrial animals, but for fish, you need something more sophisticated. Not only must the identifying device work reliably, but it would also be an advantage if you didn't have to take the fish out of the water to check it either.

AVID's new IDENTITY TAG AND READER seems to have cracked these two criteria. The implanted micro-chip (only about rice-grain size) does not depend on any batteries for its operation and cannot break down.

Unlike bar-code readers, which have to be used in close proximity to the bar code being read, the reader in this system needs only to be within three inches, and the implanted subject can be moving or even out of direct line of sight.

The number-crunching capabilities of the system almost defies description — the chips can be programmed with up to 70 trillion separate code combinations (none of which can be altered once implanted), while the reader can operate some 25,000 tests on one set of batteries.

Obviously, the main uses will be in identifying separate subjects among many lookalikes, in research and breeding programmes but, of course, its other use would be for Koi-keepers to tag their prize-winning specimens in order to deter thieves.

Details from: **AVID (UK) LTD, 89a Church Road, Hove, Sussex BN3 2GH (Tel: 0273 749017 Fax: 0273 205036)**

Haddonstone

OK, so time flies when you're having fun, but it can pass by equally quickly during a leisurely afternoon laze by the pool. **HADDONSTONE** have opportunised on this set of circumstances and have come up with both a decorative and functional piece of poolside furniture.

The ARMILLARY SPHERE SUNDIAL and ADAM SUNDIAL PLINTH stands some 68in high, is made of reconstituted stone and has an integrated brass band, with internally inscribed sundial. Now, you can see at a glance what the time of day is as you recline poolside enjoying the sunshine (well, you wouldn't be there for long otherwise, would you?).

HADDONSTONE

Haddonstone's new Armillary Sphere Sundial with Adam Sundial Plinth.

Visitors to the Chelsea Flower Show saw Haddonstone's products at first hand, and new ornamental pieces making their debut at Chelsea alongside the Sundial include the GEORGIAN BIRD BATH, a James Gibb style STRIGILATED BALUSTER, the HOUSE OF DUN URN (made in lead), the campana-shaped large and small HADDO HOUSE URNS, VICTORIAN TROUGH and SUPPORT, and the circular CORINTHIAN TABLE surmounting its CORINTHIAN CAPITAL. Haddonstone's new full colour, 92-page brochure was also released at the show.

Details of this and other Haddonstone garden ornaments from: **HADDONSTONE LTD, The Forge House, East Haddon, Northampton NN6 8DB (Tel: 0604 770711 Fax: 0604 770027).**

Bionomics

Two new products to help keep pond and aquarium water clean have recently crossed the Channel from France. From **BIONOMICS**, AQUARIUS (freshwater) and NEPTUNE (marine) will accelerate the natural process which breaks down ammonia and nitrites; the products also degrade undigested foods and detritus, leaving the water clear by removing the build-up of muck on the bottom.

Unlike chemical products, Aquarius and Neptune are in solid-state form — natural bacteria 'bio-fixed' into natural substrates. Bio-fixation is a process developed by scientists at the TBA Laboratories, working with the Jacques Cousteau Marine Laboratories, to find natural ways to clean water.

One advantage of the solid-state format is that the products can be applied directly where they are needed, mixed with gravel, or sprinkled directly on to the filter. Their active life of around six months means there is less stress imposed on the fish by otherwise necessary frequent water changes. While denying bacteria their 'food' for survival, the two products are entirely compatible with medications, should they be needed, and will ensure a stable environment for fish and plants wherever they are cultured.

Details from: **BIONOMICS LTD, Claverton House, Cirencester, Gloucestershire GL7 1YG (Tel: 0285 885201; Fax: 0285 641078).**

Powerbreaker

Are you one of those people to whom it couldn't possibly happen? Well, good for you, but it could very well happen to one of your nearest and dearest too, so why not stop being smug and selfish and protect them for a change?

There really is no reason for not fitting some RCDs around the house, especially in electrically-dodgy areas like a fish-room. The **POWERBREAKER** range of Residual Current Devices monitor earth leakage currents and rapidly (if not almost instantaneously) cut off the mains supply. Available as separate plugs, sockets (single or twin) or as a portable adaptor for around the house use, the range can be found at Texas, Payless and other High Street stores.

If you're specifically upgrading the fish-house electrics, then a SECURITY ALARM PLUG will warn you of any disruption to the mains supply, its buzzer sounding for up to 60 hours. If you're into the garden pond scene, then the WATERPROOF CABLE CONNECTORS should catch your attention too.

Details from: **POWERBREAKER (B & R ELECTRICAL) plc, Templefields, Harlow, Essex CM20 2BG (Tel: 0279 34561).**

King British

With the coldwater season now in full swing, apart from ideal water conditions, a good supply of food is about all that pondfish ask of their keepers. **KING BRITISH** are there, with their POND CHIPS and POND PELLETS. Easily digested by both large and small pond fish, Pond Chips can be successfully used to supplement a diet of Pond Pellets. Although more dense in composition than many foods, Pond Pellets are a semi-expanded balanced food for pond fish, forming a complete basic diet. For number-conscious fishkeepers, the protein content is 35%, 5% fibre and 10.5% ash. An additional bonus for pond fish is provided by BP POND PRIDE, exclusively distributed by King British.

The KB range of fish foods has been specially designed to meet the individual dietary needs of differing species of fish: SHRIMP FLAKE, GUPPY FOOD and CICHLID PELLETS are good examples which provide extra variety and interest to the more normal routine diet most fishes are expected to accept. Also available are TABLET FOOD (general and vegetable-based) and RED SHRIMPS for that extra-special treat.

Vacuum-dried foods add to the health and enjoyment of both fish and amphibians. RIVER SHRIMP, BLOOD WORM, KRILL and TUBIFEX all spring to mind, while reptiles such as turtles and terrapins will gladly accept KB's TURTLE FOOD, constituents of which include shrimps, krill, vegetable and fish-based pellets.

Assistance in maintaining a healthy fishes' environment is equally forthcoming, with SAFE-WATER, an effective cleaning treatment for ponds and aquariums alike. Other associated treatments include DECHLORINATING AGENTS, GREEN ALGAE CONTROL, ENVIRONMENT CONTROL and PLANT FERTILISER.

Full details of all KING BRITISH products from: **KING BRITISH AQUARIUM ACCESSORIES LTD, Haycliffe Lane, Bradford BD5 9ET (Tel: 0274 573551 Fax: 0274 521245).**

Ashlea

The Cable Tidy has long been a welcome piece of aquarium-side equipment, being both extremely safe functionally-speaking, and also a lot more pleasing aesthetically-wise than a tangle of connecting cables. **ASHLEA** have taken the concept a little further with their AQUARIUM FUSED DISTRIBUTION BOX which will protect, not only the associated auxiliary equipment, but also the fishkeeper as well.

Each outlet (for heater, lights and pump) is independently switched and fused; the mains supply to the box is also fused and fitted with a master switch, the availability of the supply to the other outlets being indicated by a neon lamp. Although each separate piece of equipment can be switched off at the box, it is recommended that the main supply plug is removed from the mains socket before any work is done on auxiliary equipment, and before placing the hands into the aquarium or changing fuses.

Supplied with adhesive pads, the Distribution box can be mounted on the side of the aquarium, or conveniently nearby. The unit is designed to operate with a 50 watt pump, 400 watts heating and 80 watts lighting, and comes with a corresponding standard set of fuses, 4 amp, 2 amp, 400 mA and 600 mA; other combinations can be supplied to customers' particular needs, if necessary, for a nominal fee. Price of the unit is £15.20 (inc VAT).

ASHLEA ELECTRONIC ASSEMBLIES, 13 Station Road, Mossley, Ashton-under-Lyne, Lancashire OL5 9EA (Tel: 0457 833536).

DICK MILLS

Ashlea Electronic's new distribution box allows independent, fuse-protected switching of up to three chosen pieces of aquarium equipment.

NEWS

Aquasoil

Aquasoil is going places in both senses; in addition to their growing success with their pond products (and possibly because of it), the company has moved to new premises. You should now contact them at the following address: **AQUASOIL PRODUCTS LTD, Blue Waters Estate, Bovey Tracey, Devon TQ13 9YF (Tel: 0626 835135).**

Paper Round

By Dr Ian Winfield

HOW CLIMBING PERCHES CLIMB

Very few fishes have mastered the demands of effective locomotion outside their normal aquatic habitats. The climbing perches, however, are one such group and are a common sight in the Indian subcontinent and South East Asia.

John Davenport and AKM Abdul Matin of the University of Wales have been looking at how one species of these obligate airbreathers, *Anabas testudineus*, manages to move around so well when out of water, even if their powers of true climbing have probably been exaggerated.

When in an upright position, these fish alternately drive the left and right spiny gill covers into the ground to obtain sufficient purchase and then use their tails to power a 'vault'. Using this method, they can achieve an appreciable speed of 1.8 body lengths per second (1 body length per second is a typical swimming speed for a cruising fish). This particular method of locomotion contrasts with that used by other amphibious fish, such as mudskippers and gobies, in which the pectoral fins and tail play an important role

(**Source:** *Journal of Fish Biology* **37**, 175-184.)

A TALE OF TAILS

Variation in the coloration of male Guppies (*Poecilia reticulata*) is well known from the many strains now available to the aquarist, but it is also a common feature of natural populations. It has been suggested that this variation is promoted by sexual selection by females for male conspicuousness, but depressed by predation pressure which favours the more cryptic (ie less spectacular) males.

This suggestion, known as Haskin's hypothesis, was investigated by Kirk O. Winemuller and Mitchell Leslie of the University of Texas, U.S.A., and Robin Roche of the University of Arizona, U.S.A., by a detailed analysis of variation in the conspicuousness of male guppies from several sites with differing levels of predation pressure in Venezuela.

As predicted, male Guppies from a site with no predators were more colourful than those from a site with abundant predators. In addition, the male Guppies were smallest and least colourful at the latter site during the early dry season when predators were seasonally most diverse and abundant. The selective power of female Guppies for male conspicuousness was emphasised by the finding that the dominant spot colours at each site were generally those that provided the greatest contrast with the predominant environmental background colour.

(**Source:** *Environmental Biology of Fishes* **29**, 179-191.)

DEER-EATING ALLIGATORS

C. Robert Shoop and Carol A. Ruckdeschel of the University of Rhode Island, U.S.A., have found that large (greater than 1.8m in length) alligators (*Alligator mississippiensis*) on Cumberland Island, Georgia, regularly take deer and other mammals in their diets.

While present alligator numbers have been depressed by hunting, they must have been a major pressure on their prey populations in past times. Even today, alligators have some influence on their habitats by promoting wading bird nesting colonies through deterring racoons from entering the colonies via the water.

(**Source:** *The American Midland Naturalist* **124**, 407-412.)

JOHN DAVIS

Large alligators like this one have become deer hunters in Georgia.

LAKE ACIDIFICATION, CHIRONOMIDS AND TREE SWALLOWS

Much has been written about the disastrous effects of lake acidification on fish populations, but Vincent L St Louis of the University of Toronto, Canada, and colleagues have been looking at the potential effects on the Tree Swallow (*Tachycineta bicolor*).

During egg production, Tree Swallows spend 90% of their foraging time over water where they feed on emerging chironomids. The birds preferentially feed over their nest site lakes before searching elsewhere, and observations showed that the reproductive success of the Tree Swallows is at risk should the chironomids be adversely affected by acidification.

(**Source:** *Canadian Journal of Zoology* **68**, 2385-2392.)

COELACANTHS, CAVES AND A CENSUS

While the Coelacanth (*Latimeria chalumnae*) is perhaps the best-known example of a living fossil, almost all specimens have been caught exclusively along the west coast of Grande Comore in the Western Indian Ocean.

Our knowledge of this species in its natural habitat is still extremely poor, but Hans Fricke and Karen Hissmann of the Max Plane Institut fur Verhaltensphysiologie, Germany, have recently made some fascinating observations from a deep-sea submersible. During the daytime, Coelacanths were found to congregate in small groups in caves at depths of between 180 and 210 m (c 590 — 690 ft). At night, they were seen to leave the caves to hunt singly for fish.

Fricke and Hissmann suggest that the distribution of the Coelacanths is strongly influenced by the availability of the caves which, together with prey fish, are rare below 220 m (c 720 ft) depth. Temperature-dependent oxygen saturation of the blood probably prevents the occupation of shallower, warmer waters.

Population estimates were worryingly small, at only between 150 and 210 Coelacanths for the entire coast, while the carrying capacity of the caves appears to be at most between 370 and 520 individuals.

(**Source:** *Nature* **346**, 323-324.)

HIGH ALTITUDE RARE FISH IN THE LAKE DISTRICT

The Schelly (*Coregonus lavaretus*) is one of Britain's rarest fish and so, confirmation of its existence at a site by Peter S Maitland of the Fish Conservation Centre and Alex Lyle and Ian K Barnett of the Institute of Freshwater Ecology is good news. Sampling during 1989 in Red Tarn, a small water body at an altitude of 718m (2,355 ft) in the English Lake District, resulted in the first capture of Schelly from this location since a single specimen was reportedly taken in 1961.

Echo-sounding revealed that the Schelly inhabited the deeper areas of the tarn, while Brown Trout (*Salmo trutta*) and Three-spine Sticklebacks (*Gasterosteus aculeatus*) were found in the shallower areas.

In comparison with Schelly populations in the larger lakes of Ullswater and Haweswater, the growth rate of this species is very low in Red Tarn. Populations rumoured to exist in the nearby Brothers Water and Lowes-water remain to be confirmed.

(**Source:** *Journal of Natural History* **24**, 1067-1074.)

Koi Talk

By John Cuvelier

ALGAL STRAW SOLUTION

I had a most interesting letter from a reader enclosing a cutting from **The New Scientist** which described some research carried out on algae control using rotting straw as a control medium. Strangely enough, within a few days of my receiving this letter, Central Television did a feature showing N.R.A. personnel dropping bales of straw into the river Pang at Pangbourne with the same purpose.

Apparently, as straw begins to rot down, it releases a toxin which inhibits algal growth but which is reckoned to be harmless to other life forms. The researchers found that barley straw is the most efficient, only relatively small quantities needing to be employed, circa 100 grammes per cu/m (220 galls) of water. I shall bring you up to date with fuller details at the end of my own experiments when complete. On the face of it, it sounds like the answer to many prayers.

SPEEDY BRUSH MEDAL

Time for a Gold Medal presentation! Having decided to increase the population of pre-filter brushes in my main filter, I posted a letter to the Speedy Brush Company on a Monday, received an acknowledgement the following Wednesday, and the brushes arrived the day after.

In this day and age where things can take an eternity, that service has to be worthy of mention. What's more, the same timetable was repeated three weeks later, proving it wasn't just a one-off example. Of course, the Royal Mail played its part also but, full marks to the company concerned who regularly advertise in this journal!

FLOATING HAIR ROLLERS

Towards the backend of last season I decided to carry out a major modification to both filter systems which entailed removing all the media support trays and allowing the hair roller medium to 'free float' in the chambers. My reasoning for this step was that if a floating medium was used, why bother with support trays which serve no useful purpose, other than to trap and retain large quantities of sludge which always seems to gather in even the most efficient filter. Where a non-floating medium is used, of course, support trays are required in order to maintain a void.

One major advantage of the floating bed immediately becomes apparent when filter cleaning time comes around. All one needs to do is to switch off the system, place a vacuum pump in the final chamber and, starting with chamber one, stir each chamber vigorously with a stick and all the dirt is transferred down the line to be removed to waste by the vacuum pump. Piece of cake!

The sketch shows the principle behind the idea. The fact that hair rollers overflow into the transfer ports makes no difference, as their own weight holds them in position and they do not travel into adjacent chambers.

CARELESS INTRODUCTIONS

I continue to receive sad letters from hobbyists lamenting the fact that their fish are suddenly going down with odd illnesses which they cannot explain. Closer discussion usually reveals that, at some time recently, new fish have been added to a collection.

Unless one is very careful/lucky, the installation of some new stock can bring all kinds of trouble to a careless Koi-keeper. Any fish should be closely watched at the point of sale for signs of irritation such as flicking etc, correct gill action, stable swimming attitude etc. Then, if happy with it, request the vendor to place it in a polythene bag for close visual examination for signs of external parasites.

Remember, if you introduce an infected fish to a healthy pool, that happy state could soon disappear! Should you have the slightest doubt, grit your teeth and pass the fish by. If you cannot bear to do that, then pay a deposit on the fish and come back in a couple of weeks time, after asking the vendor to treat it or hold it for you till then. If (s)he is not prepared to do this, then you can draw your own conclusions.

EARLY BLANKET

Have you noticed the very early start to the blanket weed season? I have planted a new watercress bed along our artificial stream and within days, each cress cutting had long streamers of the stuff trailing from it.

One can only surmise that successive mild winters are doing nothing in the way of killing off the latent algal spores which reawake at the first sight of sunlight. Strangely enough, there is only a normal growth in our main pool which the stream feeds. On the other hand, the number two pool, which had always been beautifully clear in the past, now resembles best quality pea soup! So much so, in fact, that I've given in to the purchase a UV for it. There's surrender for you!

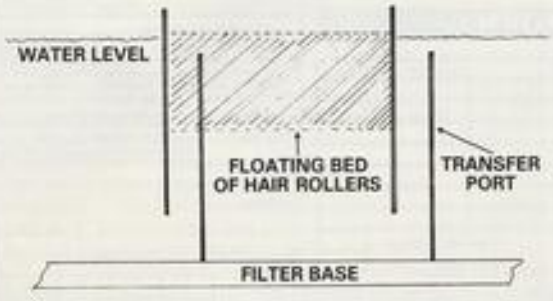
CLEAR FLESH AND BEADY EYES

Like David Twigg in last month's **Koi Calendar**, I, too, have got my spawning barriers out in the hope of some more interesting results. My Koi always seem to spawn a bit earlier than David's usually the last week in May, probably due to geographical reasons, as we live in a very warm, if not humid, part of the country.

For those of you that have not yet tried to breed your Koi seriously, I really do recommend it as being more than worth the effort. Struggling into one's trousers at daybreak while eagerly looking out of the window to see what, if anything, is happening in the pool, or rushing around with dripping spawning barriers to get them into their hatching quarters, might seem an odd way to enjoy life, but that magic moment when you see the first tiny sliver of clear flesh with two beady eyes is quite wonderful to behold.

It also gives one a bit of winter Koi-keeping in that normally barren part of the year, watching the different colours developing and wondering if you are going to be lucky to rear a real cracker.

When you consider that all Koi, basically, emanated as genetic mistakes, you could quite easily end up with something really outstanding! From my hatch two years ago, I have a Doitsu Asagi with horizontal bars of deep blue across its back and three red spots on each flank, interspersed with vertical bars. While the pundits would throw up their hands in disgust, to me, it's an absolute picture of beauty. Go on, give it a try, if not this year, next!



Books

The Interpet Encyclopedia of Water Gardening

By: James Allison
Published by: **Salamander Books Ltd**
ISBN: 5 012922 000285
Price: £16.98

In perfect keeping with Salamander's numerous other offerings, **The Interpet Encyclopedia of Water Gardening** provides the reader with colourful, competent, value-for-money advice, in language that is easy to follow and digest. The presentation — again, as we've come to expect — is also pretty good.

The main chapter headings in this profusely illustrated book are: Water Garden Design, Ponds, Moving Water, Bridging Water, Water Garden Plants, Pond Fish, Water Garden Care and, finally, Wildlife Ponds. There is also a General Index and one dedicated entirely to plants.

James Allison has written a book that will stand up well in the highly competitive pond/water garden market. I like his style and general no-nonsense approach to the subject, and commend him for leaving hardly any stone unturned in his attempt at producing a comprehensive guide to this fast-expanding area of aquatics.

Had he not been so thorough in most of his coverage, in fact, the (few) omissions would not have been, at least to me, quite so obvious. I am particularly thinking of two aspects of filtration that have become increasingly popular over the last two years or so. The first is de-nitrification, and the second, the medium that has helped so much in raising people's awareness of de-nitrification — the open-pore sintered glass medium known as Siporax. One could not conceivably have expected a mention of the very latest medium, Spirex Aquatec's dimpled/coiled 'tape' medium, Springflo, since it's only recently made an appearance on the aquatic scene, but Siporax has been around for a few years now, and is sufficiently well known and different in composition to the other biological media described and illustrated to warrant at least a mention (not by brand name, but by 'type').

On the question of de-nitrification, this, too, is fast becoming more widespread and could, perhaps, have been dealt with in some way (other than by merely mentioning that some plants are good at removing nitrates).

One other minor quibble on the filtration front: scientific names are given for all the fish, plants and invertebrates featured in the book, yet neither *Nitrosomonas* nor *Nitrobacter* bacteria (the 'workhorses' of biological water purification) are referred to by name. Other than this, there are a few slip-ups on the scientific naming of organisms (both in spelling and style).

None of the above, however, detracts from the intrinsic value of this very good book. It will still, deservedly, find numerous admirers among the UK's growing band of pondkeepers and water gardeners, and not just because it is colourful and informative, but because it's also a very good read indeed.

From one 'pond writer' to another: Well done, James!

John Dawes

Marine Aquarist Manual — Comprehensive Edition

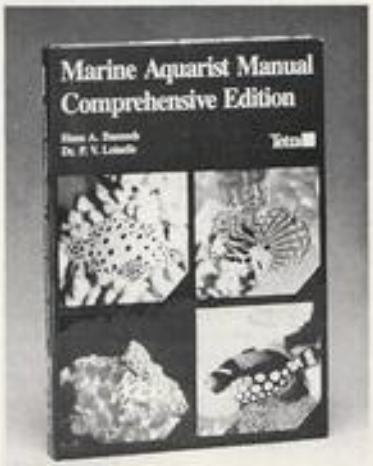
By: Dr P. V. Loiselle and Hans A. Baensch
Published by: **Tetra Press**
ISBN: 3-89356-130-7
Price: £15.95

When a high-profile company like Tetra bring out something new, then everyone sits up and takes notice. This is especially true in the case of Tetra, since the product is usually of superior quality and design.

This work — which is the sequel to the original **Marine Aquarist Manual** — is no different. The text is, for the main part, clear, concise and down to earth, and the photography stunning. As the title suggests, the book covers the topic in far greater detail than its forerunner, even though it is — arguably — no more complicated or 'scientific'. All of the usual basic stuff is here, but the new edition also covers invertebrates — a subject totally lacking from the original.

The first chapter discusses the differences between fresh and seawater environments and looks at the way in which these differences influence the culture of marine organisms in captivity. I was knocked out by this chapter, since it contains the best account of osmosis I have ever read.

The next three chapters are of the "take an all glass aquarium" variety. However, this is by no means a criticism — all such books must contain them, and this one deals with this aspect better than most, although the more advanced filtration systems (Tunze, Mini-Reef etc) are either ignored completely or merely mentioned in passing.



Chapter five looks at stocking the aquarium, both in terms of how many and what species, as well as transporting animals home and introducing them (without stress) into the tank. Almost full marks from me here, although they still talk about floating the bag in the aquarium (tch!).

There is a chapter on fish nutrition, one on routine maintenance and one on 'trouble shooting'. The chapter on nutrition is comprehensive enough — as one would expect from Tetra — as is the one on maintenance, while the trouble shooting chapter is extremely useful to ANY aquarist, let alone a beginner. The ninth chapter covers the diagnosis and treatment of disease. This is well handled, with pictures of what fish look like when suffering a particular malady — good one.

There then follow catalogues of animals and macroalgae for the aquarium, and these are as exhaustive as they can be, given the available space. I couldn't agree with everything in these chapters — but then, how often DO we, writers, agree(?) — and there was more than one completely inaccurate statement. For example, when speaking of the Flame Angel (*Centropyge loriculus*) the writer, says "net-caught specimens from Hawaii are somewhat more expensive, but are far more likely to adapt to aquarium life than are cheaper Philippine imports". Now, while I applaud — wholeheartedly — this sentiment, the fact remains that the waters around the Philippines are completely devoid of Flame Angels!

The final chapter is called Learning More

About Marine Aquaristics and, for this, the authors deserve a pat on the back. There is a book review, a list which matches common names to their scientific counterparts, and even a few contact names and addresses for societies in Britain and the U.S.A. However, a word of warning — this list is out of date. For instance, it lists me as the contact for the British Marine Aquarists' Association, at an address I left in 1986! (I should also say that I haven't been on the BMAA committee for over three years).

On the whole, this is a very nice book which is well put together and which contains everything the beginner needs to know. It also makes interesting reading for any aquarist. However, I did have a couple of niggly little problems with it. There are more than a few spelling mistakes which, by the time I was halfway through the book, I found myself looking for — to the detriment of the text.

Secondly, the authors do tend to suffer a bit from 'verbal diarrhoea'. For example, in the chapter on stocking the aquarium, they state ". . . their notions of what constitutes adequate living space also tend to undergo a dramatic upward revision as they grow larger". Why couldn't they just say that you need to think about a fish's adult size when working out stocking levels? These points, along with the ones I made earlier, took a bit of a shine off the book for me, but this is purely a personal view. The book is still, very much, worth having.

Gordon Kay

The Cichlids Yearbook, Volume 1

Edited by: Ad Konings
Published by: **Verlag Dr Gertrud Dudin, St Leon-Rot, Germany.**
ISBN 3-928457-00-4
Price: £17.95

Although Ad Konings is 'only' the Editor of this new book, this rather understates his role, as he is also responsible for the basic concept of an 'annual' on cichlids, as well as a lot of the content and most of the photographs. The intention is that a new volume will be published each year (in January, rather than April, in future), and that this will cover what is newest and best in the cichlid world — full-length articles on species or groups of species; short pieces on new introductions and reintroduction, in each case with a colour photograph; new techniques for maintenance and breeding; reviews of important new scientific literature; and up-to-date details of cichlid societies worldwide. And this is, of course, just what this first volume does.

As well as Ad himself, the contributors include specialist importers, collectors, naturalists, and hobbyists, not to mention Dr Ethelwynn Trewavas, well-known to cichlid-keepers for her scientific works on cichlids, and also for her belief that hobbyists have a worthwhile contribution to make to science (and scientists to the hobby!). They have a great enthusiasm for, and experience of, cichlids in common, and the **Yearbook** provides them with an opportunity to communicate some of their knowledge to the hobbyist at large.

The fishes are dealt with in geographical groups — the three main East African Lakes: Tanganyika, Malawi and Victoria, have a section each. These are followed by West Africa, and then a section apiece for Central and South America. All are illustrated with colour photos which, in many cases, are 'out of this world. Even my non-fishy colleagues at work were impressed! There are also habitat photographs, maps and diagrams.

Some of the species covered have yet to make their debut in the UK, but when they do, we will now know something about them and not have to work entirely in the dark. And, in the meantime, we can pester our suppliers with requests to obtain them. And dream . . .

Perhaps the best way of summing up is to quote a cichlid-keeper friend's reaction: "What a lovely book, it really does have something for everyone".

The Cichlids Yearbook is available from retail outlets, and by post from the British Cichlid Association (Dept AP), 7 Delamere Avenue, Sale, Cheshire, price £17.95 inclusive of P&P.

Mary Bailey