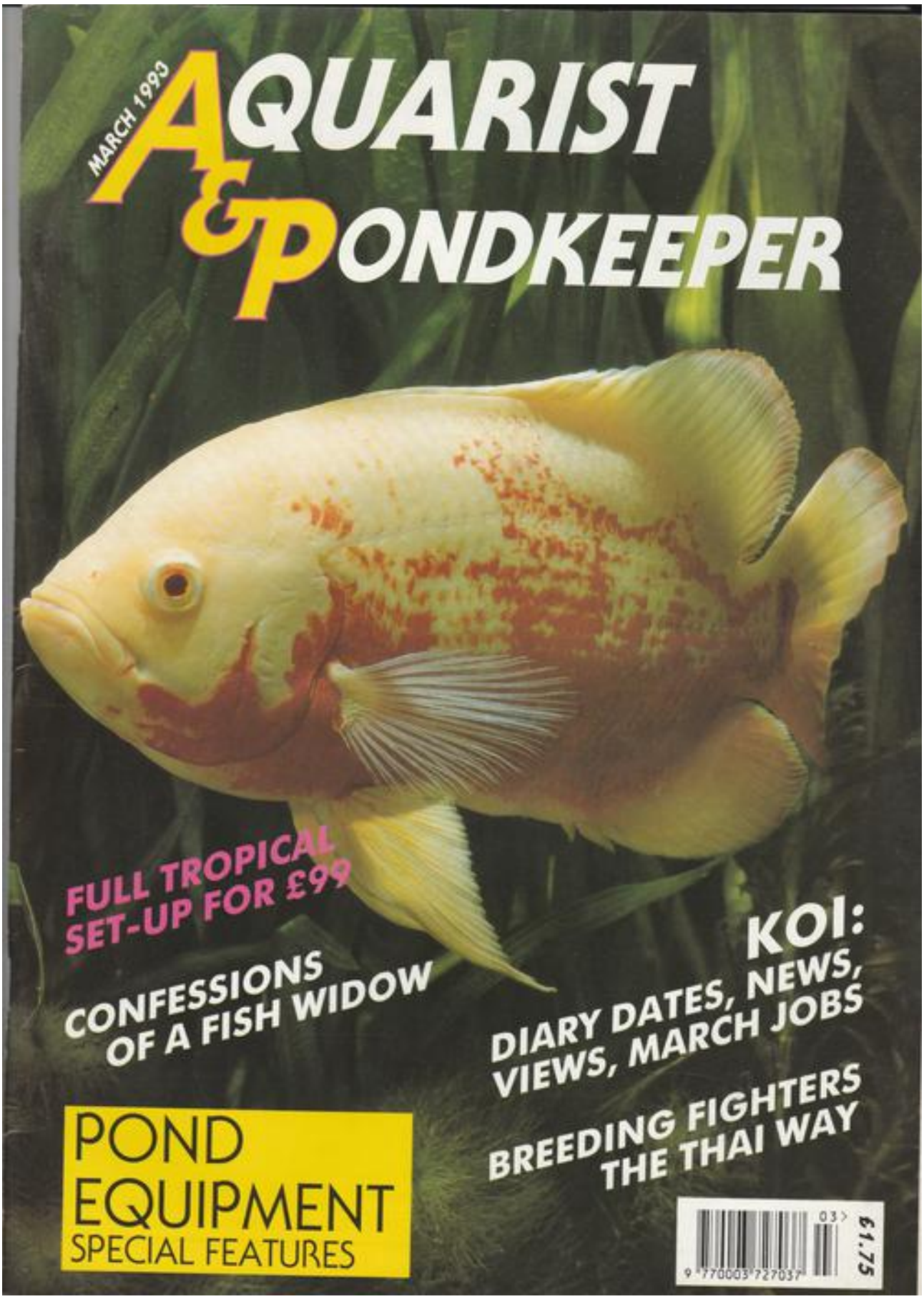
MARCH 1993

AQUARIST & POND KEEPER



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AQUARIST & PONDKEEPER
MARCH, 1993
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COVER STORY — ALBINO TIGER OSCAR

Photograph: Harry Grier — Florida Tropical Fish Farms Association

March is showtime in Florida. It is the month when the Florida Tropical Fish Farms Association holds its annual professional show in Tampa.

There is always something new and exciting to see at this great event. The Albino Tiger Oscar (*Astronotus ocellatus*) on our own front cover, for example — entered by Tropical Gardens Inc. — made the 'new' category in 1991 when it was first exhibited in the Grow-on class. This class is reserved for fish which are imported and then grown on in the State.

The Albino Tiger variety has been making great progress since its introduction from Thailand, and this year could well see the first of the Florida-bred offspring of this beautiful form of the ever-popular Oscar putting in an award-winning appearance.

We'll be bringing you a report of this and all the other highlights of this year's show in a few months' time, of course, so make sure you keep up with *A & P* for all the hottest news of the very latest fish to be produced by some of the top fish breeders in the world.

Editorial

TACKLING EXOTIC NATIVES

The vast majority of species are still found in their original habitats today, just as they were when they first evolved. Some — relatively few — are, however, now known to exist outside their natural ranges.

It's difficult to know exactly how many 'displaced' species there are, because we usually only hear of those that cause major disruption, like the notorious Nile Perch (*Lates nilotica*) and its disastrous effect on the haplochromine cichlids of Lake Victoria.

The truth is that comparatively few introduced species undergo dramatic population explosions, but those which do, as, for example, the Mosquito Fish (*Gambusina affinis*) — widely introduced into tropical and subtropical countries as a biological method of controlling malaria — irrevocably alter the nature of the native populations, unbalancing not just the fish species, but all manner of other organisms as well. The results are usually catastrophic for the endemics.

One of the problems of successful introductions is that, once such species become established and well known within their 'adopted' home (host) country, they soon become regarded as true natives themselves and complacency sets in. Take, for instance, the charming, delightful Grey Squirrel that we've all come to know and love and regard as a natural part of the UK fauna. It is, in fact, an exotic which has driven our own true native Red Squirrel to near extinction. Pheasants, likewise, are also 'exotic natives'.

Continuing the theme, many Europeans now regard *Gambusia* as a southern European species which it, most patently, is not, while in Singapore, I have heard *Oreochromis mossambicus* — the Mozambique Mouthbrooder — being referred to as the 'Japanese fish'. This may well indicate one of the sources of introduced populations, but this species is no more Japanese than a Guppy is Nigerian!

Then, there's the ubiquitous goldfish, of course . . . and now we are beginning to hear of a plague of the tropical seaweed *Caulerpa taxifolia* which is spreading round the Mediterranean after 'escaping' from the Museum of Oceanography in Monaco, with devastating effects on the endemic marine fauna and flora. And so on . . .

The problem is universal. Should the solutions, if there are any, also therefore be universal? What is *your* opinion? Should we lie back and accept these ongoing invasions as being inevitable? Are we powerless to do anything about anything? Or should we fight back?

Please let us know your views. *A & P* is widely read in influential places worldwide, so what we say might *just* generate a spark in the mind of someone appropriately placed to be able to do something about it.

We look forward to hearing from you.

John Dawes
Editor

News Desk

New London Show

The **Federation of British Aquatic Societies** has just announced plans for a new major aquatic event for the London area.

Fishworld '93, which will cater for all aspects of aquatics, will be staged by the FBAS in association with *Aquarist & Pondkeeper*, and is already being enthusiastically supported by the trade. Scheduled for the weekend of **12-13 June,** Fishworld '93 will be held at **Brit Koi** (by courtesy of **Tony Purdy**) in Syon Park, Brentford, Middlesex. Syon Park itself comprises 55 acres of parkland, incorporating a great conservatory and one of the most comprehensive horticultural centres in the UK.

The trade stands will be accommodated within marquees around the perimeter of the lawned areas, with the *Aquarist & Pondkeeper* stand, together with the Federation's hospitality suite, acting as ideal places to meet with authors and personalities of the aquatic world. Already, many established companies have confirmed their attendance, with the result that there will be plenty of opportunities to inspect (and purchase) every conceivable aquatic aid, accessory and type of water plant.

A special feature on the Saturday will be the **South Park Aquatic (Study) Society's** 40th Coldwater Open Show which will be incorporated within the Federation's theme for '93: *Water Gardening*.

Ample car parking is also provided for cars and coaches, and admission is £1.50 (adults), 50p (senior citizens). Children under 15 will be admitted free.

Remarked **Joe Nethersell,** chairman of FBAS: "It is many years since *A & P* and the Federation worked in close association on such an event, and both parties are relishing the prospect of taking up again where they left off in the late 1970s. All those with fond memories of the old and highly successful 'Ally Pally' shows will, no doubt, be delighted at the resumption of this partnership in 1993".

Further information and details of exhibition space bookings are available from: **Fishworld '93, 9 Upton Road, Hounslow, Middlesex TW3 3HP. Tel/Fax: 081 570 0934.**

Second Swallow Site

A major new aqualife centre will shortly be opened in Norfolk by **Swallow Aquatics.**

The opening (on **20 March**) creates 50 new jobs in the area and follows a most successful 1992 for the company, based in Rayleigh, Essex. The company imports fish from around the world and attracts customers from throughout the UK, with turnover for last year approaching £2m.

"The first phase of the company's £750,000 development programme was the conversion of a former garden centre into one of the most modern aquarium centres in the country, and we hope to have further expansion in the next few years," explained Swallow Aquatics director **Mick Seaby,** who founded Swallow Aquatics 17 years ago.

He continued: "There has been a significant change in the past few years, both in the numbers of people interested in keeping fish and in the widening demand for rare and unusual species from across the world.

"As the number of our own customers has more than doubled, we have simply outgrown our premises, so I am delighted that we have located such an excellent site to expand the business."

For further details ring **Bill Morris** or **Vivian Nietrzebka,** of **Principles,** on **0933 58838** (Mobile **0831 808267**), or **Swallow Aquatics** on **0268 781265; Fax: 0268 782334.**

YAF Well on Course

Hardly a spare inch of exhibition hall is available for **Fish Fayre '93,** this year's **Yorkshire Aquarist Festival** (Doncaster Racecourse, **3/4 April**), according to festival organising secretary **Marie Harrop.**

"We have had huge interest from our usual traders at the show, with many enquiries from new people in the hobby who wish to book space at Fish Fayre '93," remarked Marie. "Tableaux entries and bookings for trade stands are dropping through the door daily: there is hardly a spare inch of Doncaster Racecourse exhibition hall left for hire, we are delighted to say."

A new feature of this year's show is a **Marine Queries Section,** operated by experts in their field; while all the requirements for the fishkeeping hobby will be available at the show, including advice, fish, equipment and plants, as well as a series of free lectures.

The organisers promise "a jolly good day out for all the family". Entry fee is just £2.30 (£1 for senior citizens and children) with ample free parking directly opposite. For further information, contact **Marie Harrop** by telephoning **0484 666591 (evenings).**

West of Scotland Open Day

The **West of Scotland Goldfish Society** is holding an Open Day to introduce people to the Goldfish-keeping hobby. "We are hoping to attract families along to see that there is more than one type of goldfish", remarked **Michael McLaughlan,** editor of the society's newsletter *The Fish Tank.*

"In addition," he continued, "people will also have the opportunity to discuss the hobby in detail and talk about any problems they may encounter."

The event is being held on **Saturday 20 March** at the society's meeting venue: **Pollok Community Centre, 134 Langton Road, Pollok, Glasgow.** For further information, contact **Fergie Brown, PRO, West of Scotland Goldfish Society, 6 Invershiel Road, Summerston, Glasgow G23 5JG. Tel: 041 946 8019.**

Waterlife's New Brochure

Waterlife Research Industries has released its new brochure for 1993. Illustrated in full colour, the four-page A4-size brochure incorporates detailed technical information on the company's extensive range of fish disease treatments, specialist foods, test kits, water treatments, garden pond products, filter media, vitamins, specialist air diffusers, deionisers and plant fertilisers.

For a copy of this brochure, write to Waterlife Research.

Copies of the brochure are available free of charge by sending an 18p stamp and your printed name, address and postcode to: **Waterlife Research Industries Ltd, Bath Road, Longford, West Drayton, Middlesex UB7 0ED.**

RHS to run Hampton Show

The **Royal Horticultural Society** is to organise this year's Hampton Court Flower Show **(6-11 July 1993).**

"Our first aim," remarked RHS president **Robin Herbert,** "is to ensure that the show continues to be an enjoyable family event, with something for everyone. We particularly value the show's magnificent setting. The RHS, with over a century of experience of running the world's finest flower shows, will reinforce the strength and stature of this important event."

Aquarist & Pondkeeper will again be participating in the show, as part of the Aquatic Village. Experts will be on hand at the *A & P* stand throughout the event to answer aquatic queries; full details will be published in **News Desk** in due course.

FNAS Breeding Scheme

The **Federation of Northern Aquarium Societies (FNAS)** has announced details of its **Breeders' Scheme and Programme,** as part of its campaign to support affiliated societies, who have been invited to participate.

The scheme, sponsored by **'Aquarian',** has been instigated to promote the breeding of fish and to encourage aquarists to turn their talents to the art of breeding and rearing fish, with the aim of continuously producing more, and finer, quality specimens. No fewer than 29 participants are involved in the scheme, and these have bred and raised 224 species.

YAF's attractive, friendly venue: Doncaster Racecourse

JOHN DAWES

Prize-winning water garden from Anglo Aquarium at the 1992 Hampton Show. Similar delights await this year.

All members of FNAS or affiliated societies are eligible to enter the scheme, which comprises four grades, from fish which are considered easy to breed, to those which are more difficult. As a measure of the breeder's ability over a wide range, the participant must choose species from not fewer than five different families.

Raising of young fish to acceptable standards is the subject of Grade Four of the scheme, in which five different species are raised to a minimum standard for judging by FNAS "A" Class judges at a recognised Open Show. Providing all other grades have also been completed, the participant will subsequently be awarded a **Master Breeders' Diploma.**

The **Breeders' Award Programme** was introduced to encourage more fish to be bred by an individual, with no reliance upon the fish being entered into an Open Show. Instead, fish are taken to a society meeting for verification.

Lectures on breeding and rearing fish are being held by affiliated societies in local areas; while articles on breeding are expected to be published by FNAS in the near future.

Regulations are available to all FNAS affiliated societies, and further information may be obtained by contacting: **Brian Walsh, 9 Marsh Terrace, Darwen, Lancs BB3 0HF. Tel: 0254 776567; or Dave Sidebottom, FNAS Secretary, 18 Harry Street, Werneth, Oldham, Lancs OL9 7TA. Tel: 061 626 9128.**

Pond Pump Winners

Winner of *A & P's* **Stuart Turner Pump Competition,** launched in **Koi Calendar (August 1992),** is *A & P* reader and Koi enthusiast **Derrick Francis,** who is vice-chairman of West Wales Koi Keepers' Society, and whose photograph of his Koi pond won him top prize.

Derrick is pictured receiving his prize of a Stuart Turner XB pond pump from the company's technical representative **Mike Curtis** (left/right).

A Goldfish prize won 15 years ago by his daughter at a local fair started Derrick's interest in fishkeeping, and this led to keeping Koi and ever more ambitious projects. According to Derrick, his existing pond bears no resemblance to the one he originally constructed: "My latest pond improvements took three months to complete and involved building a secondary pool for the Koi while the work was carried out", he explained.

He added: "I am delighted to win this competition. It is great reward for the work which went into rebuilding the pond. Installing the Stuart Turner pump will complete the pond improvements nicely!".

STUART TURNER PUMPS

Sparsholt Open Day

Six to seven thousand visitors are anticipated at this year's **Sparsholt College** Open Day on **Saturday 15 May.** Students will be providing guided tours of the National Aquatics Training Centre and answering questions about the courses. Additional attractions include sheep-shearing, cow milking, piglets, nature walks, flower arranging, a brass band, fly fishing, and cream teas.

A native marine touch table will also be available; it was a major attraction at last year's event, as was the microscope, through which visitors could view plankton and fish eggs.

Also answering fishkeeping queries will be a panel of aquatic experts, including **Dr David Ford,** senior consultant to 'Aquarian'; **Dr David Pool,** head of Tetra Information Centre; **Adrian Exell,** Product Development Manager of Interpet; and **Bernice Brewster,** aquatic consultant.

Doors open at 10 am, and the event closes at 4.30 pm. Entry is free and car parking is available at £3 (single) and £5 (family).

For further information, contact **Jane Lloyd, Sparsholt College Hampshire, Sparsholt, Winchester SO21 2NF. Tel: 0962 776441; Fax: 0962 776587.**

Koi Keepers 'Launch' Aqualife

Over 560 Koi keepers, from as far as Belfast, Devon and Darlington, assembled in the West Midlands for the first Koi show meeting for **Aqualife 1993** (Hall 3, National Exhibition Centre, near Birmingham, **3/4 April**).

During the meeting, which included lunch courtesy of the organiser **John Cook,** all aspects of showing Koi were presented by Koi experts **Bill McGurk** and **Paul Stacey,** from the organising team, who discussed the high standards of filtration being used at the show, as well as the extent of planning and organisation which has been committed towards looking after show fish during the event.

"Over £1m-worth of Koi is expected to be on display in the Koi show alone, explained Paul Stacey. "There was a tremendous atmosphere at the meeting, which was well-received by those present, keen to ensure that their Koi would be in the best of hands."

The event is being organised by John Cook, and incorporates hi-tech lighting, audio facilities and video screens, a rotating turntable stage, and stadia seating for over 400 bidders in a grand Koi auction, just one of the features of the event (see also **Koi Calendar** in this issue).

The organisers have also arranged a weekend accommodation package priced at £42.50 per person for a double room, or £47.50 for single occupancy.

Complimentary show transport coaches will also be provided between the NEC and **Shirley Aquatics'** premises at Shirley, Solihull.

For further information and booking details, Koi show entries, auction reservations and hotel accommodation, telephone **Day One Limited** on **021 323 2177.**

SPARSHOLT COLLEGE

Among the highly-popular attractions at last year's open day at Sparsholt College, Hampshire, were a native marine touch table and a microscope through which visitors could view plankton and fish eggs.

Thorpe A.S. Mourn Pat Smith

Pat Smith, known as 'Mrs Fish' of **Thorpe and District Aquarist Society,** died in December 1992. Pat was treasurer of the society for a number of years and wa: assisted by her devoted husband **Eric.**

Informing **News Desk** of her passing, **Derek Wyer,** secretary of the society, said: "Pat was always helping others who had problems with keeping all kinds of fish, coldwater and tropical, and she will be sadly missed by all our members".

What's your opinion?

By Billy Whiteside, BA, ACP

BERTIE & SPIKE

Mrs B Cooper lives at 78 Kenbrook House, Leighton Road, London NW5 2QW. She says: "I'm writing this for the benefit of all those who have bought Catfish, i.e. Plecos, and who think that swimming round the tank sucking at the glass and stones is sufficient for them. Eight months ago, an acquaintance sold us his 48in tank, complete with a few tropical fish that included a 7in Pleco.

"He said, 'You don't have to worry about the catfish: he never moves or needs feeding'. I thought, little do you know! The fish must have been starving! I immediately put him on a diet of cauliflower, broccoli, peas and lettuce. Now he never stops swimming and takes great delight in swooping down on the other Pleco which is a titch to Bertie's 13in. He's grown all that much since we got him. He's very tame and swims up to his corner as I approach.

"He's given us so much pleasure, and when we move house, he's going to have a bigger tank made to look more natural. Bertie and Spike get on well, and I hope they still do as little Spike catches up in size. I sometimes say, 'Look at Bertie!' and our dog goes to the tank and barks, as he is jealous of Bertie. Plecos are ugly fish, but I wouldn't part with them for anything. Mind you, with a Pleco, you can't have a nicely-arranged aquarium, as they need room and often scratch themselves on sharp rocks and ornaments. They love soft bogwood, though, and smooth pebbles."

COLDWATER CHARACTERS

I'm getting an enormous amount of pleasure from the tank of goldfish I set up a couple of months ago and I have added a few specimens to it. The fish — ranging from a baby goldfish born last summer, through a larger goldfish, to a Shubunkin, a couple of young Orandas and a young Butterfly Moor, which I would have called a Black Moor when young — are a joy to behold.

They are chubby and extremely greedy, nudging each other out of the way, without being rough, when food is placed in the tank. The fish have the most amusing expressions — especially the Moor and one of the Orandas. The close-up shots show the Oranda and the Moor as he gobbles at a tablet of fish food, spreading fine particles like snow. He looks like some sort of absurd cartoon character with protruding eyes and a sly grin.

If you have a spare tank and are thinking about setting it up, take a look at some so-called coldwater fishes such as Shubunkins, Orandas and Moors. My few fish cost me under three pounds each, and each has more character than all the tropicals in my other five tanks. See photographs.

I added a heater/stat to the 'coldwater' aquarium recently and the temperature is around 70°F (21°C). To the Moor, Shubunkin, etc., I recently added a small white Koi that cost me £1.95 in a Belfast pet shop. The Koi was in good condition and seemed good value at the price, in my opinion.

I'd never kept a Koi before and do not have a garden pond, so I was interested to see how the fish would fare with its fat, fancy friends in the slightly-warm tank. Would the Koi die after being housed in an unheated indoor tank in a pet shop? Not a bit of it! The temperature in the shop was probably around 70°F (21°C) for much of each day, so the tank with heater did not present any major problem.

My white Koi immediately established itself in the small aquarium and took over charge of the tank as chief searcher for food. It immediately senses when I am approaching the aquarium and sets off over the water surface like a vacuum-cleaner sucking for food. It is at its best on the surface of the gravel where it pushes in front of the fat, Fancy Goldfish — which look like fat grandmothers in hooped skirts — and gets first and biggest munch at the food.

The Koi seems to ensure that both gravel surface and water surface are kept clear of any spare food. It's a greedy feeder and gets more than its share because it can move much more quickly than the goldfish bred to be fat and fancy.

It's a joy to behold what happens when a tablet of food is dropped into the tank: the four 'fat ladies' and the white Koi go rather wild and dig about on the bottom gravel making quite a bit of noise as they blow particles of gravel about. None of my tropical fishes has a quarter of the character of any of my coldwater fishes — or perhaps I'm just indulging in anthropomorphism.

ENLIGHTENED VIEWS?

It's a good many years since I first reviewed Gro-Lux lighting tubes for this magazine. Subsequent to Gro-Lux, I tried a variety of fluoresent tubes and finally concluded that a mixture of tungsten and fluorescent lighting was probably best for growing plants in an aquarium.

Some time later, I abandoned the fluorescent tubes and used only ordinary tungsten bulbs costing about 25p-45p in supermarkets. Am I wrong to ignore recent developments in fluorescent lighting for aquaria? I can probably answer *No* as a hobbyist, but have to say *Yes* as a journalist writing for the aquatic press.

In a recent letter, **Dr Neville Carrington,** of Interpet, had something to say to me on the subject. I trust he won't mind if I quote a few lines from his letter: "... I am still determined to convince you that Triton (lighting tubes) is not only more economical to run, but also more effective, and I am sending you ... a Triton set for a 2ft

aquarium. Although the capital cost is higher than for a 40-watt bulb, taking the long-term, it is much cheaper to run . . .".

I have just received the Triton outfit and will soon install it over an appropriate tank, and use tungsten bulbs over a control tank. I'll be absolutely delighted if the new tube produces better plant growth than my long-time 40- or 60-watt bulbs.

What kind of lighting encourages your aquarium plants to grow?

'SUBMARINE' PLECO

A couple of years ago I purchased a Pleco — Plecostomus — catfish. It joined several middle and surface-swimming fishes in a tank, and made few appearances when the tank lights were lit at night. Each time I did see the Pleco, I was amazed at how big it had grown. A couple of weeks ago, I persuaded my teenage nephew to assist me in cleaning out two of my tropical tanks, with two more to follow two weeks later. Yesterday was the day for the tank that houses the Pleco to be cleaned out.

The catfish in question now looks like a small submarine and, although I'm not normally afraid of aquarium fishes, I'm less than keen to wade in the seaweed in seaside pools just in case I make contact with something nasty. A similar feeling was produced by the large Pleco, and my nephew decided that I should be the one to catch and transfer it. He also decided it would leap about and jump out of the net.

The Pleco was certainly difficult to catch — in a few inches of mucky water — but once netted, it did not struggle and was moved with a minimum of hassle. I decided to house it in a larger community tank where it will have more space to sail round like a small submarine. This is certainly my largest tropical fish at present. What is your largest fish, and for how long have you kept it?

MUTUAL MONSTERS

Occasionally one hears a good, fishy story worth repeating.

My sister amused me with an anecdote recently concerning her teenage son's year-old garden pond. I hope you like black humour!

Glancing out of the window, she saw what appeared to be a giant mouth break the surface of the garden pond and leap to catch some food. The fish appeared to be a giant — much bigger than any of the Goldfish or Koi that her son had in his pond.

Somewhat concerned, she raced out to the garden — in time to see some sort of aquatic monster stick its furry, wet head up above the water surface. She uttered a scream of terror at the monster — loud enough to frighten the monster too. It turned out to be a neighbour's dog in the process of drowning!

The dog was so frightened by the scream that it plucked up enough courage and energy to scramble out of the pond and rush back home through the hedge. It was lucky for the dog that my sister happened to notice it, and lucky for both that each thought the other was some sort of threatening monster!

WELL-DRAINED GOLDFISH

Some years ago, I told another fish story recounted by my sister. You may have missed it. She was visiting a primary school to see one of her students on teaching practice and happened to visit on the Friday when the class teacher changed the water in the Goldfish bowl. My sister watched amazed as the class teacher carried the fish bowl over to the sink, reached her hand in and caught each Goldfish in turn, and placed it flapping on the draining-board. She then washed out the bowl and subsequently returned each flapping fish to the bowl of fresh water.

My sister asked the teacher if she did not use a net to catch the fish, and if she did not place them in another container of water while their bowl was being cleaned. The surprised teacher had not heard of such luxuries and told my sister that the Goldfish had been in the bowl for years and had always been cleaned using the method she had observed.

All correspondence for **WYO?** should be addressed to **Billy Whiteside, c/o *Aquarist & Pondkeeper*, 9 Tufton Street, Ashford, Kent TN23 1QN.**

Confessions of a Fish Widow

JAWS AND THE DANCING SHRIMP

Imaginary or real, pets . . . and friends . . . can have a lasting effect on young children, to say nothing of their parents! **Marylin Apps** explains.

You would think that my children, having spent most of their lives surrounded by fish tanks, would take as much notice of fish as they would the wallpaper. Unfortunately, they show every sign of being as addicted to fishkeeping as their father. Then, again, I suppose that having inherited my brains, good looks and sense of humour, they have to get something from their father!

To be fair, I was probably responsible for starting my eldest daughter off in the hobby. You see, it got to a point in my life when I could take no more of Aubrey's interference in the everyday running of the household, Aubrey being my four-year-old daughter's imaginary friend.

Aubrey had to sit up to the table for dinner and be offered Marmite soldiers and jelly. He had to come out with us in the car, and I had to hold his hand round the shops and tuck him into bed at night.

But it got worse. Aubrey became a mischievous little imaginary friend over the years. He took a liking to mud pies on the living room carpet and tipping the dirty nappy bucket out all over the bathroom floor. Aubrey had to go!

So I introduced my daughter to a sweet little Fantail Goldfish and said he could be all hers if Aubrey packed his bags. All went well with this deal until bedtime, when my daughter wanted to take Bam-Bam, the goldfish, to bed with her. Unable to comply with this immoderate whim, we had instant hysterics and Aubrey had to be rapidly recalled from his holidays.

Luckily, my husband had a small fish tank spare so, the next evening, Aubrey was once again sent packing and Bam-Bam was installed in his new home next to my daughter's bed. I crept in about ten o'clock to see how the friendship was faring. My daughter was curled up sound asleep on the pillow, her thumb in her mouth — a vision of blond-haired innocence. Bam-Bam, however, was nowhere to be seen.

I looked in his castle and poked about in the gravel at the bottom of his tank, but to no avail. Bam-Bam was missing. Suddenly, I spotted a glint of gold on the carpet. Having no lid on his tank, Bam-Bam had obviously decided to flit out for a breath of fresh air. Mouth-to-mouth resuscitation is not easy on a goldfish. Neither is it very effective.

Aubrey came home unexpectedly from his holidays the next morning.

We did not resume the Bam-Bam experiment again for several months, feeling that, at four years of age, Jane was too young to experience life and death at such close quarters. Unfortunately, she was already hooked on fishkeeping and, by the time she was five, she had not seen more sex, violence, life and death than she would have seen in your average Rambo movie.

Well, I suppose it saved us telling her the facts of life. And it did keep Aubrey out of my hair on a Sunday morning when he went fish spotting round the local fish shops with the rest of the family.

Of course, it wasn't long before Aubrey was interfering again. He spotted a whole tankful of Lake Malawi Cichlids for sale one Sunday morning and just had to have them. He bought the whole tankful as a job lot and brought them home in a very large plastic bucket.

I'm pointing no fingers here, but I just wonder where Aubrey got the money from for a job lot of Lake Malawi Cichlids . . .

The bucket of Malawis decorated my living room carpet for several days while my husband set up a tank to put them in. During this time, Aubrey discovered that the waters of Lake Malawi are very beneficial to carpets and kindly washed the floor for me several times. My daughter, meanwhile, tried to be

helpful in her own small way and liberally sprinkled cat biscuits into the bucket to feed the fish. The cat liberally sprinkled her paws *into the bucket trying to feed herself on the* fish. Finally, the Malawis, or the Mafia, as I came to think of them, were housed in their new spacious headquarters.

Instantly, the Fishfather, Don 'Labidochromis Caeruleus' decided to take revenge for his incarceration in the bucket. He ran amok, killing 'Mr Melanochromis Johanni' and fatally wounding one of the Auratus dames. Jane screamed. Aubrey whooped for joy. The fish tank thrashed with Mafioso Malawis running for their lives.

In the end, my husband managed to take out the offending Fishfather and a temporary peace reigned in the tank. Two days later, Don Caeruleus went back to his family. Too late. The Malawi Mafia had elected a new Fishfather and Don Caeruleus met with a brutal death in the night.

My daugher had nightmares for weeks over that little territorial dispute. Life goes on, however, and it wasn't long before she was entranced by a pair of *Melanochromis auratus* in jewel-bright mating colours. Before long, the tank was alive with tiny Auratus fry darting in and out of their mother's mouth. About eight survived and Jane knew each one of them by name.

Of course, the biggest of the young fish had to be called Aubrey. Unfortunately, Aubrey turned out to be a female Auratus. She lived to quite an old age, outliving all her siblings by several years and eventually mating with a *Melanochromis johanni*. The Johanni/Auratus hybrids were beautiful rainbow-coloured fish but were, unfortu*nately, sterile and very short-lived.*

I'm afraid imaginary Aubrey didn't live to have such a happy ending as Auratus Aubrey. He disappeared without trace one Saturday morning when the mighty jaws arrived in his plastic bag.

Jaws was an ugly Red Oscar with mean eyes and an evil temper. He ate earthworms (yuk!) slurping them down whole like red spaghetti. He quickly learned to recognise the clank of the plastic worm bucket and would rush to the top of the tank with his beady eyes bright with greed. My daughter seemed to think that he was rushing to see her and squealed with joy when he snatched the worms from her grasp, nipping her fingers when she wasn't fast enough with the next worm.

After eating his fill, the mighty Jaws would rise munificently to the top of the tank to have his head scratched, then rolling like a Red Arrow in a display team, he would flit to the far end of the tank and try his best to rip the heater from its housing.

Aubrey hadn't stood a chance against such magnificent showmanship. I was sad to see him go.

My youngest daughter, Kate, had needed no imaginary friends. She already had a big sister. And a house full of fish. What more could she have wanted? Well, what she wanted was a fish of her own. Daddy had hundreds of fish. Jane had Jaws. So, one day, when mummy was fed up with fish, Jane, Jaws and daddy, she was taken out to choose a fish of her own.

It is my belief in the aftermath of this occasion, however, that undue influence was brought to bear on the choice of 'Kate's fish'. It can surely be no coincidence that my husband had just set up a marine tank with a particular interest in invertebrates. He already had a 'gypsy' anemone that wandered the length and breadth of the tank at will, and two hermit crabs that changed their shells as often as their legs. How 'convenient' it must have been when three-year-old Kate wanted a Dancing Shrimp as a pet!

I have to confess that I took an instant dislike to the creature. It looked like a spider on speed. All those waggling antennae and skinny legs. Something else also took an instant dislike to the Dancing Shrimp. It only lasted one night in the tank.

The next morning, it had disappeared without trace. Having, by now, become accustomed to those things which send a three-year-old into a temper tantrum, we decided to keep quiet about the fate of the D.S. and pretended that Dancing Shrimps slept during the day and only danced at night.

To this day, the ghost of the Dancing Shrimp still haunts our fish tank after dark. You see, we've never had the heart to tell Kate what happened to her shrimp. She'll be 12 next week . . .!

Perhaps we should get Aubrey to tell her.

ASP

Seaview

By Gordon Kay

WORTHY MAGS

A couple of interesting things in my two favourite magazines around November time. The magazines in question are the *BBC Wildlife Magazine* and the Marine Conservation Society's *Marine Conservation*.

Maws and Friends

In *BBC Wildlife Magazine* there was a wonderful article entitled **Maws,** about the Basking Shark. For those of you who are unfamiliar with this species, the Basking Shark is a near relative of the Great White, although despite its massive size — these animals grow as big as six metres and more — Baskers are completely harmless. They feed on plankton, processing up to ten tons of water an hour and straining out millions of fish eggs, copepods, cirripedes and free-swimming larvae.

These gentle giants are seen each summer off the western coast of Britain and populations of Basking Sharks stay at their favourite feeding grounds in the plankton-rich 'fronts' between warm, turbid coastal water and cool, clear oceanic sea — although nobody yet knows where they spend winter. In **Maws, Jeremy Grange** tells of his first encounter with the second largest fish in the world — only the Whale Shark is bigger — in the Irish Sea.

I don't propose to tell you everything about the article, but I would suggest that you try to get hold of a copy of the November 1992 issue of *BBC Wildlife Magazine* and read it for yourself.

You may have a bit of a search on your hands, but you will find it well worthwhile for, apart from this superb article, there is a small sister feature called **A Shark Infested Sea** by **Bob Earll,** Head of Conservation at the Marine Conservation Society, which outlines the 28 or so species of shark that can be found in British waters. As well as listing all the species and their characteristics, this small article also goes on to point out how much 'danger' the shark populations are in. Superb reading and, as I said, well worth tracking down.

Humpbacks and Dolphins

I said a few months ago that *Marine Conservation*, which is the journal of the Marine Conservation Society, gets better all the time. The winter 1992 issue did nothing but endorse this opinion, and for anyone even remotely interested in marine life — especially that around the coasts of Britain — then, as I have also said before, membership of the Marine Conservation Society is worth it for this magazine alone.

The winter issue was full of interesting stuff, chief among these — for me anyway — was a new feature called **SeaFacts,** which it is hoped will become a regular. The first **SeaFacts** was about a tiny worm called *Sabellaria spinulosa*, which is hardly bigger than a five pence piece and which builds a thick-walled tube of sand grains or shell fragments, which it cements to each other with a mucus secretion.

Lovers of marine trivia like me will love this sort of thing, and I think that it is especially useful for teaching the kids more about marine life, and thereby encouraging them to grow to respect it. Well done MCS.

Also in the magazine was **Homage to Humpback** which told of close encounters with a young female Humpback Whale off the coast of southern England and Ireland. The Whale was about six and a half metres long and was first seen following boats into West Bay on the Dorset coast in mid-June 1992. A few days later, several people rode on the back of the whale only metres from the beach at Chesil Cove. There was speculation that the whale must be either sick or disorientated, having lost the rest of its family group.

Local people tried to lead it out to sea again, as the stress of all the attention could cause the weakened whale to beach itself. A week later, the same Humpback was following boats around Kinsale in Southern Ireland and, a day later, near Tralong Bay, Rosscarbery.

It was in the same bay that the whale was washed up six weeks later, and doctor **Simon Berrow,** co-ordinator of the Irish Whale and Dolphin Group, believes that the young whale followed large objects such as boats after being separated from its mother. Becoming weaker and weaker, it either died of starvation or was killed by sharks. The animal was finally washed up on 31 July 1992 with numerous shark bite wounds along its flukes and it had been dead for some time. Dr Berrow believed that the shark bites were probably from Blue Sharks, but said that it was impossible to tell whether they were inflicted before or after the whale died.

As well as that rather sad story, there was a piece about drift net research. What the article said, basically, was that research which could prevent hundreds of thousands of deaths among dolphins and porpoises every year could take 20 years or more to complete because scientists cannot afford to test the equipment fully.

Although this article was also sad, there was some hope offered in the shape of **Dr Margaret Klinowska's** group from Cambridge University and their work with the small floats which reflect the sonar signals that dolphins send out when navigating the water. Dr Klinowska's group found that by placing the floats at intervals of two metres on drift nets, the nets appear to the dolphins as though they were solid barriers. Instead of swimming straight into the nets, the dolphins avoid them.

You may remember that I have mentioned these sonar reflectors before in **Seaview** and said how delighted I was that Dr Klinowska and others were doing such sterling work. However, Dr Klinowska is quoted in the drift net research article as saying that, adding so many of these floats to a net, increases the price by around 10% and also made them more cumbersome to handle in store. Further work was needed to refine the system, but the group was being handicapped by lack of funds.

The fishing industry is also interested in the project as they do not want to catch dolphins because the dolphins damage the nets and the fish within them. It seems a great tragedy to me that more money cannot be found for the project, and I would say to everyone that only by membership of organisations such as Marine Conservation Society — along with others like the Whale and Dolphin Conservation Society — can enough money be raised. Remember that EVERY penny helps.

SNIPPET

And now, on a lighter note, for something completely different — a **Snippet:**

Most fishes are covered in an outer layer of transparent plates called scales. They vary in size and shape, but the average bony fish scales are small and rounded, flexible and single-layered — called *cycloid* scales. A closely related type of scale (bearing small 'teeth' along one edge is known as *ctenoid*.

There are three other basic types of fish scale. Sharks and Rays have tooth-like *placoid* scales, also called "dermal denticles". The ancient Coelacanth has four-layered *cosmoid* scales. *Ganoid* scales found in Gars are diamond-shaped.

Two types of scales: the placoid type found in sharks and rays, and the diamond-shaped ganoid type found in fish such as the Gar.

Some fishes have no scales at all, but they have extra-tough skin. The 'sliminess' on a fish comes, not from the scales, but from the skin underneath, which makes special mucus. This helps fish to glide easily through the water and protects against parasites.

FULL TROPICAL SET-UP FOR

The newcomer to freshwater tropical fishkeeping may well, with great justification, be put off by the apparently high initial cost of setting up and stocking an aquarium. The same problem can apply to a hobbyist who wishes to return to fishkeeping after a break of many months. I therefore set out to see if it would be possible to obtain a full aquarium set-up, with decor and fish, for under £100. While such an amount is not peanuts, it brings fishkeeping within the budget of most people who would want to take up the hobby — especially if the equipment is purchased a little at a time, over a period of weeks or months.

My aim was to produce a high-quality, attractive tank that would be fit for the finest living room and create plenty of interest for the fishkeeper and other members of the household.

CONSULTATION

At this point the newcomer, rather than the 'returner', should consult a good book (or **Supplement**, such as that published in the October '92 issue of *A & P*) on tropical fishkeeping. There are literally hundreds of books available, and the library would be able to provide the relevant material at no cost.

Although setting up a tank and keeping fish is very straightforward, an introductory text is essential to explain about the different types of equipment, the biology of fish and their environment, and the different fish available — including which ones will mix together, and which ones won't!

The process is broken down into three steps: **Step One** involves listing all the essential equipment needed, e.g. filter, heater, etc. **Step Two** is to add the less essential items, such as decor and cleaning materials; and **Step Three** is the purchase of the fish and plants themselves.

STEP ONE

Clearly, the cost of **Step One** determines the amount left to be spent on **Steps Two** and **Three.**

Step One: Essential Items

Tank, hood, heater/stat, lighting, filter, air pump, gravel, fish food, stand.

The most important thing to do now is to buy these items at the lowest possible prices. The prices shown are the lowest from the range of suppliers advertising in *Aquarist & Pondkeeper* over the past months. Generally, the low-cost manufacturers have been chosen, but we must bear in mind our commitment to creating a piece of furniture as an end-result, not a messy tank with tubes and wires sticking out all over the place.

However, this is very much dependent on the care and individual attention with which the aquarium is set up and located. You may be able to find lower prices locally, and if all the equipment is purchased from the same dealer, a discount will almost certainly be available.

BILL TOMEY

While not quite being inside the £99 budget (largely, because of the hand-crafted wooden housing) the actual original contents of this aquarium can be obtained for a modest outlay.

Aquarium plant collections can, with careful management, grow into beautiful underwater gardens.

A tank size of 24in (60cm) long is the minimum viable size for a biologically successful aquarium to function with the minimum of maintenance. A larger size would take us out of the £99 budget, all the accessories being proportionately more expensive, as well as the tank itself, of course.

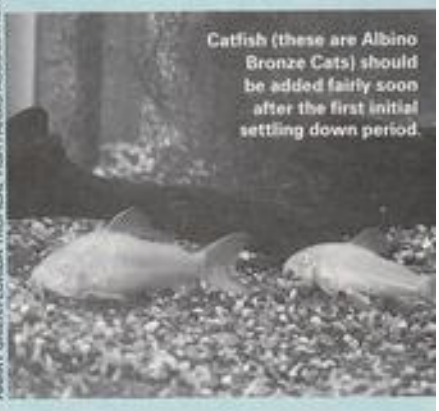
The tank, when filled, will weigh over 130lb (c60Kg), so it is essential that the stand or piece of furniture on which it is placed will take this weight easily. If in doubt, take a professional opinion from the manufacturers. A purpose-built stand is not within the means of our limited budget, but if a suitable item of furniture is not already available, then one must be found or bought.

An undergravel filter is the cheapest, simplest and most maintenance-free way of cleaning the water. It is, however, important to understand the biology behind the operation of these filters; this is where the book from the library will be invaluable, devoting many pages and diagrams to the subject. In particular, the aquarist must understand that the water flow must never be stopped, i.e. the pump or power head must never be switched off (or only for very short periods), or the bacteria in the gravel will be deprived of their supply of oxygen and die.

Many regard undergravel filters as not being ideal for the long-term success of plants. However, numerous aquarists grow perfectly healthy plants using a UG filter, as long as there is a thick layer of gravel (at least 3in — 7.6cm). A diaphragm air pump would also aid plant growth, and the hobbyist particularly interested in growing plants may wish to choose this method of air flow.

RICHARD HOWE

A good, inexpensive 'first' cichlid: the Kribensis.



HARRY GRIER/FLORIDA TROPICAL FISH FARMS ASSOCIATION

Catfish (these are Albino Bronze Cats) should be added fairly soon after the first initial settling down period.

However, air pumps do make a noise, both mechanical and from the bubbles of air rising to the surface of the water, and this may be considered a big disadvantage, particularly in a smallish living room. A power head will make almost no noise — choose one with a low turn-over rate (a high turn-over of water may be desirable in a marine aquarium, but it is totally unnecessary to process hundreds of litres per hour in a freshwater tropical tank; a very high turn-over rate that will also hinder plant root development).

A suitable combined heater/thermostat can be purchased for well under £10.

Step One can be achieved for about £74, made up (approximately) as follows:

Tank: 24 x 15 x 12in (60 x 38 x 30cm)	£10.75
Hood: 24 x 12in (60 x 30cm)	£11.37
Starter Unit for Light 24 x 1in (60 x 2.5m)	£9.15
Fluorescent Tube	£5.99
100W HeaterStat	£8.69
23 x 11in (58 x 28cm) UG Filter	£4.60
150 l/hr (33 gal/hr) Power Head	£10.45
Lime-free Natural Gravel: 25kg (55lb)	£9.95
Tropical Flake Food	£3.05
TOTAL FOR STEP ONE	**£74.00**

£99

As **Richard Howe** shows, you can have a decent freshwater community aquarium without having to spend a fortune.

BILL TOMEY

Platies are good resilient fish to start off with.

HARRY GIBER, FLORIDA TROPICAL FISH FARMS ASSOCIATION

Although you should, ideally, buy a small shoal of Tiger Barbs (instead of just one or two specimens) you won't need to spend too much on these popular and attractively priced fish.

STEP TWO

This step involves buying the other items which will be needed to run and maintain the aquarium.

Step Two: Other Items

Plastic tubing, decor, magnet cleaner.

Rocks and pieces of wood can be purchased from retailers, but broken (or whole) flower pots can be used at very little cost. (If you do not like the look of them, they can be hidden by plants.)

A magnetic cleaner is almost essential to keep the front of the tank clear of algae. A length of plastic tubing is needed for siphoning when carrying out partial water changes.

Step Two can be achieved very economically:

Plastic Tubing: 9mm x 1mm	.75
Magnetic Glass Cleaner: 2in(5cm)	£1.99
3 Plastic Flower Pots	.80
TOTAL FOR STEP TWO	**£3.54**

STEP THREE

Step Three is the purchase of the fish and plants — those living things which finally complete the whole effort and bring the picture to life.

A standard, 40-plant selection especially selected for a 24in (60cm) community tank is available from many suppliers and is, by far, the most economical way to buy plants.

The choice of fish is still very large, despite the £99 total limit. As with any newly set up tank, the fish should be introduced in stages. Start with a few Guppies, Neons or Zebra Danios. They will help the aquarium in its initial biological settling-in period.

Then, a couple of weeks later, you can add the other fish — and here it is purely a matter of personal taste. I would suggest a dozen or more Neons (ask for a quantity discount and you'll probably get it) six Tiger Barbs, two Kribensis (one male and one female) and two or three Corydoras Catfish. Again, for such a bulk purchase, you may be able to negotiate further discounts.

The least expensive fish are the smallest, and youngest. There is absolutely nothing wrong with buying very small fish — providing they are from a reputable dealer and are clearly normal and disease-free. (The dealer will have quarantined/acclimatised them initially on purchase).

Death of the odd specimen may occur, however, and the hobbyist must be prepared for this. Nevertheless, purchasing very small fish is by far the most economical way to buy, and the aquarist will have the satisfaction of seeing them grow into full adult specimens.

Very approximate costs for **Step Three** (buying young/small specimens of fish) are:

40 Plants: 24in (60cm) Selection	£6.95
3 Guppies	£1.00
6 Zebra Danios	£2.00
14 Neons	£4.00
6 Tiger Barbs	£2.00
2 Kribensis	£2.00
2 Corydoras	£2.00
TOTAL FOR STEP THREE	**£19.95**

The price list for **Step Three** ignores any discounts you may negotiate. If there is any spare cash left over as a result of bargaining, a bottle of White Spot Remedy (around £2.04) can be added to the list for **Step Two.**

PRECAUTIONS

As with all newly set up aquaria, the initial problems are greater than the long-term ones. To save further expenditure on remedies and treatments, a few simple precautions are advised.

Hairy algae are especially likely and are hard to treat. They tend to disappear after a few months and can be inhibited initially by having plenty of plants and not keeping the lights on for too long (only for a few hours in the evening to start with, then gradually increasing to all day after two or three months).

A good-quality flake food is fine, but don't over-feed. All food put into the tank should be gone within 2-3 minutes. You can always add more, but over-feeding is the biggest cause of disease and other problems, which will be expensive to treat.

FULL COST OF SET-UP WITH FISH AND PLANTS

Step One	**£74.00**
Step Two	**£3.54**
Step Three	**£19.95**
TOTAL	**£97.49**

So, for a total outlay of under £99, a complete and very attractive and interesting aquarium can be established. And you will have the satisfaction of knowing that you have created (for less than £100) what many people spend several times that doing. Happy fishkeeping! AAP

My favourite: Gourami

Mating underway between a blue male and a deeply-coloured Amethyst female.

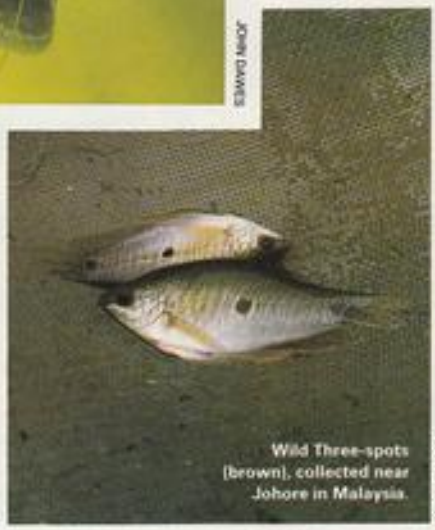
JOHN DAWES

Bubblenest, photographed in the wild.

JOHN DAWES

Wet but happy: collecting Labyrinths (*Ctenopoma ansorgii*) in Gabon.

BARBARA BROWN



Wild Three-spots (brown), collected near Johore in Malaysia.

JOHN DAWES

JOHN DAWES

For **David Armitage,** editor of the AAGB magazine *Labyrinth,* the Two- (or is it Three-?) spot Gourami is a very special fish.

A colleague of mine, returning from the International Entomology Congress at Beijing, called me over. "You know those fish of yours?" he chuckled. "Well, they had a tank full of them ready for the table in the restaurant where we had the Congress banquet. You could choose your own, just like trout in the UK."

'Those fish' of mine were *Trichogaster trichopterus,* the Three-spot Gourami. You may regard it as an ignominious end for a fine aquarium fish, but I regarded it as a tribute to its utility, and quite typical of the beast.

There is some controversy even over the name of this species. Is it the Two-spot Gourami or do you include the eye and call it the Three-spot? Is the Blue Gourami, a separate sub-species, *T. t. sumatranus*? This sub-species status could only be justified if it was a geographically-isolated variant from the Island of Sumatra which, in view of the transplants of this species by man, would be very difficult to prove. They certainly aren't a different species, because they interbreed freely, as I will explain later.

FASCINATING BEHAVIOUR

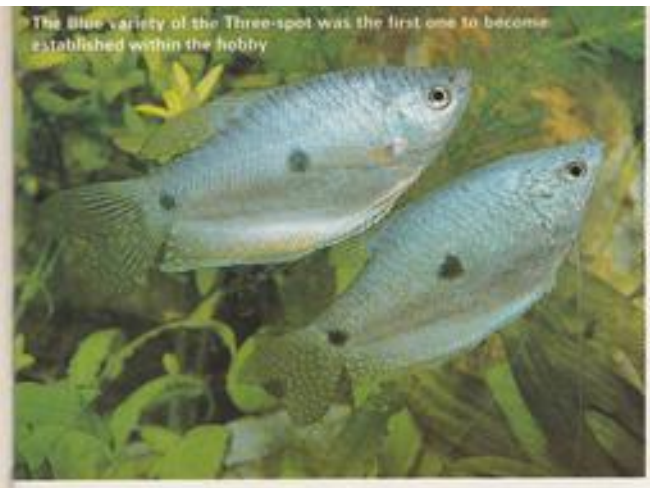
This was the first gourami that I kept, and the first egglayer that I successfully bred and raised to maturity. I suppose it was the animal most responsible for drawing me into the fascinating world of anabantoids and the more than ten years of fruitful association that I've had with the Anabantoid Association of Great Britain (AAGB).

It shows all of the characteristic behaviour patterns of the family, all too often casually summarised by hobbyists, for instance, as 'the typical anabantoid embrace' (I am as guilty as anyone else in this) but of course, there is no such thing; each species behaves differently.

The study of these differences has been a fruitful source at Oklahoma State University by Dr Rudi Miller and colleagues for close to 30 years. Writing to him, on behalf of AAGB, I was introduced into a new world of a different fish language. The language of behaviour (ethology) which has its own formal rules, just like speech, is responsible for maintaining social heirarchies, selecting the fittest mate and preventing fruitless breeding with unrelated species. Many of the behavioural elements are similar in both aggressive and sexual encounters, which most readers will have already discovered for themselves in a non-aquarium context!

Non-breeding Encounters

When not breeding, the fish maintain a stable rank order by aggressive encounters. When one fish approaches another, the fins can be spread in varying degrees. Sometimes, the approach is rapid, when the mouth may be opened, ready for attack, but if the opponent is larger, the approach can be jerky, with some back-pedalling. The thread-like pelvic fins are extended and sometimes contact the other fish. Fish displaying will spread their fins with the tail curved upward or the body curved into an 'S' shape. Tail beating occurs in this display,



The Blue variety of the Three-spot was the first one to become established within the hobby

MAX GIBBS, THE GOLDFISH BOWL, OXFORD

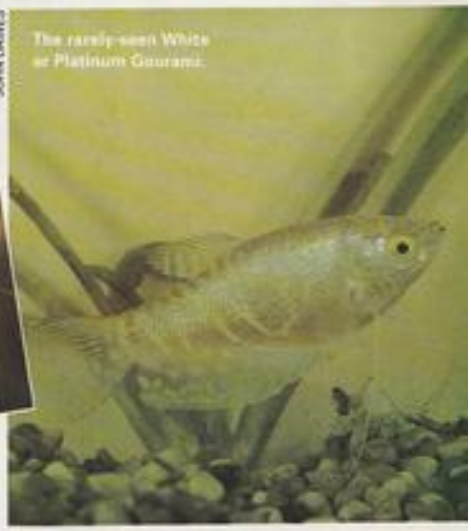
Crossing the Opaline (Cosby) Gourami with a Gold produced the Amethyst.

Golden Gouramis are probably more popular these days than any other variety of their species.

MAX GIBBS, THE GOLDFISH BOWL, OXFORD

An Amethyst male in normal (non-breeding) colours.

JOHN DAWES



JOHN DAWES

The rarely-seen White or Platinum Gourami.

with thrusts toward the opponent or an unco-operative female.

When attacking, the fish swims directly with the fins partially folded but to prevent this, the opponent can adopt the appeasement display by folding the fins and tilting on its side. Biting can occur by grasping the body or fins between the teeth and jerking the head, while butting is a thrust against the body with the lips. These actions often occur after the lateral display and fin beating, but when a female butts a male, it is an invitation to spawning.

Breeding Encounters

The onset of breeding is signalled by the male defending a territory. In West Java, at least, there are two breeding seasons: at the beginning and end of the rainy season, with two-four spawnings in each.

Males blow bubbles in two ways: after circling beneath the nest with snout up and body at an angle of 30°, air is gulped in, the mouth closed and then blown out in a stream of bubbles at the surface. Alternatively, air can be gulped up to 40 times and the bubbles released from the mouth and gill-covers beneath the nest.

When leading the female to the nest, the male adopts the lateral spread, with the body in an 'S' shape. Beneath the nest, he drops beneath the female's chest and rocks back and forth. After this has proceeded for some time, the female remains at right angles to the male in the centre of a circle formed by the male's body and, as his circle tightens, head and tail come together, with the female against his side, and her head above his back.

The anal and caudal fins of both partners then vibrate and the pair roll over, so the female's vent is directed upward, to the nest. The female assists the roll by bending her caudal fin up and increasing the beats. Both fish then tremble violently as eggs and sperm are released. Afterwards, the pair sink for a few seconds before the male chases the female away. The male then spends much time moving the eggs about the nest or retrieving eggs. This may carry on for three to five days.

Vertical dark bands, reticulations, can appear over the entire body and head during courtship, with an irisdescence on the fins, while the yellow of the anal fin becomes brighter. The intensity becomes even greater during territorial encounters, so the male can become almost inky black. Females also have territories and aggressive disputes with similar, but less intense, colour changes, and their territories tend to be toward the (aquarium) base.

THE SPECIES

The body patterns of the four species of *Trichogaster* contain clues to their relationship. *T. microlepis*, the Moonlight Gourami, has little mating colour, *T. leeri*, the Pearl, is always brilliantly coloured, while *T. trichopterus* shares with *T. pectoralis*, the Snakeskin, the vertical reticulations.

T. micropelis has no apparent lateral band, but a very faint one and a caudal spot can just be made out in older adults. *T. leeri* has a band and a spot, *T. pectoralis* has a series of spots and, in *T. trichopterus*, just two spots remain. One can imagine an ancestor with a single lateral band may have developed into the four species which have either intensified it, broken it into spots, or masked it, as in *T. microlepis*.

The Moonlight produces more eggs than the other species and has a lower number of embraces, suggesting each is more efficient. The Three-spot and the Snakeskin may try to spawn before their partners are ready, and so have a longer courtship. They also never incorporate plants into their nests while the others do; Moonlights with enthusiasm!

In addition, Moonlights don't blow bubbles at the surface. It therefore seems that *T. microlepis* and *T. leeri* are more specialised than *T. trichogaster* and *T. pectoralis*.

Comparing the behaviours of *Trichogaster* and *Colisa* (the other popular genus of Gouramis), Miller came to the conclusion that they evolved from a *Macropodus* (Paradisefish)-like ancestor with short pelvics and a mid-body stripe. *Trichogaster* became larger and longer, with longer spawning bouts and specialised signals, while *Colisa* reduced overall body size but increased parental care. *Colisa* may have been of older origin because of its wider range in size and colour.

COLOURED INTEREST

Another reason for my affection for *T. trichopterus* was my involvement in the tale of unravelling the explanation for the colour varieties of this species, which is when I was first introduced to our editor, John Dawes.

My Head of Department at that time was, among other things, a geneticist, Peter Dyte, whose investigation into cat genetics had filled the houses of most of our colleagues with a curious variety of peculiarly intelligent Siamese crosses.

His interest in the increasing number of fish tanks in the controlled-temperature rooms intended for stored-product grain beetles was eventually revealed during a prolonged career interview, when he explained that he had kept this species since the war and, after the appearance of the gold and white forms in the 1960s, had carried out sporadic crossing experiments which had led him to believe the four colour varieties — white, gold, blue and brown — were governed by two independent recessive genes for gold and blue.

Writing to John Dawes on the subject, I learned that he had supervised an experiment carried out through the British Aquarist Study Society (BASS) which provided Peter Dyte with the data he needed to prove his hypothesis. John had been investigating his 'Amethyst' variety which was produced by crossing an Opaline with a Gold Gourami. (The amethyst can be regarded as non-blue, like the brown or wild-type, and the peculiar caste that gives its name, may be something to do with inheritance of the 'Cosby', i.e., Opaline pattern).

The contrasted body colours are produced by the action of genes which are present in all cells of the body in pairs, but in the eggs and sperm, they occur singly. If only one pair of genes were involved, call them *B* for dominant non-blue colour (as in the wild, brown fish), and *b* for the recessive blue colour, all the offspring would have the dominant gene and thus be brown.

But when these offspring mate, all four combinations would occur: *Bb, bB, BB* and *bb*. As one of these contains both these recessive genes, the colour could express itself and there would be a ratio of 3 : 1 brown to blue, but only two varieties could result. Alternatively, if neither gene had been dominant, the first generation would have been halfway between the parents' appearance and the result of crossing that generation would produce three varieties: the parents' and the intermediate varieties.

To explain the four colour varieties, requires two recessive genes, *g* for gold, as opposed to *G* for non-gold and *b* for blue, as opposed to *B* for non-blue. The cross blue x gold can be represented as *bb GG* (blue) x *BBgg* (gold), which yields a first generation, *BbGg* with the dominant genes which ensure neither gold nor blue colour is expressed. All these offspring would be the wild, brown or amethyst type.

However, in the second generation, all combinations would occur. Nine would contain both dominant genes, *B* and *G*, and be brown-bodied; three would contain one dominant gene only: *bGbG, bgbG* or *bGbg*, these will be blue; three will contain the other dominant gene only: *Bgbg, bgBg* or *BgBg*, these will be gold; and only one will contain all recessive genes *bgbg*, these will be white (also referred to as Platinum). This is probably better explained in the accompanying chart.

The ratio of brown : blue : gold : white would therefore be 9 : 3 : 3 :1 if Peter Dyte's hypothesis would be correct. John Dawes' data supported this well. He produced 88 offspring: 50 amethyst, 20 blue, 15 gold and 3 platinum fishes. A simple statistical test called Chi squared, showed that the deviation from expectation was due to chance.

COLOUR INHERITANCE CHART

PARENTS: BBgg (Gold) x bbGG (Blue)

SPERM/EGGS: Bg, bG

FIRST GENERATION: BbgG (Wild/Brown/Amethyst)

FIRST GENERATION CROSS: BbgG (Wild/Brown/Amethyst) x BbgG (Wild/Brown/Amethyst)

SPERM/EGGS: BG, Bg, bG, bg BG, Bg, bG, bg

POSSIBLE SPERM/EGG COMBINATIONS:

SPERM/EGGS	SPERM/EGGS BG	bg	bG	bg
BG	BGBG (Wild)	BGBg (Wild)	BGbG (Wild)	BGbg (Wild)
Bg	BgBG (Wild)	BgBg (Gold)	BgbG (Wild)	Bgbg (Gold)
bG	bGBG (Wild)	bGBG (Wild)	bGbG (Blue)	bGbg (Blue)
bg	bgBG (Wild)	bgBg (Gold)	bgbG (Blue)	bgbg (White/ Platinum)

The above combinations will result in the following ratios: 9 Wild/Brown/Amethyst: 3 Gold: 3 Blue: 1 White/Platinum.

CLOSING THOUGHT

It is reassuring to know, when humankind has achieved its heart's desire and concreted over the face of the earth and chopped down the forests so that today's variety of tropical fish is a distant memory, that the Two-, Three-spot or Blue Gourami will probably still survive, if only as a delicacy for the table, and future generations will not be deprived of first-hand experience of the beauty and interesting behaviour of this characteristic representative of the Labyrinthfish. MP

REFERENCES

Miller, R J (1964). Studies on the social behaviour of the Blue Gourami, *Trichogaster trichopterus* (Pisces, Belontiidae). *Copeia* **3**, 469-496.

Miller, R J and **Robins, H W** (1974). Reproductive behaviour and phylogeny in the genus *Trichogaster* (Pisces, Anabantoidei) *Z. Tierpsychol.*, **34**, 484-499.

For further information on Labyrinthfish contact the Secretary, Anabantoid Association of Great Britain, 12 Pinefield Road, Barnby Dun, Doncaster DN3 1QT.

Trade Talk

Interpet Claims Market Leadership

Pet and aquatic specialist **Interpet** claims to have achieved a 50% share of the rapidly-growing UK market in pond water treatments. According to the company, it has reached the figure as a result of intensive market research, and attributes its success to a combination of factors:

(a) Unique, innovative and effective products;
(b) A comprehensive, well-thought-out range;
(c) Market confidence in the company to continue to launch innovative, market-led products;
(d) Award-winning product and point-of-sale packaging;
(e) Provision of clear instructions on products which are simple to use;
(f) Effective merchandising at point-of-sale, including the highly-popular "Pond-stand" deal for traders.

Explained **Mark Senior,** managing director of Interpet: "More and more retailers are realising the sales potential of pond water treatments and are turning to Interpet for quality products and advice, together with professional service".

He added, "Interpet does not intend to rest on its laurels: new products to strengthen the range are in production and will be launched at **Pet Index** in April".

For information, contact: **Interpet Limited, Vincent Lane, Dorking, Surrey RH4 3YX. Tel: 0306 881033; Fax: 0306 885009.**

Sparsholt One-Day Course

A number of last-minute places are still available on **Sparsholt College's** short courses for retailers. Fees are £100 per course, with discounts for more than one course.

The courses cover Water Chemistry (1 and 2 March); Basic water quality maintenance and filtration systems (3 and 4 March); Anatomy, physiology and ecology (8 and 9 March); and Diseases and use of the microscope (10 and 11 March).

The college is also undertaking interviews for recruitment on the NDAOFM and NCAOFM courses, while plans are being finalised for the college's **Aquatics Trade Conference** to be held on **21/22 June,** further details of which will be published in a future **News Desk.**

For full information, contact **Jane Lloyd, Sparsholt College Hampshire, Sparsholt, Winchester SO21 2NF. Tel: 0962 776441; Fax: 0962 776587.**

New JMC Consultant

Jane Cruise has been appointed as aquatic consultant at ornamental fish importer **JMC Aquatics.** Jane is a graduate of Sparsholt College, Winchester, and will primarily be responsible for monitoring health and quality of imported fish during their quarantine/acclimatisation period.

JMC imports fish from around the world, with as many as one million fish housed at the JMC livestock centre at any one time. Jane will regularly check new arrivals for signs of disease, ill-health or stress. She will also be responsible for running the company's new trade customer advisory service, offering advice on general fishkeeping matters, as well as visiting customers who may be concerned about their livestock.

Janet Cruise, director of JMC Aquatics, said, "We are delighted Jane is joining us in this critical quality assurance role. She has already had two work placements here from college and has obviously learned our procedures very well. Jane's recruitment will bring added strength to our experienced team".

JMC Aquatics Ltd, 59 Stubley Lane, Dronfield, Sheffield S18 6PG. Tel: 0246 415275/ 410412; Fax: 0246 290486.

Independance Expands

Following a year of rapid business expansion, **Independance (UK)** has outgrown its company premises at Batley and has moved to large offices and warehousing at Sherburn-in-Elmet, near Leeds.

The new 8,000 square foot premises offer extensive manufacturing facilities for the future production of the company's own-label products. The company was formed in March 1992 by **Sandra Shankland,** and has moved premises in order to meet increased demand for its ranges of **Aquarium Pharmaceuticals Inc (API)** water treatments and fish care remedies, as well as **Shark** internal filters and powerheads.

Said Sandra, who is joint managing director with her husband **Derek,** a former sales director with Hagen, "The growth of the company has been exceptional, particularly when you consider that it has taken place during an economic recession. We have swiftly established a distribution network of all major UK wholesalers and needed larger premises in order to service our customers more effectively".

The new Independance (UK) premises are at: **Blackburn Industrial Estate, Enterprise Way, Sherburn-in-Elmet, Leeds LS5 6ES. Tel: 0977 681962; Fax: 0977 681963.**

Diary dates

Saturday 6 March

Association of Aquarists: The next A of A quarterly meeting will be held at The Macintyre Project, Moot Hall, Great Holm, Milton Keynes, Bucks, at noon. The meeting will include a lecture on *Coldwater Fishkeeping.* Full details from **Mrs Louise Crook** on 0235 533994 (after 7 pm).

Sunday 7 March

Cannock & District AS: An Aquatic Auction will be staged at Avon Road Community Centre, Cannock, at 1 pm. Lots accepted from 10.30 am.

The event will be signposted from junction 11 on the M6. Alternatively, follow the A460 towards Cannock town centre.

For further details, ring **Mick Blackburn** on 0902 344515 after 6.30 pm.

Saturday 13 March

Association of Aquarists: The A of A 1993 Convention which will be held in conjunction with the **Federation of Northern Aquarium Societies** will be at Chester Zoo. Entrance fee: £10, to include the Convention, entry to the Zoo, morning and afternoon tea, and a hot lunch. **Lecturers: Darell Siebert** (USA Natural History Museum, New York) — *Fish From Barito River, Borneo;* **Oliver Crimmen** (British Natural History Museum) — *Environment to Scientific Study;* **John Chalmers** (Hobbyfish) — *Planting the Aquarium;* **Brian Walsh** — *Audio Visuals.*

Tickets are available from **Mrs K Allen,** 12 Sun Crescent, Oakley, Nr Aylesbury, Bucks HP18 9RF, or **Dave Sidebottom,** 18 Harry Street, Werneth, Oldham OL9 7TA.

Sunday 14 March

Greenock & District AS: The 8th Annual Open Show will be staged at James Watt College, Finnart Street, Greenock. All fish must be entered by 1 pm. For further information, contact **Jim Sheekey** on 0475 743591.

Skelmersdale & DAS: The first Bi-annual Auction will take place at Skelmersdale Labour Club, Westgate, Skelmersdale, Lancs. Booking in of lots: 10.30 am-1 pm. Refreshments and hospitality. For more details, contact **Gary** on 0695 25734 or **Ron** on 0695 28971.

News from the societies

Association of Aquarists: The following were elected as committee members of the A of A at the last AGM:

Chairman — Malcolm, Goss, 0494 722786; **Vice-Chairman** — George Liddle, 0670 814616; **Secretary** — Mrs Louise Crook, 0235 533994; **Treasurer** — Mrs Kate Allen, 0844 238041; **Membership Secretary** — David Davis, 0705 814622; **Programmes** — Nigel Ridley, 0908 310847; **Superbowl Co-ordinator** — Nigel Aylmer, 0908 319324; **Sales** — Mrs Joan De La Mare, 0604 766668; **Public Relations Officer** — Adrian Cooper, 0473 611148.

For further details, contact the Secretary, **Mrs Louise Crook,** 4 Wick Close, Abingdon, Oxon OX14 2NQ.

Reigate and Redhill AS: The following are the newly elected committee members of the R & RAS for 1993:

Chairman — Sid Fewtrell, 0293 786078; **Secretary** — Ivor Stemp, 0293 783249; **Treasurer** — Dick Gush, 0737 765152; **Public Relations Officer** — Jeremy Spence, 0293 512932.

For full details regarding the society's 1993 programme, please contact **Jeremy Spence,** 60 Railey Road, Northgate, Crawley, West Sussex RH10 2BZ.

Coldwater jottings

By Stephen J. Smith

FURTHER FEEDING ADVICE

Following my advice on cleaning and feeding (**Coldwater Jottings**, January 1993), I have received a letter from **S R G Lobbett** (no first name given) of Wexham, Slough, who has enquired about feeding his Koi during the winter.

He had seen a proprietary brand of winter Koi flakes and wondered if winter feeding really is appropriate for his fish.

My own opinion, "SRG", is that winter feeding is not advisable in the pond. Now, while the specialist Koi keepers and coldwater enthusiasts raise their hackles at my outlandish statement, the reason for this is straightforward: the make-up of Koi and goldfish (and all members of the carp family) is that they do not have a stomach and, therefore, food is digested only as it passes through the gut.

Through the winter, the metabolism of the fish slows down considerably (readers may have noticed their fish 'sleeping' near the bottom of the pond) and thus the digestive processes also slow down.

Therefore, in my opinion, it is unwise for the average pondkeeper to feed fish too often during the colder months (I continue to feed my fish kept in indoor aquaria, though only as much as a small feed just once every day or so), as food may be retained undigested within the fish's gut, or remain uneaten within the pond.

Some Koi keepers (our own **David Twigg**, for exmple) attempt to help their fish to continue to grow through the winter by heating the pond, or by passing fresh water continuously through the pond: either method helps to keep the metabolism of the fish at a level where feeding would be appropriate.

Pondkeepers should also beware of a 'false dawn' for the fish when (if ever) the sun breaks though on a winter's day. The slight rise in temperatures which ensues may well bring the fish to the surface and they will take food readily. However, do not be tempted to feed, as temperatures will drop at sunset and any undigested food will decay and risk the health of the fish.

High-protein foods have become extremely popular among Koi and pondkeepers, and these are ideal during the warmer months only. However, the use of wheatgerm foods which are easily digested are ideal for the cooler months of autumn and early spring, while my own opinion is that no food should be given to outdoor fish between mid-November and mid-March (usually the coldest months of the year). After all, if the fish have received a balanced diet throughout the fishkeeping season, they will have stored sufficient reserves to sustain themselves throughout the 'close' season.

SPOT THAT!

I was delighted to hear from **Mrs Marylyn Nesbitt**, of London W4, who sent me the most beautiful Christmas card following our meeting at Aquarium '92 at Sandown Park in June last year.

Marylyn writes: "I'm happy to tell you that I'm having some success with my Ryukins following your advice. I have bought a gravel cleaner and change part of the water every one or two weeks".

However, she is worried about one of her Ryukins which has small white lumps on its finnage which, she writes, "is proving very difficult to improve. I've used various treatments to no avail. Nevertheless, the fish does not look unwell, so perhaps he will just have to live with it."

He may well be grateful for that, Marylyn, as the 'spots' you describe may well be none other than one of the characteristics of a healthy MALE goldfish! These spots, properly referred to as *tubercles*, appear along the forward rays of the pectoral fins and on the gill covers (operculi). Often, these can build up to quite a thickness, especially on the pectoral fins, and can sometimes be seen with a trailing of mucus where this has also built up on the rough surface of the tubercles.

The condition is absolutely nothing to worry about; just the opposite, in fact. If my long-distance diagnosis is correct, Mrs Nesbitt has a very healthy fish (the reward of obvious good husbandry) and, who knows, if this Ryukin is paired with an appropriate mate, we could well be hearing soon of our first spawnings of 1993 . . .

SOCIETY UPDATE

With the new coldwater season about to begin, this is the time when hobbyists who aren't already members of a society begin to join one. Involvement in any society can provide a whole new dimension to our pleasurable pursuit, and provides the opportunity to meet similarly enthusiastic hobbyists and exchange views and methods of keeping, breeding, and showing fish, as well as attending talks by leading authorities in the fishkeeping scene.

Hopefully, the following list will provide a guide to some of the major coldwater societies around the UK. I have tried to be as up-to-date as possible, but if there are any inaccuracies, changes, or even omissions, perhaps you would let me know so that I can publicise your coldwater society or section correctly within these columns.

ASSOCIATION OF MIDLAND GOLDFISH KEEPERS

Secretary: Anne Bloor, The School House, Church Lane, Hanwell, near Banbury, Oxon OX17 1HN. Tel: 0295 758297 (daytime); 0295 738147 (evenings). **Meetings:** Approximately quarterly; Foleshill Community Centre, Coventry.

BRISTOL AQUARISTS' SOCIETY

Secretary: Tom McDermott, 10 Copley Court, Hanham, Bristol BS15 3SH. Tel: 0272 608512. **Meetings:** Monthly; St Ambrose Church Hall, Stretford Road, Whitehall, Bristol.

GOLDFISH SOCIETY OF GREAT BRITAIN

Secretary: Tony Barnes, 33 White Hart Lane, Portchester, Fareham, Hants. Tel: 0705 380639. **Meetings:** Monthly; YWCA, Great Russell Street, London.

NORTHERN GOLDFISH AND PONDKEEPERS SOCIETY

Secretary: Alan Ratcliffe, 2 Borrowdale Close, Burnley, Lancashire. Tel: 0282 420097. **Meetings:** Monthly; Sports Centre, Silverwell Street, Bolton.

SOUTH PARK AQUATIC (STUDY) SOCIETY

Secretary: Norma Brown, 14 Coombe Lane, Whiteley Village, Walton-on-Thames, Surrey KT12 4EL. Tel: 0932 842611. **Meetings:** Monthly; Wimbledon Community Centre.

White dots on the pectoral fins and on the gill covers are a sign of a very healthy male in breeding condition.

STEPHEN SMITH

WEST OF SCOTLAND GOLDFISH SOCIETY

Secretary: Brian Patterson, 16B Bruce Road, Pollokshields, Glasgow G41 5EJ. Tel: 041 429 0363. **Meetings:** Monthly; Polloks Community Centre, Langton Road, Polloks, Glasgow.

AND FINALLY . . .

A 'tropical' welcome is extended to coldwater enthusiasts by the organisers of **Grocklemania** (23-25 April, Whitecliffe Bay Holiday Park, Bembridge, Isle of Wight).

Paul Corbett, show manager of **Isle of Wight Aquarists' Society** which organises the annual event, writes: "We are keen to encourage the coldwater side of the show scene, and have included extra single- and twin-tail classes. Together with the AOV and a separate coldwater breeders' class, this gives a total number of six classes, which compares well with the usual FBAS Open Show number of three coldwater classes".

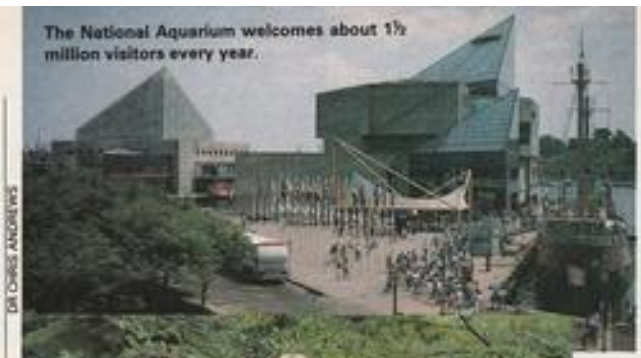
Paul continues, "The coldwater side is fairly well supported on the Isle of Wight — our defeat of SPASS (South Park Aquatic Study Society) is proof, and our SPASS friends have assured us of their support at **Grocklemania.**

"Among the attractions we are hoping to put on, is a display of the many new varieties of coldwater fish which are now available to hobbyists," concluded Paul.

For further information, please contact: **Paul Corbett, Show Manager 'Grocklemania', Isle of Wight Aquarists' Society, The Orchard, Gatcombe, Isle of Wight PO30 3EF. Tel: 0983 721246.**

All news items and letters for this column should be addressed to **Stephen Smith, Coldwater Jottings,** c/o *Aquarist & Pondkeeper.* If you require a response, please enclose a stamped, addressed envelope.

"You have only had them five minutes, so how you can know they are Grass Carp hybrids and will scoff your plants, beats me!"



The National Aquarium welcomes about 1½ million visitors every year.

Regular field trips take me (seen here holding a sizeable lizard) and other members of my staff to many interesting locations, like the rain forest of Costa Rica.

Best Wishes from Baltimore!

In March 1991, **Dr Chris Andrews** left London Zoo to join the National Aquarium in Baltimore, Maryland, USA. Two years on, he updates us on some of the more interesting aspects of his work at the NAIB.

It is two years since I left London Zoo. I am standing on the tarmac at Baltimore-Washington International Airport in driving rain at 4 am on a cold winter morning watching my staff and staff from Sea World load two Beluga Whales onto a specially chartered cargo jet. A lot has happened in two years and, yes, I *am* enjoying myself!

The two Beluga Whales were housed in the recently opened Marine Mammal Pavilion at the National Aquarium in Baltimore (NAIB), but we made a decision to send them on breeding loan to Sea World of Texas, thus enabling NAIB to concentrate on its colony of Atlantic Bottle-nosed Dophins. Belugas had long been associated with NAIB and so it was a sad day when they left for Sea World.

However, our two females would be a very important part of the breeding programme at Sea World, where a large group of mature and maturing Belugas had been assembled. This is an excellent example of the way zoos and aquariums are co-operating to improve the breeding opportunities for the animals around which their educational programmes are built.

WHALES AND DOLPHINS

Much has been written about the keeping of marine mammals, especially whales and dolphins, in aquaria and oceanaria. Everyone has an opinion but, unfortunately, opinions sometimes get in the way of the facts. As we learn more and more about whales and dolphins (both in aquaria and in the wild) we know that, for example, the longevity of Bottle-nosed Dolphins in captivity is very similar to that in the wild, and that they can live up to 40 years in both situations. Survival rates of the young born in captivity is also similar to, if not better than, that seen in the wild.

Furthermore, aquaria are putting together co-operative breeding programmes to reduce the need to take animals from the wild, as well as conducting much needed research of these animals which would be impossible to carry out in the wild.

Aquatic Ambassadors

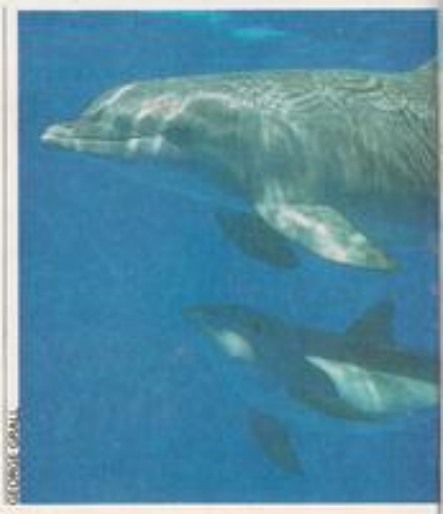
Captive whales and dolphins (just like other animals in zoos and aquariums) are ambassadors for their wild counterparts, teaching and intriguing the public about a world that few are able to understand or perhaps even visit. At Baltimore, we see the magic in the eyes of a small child when, for the first time, they see a dolphin (or a shark, octopus or one of our many other wonderful creatures) up close and live . . . and we know our visitors take away with them a strong conservation message as a result of our educational displays and demonstrations. What a shame more of the so-called 'animal activists' cannot claim similar results and public enlightenment . . .

Our dolphins at NAIB are housed in a 1.3 million gallon facility comprising four interconnected pools. There is also a separate 100,000 gallon 'isolation pool' for the treatment of stranded and/or sick marine mammals, and an adjacent state-of-the-art marine mammal medical laboratory. The main exhibit pool is 24ft deep and the system contains our own mix of synthetic seawater, which we find is much better for these mammals than just brine (sodium chloride).

As in the fish displays elsewhere in the aquarium, we rely heavily on ozone as a disinfectant and to keep the water white, bright and sparkling. Regular educational presentations take place in the 1,300-seat amphitheatre surrounding the pools, which, in addition to natural behaviours from the dolphin and dolphin-mammalogist interactions, also utilises the latest vidi-wall and video disc technology.

We were, naturally, delighted in March 1992, when two of our female dolphins each gave birth to a calf, the first time this has happened at NAIB.

Dolphins are not the only marine mammals we have at NAIB. We also have an outdoor colony of Harbour Seals and Grey



RICHARD T. NOWITZ

Many of the smaller exhibits house spectacular collections of tropical marine fishes.

Seals in a 74,000 gallon pool, and our marine mammal and veterinary staff frequently work with seals and, occasionally, whales which wash-up stranded on the Atlantic shores of Maryland, Delaware and Virginia.

ORIGINAL BUILDING

While the Marine Mammal Pavilion was opened in late 1990, the original Aquarium building, which is situated on an adjacent pier in the harbour of downtown Baltimore, was opened in 1981.

Moving walkways take you through six levels of exhibits, which range in size from the large displays listed in the Table, to smaller exhibits of a few hundred gallons, or a few cubic feet, which feature marine and freshwater fish, marine invertebrates, birds and rain forest reptiles and amphibians.

The exhibits are grouped into themes, each supported by excellent text and identification graphics. The themes include: Maryland: Mountains to the Sea (local freshwater and marine exhibits), Surviving Through Adaptations (a wide range of aquatic animals), North Atlantic to the Pacific (fish, birds and marine invertebrates, including touch pools) and Hidden Life (neotropical reptiles, amphibians and terrestrial invertebrates).

LIFE SUPPORT

Many of the exhibits (large and small) are on their own isolated life support systems, which frequently, although not always, feature high-pressure sand filtration, protein skimming with ozone and/or air-exposed trickle filtration, with a return via reverse flow through the gravel bed on the tank floor. Temperature control, especially chilling in the hot Maryland summers, is a particular challenge when housing such a wide range of aquatic animals in close proximity.

As mentioned above, we produce our own synthetic saltwater in batches of 100,000 gallons or so. Freshwater tanks use dechlorinated tapwater, which may (or may not) have its pH and hardness adjusted, depending upon the animals in question.

In most of our aquaria, we follow the time-honoured 'rule' of regular, frequent partial water changes, although on a 300,000 gallon coral reef tank this can involve quite a lot of water! As we find out more about our exhibits and the stability of their water conditions, we may well be able to move away from this approach.

DR CHRIS ANDREWS

Small sharks caught during a collecting trip may be tagged and released.

FIELD WORK

The opportunity to take part in field work is a welcome bonus to the day-to-day management of the Husbandry Department at NAIB. I have managed to take part in seine netting in the Chesapeake Bay, shark fishing off the coast of Delaware, and a trip to the Costa Rican rain forest in the last year or so, as well as undertaking my first SCUBA dive on a coral reef (in the Florida Keys).

We do still obtain many of our animals (especially fish) from the wild, although in relatively small numbers, and their survival rate, once through quarantine at NAIB, is generally very good.

Our field trips are seldom *just* about collecting animals, though. Thus, when shark fishing, we often tag and release some specimens, as well as collect blood samples to study the effect of capture on the physiology of sharks.

Our trip to Costa Rica also involved collecting water samples to investigate the possible effects of water chemistry on the spawning success of tree frogs, obtaining photographs and sound recordings for the Rain Forest exhibit at NAIB and staff familiarisation with the natural habitat of the animals in their care. However, when you are hanging off a mud bank 50ft above a rocky stream bed in the pouring rain, these things are *not* paramount in your mind!

We are currently seeking ways to support conservation in developing countries (where the real threat of habitat destruction and loss of biodiversity can be found). One very successful project has been the placement of a 'parking meter' in our Rain Forest exhibit to receive quarter dollar coins which we then send to the Nature Conservancy to purchase rain forest in Central America. In a little over a year, our parking meter has raised over $60,000, all of which has gone to purchase rain forest habitat (2,278 acres in all).

CHRIS CRAIL

Divers regularly enter the large exhibits to feed the fish.

Recently, two Atlantic Bottlenosed Dolphins gave birth at NAIB. In this photograph, one of our females, Shiloh, swims with her calf.

BREEDING AND RESEARCH

The NAIB are investing time, money and effort into a number of breeding and research programmes. Our recent successes with dolphins have been mentioned. In addition, Rain Forest staff have bred a large number of neotropical reptiles and amphibians, including 20 species of Poison Dart Frogs.

Our Neon Goby population is now up to its fourth generation of captive-bred young, and we are also undertaking a research programme with the University of Maryland on the spawning and rearing of a number of other coral reef fishes.

We are also extremely fortunate to have very well equipped veterinary and water quality laboratories so that we can begin to practise and understand the need for truly preventive medicine, as well as investigate some of the chemical and biological intricacies of our life support systems.

IN CONCLUSION

The modern-day public aquarium can fulfil many roles. It can educate and motivate, encourage and support research and conservation, entertain and act as a catalyst for inner city development and tourism. Every public aquarium cannot do all of these, but we are proud of the NAIB's achievements to date.

Much of the success of the NAIB can be attributed to the dedication of its full-time staff, as well as the devotion of its huge bank of volunteers. We have over 450 active volunteers, who work an average of 3.5 hours per week. Such is the devotion of certain of these volunteers, that some may work several *thousands* of hours each year. They take part in many tasks, including acting as exhibit guides, as divers to feed and clean the larger exhibits, as office assistants, as gift shop clerks, as librarians . . . even as aquarists!

What has the move been like for my family and myself on a personal level? Adjustment to the 'American way' was relatively easy, even to the extent of driving on the 'wrong' side of the road! The summers are hot and humid (which we like) and the winters are mild (which is OK!).

We do miss English TV, newspapers, beer and football . . . and having our family a bit closer would be nice too. On the positive side, the American way of life brings with it 'Dunkin Donuts', 46 channels ("but nothin' on") and a bewildering game they call football! But don't worry, the World Cup is here in 1994. Watch this space . . .!" AMP

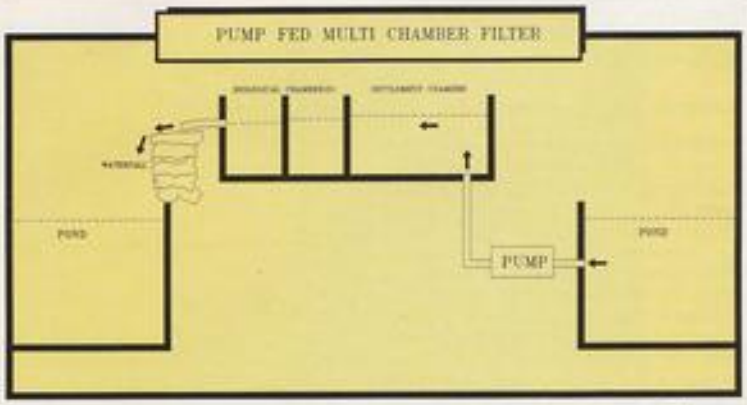
FACTS ON THE NATIONAL AQUARIUM IN BALTIMORE

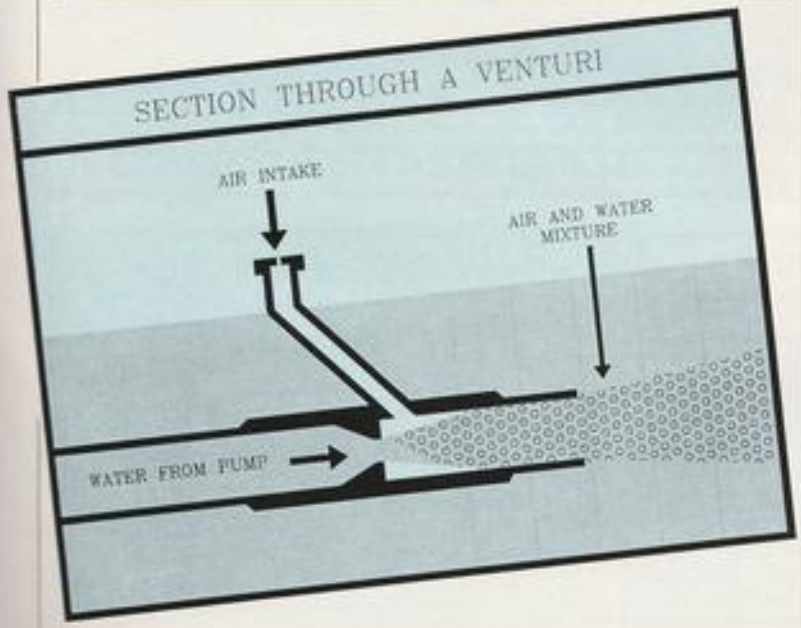
	1. Original Pier 3 Aquarium Building	2. Pier 4 Marine Mammal Building
Opened:	1981	1990
Cost:	$21 million	$40 million
Sq footage:	122,000 square ft	90,000 square ft
Annual attendance:	1.5 million	
Full-time staff:	240	
Annual operating budget:	$13 million	
Main Exhibits:		
Marine Mammal Pavilion	1.3 million gallons	
Atlantic Coral Reef (Fish)	335,000 gallons	
Open Ocean (sharks)	220,000 gallons	
Ray Tray (rays, sharks)	260,000 gallons	
Rain Forest (walk-through)	80ft tall, 519,060 cu ft	
Specimen Inventory (as of 31/7/92):		
Mammals	18 specimens	5 species
Birds	71 specimens	23 species
Reptiles	157 specimens	39 species
Amphibians	1,116 specimens	66 species
Fishes	3,743 specimens	307 species
Invertebrates	2,515 specimens	166 species

Focus on: *Pond Equipment*

Pumping Systems — Have you got good circulation?

Peter Skinner of Koi Kraft guides you through all the main points you need to consider before you buy a pond pump.
Illustrations by the author





There is a very wide variety of pumps available to today's pondkeeper, but it is still difficult to select the best pump for the job because, in many cases, you won't know that you have bought the wrong pump until you have tried it, by which time it may not be possible to change it.

Perhaps the most important factor when choosing a pump is the flowrate. If a pump is too large, the flow can be restricted, but running costs will be unnecessarily high; if the pump is too small, then either it will need to be replaced, or other problems will be caused by the insufficient flowrate. For instance, if the flowrate through the filter is too slow, its efficiency may be reduced.

In order to decide what size pump is required, it is necessary to determine what items within and around the pond require a water supply and what the flow requirement is for each item.

One of the most important tasks for the pump is to circulate the water through the filtration system. Many proprietary filters will have flowrate recommendations included in the instructions but, more often than not, it is left to the purchaser to make up his or her own mind as to what the flow requirement is for a particular system.

Unfortunately, there isn't a formula that can be used to get over this problem because there are so many different hardware options which will have a bearing on the final decision. In general, the flowrate for most filtered ponds will range between the slowest, when the entire volume of the pond is passed through the filter every four hours, and the fastest, which would be once every forty minutes. For most filter types, a flowrate of once every hour and a half would be adequate.

WATERFALLS

Many people like to have a waterfall, but whether or not this feature will be aesthetically pleasing will depend to a certain degree on how much water is pumped to the waterfall.

It is the overflow aperture (width of water flow) which will determine what flowrate would look 'natural'. As a very rough guide, about 500 g.p.h. (c 2,270 litres/hr) should be

allowed for each 6in (15cm) of overflow aperture width.

When designing a waterfall, always remember that if you have a large volume of water dropping from a height greater than a few inches, there will be a fair amount of noise. This noise may be pleasant and soothing to you, but your neighbours may have other ideas!

If you want to install a fountain, consider first that the size of your pool and the nozzle will determine the flow requirement. If the fountain is very high and the pond is exposed to wind, you may find that you have unwittingly installed an irrigation system for your garden. Conversely, if the flowrate is too slow, the effect will just look ridiculous.

VENTURIS

If you need the pump to provide aeration for the fish, then it may be worth considering the use of one or more venturis. A venturi is a simple commercially available fitting which is connected to the end of the return pipe(s). The end is pointed into the water in the direction that you want the pond water to rotate.

The device works because the water is channelled through a nozzle which creates a partial vacuum that allows air to be drawn into, and mixed with, the water (Fig 1). Most proprietary venturis have a flow requirement of between 1,000 and 2,500 gallons per hour (4,500-11,360 litres/hr). If your pond is very small or you do not have sufficient pumping power to meet this requirement, it may be better to employ an air pump for aeration purposes.

If you intend to have a filter system and a waterfall, it may be possible to have these arranged in series which will save on pumping expenses (Fig 2). If the first stages of the filter system are fed by gravity from the bottom or wall drain(s) then, of course, they need to be situated at the same height as the pond so that the pond and filter share a common water level. The pump will be located at the end of these chambers opposite to the inlet and it will pump the water to the final (biological) chambers which will be at the same height or higher than the waterfall (Fig 3).

WATER HEAD

One important point to remember when choosing a pump is that the higher you want to pump the water, the more back pressure is exerted on the pump, and the less output will be achieved. If, for instance, a pump delivers 1,000 g.p.h. (4,500 litres/hr) at 3ft (90cm) head, it may only deliver 400 g.p.h. (1,800 litres/hr) at 10ft (3 metres) head.

The head is measured from water level to the height at which the water emerges from the end of the delivery pipe (Fig 4). It doesn't matter whether the pump is located above, at, or well below, water level — the head is still measured from water level. In order to allow for the flow loss as a result of the resistance created by the head, you should look at the performance chart which is available with all pumps (Fig 5). You would be well advised to do this before you decide on the size of pump required for your system.

WHICH PUMP TYPE?

Once you have decided what your flow requirements are, the next hurdle is to choose what type of pump would be most suitable. In general, it is better to go for a submersible pump if you require less than 2,000 g.p.h. (9,000 litres/hr) and a surface pump if you need more. I must stress that this is only a rough guide, as there are some exceptions to this rule.

Submersible Pumps

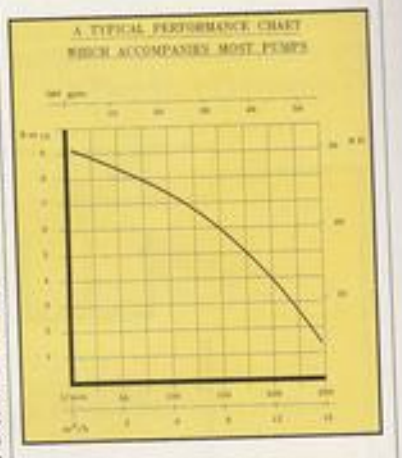
Submersible pumps have the advantage of being very easy to install; all you need to do is connect the hose and the power supply and lower the pump into the water. These pumps do not need priming and are easily removed for servicing. The smaller, specially designed garden pond pumps offer outstanding reliability, performance and serviceability in relation to their cost, and they are far more practical than surface pumps of the same size.

Most of the medium sized submersibles (1,000-2,000 g.p.h. — 4,500-9,000 litres/hr) are of the sump type. This means that they stand upright, with the suction grille and impeller at the base. These were originally designed for pumping out cellars and tanks, an operation which normally entails only intermittent running. In Koi ponds, these pumps are required to run constantly, which means that the poorer quality versions of these pumps may not last very long. It's the old well-worn story: you get what you pay for.

Large submersibles are probably best avoided for constant circulation purposes because their electricity consumption, reliability and price usually do not compare favourably with swimming pool pumps.

Surface Pumps

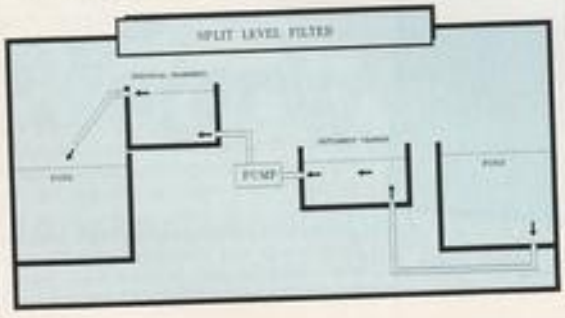
Swimming pool pumps are surface pumps. This means that they must be located in a dry environment, and the water inlet to the pump is via a pipe. These pumps are usually very reliable and efficient, but they must be kept dry at all times, which usually means that a watertight inspection pit or a little housing will need to be built.

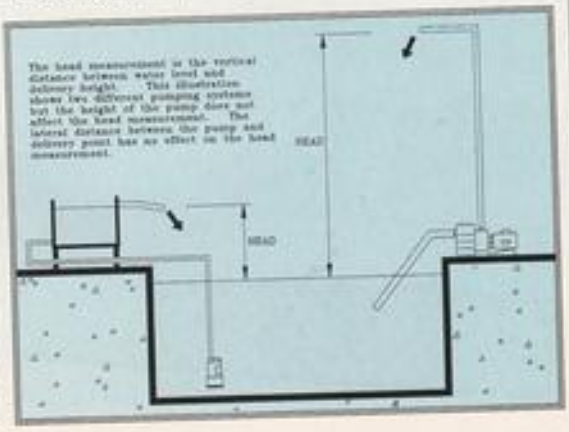


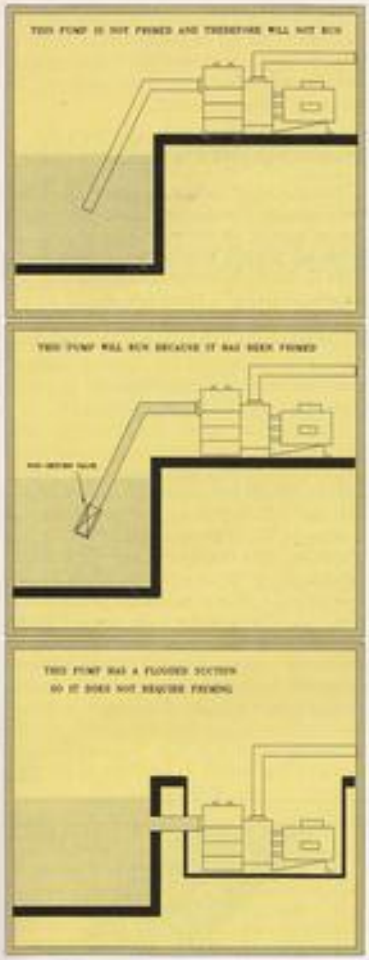
One major consideration when using this type of pump is its location in relation to the water level from where the water is being drawn.

If the pump is below the water level, then it is possible to have a flooded suction which will allow the pump to be turned on immediately after installation.

If the pump is higher than the water, then it will need to be primed before the pump is commissioned. This is done by putting a non-return valve at or below water level and filling the suction pipe and pump casing



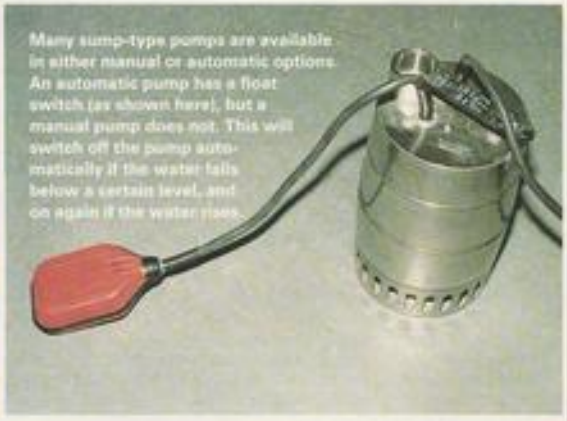




This is the final biological chamber of a gravity-fed multi-chamber filter system. Note the submersible pump which is very easily accessible for maintenance purposes.

This is a domestic central heating pump with the impeller housing removed. Note how small the aperture is between the impeller plates; these will become blocked very rapidly if the water being pumped is not kept clean.

This photograph shows how the output from a pump (entering via the black pipe) may be split two ways and the flows balanced by valves being set at different positions.



Many sump-type pumps are available in either manual or automatic options. An automatic pump has a float switch (as shown here), but a manual pump does not. This will switch off the pump automatically if the water falls below a certain level, and on again if the water rises.

with water before the pump is turned on.

Ideally, it is better to have a flooded suction system because the extra components, expense and time involved in having a primed system make the latter less attractive (Fig 6).

Central heating pumps are used by many people for pond circulation because they are relatively cheap to buy and have low electricity consumption. It is very important that the water supply to these pumps is kept clean at all times, because the impeller is prone to blocking by debris, since it has such a small gap between the impeller plates.

As the impeller starts to get clogged, the output of the pump gradually subsides and the pump will need to be taken apart for cleaning.

Really, I would advise the use of these pumps only for indoor systems, but if you do decide to attempt to use them outside, remember that they must be kept dry. They also need a flooded suction and you must install them with a valve in the suction (and

possibly the delivery) pipe(s) to facilitate the removal of the pump without the ingress of water to the dry pump pit. The installation of these valves is necessary with any surface pump if it has a flooded suction.

MORE THAN ONE PUMP?

It may be worth considering the use of more than one pump for circulating your system, because this gives improved reliability and allows greater flexibility. If one pump should fail, then, at least, your system will still be running, albeit more slowly, until you are able to reinstate the failed pump.

Another advantage is that you will have a choice of flowrates. In the summer, you may require maximum output from your pumps, but in the winter, it may be better to turn one off, thus saving electricity and also reducing turbulence in the pond. This will be of benefit to the fish because they will not need to consume as much valuable energy maintaining their position in the water.

FAILSAFE MECHANISMS

One thing to bear in mind when installing a pump is whether or not there will always be an uninterrupted supply of water to the inlet of the pump. If the pump suction becomes blocked by debris or weed, then the pump will be starved of water. Another cause of water starvation is if the water level drops below the suction level.

Most pumps will get warm if they are deprived of water and may be damaged if left to run for a long period of time in this state. Some of the more up-market pumps will have a thermal overload which will turn the pump off if it gets warm for any reason.

If there is a risk of the water level dropping below the suction, it would be prudent to use either an automatic pump, or a float switch in conjunction with the pump. This will turn off the pump as soon as the water level drops below a pre-set height.

PIPE SIZES

The pipework system which connects the pump(s) to the destination devices should be kept as simple as possible because, the more joints there are, the greater the risk of leakage, not to mention the flow loss caused by long pipe runs and the over-use of elbows and bends.

It is important to ensure that the delivery pipes running from the pump are sufficiently large in diameter to cope with the flowrate without causing a pressure increase that will reduce the pump output. It is best to be guided by the size of the delivery port on the pump; if that is 1½in (3.8cm), the pipe bore should not be smaller than that, otherwise efficiency will be compromised.

If the pump delivery is to be split two or more ways, it may be necessary to balance the flows with valves. Water will always take the easiest route and so, if you have one pond return at water level and one 6ft (1.8m) higher, you may find that the upper one does not run at all. In this situation, a partially closed valve in the lower line will pressurise the system so that some of the water will be forced to the upper outlet.

PUMP MAINTENANCE

It is very easy to neglect a pump once it has been installed because, usually, you cannot see or hear it, so the only time it gets any attention is when the flow stops or declines. This is not really the right approach if you want your pump to last a long time.

The suction should be checked regularly for obstructions and, occasionally, the pump should be dismantled for cleaning (refer to manufacturer's recommendations) and also, if possible, for checking the bearings.

Some of the small pond pumps have bushes, rather than ball bearings, and these will not last as long as the rest of the pump. Bushes should be inspected occasionally so that they can be replaced before any damage is done to the shaft or casing. This may be cheap, but may double the life of the pump.

Recently, a customer came to me saying that he was a little disappointed because his pump had lasted only three years. I asked him what maintenance he had done, to which he replied "None". When I gently informed him that getting 26,000 hours' service from a machine without giving it any maintenance is not too bad, a smile spread across his face and he said, "I hadn't thought of it like that before. It isn't bad, is it?" AdP

Focus on: *Pond Equipment*

Cement, concrete and brick/block ponds can be both beautiful and durable.

A & P editor **John Dawes** highlights some of the pros and cons of the various prefabricated ponds and pond building materials which you are likely to find on offer this season.

POND

If you are planning a water garden of any sort, the pond itself will, of course, be right at the heart of your scheme. However, deciding what sort of pond you are going to have — not in terms of whether it is going to be a wildlife, formal, informal ... or whatever design, but in terms of construction materials — can be a bit tricky.

One single article on the subject will not be able to provide you with all the answers, of course, but it can, at least, help point you in the right direction. I hope that the text that follows will achieve this to some extent so that when you visit your aquatic shop or water garden centre, you will have *some* idea of the relative merits of the various options you will find there. Back this up with advice from a qualified member of staff, and you will stand a pretty good chance of ending up with something that will meet your needs and preferences.

Pond materials fall into six main categories:

- Concrete, cement, brick, blocks
- Liners, e.g. polyethylene, PVC, butyl
- Prefabricated materials, e.g. plastic, fibreglass
- Wood, as in tub ponds
- Ceramics, as in sink ponds
- Artificial/reconstituted/natural stone, as in millstone water systems

CONCRETE AND ALLIED MATERIALS

Concrete, cement, blocks and bricks have all been grouped together under this category.

In the olden days (and I mean olden), ponds were virtually exclusively built from one or other — or a combination — of these materials. The alternative was 'puddled clay'. The technique of puddling still exists (just!) today, but good clay puddlers are, sadly, a fast-disappearing species.

It is a great tribute to the durability of concrete and its allied materials that so many old ponds of these types still survive today. When built properly, few materials will outlast concrete and its relations. What is more, all these products can be worked into any shape imaginable. They may be rock-hard when set, but this belies the underlying flexibility that renders them infinitely malleable in the hands of a good practitioner.

There are, however, disadvantages inherent in the use of cement and concrete. For example, inexperienced 'concrete-users' will find that all of the materials in the group are far from easy to work with, particularly during hot, dry periods. Consequently, the best time of year for constructing a concrete or cement pond is autumn, when the air is relatively humid, but frosts (at least, in those countries where frosts are commonplace) have not yet started.

Further, if concrete cracks, it can prove

STEPHEN SMITH

Tub water gardens are becoming increasingly popular for installation where space is at a premium.

DAVID ALLISON

Specially constructed ceramic/stonework troughs are now becoming more readily available.

STEPHEN SMITH

It's amazing what you can do with liners, rocks and a little flair! This prize-winning water scheme outside Tetra's stand at last year's Hampton Court show was devised by Tony Howells.

ERINGS

Prefabricated ponds are available to meet every need and preference.

BLAGDON WATER GARDEN PRODUCTS

Wood and liners combined to great effect on the FBAS's Hampton stand at last year's show.

STEPHEN SMITH

difficult to repair. It is often a major operation to repair quite a small fracture, particularly if this occurs below water level.

Another potential drawback is the fact that the lime which concrete and cement release is highly toxic to plants and animals. Waterproofing, sealing, neutralisation (e.g. using Hydrochloric Acid) or a long maturation period, accompanied by repeated filling, draining, and refilling, are therefore essential to make concrete ponds safe.

LINERS

Partly because of the challenges presented by concrete and its allies, other materials have overtaken them in the popularity stakes, the two main ones being liners and a range of 'prefabricated' products.

Liners are flexible during every stage of installation, are not 'over-heavy' and can often be laid in one single session. There is also a wide choice these days, including butyl, polyethylene (plus the increasingly popular rubber-modified polyethylene), laminated, non-laminated and UV-stablised polyvinyl chloride (PVC) . . . and others.

Butyl liners are not only durable but also tremendously flexible and quite easy to work with. What is more, butyl-lined ponds can be installed virtually all the year round.

Some Disadvantages

Despite these and several other advantages, it would be wrong to think of butyl as the ideal solution for every occasion. For example, it is next to impossible to achieve clean-cut straight lines, or perfect unwrinkled curves. This could present problems if a trim, precise, formal layout is desired.

Butyl is also expensive, and this aspect of pond construction can be an important deciding factor, though expense should not be the main guiding criterion when building a truly permanent pond. If a temporary pond is required, it might make more sense to use a cheaper, less flexible or less durable, liner.

Some butyls have been known to release toxins into the water (these are by-products of the manufacturing process). It is therefore wise to wash/scrub butyl before fish are introduced into a lined pond of this type.

Of the other liners, Polyethylene, PVC, and PVC laminated with nylon or Terylene weave are, in general ascending order of price, the most popular alternatives to butyl.

'Straightforward' polyethylene is the least durable and is sensitive to the ultra-violet radiation of the sun's rays. Rubber-modified polyethylene, however, is tough and stretchable, *and* it is UV stablished. These rubber-modified liners have become quite popular in some countries because they incorporate some of the good qualities of butyl at a cheaper price. Among the latest polyethylene-based products, is a laminated liner consisting of a backing material (designed to act as an underlay) bonded to a heavy-duty polyethylene membrane.

On the polyvinyl chloride front (PVC), the basic type is more durable than the basic polyethylene. It is also more expensive. A fairly recent introduction (at least to the pond-construction scene) is a UV stabilised PVC liner manufactured in Holland which has been used for a variety of engineering purposes, such as providing an under-road 'seal' against the high water table that exists in that country.

PREFABRICATED PRODUCTS

To many enthusiasts, the challenge of designing a pond from scratch can only be regarded complete if, in the process, they have to tackle *every* aspect of the project, including the shape of the pond itself. However, for numerous reasons, e.g. lack of time, this may just not be practicable. Further, to some, the mere idea of designing an appropriate pond shape may appear so

daunting that an alternative approach needs to be found.

Yet, it would do the prefabricated industry a great disservice if we were to create the impression that choosing a prefabricated pond results from these or other similarly negative reasons. Certainly in the past, there were some designs and colours that many serious pondkeepers and water gardeners found quite offputting. The situation is very different today, though, with superb ranges of shapes, sizes and depths to suit even the most demanding of tastes.

The two materials commonly used in prefabricated ponds are plastic and fibre-glass. In recent years, ABS (Acrylonitrile Butadiene Styrene) ponds have also appeared. Of the three, plastic is the weakest. Fibre-glass, particularly if reinforced, and ABS, are considerably stronger and can last for many years. In fact, some companies dealing in these ponds offer guarantees of 10 years or even longer.

Some prefabricated designs are on the shallow side, and this can present a real threat to the survival of some aquatic creatures during a long hard winter. However, where harsh winters do not exist, shallow ponds are perfectly acceptable ... always assuming that the fish and plants can handle the lack of water depth, of course.

Some prefabricated ponds are also on the small side. Though this could be seen as an obvious disadvantage where large, permanent collections are envisaged, it can prove a significant advantage for temporary, quarantine (acclimatisation), or hospital quarters. Small ponds of this type can also provide excellent, manageable facilities for rearing young fish during spring and summer.

Children love these ponds, too, because they are so accessible, and parents like them because they are safe. If frogs, toads and newts are seen as welcome additions to a water garden, small prefabricated ponds can provide ideal spawning sites, particularly if fish are omitted during the appropriate months of the year. Prefabricated ponds can be installed either raised or sunk into the ground.

WOOD

While not being an 'obvious' pond building material, wood can be used to very good effect either in small-scale features or full-sized systems.

The best-known small wooden water feature is the tub pond, reference to which was made earlier. Three main types of 'tubs' are generally available: genuine barrels or water butts cut in half, specially-constructed wooden tub ponds, and wooden half-barrels sold at garden centres as tub gardens (as opposed to ponds).

Of these possibles, the first two are likely to be waterproof on purchase, or shortly after they are filled with water to allow the wood to expand. The last type is not usually waterproof (and may not become so even after prolonged filling or immersion) and generally comes with a drainage hole in the bottom. This does not mean, of course, that it cannot be used as a tub pond. It does, however, mean that it needs to be lined or otherwise sealed.

Tub ponds can be used free-standing or sunken, according to taste or requirements. If used in the sunken mode, even if the iron supporting rings were to corrode, they should not pollute the water since the whole structure is (should), by definition, be competely waterproof. Neither is the pond likely to 'implode'. Outwardly-directed water pressure, plus the structure of the tubs themselves, i.e. the way the wooden strips are cut, will ensure that this does not happen. Sunken ponds also experience more stable temperature conditions than free-standing ones.

Natural stone is often encountered in water gardens either as a constituent of pebble/boulder fountains or millstones. Their very 'naturalness' is, of course, a great bonus. However, their considerable weight can make them quite expensive. Should specific types of pebbles or boulders be required, this, too, will add to the price. Counter-balancing these potential drawbacks are the absolutely stunning effects that can be achieved.

Millstone fountains (or variations on the theme) also come in kit form and these are built from light materials such as fibre-glass. Many such kits will require the addition of pebbles to complete the set.

Prefabricated ponds can be installed fully sunken, or, as in this case, raised, with a surrounding brick/block wall built on solid concrete foundations. Diagram reproduced from *John Dawes' Book of Water Gardens* (TFH Publications, ISBN: 0-86622-662-1).

Stout planks or logs, held in place by equally stout supports, can be used to construct (usually) square or rectangular raised ponds. Structures of this sort are not watertight, of course, and have to be lined. If properly constructed, these ponds can last for many years.

Wooden railway sleepers can also be used as part of an overall water garden design, for example, to build banks, or dams/weirs, between connecting ponds. Effects obtained in this way can look very dramatic.

One point needs to be borne in mind when using wood as a pond-building material: it must not contain any harmful preservative or other toxic substance if the wood itself is in direct contact with the water. Several coats of yacht varnish or other non-toxic polyurethane coating, or other suitable sealant, should, however, be applied to make the wood waterproof, thus prolonging its useful life.

OTHER MATERIALS

Ceramic basins or sinks can make suitable mini-ponds. I know of kitchen sinks and washing (laundry) basins that have been used very successfully, especially when suitably coated and sealed/cured.

When coated, they will leach out toxic lime which will need to be counteracted in some way. In addition, such sinks/basins have plug holes that also need to be filled/sealed. The end result can, however, be very attractive.

Nowadays, there are specially constructed ceramic troughs or mini-ponds and these, obviously, require no pre-treatment or sealing of any kind. They look pretty good too.

Natural stone troughs are hardly ever sold as mini-ponds. In those countries where they are sold at all, such as in the United Kingdom, they are primarily offered as trough gardens designed to house xerophytes (succulent) or alpine plants.

These troughs — being designed for 'terrestrial' use — have drainage holes which need to be plugged. The stone surface may also need sealing but, nevertheless, such troughs can make delightful small water features.

One of the most — if not *the* most — natural pond-building material is clay. In past times, puddled clay ponds were the norm; today, they are hardly ever encountered. However, few products can beat clay when it comes down to designing a really natural feature, such as a wildlife pond.

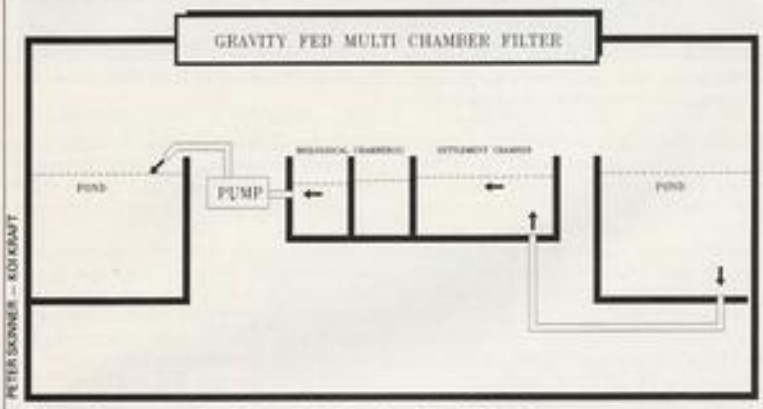
Having said this, puddled clay ponds require the application of a considerable degree of expertise ... and 'painful' hard work. On top of this, clay tends to cause turbid water conditions, and good-quality clay may not be the cheapest to buy, or track down. While clearly not the best choice for many garden/patio set-ups, puddled clay does have many attractions when it comes to adopting a *really* genuine approach to wildlife water gardening.

Whatever your natural inclinations, it makes sense not to rush your decision regarding the type of pond you choose in terms of shape, size and materials. A little time spent on this very important aspect of the exercise will, however, pay rich dividends in the end and could well prove to be the launching pad for a long and happy 'career' in outdoor aquatics. AAP

Focus on: *Pond Equipment*

CHOOSING A FILTER

Pond filters come in a vast array of shapes, sizes, designs and prices. **Dick Mills** takes a look at the relative merits of some of the filter types available.



PETER SKINNER — KOI KRAFT

Schematic representation of the principles of gravity-fed filtration.

SPEEDY BRUSH

Filter brushes are efficient barriers for dirt-laden water as it enters the first chamber of a pond filtration system.

Why should a pond need filtration? After all, a pond is theoretically cleansed and refreshed by virtue of the elements, much more so than an indoor aquarium. However, taking two extremes, ponds are either too small or too big. In the first instance, a small pond presents a fairly unstable set of circumstances, fluctuating wildly both in temperatures and vegetative growth. The largest pond (and we're not talking lake sizes here) may have been given over to Koi, and so the beneficial effect of aquatic plant growth on conditions is also not available.

Therefore, there's a need for the pondkeeper to take a hand in removing, say, very green water on one hand, or the build-up of wastes on the other. From the fishkeeping point of view, some strains of Fancy Goldfish will suffer fin congestion if the water is not kept especially clean, but I suppose the main reason that most people want to have a filter is so they can actually see their fish more clearly (so can the herons!).

THE FILTER 'SPECTRUM'

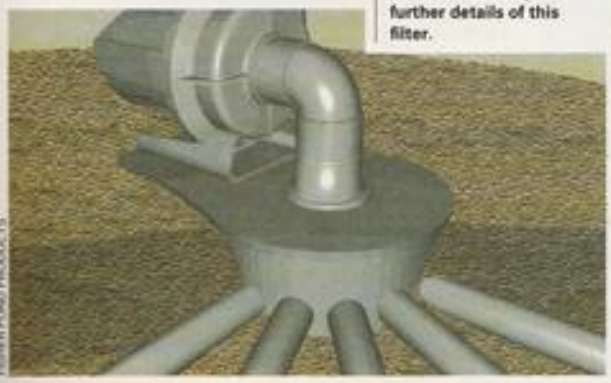
Like aquarium filtration systems, those for ponds come in many guises and may be situated either in or out of the pond itself, and even in or out the ground. Unless you inherit a non-filtered pond when moving home, it is always a good idea to think about filtration right from the start when installing a pond for the first time.

In-Pond Filtration

Let's deal with **in-pond filtration systems** straightaway. These usually take the form of a biological system buried beneath a bed of substrate; designs can be 'home-made' or a proprietary system can be purchased.

As most pond fishes are notorious scav-

A new interpretation of an efficient established filtration method is represented by the 'Spider Undergravel Pond Filter' where filtration 'spikes' radiate from a central area (see Product Round-up for further details of this filter.



FISHER POND PRODUCTS

GUY PALTRIE

Filters don't necessarily have to look like filters!

engers (sorry, foragers for food on the pond base) the substrate should be protected against any digging activities which might uncover the filtration system and so prevent it working properly. An outsize 'gravel-tidy' might be the answer, but placing the substrate in an enclosed area, such as a low wall, is better. A general rule is to allow a third of the base area of the pond for a biological filter bed.

Other in-pond systems are multiple cartridges fitted to the intake of a fountain pump, but this design, although undeniably effective, means periodically donning wellies to clean the cartridges. Here, you should be guided by the manufacturer's specifications as to the number of cartridges that: (a) your pond requires, and (b) how many the pump can deal with — not necessarily both the same figure!

A system peculiar to many Koi ponds, while not exactly a filtration system, involves a separate chamber in which there is a stand-pipe. Removing this stand-pipe causes dirty water to be drawn from the base of the pond into the chamber from where it can be drained away. This periodic, partial water-change fulfils a very valuable cleaning function.

In-Ground Filtration

Back to the start again, and you should decide what form of filtration system you need (or want) to fit. **In-ground systems** are fed by gravity from the pond and the cleaned water pumped back to the pond. These systems have both advantages and disadvantages:

They are quite invisible in use (usually covered by a planked-over 'patio area') but do require some alteration to the pond's construction; drains (or feed tubes) must be fitted although this is no longer any problem with liners. Incidentally, whether you have a filtration system fitted or not, a bottom drain to the pond, leading to a soakaway, is always a good thing.

The number of filtration chambers used is a matter of choice, necessity and, of course, personal finances! A typical, comprehensive set-up would consist of an introductory settling chamber fitted with brushes, in which large solids are screened out. Foam and/or large surface area biological sections may follow (e.g. Flocor, 'hair curlers', open-pore sintered glass, 'ribbon' medium or Canterbury Spar) with an Ultra-Violet clarifier bringing up the rear.

A fairly recent development has been the introduction of a special conical chamber which sets up a swirling type of water flow to separate dirt from the water; this filter needs a particularly large hole to accommodate it!

One real advantage of in-ground filters is that access to the return pump is usually quite easy, so regular maintenance and lubrication is no bother.

Filter design offers great scope for creativity. In this case these out-of-pond filters have their water supplied via rotating lawn sprinklers.

Out-of-pond Filtration

Out-of-pond systems are probably the most popular. What could be simpler than hiding a filter within the surrounding rockery (well, where else did you put all the earth you dug out for the pond?). However, the dirty pond water has to be got to the filter and this will involve a pump of some description. (Here again the choice can be either in-pond or out-of-pond types. See **Peter Skinner's** article on this subject for some sound advice.)

It is good practice to use non-crushable, armoured piping for the feed (and make sure you know where the 'run' is, to avoid spiking when weeding the rockery!). The return from the filter often takes the form of a waterfall or cataract, and here, it is very important to make sure that all the water returns to the pond and not lost through leaks.

Once more, the actual filter design can be as simple or as complex as needed. If you already have a standard filter set-up, the addition of Ultra-Violet clarification can be done fairly easily, as some filter manufacturers market a conversion kit for their own models. Designs for UV treatment vary: some allow only a 'bleed-off' proportion of the pond water to pass through, while others have the UV tube directly in the main feed.

Whatever the design, it is important to keep the quartz tube surrounding the UV tube itself clean so that optimum exposure of the water to the UV occurs. REMEMBER, ON NO ACCOUNT LOOK DIRECTLY AT THE UV LAMP WHEN IT IS SWITCHED ON!

The increasing popularity of UV clarification has come about because of its effectiveness against 'green water', but it is also fair to point out that there are other means of removing some of the larger algae. Special agents can be sprayed into the water which cause some algae to coagulate together in a floating raft which can then be easily netted out or collected mechanically within the pond filter. The use of magnets in this respect has both its proponents and opponents.

Other treatments for green water are also effective, but you must follow the instructions implicitly if the best results are to be achieved. Algicides, for example, may well kill the green pests but, unless you remove the 'dead bodies', you may be only adding further problems to the water conditions which were probably a lot more healthy before you started treating!

Both in-ground and above-ground filters can be fitted with by-pass and back-flushing facilities. Whatever design you eventually opt for, maintenance of filters must not be neglected. There is no point in simply fitting your pond with a box into which all the dirt is efficiently collected and deposited, only to have all the pond water pumped through it 24 hours a day! ASP

Ultra-Violet filter attachments have become deservedly popular in recent years.

Focus on: *Pond Equipment*

POND ACCESSORIES

Pond lighting (with or without a weatherproof transformer) is well worth considering for day-round appreciation of a pool.

Ornamental fountains play a vital role in oxygenating the water.

An aerator and large diffuser stone especially designed for pond use.

What else do you need, besides a pond, pump and filter to maximise your chances of success? **David Fletcher** provides some suggestions.

Photographs — unless otherwise indicated — by the author.

When I was asked to write this article recently, it seemed a tall order to fill the required space with an article just about pond accessories. However, after doing a little delving into the subject, I was pleasantly surprised to find more than enough words to meet requirements.

It seemed that the biggest problem was going to be posed by the need for photographs of various products during the winter season, when most shops have long since disposed of their summer stock. Happily, **Mike Newman** at **Hinton Parva** came to the rescue, and even turned on the fountains and waterfalls to create some nice backgrounds.

PLANT CONTAINERS

Plant containers for pond use are generally constructed in the form of a basket, with three variations available at the present time. The original type has fairly large holes, which measure several millimetres. Because of the size of the holes, it must be lined with hessian fabric before filling, otherwise the soil will all fall out through the sides. Having used this type, I find it very troublesome because the hessian rots away after a year or two and the soil falls into the bottom of the pond anyway.

The second type is very similar to the first, except that a fine mesh covers the large holes. This prevents the soil falling through without using hessian.

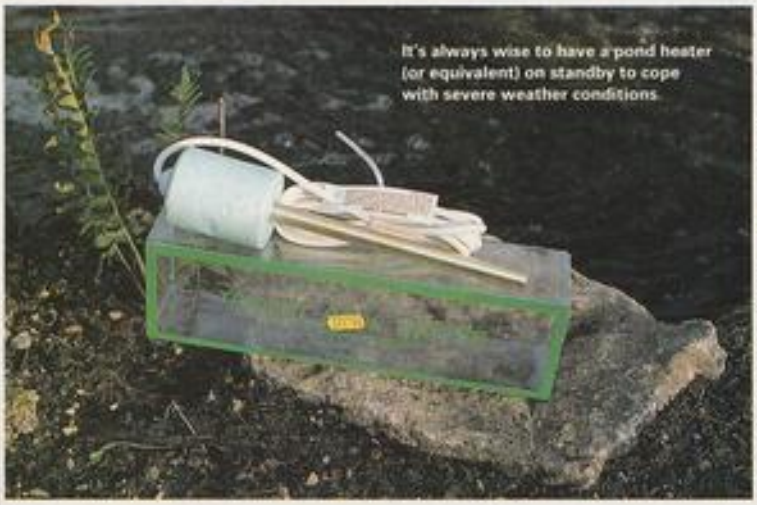
Latest on the market is a type with louvred sides, which, again, does not need a hessian liner and may also have lifting rings to aid retrieval from the bottom of the pond.

FOUNTAINS

Ponds are much better for fish, and more aesthetically pleasing, with the inclusion of a fountain. Apart from the pleasure derived from the sound of falling water, the splashing improves the oxygen content of the pond, which is particularly important during hot weather, because the higher the water temperature rises, the less dissolved oxygen it can hold.

In my experience, fountain jets which

One of several models of automatic feeder currently available.



It's always wise to have a pond heater (or equivalent) on standby to cope with severe weather conditions.

generate fine sprays are best avoided in small ponds or near the edge of larger ones, because

① when there is a wind blowing across the garden, some of the spray from the fountain is carried away and falls on the patio, causing the water level in the pond to fall;

② the water splashes over a large proportion of the surface of a small pond, leaving very little area to grow a water lily, which likes to keep the top surface of its leaves and flowers dry.

For small ponds, an ornamental fountain, such as the frog-shaped ones which stand on the edge and generate a single coarse jet, or possibly a foaming jet, which should be excellent for oxygenation, might be better.

LIGHTS

Underwater lights can be used to produce spectacular night-time effects in the water garden, particularly when used to illuminate a fountain with a foaming jet.

Most underwater lights are supplied with power at a low voltage. This makes them very safe to use, but they require a transformer to step the domestic mains voltage down. The accompanying picture shows the components of a system which consists of two lights, a transformer and low voltage cable. Some transformers have a weatherproof housing, enabling them to be sited close to the pond, but others must be kept dry at all times.

The problem with a low voltage supply is that, with a long cable run, a significant voltage drop is experienced because of the consequently high current. So if your pond is a long way from the house or garage, don't buy a lighting system with a non-weather-proof transformer and then try to extend the low voltage supply cable, because the lights will most probably be dim. It is far better to run the mains power out to the side of the pond and use a system with a weather-proof transformer, even if it is more expensive.

ORNAMENTS

These are many and varied, and can have a practical as well as an aesthetic use. For example, ornamental herons, which are extremely realistic from a distance, are reputed to discourage visitations of the real thing.

Many beautiful statues are available, some of which also function as fountains, such as the one illustrated. If you intend to install a statue or fountain of substantial weight in a pond, it is essential to provide a firm and level foundation, preferably during the constructional stages, to ensure that the bottom of the pond has ample strength to support the load. (See Ref 1, *Construction in the pond*).

FEEDING DEVICES

Feeding Rings

When feeding fish, any wind will blow floating pellets away down the pond. In my case, this is usually to the end with the waterfall, so they end up in the bottom pond, out of the reach of the fish. Feeding rings float on the surface to keep food placed within them together in one place.

Automatic Feeders

These are battery operated units, with a built-in electronic timer. Before leaving home for any length of time, the pondkeeper can load the feeder and set the quantity per feed and the time interval. The fish will then be fed the correct amount every day without having to rely on friends or neighbours, who are sometimes tempted to overfeed. This is far worse than no feeding at all.

SPAWNING MATS

When fish are ready to breed, they require a medium to which the eggs can stick. Many pond plants are perfectly satisfactory, so far as the fish themselves are concerned. If, however, the resultant fry are required for eventual sale or to increase stock, it is necessary to remove the eggs from the pond. Otherwise, the fry are in grave danger of being eaten by their parents, who presumably do not discriminate one tiny wriggling creature, such as a water flea or tadpole, from another, such as a newly-hatched fish.

The usual way to ease removal of the eggs is to place spawning mats in the pond when the fish start to show breeding behaviour by chasing each other around, and remove them to another pond or aquarium when the action is over. The fry can then feed and grow in complete safety.

POND VACUUM CLEANERS

It is desirable to clean the bottom of a fishpond periodically. This reduces the amount of waste organic matter, such as faeces, uneaten food and plant debris.

The job can be done by draining the pond and cleaning it out by hand, but this obviously causes disturbance and stress to the fish. The other solution is to use a vacuum cleaner specifically designed for pond use. These are available powered by either an electric pump or mains water pressure.

Unfortunately, these items, particularly the electrically powered types, can be expensive, and I am informed that some of them can block easily. **Kevin Curtis** and **Ian Sawyer** who, until recently, ran **Fishy Business,** have designed their own system, which was very expensive to put together but apparently works well. The best course of action for anyone who wants this kind of equipment would seem to be to visit a good

Remedies and treatments/conditioners will always prove helpful sooner or later.

local aquatic dealer and see it demonstrated before parting with any money.

I, personally, use a small pump which is powered by my electric drill, and some PVC tubing with a drilled shampoo bottle for a suction head. For my requirements, this does an adequate job for around a tenner.

TREATMENTS AND ADDITIVES

There are many brands and varieties of products which are designed to treat conditions of both fish and water.

If you are lucky, as I have so far been, you will not need to use fish disease treatments. They will, however, be vital if trouble is encountered, and have saved many fish from an unpleasant death.

The only tip which can be given about disease remedies in a single paragraph is to ask the advice of an expert before purchasing them, and if he/she doesn't sound convincing, then get a second, or even a third, opinion. As an example, I once (a long time ago) suspected that one of my goldfish was suffering from an infection of White Spot. It was a case of the fish being a male, and the white spots were simply advertising that he was ready and able to breed!

Water treatments, such as the ones designed to mature raw tapwater quickly, will definitely be useful to all of us from time to time. But again, a word of caution is in order. It does not need an expert to diagnose a problem with Blanketweed, but bear in mind that certain types of fish, such as Orfe, can be sensitive to chemical additives. Some treatments include an instruction sheet inside the box, which details such side effects of the product. Always read it before you buy or use.

TESTING KITS

These enable the pondkeeper regularly to monitor the water for pH (acid/alkali), nitrate content, etc. Testing for pH is particularly important if a new concrete pond has been constructed and is being used without a coat of sealant. New concrete causes the water to become alkaline, and even after maturing the pond for a few weeks, partial water changes may be necessary if indicated by regular testing.

Electronic Testers

Digital test instruments are now available to check pH. They are several times the price of a conventional test kit, but will, of course, last indefinitely. In the long run, they will pay for themselves, particularly if several separate ponds have to be monitored.

POND PROTECTION DEVICES

If your pond is situated where cats or herons are a threat to the fish, some form of permanent protection is necessary. It is possible to achieve this without completely netting over the pond (see my article in a forthcoming issue of *A & P*), but, for peace of mind, some pondkeepers prefer to use a net over the entire pond area.

This solution is definitely not the most aesthetic one, but is probably the only one which can give a cast-iron guarantee of protection for valuable fish.

Other solutions to the problem include artificial lily pads which float at the edge of the pond and prevent cats taking a swipe at the fish, and a device which is triggered by a trip wire to open a pair of flaps with a loud bang and display a pair of eyes, to frighten off herons.

AIR PUMPS AND AIRSTONES

Aeration of the water can be useful during both summer and winter seasons.

When the water becomes very warm in hot weather, it is less able to hold dissolved oxygen, which obviously causes distress to the fish. A column of bubbles rising from an airstone placed in the bottom of the pond helps to boost the oxygen content, and makes the fish far more comfortable.

Winter use helps keep part of the surface free of ice by agitation, moving some of the warmer water at the bottom of the pond to the top. Personally, I prefer to keep the water undisturbed during cold weather, so that there is always a slightly warmer layer at the bottom for the fish to retreat into.

Like most electrically powered accessories, air pumps are available in a range of capacities, and you will have to choose the correct one to suit your pond. This will depend on the size of the airstone and the depth of the pond, which determine flow rate and working pressure respectively. The large, round airstone shown in the photograph is designed specifically for pond use, to give a broad column of bubbles.

FROST PRECAUTIONS

During the winter season, there can be long periods when the pond surface is completely frozen. This isolates the water from the atmosphere, eliminating the exchange of oxygen and other gases.

The fish will be very lethargic under these conditions, spending most of their time at the bottom of the pond. The oxygen supply could, however, be exhausted eventually. Any dead vegetation in the pond will decay, producing toxic gases which cannot escape. The water will therefore become foul, and the fish will die.

This situation is easily prevented by the use of a device which maintains a hole in the ice. The hole should be made initially by pouring warm water onto the ice. Never hit the ice with a hammer to break it! The devastating shock waves set up in the water below can easily kill the fish.

Two types of device could be used. The first is a thermally insulated, floating plastic dome which works like pipe lagging on an area of the pond surface. The second is a small electric heater, which is fitted with a buoyant collar to float on the water surface, and keep a few square inches free of ice. This is sufficient to allow the exchange of gases and keep the water sweet.

FINALLY . . .

So you've got everything set up and running smoothly . . . and then you need to take a fish out for treatment. Long-handled pond nets are not always near the top of everybody's accessory shopping list, but they should be! Just make sure you don't miss this vital item out; you'll regret it sooner or later if you do overlook it.

And finally, make a regular 'tour' of your local shop or water garden centre. You are bound to see something that will help make your pond keeping activities even more pleasurable than you imagined. A&P

ACKNOWLEDGEMENTS

1 **Mike Newman** for his help with the photography and provision of examples of products during the winter season. **The Water Garden, Hinton Parfa, Swindon, Wiltshire SN4 0DH. OS ref SU228832. Tel: 0793 790558.**

2 **Kevin Curtis** and **Ian Sawyer** for their helpful advice and the loan of their literature.

PRODUCT ROUND-UP

BY DICK MILLS

Cyprio

A word of warning — don't talk to **Malcolm Goodson** of **CYPRIO** about UV sales figures for 1992, unless you're prepared to buy one in 1993. Despite sales trebling just after the launch of their new 'ultra-safe' unit, problems set in when the manufacturers supplying Cyprio ran out of tubes. However, all is now so much under control that the UV range now comprises of 5 models. The new baby of the range, the UVC 1000 can also be used for aquariums up to 60 gallons (c 275 litres) capacity.

On the filter front, things are expanding too for the new season, with six new models further to enhance Cyprio's claim to be 'Leaders in Pond Filtration'. The modestly-priced, upward flow BIOFLOC 1000 and 2000 models can be unobtrusively installed in-ground, or behind a waterfall. Similarly, the BIOZORB range has a new baby, the 500 model for ponds up to that number of gallons.

The GREEN MACHINE FILTERS were originally designed as external, above-water level filters, but they, too, can now be sited in the ground and are gravity-fed. Like their predecessors, they contain brush sedimentation chambers, foam for mechanical-biological filtration, plus a final biological 'polishing' stage using CYPRI-PAK plastic medium. All from CYPRIROCK, a light-weight material that looks like the real thing, but is far more physically manageable. Isn't it clever how the returning water covers up the supply hose at the bottom?

The new MAGN-IT unit is the latest weapon in the fight against reducing pump flows,

Cyprio filters are guaranteed to give clear water when coupled with a Cyprio UVC unit.

If you haven't got a waterfall behind which to hide your filter, fear not, Cyprio have the answer. Their new FILTER-FALL units (one is already on the market, the second is on its way for the summer) are built failing UV effects and, to some extent, blanketweed. By reducing the formation of scale in hoses, pipework and on UV quartz jackets, the MAGN-IT further optimises your Cyprio filter's ability to deal with green water. By altering the actual size, shape and composition of mineral salts, it appears that blanketweed finds it harder to absorb these salts for its continuing support, and generally declines.

There are two units available: the MINI MAGN-IT treats up to 1,500 gallons (6,800 litres) at flow rates up to 750 gph (3,4300 lph), while the larger unit can deal with 4,000 gallons (18,000 litres) at 2,500 gph (c 11,400 lph).

Speaking of flow rates, we mustn't omit to mention the range of FILTERPUMPS. Unlike most submersible pumps sold for fountains, etc, these can handle solids, thus getting more of the dirt up to the filter for removal.

Seven LOWARA pumps are available: five PRIMA models and two DOC models. These pumps will deliver from 960-3,280 gph (c 4,360-14,800 lph) at heads from 3.2-11.1 metres (10.5-36.4ft); the Prima range is factory serviceable/repairable.

Details of all Cyprio products and services from: **CYPRIO LIMTED, Eastgate Mews, 131/133 Eastgate, Deeping St James, Peterborough PE6 8RB. Tel: 0778 344502; Fax: 0778 348093.**

Speedy Brush Co

We've all heard of coals to Newcastle, but 'Brushes to Saudi Arabia' was a new one on me. I should have guessed it was yet another successful sale by **Bob Lomax** of the **SPEEDY BRUSH COMPANY** who have been busier than ever in supplying BLACK KNIGHT FILTER BRUSHES and SPAWNING BARRIERS to many grateful, and satisfied, customers. Apparently, word travels fast, as most new customers are on the strength of personal recommendation by friends.

The Filter Brushes owe their filtering efficiency to the fact that they are constructed using Hydrotek Polypropylene which almost attracts dirt magnetically (possibly something to do with static electrical charges).

The Spawning Barriers treat the female Koi with gentle caresses (that's when they're not being bashed about by ardent males!) and this helps to stimulate the release of even more eggs. Fertilised eggs adhere to the bristles (which also act as a slight deterrent to would-be egg-eating parents) and the whole barrier can be lifted out, disinfected, say, in Malachite Green, and placed in a separate pond or aquarium for hatching.

A simple boiling will sterilise the Barrier leaving it ready for the next happy thousands of events. Each Barrier is 8ft 6in (2.6m) long with a 5in (c 13cm) diameter, so it is easy to create a spawning area in even the largest pond.

Full details of all Speedy Brush products from: **SPEEDY BRUSH COMPANY LTD, Mercury Works, Kingswood Avenue, Swanley, Kent BR8 8AW. Tel: 0322 662480.**

Fisher Pond Products

I don't know — first we had tigers in tanks, now we've got spiders in ponds! The spider in question is in the shape of a new sub-gravel filter especially designed for ponds by **FISHER POND PRODUCTS.**

The SPIDER FILTER looks — in a way — superficially like (if **Mark Fisher** will forgive me) a bicycle wheel without the rim; the radiating 'spokes' form the perforated intake tubes and the pump sucks water from the central 'hub', although I suppose it could equally drive water through the spokes for a reverse-flow system? (See my article on pond **filters** within the **Focus on Pond Equipment** for a picture of the Spider Filter.)

Promoted with all the advantages of its aquarium counterpart: low maintenance, invisible when installed and working, no moving parts, nature's way of biologically-cleaning the water — additional units can be linked together to suit larger ponds. With the pond water being effectively mechanically filtered en route to the pump (when in suction mode), wear on the pump is reduced even further.

Suitable for any shape of pond, the Spider needs only a clean-out every 2-3 years, and to let Mark have the last word: "Just fit it, and forget it!"

FISHER POND PRODUCTS, The Round Lodge, Newlands Manor, Everton, Lymington, Hants SO41 0JH. Tel: 0590 644405.

Purity on Tap

If, like me, you're often bewildered with all the various model numbers of sundry pieces of equipment and wish that someone, somewhere, would just bring out a straightforward model, then take heart, because **PURITY ON TAP** have done just that.

The new, all-purpose UNIVERSAL FILTER is aimed at the Koi keeper primarily, but any pondkeeper will be just as interested. Delivering between 60-120 gallons (c 270-545 litres) per hour, the water filter will remove chlorine, choramines, pesticides, herbicides, etc, from tapwater with great efficiency.

The 1-micron pre-filter protects the highly activated granular carbon from physical damage, and the filter works on the counter-gravity principle which avoids the channelling effect (water taking the path of least resistance) found in some other designs.

Designed with a 55,000 gallon (¼ million litre) life, using water of average incoming quality, the cartridges are easy to change when the need arises; the standard 1in BSP fittings are equally easily adapted to other sizes, too. The housings carry a 5-year guarantee. So to get your pond water conditions off to the best possible start, the Universal answer is here.

PURITY ON TAP

Details from: **PURITY ON TAP, Wickfield Farmhouse, Shefford Woodlands, Newbury, Berkshire RG16 7AC. Tel: 0488 648319.**

Blagdon

Never a company to be short of exciting ideas, **BLAGDON WATER GARDEN PRODUCTS** have launched quite a range of brand new items for the coming season.

Leading the '93 collection, the PEBBLEFINISH POOL range has been developed as a direct result of the company's success achieved with the similarly faced WATERFALLS last season. These new pools are spectacular to look at (see **John Dawes'** article: **Ponderings,** within the **Focus on Pond Equipment** elsewhere in this issue), are ideal for both indoor and outdoor displays and should do very nicely as 'natural' ponds as well.

HI-FLOW POND PUMPS for 1993 consist of three models: 200, 270 and 290, capable of turnovers of 1,150 gph (around 5,230 lph), 2,270 gph (c 10,300 lph) and 3,180 gph (c 14,460 lph). All models are supplied with 10 metres (33ft) of cable and can handle — in ascending order — maximum heads of water of 18ft (5.5m), 29.5ft (9m) and 36ft (11m).

For concrete ponds, new products include POOL PAINT, POOL MENDER, POOLGLAZE and WATERPROOFING POWDER, while, for all ponds, there's the new UV FILTER range (available in three models for ponds containing 500, 1,000 and 2,000 gals (c 2,300, 4,500 and 9,000 litres), the FILL-LINE AQUATIC PLANTING BASKETS which do not require a hessian lining, and two POOL CLINIC products: ALGAE CLEAR and POOL SAFE, the latter consisting of an easy-to-use, all-in-one test kit for nitrite, pH, chlorine, nitrate and other compounds.

Full details of these products, plus Blagdon's new-season *The Water Garden Book*, are available from **BLAGDON WATER GARDEN PRODUCTS plc, Bristol Road, Bridgwater, Somerset TA6 4AW. Tel: 0278 446464; Fax: 0278 446155.**

Algarde

They're moving out at **ALGARDE.** No, the rent's not overdue or anything like that; the company is moving into the pond scene after years of aquatic manufacturing experience for the indoor aquarium.

Their first pond product is a high output POND AIR PUMP. Hopefully, by the time you read this, you won't need to take advantage of the pump's ability to help prevent your pond from freezing over, but its variable output from 180 to 600 litres per hour (40-130 gph) may well save our fishes from suffocation once those hot, thundery days of summer finally arrive. The silent-action pump is splash-proof, with sealed coils, and has four twin rubber feet for maximum stability. It consumes 5 watts of electricity.

Algarde have also developed two distinctive display stands for their other aquatic products: one will display all 36 items (from 'T' pieces to thermostats), while the second will feature the complete range (all twelve of them) of undergravel filters for easier customer selection. Look out for the Algarde logo at your dealer.

Details from: **ALGARDE, Enterprise House, Wharf Road Industrial Estate, Pinxton, Nottinghamshire NG16 6LE. Tel: 0773 581481; Fax: 0773 581524.**

Eheim

Building on the company's growing influence in the pond filter market, **EHEIM** have just produced a new OUTDOOR POND FILTER — the 3480 — to add to the already popular 3450 and 3460 models.

This latest addition is designed for ponds containing from 1,300 gallons (6m³) upwards and consists of a large canister (approx 4 gal — 18 litres capacity) for location outside the pond. The filter itself is supplied with pond water at the rate of nearly 1,200 gph (approx 5,400 lph) by a powerful EHEIM 3180 PUMP with built-in PREFILTER.

It is claimed that the well-matched media (EHFIFIX — mechanical — and EHFILAV — biological — supplied), the large volume and high pumping performance of the pump — which can deliver water to a height of 14ft (4.2m) — produce an above-average longterm filtering capability.

Also new this season are three high-performance POND PUMPS: the 3180 already mentioned, plus 3170 and 3190 models. The robust pump casings for the two smaller pumps are made from fibreglass-reinforced plastic, while that for the 3190 is made from hard-wearing red casting brass. The 3170 and 3180 come complete with an integrated coarse filter.

Units free of gaskets in the stainless steel collimator, ceramic axles and motors designed to save energy, guarantee a high degree of efficiency with long-life continuous maintenance-free running.

Details of the full Eheim range are available from: **JOHN ALLAN AQUARIUMS LTD, Eastern Way, Bury St Edmunds, Suffolk. Tel: 0284 755051; Fax: 0284 750960.**

King British

What could be more attractive than a Sanke Koi drifting below some bright green lily-pads? Spot this design and you'll be looking at one of 10 POND MANAGEMENT PRODUCTS from **KING BRITISH.**

No fewer than 3 preventive, 4 preventive/treatment and 3 pond and plant conditioners (plus WS3, the well-proven aquarium remedy for external parasites, now available for pond use) will feature the attractive packaging.

KING BRITISH

Most products in the range are bio-degradable and environmentally-friendly; look out for the 'Pond Treatment Badge' sticker, together with a great idea — the manufacturer's telephone number. Obviously, the latter is not an indication that things will go wrong, but a total commitment to customer service. If in any doubt about the product's suitability (or how to use it correctly) you don't have to risk your fishes' well-being at all — just check up with KB first.

Details from: **KING BRITISH AQUARIUM ACCESSORIES CO LTD, Haycliffe Lane, Bradford, West Yorks BD5 9ET. Tel: 0274 573551/576241; Fax: 0274 521245.**

Remanoid

I wouldn't be at all surprised if some members of the **REMANOID** company aren't Scouts or Guides, for they have obviously taken note of Baden-Powell's immortal words 'Be Prepared' in their approach to pond design, installation and care.

Right from the start, you can have the pond of your choice: from the three small MARSH POOLS and the AQUADEX and NEW GENERATION in the semi-rigid, pre-formed ranges (including cascades and waterfalls) to the 'design-it-yourself' freedom that the HIGH LASTIC and FLEXIPOND LINERS allow. Depending on type, guarantees run from a comforting 10 years, to a thoroughly 'laid-back' 20.

In whatever pond of your choice, the new POND PUMP models (Nos 200, 250 and 450) will bring you water movement, too, from fountains to waterfalls (both on the larger models). Each pump is entirely surrounded by a foam filter, there's a fold-down handle for easy positioning and removing, and the bayonet-fitting lid makes for easy maintenance, too.

Maintaining water quality has not been overlooked either. The AQUAFRESH range of external filters will ensure that pond water stays pure, especially so with the addition of an ULTRACLEAR UV UNIT. The DELUXE AQUAFRESH 1,200 unit combines mechanical and biological filter media with a built-in UV unit. For those with existing filters, an ULTRACLEAR ATTACHMENT is available, fitted to a replacement lid for instant fitting and upgrading.

What about in and around the pond? ARTEFACTS BY DESIGN include in-pond fountains and poolside statuary naturally enough but, further away from the water, there are birdbaths and plinths for sundials. Each is created from frost-resistant concrete, with an added organic compound to facilitate weathering by lichen and mosses.

Once the pond is up and running, keeping it clean and healthy is not always easy. A SEASONAL ACTION CHART and a DISEASE DIAGNOSIS CHART are but two more aids to excellent pond health; a CARING FOR YOUR POND LEAFLET (featuring Harry the Fish, a cartoon fish character) deals not only with algae and blanketweed problems, but also with fish diseases, water conditions and general pond care.

The POND CHECK pH TEST KIT, pond treatments and conditioners such as AQUASURE and BACT-ERAD all leave no eventuality overlooked.

Details from: **REMANOID LTD, Unit 44, Number One Industrial Estate, Medomsley Road, Consett, Co Durham DH8 6SZ. Tel:** 0207 591089.

Tetra

There are, apparently, subtle differences in keeping Koi in European conditions to those found elsewhere. **TETRA** have devoted a large proportion of their research and development into this matter, and their WHEATGERM STICKS FOR KOI reflect this, forming an easily digested balanced diet which also promotes health, vigour, growth and fertility.

The food loses none of its appeal at low temperatures and, providing the fish are active, can be given at temperatures as low as 5°C (41°F). Enriched wheatgerm, combined with *Spirulina* colour enhancers, Vitamin E and stabilised vitamin C, ensure the fish also look their colourful best too, with added vitality. Available in 200g, 780g and 1400g sizes.

Details about this food, or the TETRAPOND KOI range in general, from: **TETRA, Lambert Court, Chestnut Avenue, Eastleigh, Hampshire SO5 3ZQ. Tel: 0703 620500; Fax: 0703 629810.**

Waterlife Research Industries Ltd

Much talk has centred around filter media, with surface areas being uppermost, especially when it comes to bacterial colonisation of such places. More and more inventive ways of using unexpected materials seem to come out with increasing regularity, but there's one substance that seems to have been overlooked by most people, except **Graham Cox** at **WATERLIFE RESEARCH:** large-diameter CORAL GRAVEL.

This product has several advantages: it's many times cheaper than some of the more exotic large-surface area media and it's 98% calcium carbonate, which has excellent buffering capabilities, as well as being the preferred material for bacterial colonisation (8 out of 10 bacteria asked said they preferred it!), even over silica sand.

Full of innovative ideas, Graham is also an advocate of using air in ponds, and his range of GHOST AIR PUMPS certainly have plenty of performance, with even the smallest (GHOST 1) being able to deliver a good supply of air at 5ft (1.8m) depths with no trouble at all. Apart from lowering the demand by biological and chemical actions for dissolved oxygen, the use of air in the pond significantly increases the redox potential as well.

Why not give your pond fish the treat of a good tonic? POND-SAL is more than just good old sodium chloride; it contains 6 inorganic salts, too, and acts as a buffering agent to maintain the pH at the correct level. This is particularly important in heavily planted ponds where the pH can fluctuate quite dramatically during the course of a day and night.

Details of all these, and many more products from: **WATERLIFE RESEARCH LTD, Bath Road, Longford, near West Drayton, Middlesex UB7 0ED. Tel: 0753 685696; Fax: 0753 685437.**

Independance (UK) Ltd

Here's a not-too-difficult puzzle: spot the advertising character from this sentence: "What's up, Doc?" "Well, fish actually, and pond fish in particular." I don't expect you took too long over the answer (**Doc Wellfish** API's logo).

POND CARE is an entirely new range from **AQUARIUM PHARMACEUTICALS INC** (marketed in this country by **INDEPENDANCE [UK] LTD**) that makes sure that pond care and maintenance is both safe and easy. Because of their high concentration, each 16oz (454g) bottle of treatment will treat far more volumes of water than first suspected, between 1,920-9,600 gallons (c 8,700-43,600 litres).

ACCU-CLEAR will clear algal and bacterial blooms; AQUATIC PLANT STIMULANT hardly requires description and is safe with all fish; CHLORINE AND HEAVY METAL NEUTRALISER is both useful when setting up and during partial water changes; STRESS-COAT is a "liquidbandage' for coating wounds and for alleviating stress; and POND-ZYME dissolves pond wastes and, again, is valuable when setting up, changing water or at seasonal changes.

The POND FEEDER SIGNAL BLOCKS signal the time for more to be added, as a brightly-coloured float bobs to the surface when all the slow-release pellets have been eaten. The DRY-DAB MASTER KIT has four tests in one — pH, ammonia, nitrite and nitrate.

One of every product is available in a special presentation POND PACK, shrink-wrapped to ensure ultimate freshness.

Details of all products are available from: **INDEPENDANCE (UK) LTD, Blackburn Industrial Estate, Enterprise Way, Sherburn-in-Elmet, Leeds LS2 6ES. Tel: 0977 681962; Fax: 0977 681963.**

Books

The Fascination of Breeding Aquarium Fish

By: Dr Herbert R Axelrod and Mary E Sweeney
Published by: **TFH Publications, Inc.**
Price: £50
ISBN: 0-86622-408-4

TFH have pretty well cornered the market for large-format, attractively presented colourful aquarium books. In fact, it's difficult to see anyone doing a better job and still to offer the finished product at a realistic price.

Yes, I know that £50 is not particularly cheap, but when you consider that this giant of a book, measuring 10 x 14in, contains 448 pages and nearly 1,000 full-colour, laminated photographs, many of them of outstanding quality and beauty, you begin to appreciate that the cover price is, indeed, reasonable.

Numerous years of experience, allied to contact with many of the world's top aquarists and photographers, have equipped Herbert Axelrod and Mary Sweeney to produce a work of great worth that carries, at the same time, a real spectacle on every page.

Starting off with a scene-setting introduction, the text quickly gets into the meat of the subject matter. It deals first with a section entitled How to Breed Aquarium Fishes, which, while being, almost by definition, somewhat general at times, still tackles topics such as: breeding seasons, diet, water, breeding sites, secondary sex characteristics, pre-spawning activity, courtship rituals, mating, longevity and feeding of fry.

There then follow chapters on: Barbs and their relatives, Catfishes, Cichlids, Killifishes, Labyrinthfishes, Livebearers, Tetras and relatives and, finally, Oddballs.

There is a description (of varying length and depth) for each species selected, accompanied by numerous colour photographs, some of which are truly breathtaking. I was particularly impressed by the Cardinal Tetra spawning sequences, not just because of the fact that these popular fish are difficult to spawn, but also because of the outstanding colours of Hans Joachim Richter's pictures — the work of a real master of the craft.

Impressed though I undoubtedly was (and still am) by this massive work, I nevertheless felt that there were a few 'hiccups' which could easily have been avoided with just a little greater attention to detail.

For example, on page 18, there is a photograph of a female Checkerboard Cichlid (*Crenicara filamentosa*) laying eggs on a leaf. Yet, this same page tells us that dwarf cichlids do *not* spawn on vegetation!

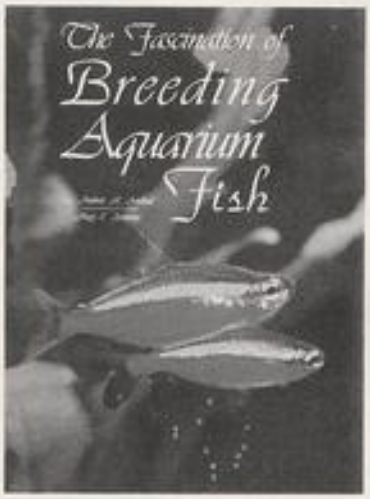
Earlier, on page 10, the text refers to the Cypriniformes containing "four distinct suborders . . . the catfishes (Siluroidei), the electric eels (Gymnotoidei), the tetras or characins (Characoidei) and the loaches, barbs and minnows (Cyprinoidei). It is the last two groups to which we will devote our labours". Certainly, the Characoidei and Cyprinoidei receive their due attention, but so do the Siluroidei. In fact, some of the catfish section is very good indeed.

It also niggled me a bit to find that, in at least two cases, the scientific naming was somewhat out of date. *Haplochromis burtoni*, Burton's Mouthbrooder, for instance, has now been pretty widely accepted as being *Astatotilapia burtoni* for over ten years. Similarly, the Honey Gourami is now regarded as *Colisa sota* and not *C. chuna*.

Then, on page 105, there is an unfortunate slip-up in captioning of the two bottom photographs, where the anal fins of a male and a female Woodcat (*Parauchenipterus fisheri*) are wrongly identified. Having been the 'victim' of such an error myself, I fully sympathise with the annoyance that the authors will have undoubtedly felt at having noticed this particular example of "there's many a slip twixt cup and lip", i.e. between proof-reading and final printing.

The cover notes for *Breeding Aquarium Fish* refer to there being "no single thing more important to saving our planet than to learn how living things reproduce and to develop a reserve against a natural calamity so the endangered species can be replenished in nature". Herbert Axelrod and Mary Sweeney have, in my view, certainly done *their* bit in trying to drive this point home in a readable and spectacular fashion in this, their latest, publication.

John Dawes



Tanganyika Secrets

By: Ad Konings and Horst Walter Dieckhoff
Published by: **Cichlid Press, St Leon-rot, Germany**
ISBN: 3-928457-09-8
Price: See box at end of review*

There were cichlid books before Ad Konings, but most cichlid fans will agree that his books are the definitive works (at least, for the hobbyist) on the topics he has

covered. Therefore, news of the arrival of another volume always provokes anticipation of further enjoyment and a new opportunity to learn — and, so far, we have not been disappointed.

When Ad first told me about this book, he described it as a vehicle for the superb underwater photography of Horst Walter Dieckhoff, with his (Ad's) text subsidiary to this main theme. This is characteristic Konings modesty; the text is by no means trivial, and it would be fairer to say that it and the photographs complement each other perfectly to produce what those who have seen the book are describing as "his best yet".

The title refers to the main theme — our far from complete knowledge of the lives of Lake Tanganyika cichlids and the manner in which they have evolved to populate the entire shoreline and occupy every available ecological niche in the process. The first chapters give a general overview of the lake and its fishes, followed by a detailed examination of feeding strategies, utilisation of living space, and breeding strategies, with a cichlid species cited to illustrate each strategy. Finally, the probable effects of changes in the lake level on speciation and colonisation are explained and discussed in detail, with useful diagrams to illustrate the processes involved.

The photographs are out of this world, and there are a tremendous number of them. As a confirmed fan of Tanganyikan cichlids, I was left practically drooling, and I am sure I will not be alone in hoping that we will see some of the splendid fishes illustrated 'on the fin' here in the UK before too long.

Tanganyika Secrets is intended to complement, rather than to supercede, Konings' earlier work *Tanganyika Cichlids*. Anyone who already owns the latter should not hesitate about buying the new work, as there is little duplication of material. For those new to Tanganyikans, the problem will be which book to buy first. Both are essential reading!

Mary Bailey

* At the time of writing, details for UK distribution of this book had not been finalised. The British Cichlid Association does, however, hold stocks and can supply copies at £29, plus £3.25 p&p to non-members and £25, plus £3.25 p&p to members. Contact: **BCA (AP), 7 Delamere Avenue, Sale, Cheshire.**

Tanganyika Secrets is also available from **Animal House (Tel: 0924 479946)** at the introductory price of £29.95.

Dad, how did the ancient Greeks throw their Discus so far?
We could only throw your Discus about ten feet. . .

Koi Talk

By John Cuvelier

With the weeks rolling remorselessly around as they do, the time is now ripe for our happy Koi keepers to get stuck in and plan for the months ahead. Those of you planning a future pond, or even altering your existing set-up, can be certain that there is much to look forward to and much planning ahead.

For us old hands (no disrespect intended), we can only ponder on what else we can do to improve our systems. I'm the first to admit that I sometimes suffer from that ancient malaise of 'getting into a rut'.

Writing this in January, I can safely say that, apart from a spell of really vicious frosts of about a week's duration, the very heavy and prolonged rainfall we have experienced appears to have bucked up our Koi which have been happily cavorting around the pool and have also been seen feeding heavily upon winter algae and blanketweed, in spite of its usually low growth normal at this time of the year.

WELL DESERVED PRAISE

What a splendid array of Koi ponds was displayed in the January edition which **David Twigg** had put together as a result of the **Stuart Turner Koi Pool Competition.**

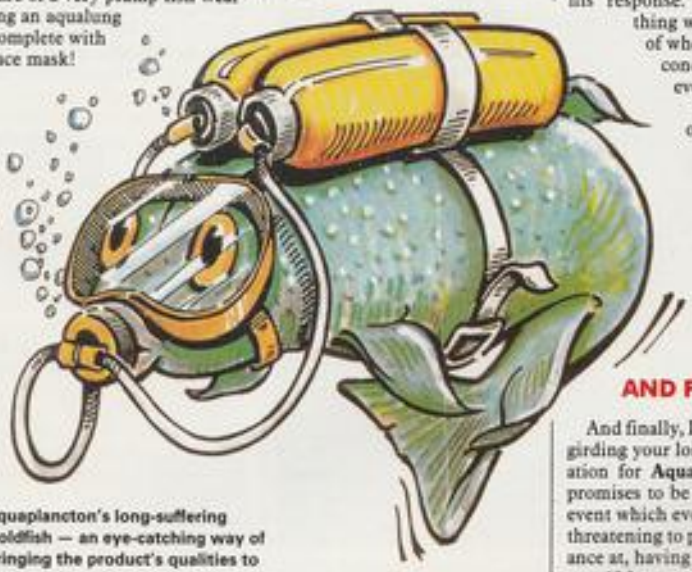
It's really quite remarkable that such a high standard of design and construction has been achieved from the owners of these ponds when one considers that many of the people responsible probably had little or no knowledge of the subject prior to commencing construction. It just serves to emphasise how versatile the average fishkeeper can be.

Two of the ponds concerned were, I thought, worthy of special mention, simply because their designs, although strictly formal in style, were really attractive and had obviously been very carefully thought out to blend in with the surroundings.

It can be extremely difficult to obtain that something special when designing a semi-formal pond, as I know to my cost, never having been completely satisfied with my own efforts in this direction. The purely formal design having been carried out so successfully in these two examples really do have a lot to commend them. If I ever come round again in another world, I'm confident that a formal pond would be top of my list. Well done to all concerned!

SLUDGE BUSTER

Sitting in the dentist's surgery a couple of months ago, I came across an advert in a copy of *The Field*, a magazine devoted to country folk, which really caught my eye (if ever there's anything of a fishy nature in a magazine, you can bet I'll spot it!). What really caught my attention was the heading picture of a very plump fish wearing an aqualung complete with face mask!



Aquaplancton's long-suffering Goldfish — an eye-catching way of bringing the product's qualities to one's notice. Picture reproduced by kind courtesy of Aquaplancton.

Even more interesting was the technical write-up which I feel sure many readers will find of equal interest.

The material advertised is a purely inert and non-toxic additive which, among other things, accelerates biological digestion of organic matter. **Aquaplancton** is merely sprinkled over the surface of the pond or, alternatively, it can be added via a net bag into flowing water such as a venturi, etc.

Measuring the correct quantity is simplicity itself; all you need to know is the surface area of your pond. For example, for a pond of 200 sq ft, you will need 12lb of the material, followed by a smaller dose the following spring (all the details are provided in the brochure). As the material is supplied in 25 kilo bags, it can be seen that it is not expensive (circa £45 a bag) and can be used all year round, even when the weather is a bit 'iffy' and temperatures are very low.

The first treatment was added to my own pools about six weeks ago and, already, I can perceive a definite improvement. I also added a hefty dose to my growing-on pond and the result was nothing short of miraculous, all the sludge having disappeared who knows where? Even the heavy 'matting' which usually coats the filter brushes appears to have reduced by about 50%, so I have high hopes that the amount of 'sludge' which has to be vacuumed out each week will also be reduced by a like amount. An initial colouring of the water quickly disappeared and is apparently quite normal.

Anyway, should you be interested in further details, the address to contact is, **Aquaplancton, Clavering Cote, Little London, Stowmarket, Suffolk IP14 2ES. Tel: 0449 774532,** and you will receive a brochure by return. And remember, you first saw it in *A & P!*

SINGAPORE EXCHANGE

I've recently been exchanging correspondence with a reader from Singapore, of all places, and we have been discussing the why's and wherefore's of spawning Koi. The main problem, as far as I can understand, is one of keeping the temperature down once the fry are free-swimming.

It seems that most of the year out there is pretty warm, a phenomenon which we certainly don't suffer from!

Having given my reader a description of my own ground rules for spawning and hatching Koi, I'm looking forward to his response. If there's one thing we can be certain of where our hobby is concerned, it is that everyone has their own pet theory on how it should be tackled, and this is precisely the reason we expand our knowledge (see **Your Questions Answered** in this issue of *A & P*).

AND FINALLY . . .

And finally, I trust you are all girding your loins(?) in preparation for **Aqualife 1993.** This promises to be a spanking Koi event which even yours truly is threatening to put in an appearance at, having been promising myself for several years to visit **Shirley Aquatics.**

Your questions *Answered*

Having problems? Send your queries to our panel of experts who will be pleased to be of service. Each query receives a personal answer and, in addition, we will publish a selection of the most interesting questions and responses each month. *Please indicate clearly on the top left hand corner of your envelope the name of the experts to whom your query should be directed.*

All letters must be accompanied by an S.A.E. and addressed to:
Your Questions Answered, The Aquarist & Pondkeeper, 9 Tufton Street, Ashford, Kent TN23 1QN.

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

HERPETOLOGY

EUROPEAN HERPTILE SUPPLIES

I am very interested in obtaining specimens of Midwife Toad, European Tree Frog and European Pond Tortoise. Would you please advise me on the best sources of supply?

There is a difficulty in the availability of the three European species of reptile and amphibians which you wish to acquire and keep:

European Pond Tortoises (*Emys orbicularis*)

Midwife Toads (*Alytes obstetricans*)

European Tree Frogs (*Hyla arborea*).

They are all included on Annex A of the proposed legislation which will control the trade in wildlife (animals and plants) within the European Community (the EC). Details about this proposed legislation and its implications appeared in the February 1993 edition of **Herpetology Matters.**

Even before the introduction of any new controls on the wildlife trade, these three species have only been imported in very small numbers with the necessary documentation. Therefore, the most probable way in which you are likely to obtain Midwife Toads and European Tree Frogs is from captive-bred stock.

In particular, members of two herpetological societies frequently breed these two species. Thus, I would first be inclined to place a request in the 'advertisements' section of *The Rephiberary* — the monthly newsletter of the Association for the Study of Reptilia and Amphibia (ASRA) and the quarterly *Bulletin* of the British Herpetological Society. The relevant addresses to contact the editors are as follows:

ASSOCIATION FOR THE STUDY OF REPTILIA AND AMPHIBIA (ASRA)

To place a 'Requests' ad in *The Rephiberary*, details of your requirements for captive-bred Midwife Toads and European Tree Frogs should be sent to:

Trevor Rose,
The Rephiberary Editor,
19 Longmead,
Abingdon,
Oxon OX14 1JQ.

BRITISH HERPETOLOGICAL SOCIETY (BHS)

The *Bulletin* of the BHS is edited and produced by John Pickett and Simon Townson. Relevant details of your requirements of captive-bred amphibians should be sent to:

John Pickett,
84 Pyrles Lane,
Loughton,
Essex IG10 2NW.

You could also, of course, place an advert in *A & P!*

LAURENCE E PERKINS

The European Tree Frog *(Hyla arborea)*, is now on Annex A of the latest European legislation.

PLANTS

GROWING 'THAT' HYGROPHILA

I have come across a plant called Hygrophila (That) stricta *and would welcome advice on how to cultivate it, as I've not seen this species before.*

Hygrophila stricta (Thailand) is treated in exactly the same way as other Giant Hygrophilas. It will grow in up to 60cm (24in) of water and requires very good lighting, a temperature of 22-29°C (c 72-84°F) and a rich laterite substrate.

It should be planted in bunches of five cuttings, to the rear and sides of the aquarium. If lighting is in a canopy, the plants should be pruned regularly. With HQL (quartz lighting) suspended lighting, it may be allowed to grow above the surface, when it will flower, producing racemes of small blue flowers.

Trace elements should be added on a regular basis, especially iron and manganese. CO_2 infusion will also give much lusher growth, with broader leaves. In good light, the leaves take on a reddish tinge on the upper surface.

MARINE

BREEDING NATIVES

I am attempting to breed British marine inverts and was wondering if you could help me with the following questions:
① Do you know the names and addresses of firms supplying planktonic cultures?
② Is it in any way possible to use cement, perspex and blown polystyrene tiles in invert-only aquariums, and if perspex is safe, what type of adhesive could I use on it?
③ Are there any books available that you can recommend which deal with the breeding habits/requirements of our native marine species?
④ Is it safe to use beer coolers/flash chillers as seen behind bars, to keep the water cool, as I have a recurrent problem with high temperatures?
⑤ Are there any non-submersible pond pumps that are safe to use in salt water, as I could use a powerful one, i.e. 400 gallons per hour?
⑥ Is it legal to collect native marine species, and if successfully bred, to sell their offspring?

I have to say that you are indeed a brave man. I know of no one else who has ever even thought of breeding temperate marine invertebrates, and think that you are faced with quite a challenge. However, this is no reason for not trying, and I shall answer your questions to the best of my ability.


ANDY HORTON

Native marines. The breeding challenge awaits!

① Planktonic cultures can be obtained from **Underworld Products, Units 1 & 2 Belton Road West, Loughborough, Leicestershire. Tel 0509 610310.** The man to talk to there is, of course, **Dave Keeley.**

② It is possible to use both *cured* cement — notice I stressed the word 'cured' — and perspex in aquariums. However, perspex has a tendency to scratch easily and therefore I, personally, would recommend glass every time. Perspex is also expensive. I have no idea about blown polystyrene tiles. It would be best to contact the manufacturer. Normal aquarium adhesive works well — to the best of my knowledge — on perspex.

③ It just so happens that in the December 1992 issue of this magazine I did a review of the new Salamander book called *The Book of the Marine Aquarium* by **Nick Dakin** and others. There is a fine section in that about native marines.

Our own **Andy Horton** is also well worth contacting c/o this magazine. It would also be well worthwhile contacting the British Marine Life Study Society, through Andy.

④ The answer to this is simple: Yes, provided that all the moving parts are made from stainless steel — which they should be. Having said that, you can now buy custom-made aquarium coolers; a chat to your local dealer should source the supply.

⑤ In the days when Graham Lundegaard was at the Aquatic Centre in Brockworth, they used to sell a pond pump that had all-stainless-steel moving parts. However, as you can imagine, this was horrendously expensive. As I do not know whether the Aquatic Centre still sell this brand of pump — and bearing in mind the cost — I would suggest you think about buying an Eheim pump and the contact for these is: **John Allan Aquariums Ltd, Eastern Way Industrial Estate, Bury St Edmunds, Suffolk IP 32 7AB. Tel 0284 755051.** A phone call or letter to them will bring you everything you need to know.

⑥ As far as I know, it is legal to collect native marine species, with a few reservations. To be sure that you are not breaking the law, however, I would advise you to contact the **Marine Conservation Society, 9 Gloucester Road, Ross-on-Wye, Herefordshire HR9 5BU.**

TROPICAL

COMMUNITY TIGERS

I am planning to set up a community tank and would like to know the best fish to keep with my Tiger Barbs. I am particularly interested in Angels and Red-tailed Black Sharks.

My present tank has the following water conditions: pH 7.5, GH (General Hardness) 8.5°, KH (Carbonate Hardness) 6°, and regularly receives a small amount of salt.

The Tiger Barb (*Barbus tetrazona*) is a quarrelsome fish, and it has sharp teeth. However, the solution to the problem of their quarrelling is to get more! In the wild, they live in shoals, with a strict pecking order maintained by nipping and displaying. If you only have one or two of the species, they will try to involve other fish in the aquarium, but stately fish like Angels act aloof. This infuriates the Tigers who actually nip, even shred, the Angel's fins.


HARRY GREENSTREET, TROPICAL FISH FARMS ASSOCIATION

Tiger Barbs (this is an Albino Blushing Tiger Barb from S-D Tropicals in Florida) are notorious fin nippers. However, a shoal will be less prone to this activity than single specimens, or a pair.

If you have five or more Tiger Barbs, they form a shoal and only (largely) concern themselves with each other, ignoring other species.

Other species you can add can be anything from the community tropicals list (which, by definition, can live together) which includes Angels, but only one Red-tailed Black Shark because they are territorial and two Sharks would fight over the ownership of the tank.

As to adding salt, the fish you want prefer soft, slightly acid water. Save the salt for treatment if there is a disease or parasite problem.

KOI

KOI BREEDING THEORIES

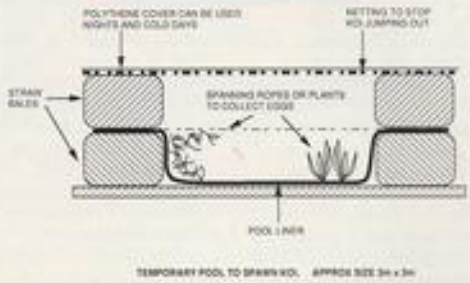
I live in Singapore where we get sunshine all year round, although it tends to rain almost daily in December. It is therefore not surprising to find that Koi spawn at this time of year.

I have sought advice from friends and consulted many books — after having failed to hatch some spawn which my Koi unexpectedly produced last December. However, there appear to be conflicting theories and advice, so I would welcome your comments based on your many years of experience keeping and breeding Koi.

I'm sure you are aware that every Koi keeper has his or her pet theory on how to handle the question of spawning and rearing Koi, and I'm no exception. For your information, these are my own ground rules.

My Koi are left in their main pool until spawning has finished. I have used an assortment of media (I cannot yet decide which is most effective), including commercial 'ropes', sections of car wash brushes, twigs of 'Japanese Larch' trees, and even rolls of pan scrubbers, all of which are equally effective.

As soon as spawning has been completed, all the medium is removed, complete with eggs and transferred to my two hatching facilities. My main hatchery is a 450-gallon (just over 2,000 litres) circular pool 8ft in diameter by roughly 2.5ft in depth (2.4m x 75cm).



Koi can be spawned in many ways, ranging from the 'natural' approach, where pairs are left in the main pool, to the 'spawning pool approach', where temporary breeding accommodation, such as that illustrated, can be provided away from the main pool, thus affording the breeding pair some peace and quiet.

Full trickle filtration is used throughout the year to maintain constant biological action, Siporax being the medium used. No aeration is used for about the first 5 to 6 weeks until the fry are large enough not to be disturbed by the agitation. No 'new' water is added, and all dead eggs are removed where possible. A very slight tint of Malachite Green is added for antiseptic purpose, but this should only be used very sparingly. After about 7 weeks, all the medium is removed and cleaned and ready for next year.

The tank itself is covered over with clear twin-wall polycarbonate plastic which helps to maintain the temperature at reasonable levels (not a problem in Singapore, I believe), at the same time preventing heavy algal growth. Once the fry have reached about 5-10mm (0.2-0.4in) aeration in the shape of a 'curtain' airstone is added, which allows good water circulation for the growing fry.

Feeding consists initially of Liquifry, followed by very finely crushed commercial food. Last year I settled upon Phoenix 2000, an excellent all-year-round food. I had to abandon the use of livefood owing to the high cost, but Phoenix works very well.

From then on, that's all about I can tell you, as the fry will simply grow at their own pace come what may, with the inevitable losses as nature takes care of its own!

My second hatchery consists of a standard 48 x 15 x 12in (120 x 38 x 30cm) aquarium housed in my garage and fitted with normal undergravel filtration. The eggs are merely dropped into lumps of blanketweed after spawning, and hatching takes place in the same way. The tank temperature is controlled at around 68-70°F (20-21°C) throughout and fresh water is added at regular intervals. I usually aim for a stocking rate of around 40 and they appear to thrive.

I think that, perhaps, the temperature in Singapore could well be a problem for artificially rearing of your fry, so possibly, some form of control will be required.

Having carried out all your necessary precautions, there is always the unexpected problem. Twice in the last 10 years I have had cases where no hatching has occurred, in spite of everything appearing to be normal. I cannot offer any explanation for this phenomenon and can only put it down to what we call 'Murphy's Law'!

I hope the foregoing will be of some help.

COLDWATER

IMPERFECT FANTAIL

I hope you can identify one of my goldfish. I bought two so-called Japanese Fantails some time ago. One is definitely what it's supposed to be, but I'm not sure about the other. It has a 'twin tail' but it is joined up. Otherwise, it's like my Japanese Fantail in both body and finnage, although it holds its tail very high.

I strongly suspect that your mystery fish is a Fantail just as its companion. The Fantail is one of my favourite varieties, and I have been breeding them for several years. Among each spawning, there will be a variety of what we term 'faults' which would disqualify them from being of show quality. Therefore, those which do not have the desired characteristics are culled from the rest of the brood. These will include single tails, single anal fin, tails which are not divided into two but joined along the top, etc.

A quality Fantail. Few of its siblings would have been this good, though.

Like myself, other hobbyists are hoping to produce the best possible quality goldfish and therefore, we are usually very critical when selecting the best from our spawnings. The emphasis is on quality, rather than quantity. Commercial producers cannot be so fussy, of course. Besides, not everyone is looking for the perfect or show fish. What some think unacceptable, others find acceptable, even beautiful, so the commercial breeders must cater for all tastes.

Tomorrow's Aquarist

By Gina Sandford

TROPICAL v COLDWATER

Now then, here's something for you to contemplate: what is a tropical fish?

"Easy," I hear you say. "One that lives in warm water!" Well, I have to admit that was my first reaction, but is it that easy? This question arose when working with a colleague on an EC report into the tropical fish trade.

When you sit and think about it, there are many species which we refer to as tropical that could, and do, survive in temperate waters. One only has to look at some of the strange fish that have appeared in our rivers and canals at points where power station cooling water effluence raises the ambient temperature to about 18°C (64°F). It is not unknown for fish such as the large Lake Victorian cichlid, *Tilapia zillii* (there's no common name for this species), to thrive along with Guppies, Swordtails and several others in the UK.

Let's look at the White Cloud Mountain Minnow, *Tanichthys albonubes*, recommended by most people as an easy tropical fish for beginners. While I agree wholeheartedly with the 'easy' part of the last statement, I'm not sure that I agree with the 'tropical' part. White Clouds are coldwater fish which will live quite happily in temperatures of 16-18°C (61-64°F) during the winter months and then spawn as the water temperature rises, just like the Goldfish (*Carassius auratus*).

Talking of Goldfish, they must be the most well-known coldwater fish, but what about those that are being bred in the Far East? These creatures have become so accustomed to warm temperatures that they might not survive in the garden pond. So, should we now term some strains of the Goldfish as tropical?

But consider: how 'cold' is coldwater? There are fish that live in water only a few degrees above freezing point under the Arctic ice. The increase in temperature between this perpetual state and that of the Goldfish in your pond is greater than that between the same Goldfish and the nominal 'tropical' fish.

Technically, there is no such thing as coldness, only a degree of temperature. When you go outside in mid-winter you do not feel cold, you merely notice the difference between the 'heat'(!) around you and that which is considered amenable or comfortable.

Perhaps a better description of 'coldwater' fish would be 'temperate water' species. (For more on this subject, see Dr David Ford's article entitled **Coldwater Tropicals** in this month's **Supplement**).

One-way Adaptation

Fishes which live in cooler water are able to acclimatise, over a period of time, to warmer conditions without ill effect, but the reverse is not true. Those which are truly tropical cannot readily adapt to cooler waters.

Talking this over with a friend, he related an experience he had in the Okavango in Africa. Having left nets out all night to catch fish, he jumped in the water the following morning to find that it was very cold (or should I say lacked heat!) — he said, "Not far above freezing!" Yet there were Tiger Fish (*Hydrocinus*) swimming about.

Look at the Middle East barbs, the *Barbus, Capoeta, Barbodes* (call them what you will!) type fishes. These tolerate high summer temperatures but, in winter, it can go below freezing, and they are still to be termed 'tropical'.

Hillstream Loaches are another case. The higher the altitude, the colder the climate. Fishes such as the Hong Kong Plec (*Gastromyzon* or *Pseudogastromyzon*) come from highly oxygenated, fast-flowing, cool waters which their metabolism relies on, and cannot cope with warm conditions, which, in turn, will not contain such high levels of dissolved oxygen. But again, the question arises: are these tropical fish?

Important Questions

My first reaction to how we should keep a particular fish was that it depends on whether it is wild-caught or farmed, and if the latter, where it was farmed. Looking again at the goldfish, if a wild specimen is on offer, or if a farmed specimen from, say, Italy is offered, then it will be able to cope with life in the pond. However, if it is one of the Singapore specimens, it is quite possible that, through acclimatisation, it will only survive in tropical conditions. This could be even truer for the cultivated varieties.

We also need to find out more about conditions in the wild. What are the daily and seasonal fluctuations in temperature? Such information could be one of the keys to successful rearing and breeding of some species if the conditions can be reproduced in captivity. How many times have you heard it said by one fishkeeper, "You raise the temperature to spawn so and so," and by another, "They spawned when I topped up with cold water."

What effects does the constant temperature have on our fishes? Does it, for example, affect their feeding? Do fish which normally live in deeper, cooler bodies of water only venture to the shallows to feed at night when the water temperature drops? If we kept these creatures at too high a temperature, would it deter them from feeding? Indeed, do we shorten their lives by keeping them at too high a temperature, or through lack of temperature fluctuations?

There are so many, many questions and so very, very few answers . . .!

NEW YEAR'S RESOLUTION COMPETITION

I'd like to thank those of you who took part in our **Interpet N Y Resolution Competition.** The prizes for the two top winners — a copy of *Interpet Guide to Coldwater Fishes*, by our own **Dick Mills**, are on their way!

From **Edward Johnson** of Toynton St Peter, Lincolnshire, we have:

To read all of the articles in Aquarist & Pondkeeper and not just those that apply to my particular field of interest.

And from **Ron Barrow** of Halesworth, Suffolk:

A new year, a new look.
Time to bring old faults to book.

Thanks to **Interpet** for sponsoring the competition. Watch this space for further competitions!

JOHN DAWES

When such 'classic' coldwater species as Goldfish are housed with such 'classic' tropical fish like Discus, the term 'coldwater' begins to lose its meaning.

Paper Round

By Dr Ian Winfield

LET ME INTRODUCE YOU . . .

Walter R Courtenay of the Florida Atlantic University, and **Jay R Stauffer** of the Pennsylvania State University, USA, are internationally recognised for their many studies of the problems caused around the world by fish introductions. In a recent review article they focused on such introductions to the USA which account for 65% of the 46 fish species known to have become established in that country. The stories catalogued in their review make fascinating reading, but are unfortunately far too numerous to summarise them all here. However, I cannot resist three examples.

As might be expected, the first species to be introduced primarily by aquarists was probably the Goldfish, *Carassius auratus*, as long ago as the late 1600's. More recent introductions have probably been due largely to fishermen discarding Goldfish used as bait. Not surprisingly, the Goldfish is now well established in most states.

Fishermen also feature in the story of the introduction of the Oscar, *Astronotus ocellatus*, although, this time, merely as the end users. This species has been established in south-eastern Florida since the late 1950s, following a deliberate release from an aquarium fish farm, and today can be found in wider parts of the Sunshine State, where it is a favoured quarry of some sport fishermen.

Walking Catfish, *Clarias batrachus*, are also now widespread in Florida, where they originally escaped (presumably by living up to their name!) from an aquarium fish farm in 1966 or 1967. While all of the original escapees were albinos and so easily seen by predators, within two to three years, the natural dark brown to grey colour phase was common. Ironically, the greatest effect of this introduction has been on the local fish culture industry because farmers must now erect protective fences around their ponds to prevent Walking Catfish dropping in for a meal!

(**Source:** *Journal of the World Aquaculture Society*, **21**, 145-159.)

SALMON AT SEA

Both Atlantic and Pacific Salmon species spend extensive periods of time at sea, where they feed and mature in preparation for their return spawning migrations to their natal streams. In summer of 1989, **Miki Ogura** and **Yukimasa Ishida** of the National Research Institute of Far Seas Fisheries in Japan, made a detailed study of the movements of Coho Salmon (*Oncorhynchus kisutch*) over five days in the central North Pacific Ocean.

Four Coho Salmon approximately 50cm (c20in) in length had ultrasonic transmitters attached near to their dorsal fins. Over the course of the study, the average swimming depths of the fish ranged from 7.1 to 13.4m (23·3-44ft) and they spent the majority of their time in the upper 15m (49ft) of the water column. Maximum depths attained by the four individuals ranged between 53 and 74m (c174-243ft), while average speeds varied between 0.29 and 0.40 metres per second (0·95-1·3ft/sec).

Swimming depths during the day were deeper than at night, but the one Coho Salmon that was tracked for five days did not show any regular daily patterns of horizontal or vertical movements. While other studies on migratory salmonids in coastal waters have suggested that the sun and polarised light are involved in orientation, this is clearly not the case for Coho Salmon in the open sea, because they maintained relatively constant courses during both day and night.

(**Source:** *Canadian Journal of Fisheries and Aquatic Sciences* **49**, 453-457.)

SIGNAL BLENNY SUCCESS RATE

Many fish species from a wide range of taxonomic groups display remarkable parental care for their eggs. In the case of the Signal Blenny (*Emblemaria hypacanthus*), which is found only in the Gulf of California, this takes the form of the male guarding the eggs in a vacant gastropod (snail) shell. **Philip A. Hastings** of the University of Arizona, USA, has made a detailed study of the role of nest-site size in the reproduction of this tube blenny.

A series of simple laboratory experiments showed that female Signal Blennies preferred larger males over smaller ones. Hastings consequently predicted that bigger males would have a relatively greater reproductive success in nature and tested this hypothesis by looking at the numbers of eggs guarded by different sized males at two sites in the central Gulf of California. However, the prediction was only correct at one site, Bahia San Carlos, while at the second site, Isla Raza, there was no relationship between male size and reproductive success.

The two sites were similar in many respects, but Hastings noted that they differed in the size of available vacant gastropod shells. Shelters were smaller at Isla Raza, where relatively more males had their nest-sites filled to the brim with eggs. At this site, the reproductive success of the male was not determined by its body size and the consequent choice shown by females, but by the size of its nest-site.

(**Source:** *Environmental Biology of Fishes* **34**, 213-218.)

HOMING MBUNA

The phenomenon of homing is best known in the fish world among salmon and eel species and has been surprisingly little documented among the cichlids, despite the huge amount of research published on the behaviour of these fishes. This rarity makes a study of homing in the mbuna of Lake Malawi by **Eva Hert** from the Max-Planck-Institut fur Verhaltensphysiologie in Germany, all the more interesting.

While Hert worked with several species, she concentrated on the Zebra Cichlid, *Pseudotropheus aurora* occupying territories in rocky habitats around Thumbi Island West in the southern part of Lake Malawi. The locations of fish were determined by SCUBA diving, after which they were carefully caught in large nets before being moved varying distances and then released. The return of males to their territories was then awaited.

Zebras were able to home from distances of up to 2,500m (8,200ft), no matter which side of the island they were released on, although they would not move across deep water. While clearly demonstrating the homing ability of this particular cichlid, at this stage, Hert is unable to show how or why they have this impressive ability.

(**Source:** *Environmental Biology of Fishes*, **33**, 229-237.)

JOHN DAWES

Florida Walking Catfish escapees are now threatening stocks of fish in farms within the state.

Jason Endfield

Jason Endfield crosses the human-fish divide . . . and fears for his sanity!

CONVERSATIONS WITH JANIS AND LINGUS

Do you ever stare into your tank at your lovable Oscar or affectionate Plecostomus and wonder what they are thinking? I know I do, and I don't think I am alone. Today I'm going to come clean with you all and admit to a theory I have that could well result in my being locked away in a straitjacket labelled 'psychologically disturbed' (many would do that to me anyway, theory or not . . .!)

Anyway, allow me please to elaborate. I am now going to pluck up the courage and put forward my disturbing theory. Here goes. But no, just before I do, as usual, I can feel an 'illustration' coming on.

Picture the scene: some time ago, me in my fish room. Sounds good, 'fish room' doesn't it? Actually it's my bedroom, but tanks do occupy more room than the bed! The following incident first took place many months ago, but has been repeated (and still is repeated) on innumerable occasions since.

In one of my tanks was, and still is, my male Oscar, Janis (named in error at an early age, but the name stuck). He is in his tank with a Polypterus by the name of Lingus, named after a particularly enjoyable flight on Aer Lingus, just the two of them sharing the tank. They have lived together for years now and, as such, have developed some sort of relationship — probably morally unsound, but what the heck, it's a free country.

On this, the first occasion, I had been gazing into the tank for several minutes, not transfixed by anything in particular in the tank, but merely allowing thoughts to cross my mind unhindered. It would have been excellent relaxation therapy, except that these thoughts surrounded the fact that my bicycle tyre needed fixing and that I had four bills in the post that morning.

Ah, but never mind, there were more important things to life — fish, for example.

My Oscar, Janis, and my Polypterus, Lingus, were well used to me staring at them (poor things, they had no choice). It didn't bother them too much and they went about their everyday business, which mostly involved swimming and eating, and, as I was about to find out, *thinking* too!

Janis was at the back of the tank. "Come over here," I said to him silently in my mind, "If you do, I'll give you some food". It was an exercise rather like talking to plants, rhetorical in that one doesn't expect a reply. Indeed, I didn't get a reply, but I did get a response!

In an instant, he was at the front of the tank in a frenzy as if begging for his food at feeding time. I don't mind saying that I was taken aback! I hadn't tapped the glass, changed my position — not even a twitch — I had merely willed the Oscar to come over to me. Naturally, I dropped a few cichlid pellets into the tank and after devouring them, Janis went back to skulking around at the back of the tank.

A few days later, I tried the same 'trick' again. Staring into the tank at the two fish who, as usual, weren't taking much notice of me at that point; gravel seems to be far more interesting . . . I willed them to come across to me, again with the promise of food as their reward. Like a shot, they were at the front of the tank begging for food — both of them!

I've continued the 'experiments' ever since, 'talking' to my fish with very positive results. So that's the story. It's short and to the point, and although simple, I have to say that it's taken me a considerable length of time to admit the truth in it — even to myself. That's hardly surprising, though. It's like admitting that one has met aliens (which I haven't). The point is that it seems just about possible — just about conceivable — to believe that it is maybe just feasible to communicate telepathically with a fish.

There now I've said it!! I expect the men in white suits to arrive any minute now to take away! You might think I'm joking, but I'm not; at least I don't think I am. I just wonder if it could be possible to communicate in such a way with the more highly developed species, like an Oscar, for example. I mean, thought has no language and no boundaries (except the borders of one's imagination), and I have seen for myself something convincing enough to act as proof; proof that is good enough for me.

I'm not alone either. There are others who, I believe, would, at a push, admit to having the same belief. Talk to anyone who has swam with dolphins (yes, I know they're not fish, but the principle is exactly the same). It would be interesting to know how many readers have had similar experiences with their fish. Go on, I dare you to admit it!

In this day and age when just about everything has to be proven and rationalised by the scientists, wouldn't it be nice to think that we can believe in interacting with nature on a very basic level using nothing more complicated than simple thought? Many scientists would scoff at me, but it is those same scientists who have complicated our lives so much that we have lost touch with our instincts and ruined our natural world.

So, go and gaze into your tank. Talk to your fish with thought; I think you will be amazed at the results. And don't let it stop there. After all, a little thought really can change the world, and boy, it could do with some changes for the better!

As the famous American poet Emerson wrote: "Great men are those who see the spiritual is stronger than any material force, and that thought rules the world . . .".

Ugh. There are two men in white coats knocking on the door . . . AJF

Herpetology matters By Julian Sims

TOAD SPAWN

In the January '93 edition of **Herpetology Matters**, I drew attention to multiple frog deaths — an environmental problem which has been reported as occurring recently in southern England. To prevent the transfer of any bacteria or viruses which may be causing these deaths, it seems sensible not to move frog spawn from one garden pond to another during the spring of this year.

Unfortunately, the exchange of toad spawn is not always a suitable alternative, even though such action might result in the wider distribution of this native amphibian throughout the British Isles. There are at least two important reasons why the characteristic strands of spawn released by female Common Toads (*Bufo bufo*) should not be moved from pond to pond at random.

① Transferring moist toad spawn from one pond to another can also result in the spread of any bacteria or viruses which are causing the mystery deaths of Common Frogs (*Rana temporaria*).

② An important limiting factor when considering the introduction of Common Toads to a pond is the fact that these amphibians are much more selective in the choice of their spawning sites than are Common Frogs. Migrating toads often pass ponds which seem to be perfectly suitable as a spawning site in order to reach their traditional ancestral pond or lake. The reasons for this behaviour, which can result in toads migrating distances from between 50 metres to 3 kilometres (55 yards to nearly 2 miles), are not fully understood.

However, Common Toads can spawn in very much deeper water than Common Frogs. For example, toad spawn has been found in water as deep as 4.5 metres (15ft) and Common Toads have been trapped at a depth of 6 metres (20ft) in Windermere in the English Lake District.

It is probable that the bitter glandular skin of toads (and their tadpoles) gives them some protection from predation by fish, and so these amphibians can inhabit deeper water. Common Frog tadpoles do not have such protection and usually remain in shallow water and at the edge of ponds to avoid being eaten. Even so, there are exceptions to any rule, and Common Toads can spawn in water as shallow as 15cm (6in). For example, the strands of toad spawn in the picture were deposited at the edge of a man-made trout lake near Pewsey in Wiltshire.

Clearly, the introduction of Common Toads into ponds and lakes inhabited by fish is a possibility due to the protection given to these amphibians by their glandular skin. Indeed, the wider distribution of Common Toads resulting from such introductions would help to ensure the long-term survival of this species. However, due to the two reasons given above, the translocation of toad spawn (especially in 1993) must be given careful consideration and the introduction of this amphibian into a garden pond is certainly not an automatic choice.

AMOROUS AMPHIBIANS

"Absence makes the heart grow fonder". Well, in the case of some types of amphibian, this certainly seems to be the case. To induce these species to breed in captivity, it is essential to keep males and females in separate vivaria for most of the year.

For example, if male and female Sharp-ribbed Salamanders (*Pleurodeles waltl*) are only given the opportunity to encounter each other during the spring, then breeding usually results. Duplicating natural environmental conditions, including the hours of day and night that these amphibians receive, is important because they are mainly nocturnal and aquatic salamanders. Daylight control is relatively easy because this is a predominantly European species originating from Spain and Portugal, as well as Morocco in North Africa.

Sexually mature males can be identified by the presence of dark 'nuptial pads' on the insides of their front legs. These interesting amphibians normally grow to a total length of 15 to 30cm (approximately 6 to 12in). The tail forms at least half of this length and tends to be longer in males. Sharp-ribbed Salamanders are Europe's largest Urodeles and can exceptionally reach a length of 40cm (15½in).

Research has also proved that if several adult African Clawed Toads (*Xenopus laevis*) are maintained in the same aquarium, then their reproductive organs become reduced in size. Therefore, adult toads should be kept in separate heated tanks during the winter months. In the spring, keep the toads as 'true pairs' — one pair per tank. Sexually mature males can, again, be identified by the presence of dark 'nuptial pads' — patches of spine-like thickenings of the skin on the inner surfaces of their front limbs.

It is a particularly satisfying achievement (as well as being important from a conservation point of view) to breed amphibians in captivity. Practical advice, as for the two species mentioned above, can be very helpful to other herpetologists. If you have similar practical hints for other species of amphibians (or reptiles), please send these in for inclusion in future editions of **Herpetology Matters**.

Numerous strands of toad spawn deposited in shallow water at the edge of a lake used for rearing trout. See text for further details.

Koi Calendar

JOBS FOR THE MONTH

Hooray! We are coming out of winter. The weather is not a lot better, but the days are getting longer and water temperature, while still being low, is starting to rise. The population of potentially harmful parasites and bacteria will also be increasing, and steps should be taken to minimise any potential problems they may cause.

If you have a pond system which does not include a UV steriliser then maybe this would be a good time to give thought to the purchase and installation of one or more of these very useful pieces of Koi related equipment. If you do have a UV installed, then this is the time of year when it would be wise to check that it is working at its optimum capability to help fight these enemies of Koi.

A thorough cleansing of the quartz tube through which the UV light penetrates and which separates the fluorescent tube from the water is a way of improving 'kill', but this is no substitute for tube replacement if it has been in long service. A change after six months' use is the accepted norm in Koi circles, although there are now tubes on the market which have a twelve-month life.

With the unit stripped down, check the condition of the 'O' sealing rings. If perished, or damaged, which could allow water (it is under pressure) to get past, replace with new items. Water and electricity don't mix well, so please remember the rules when carrying out this task. Disconnect from supply *before* dismantling, and *don't* look at the bright UV light (harmful to the eyes) when reassembled and under test.

If water temperature rises sufficiently to consider starting to feed Koi this month, may I suggest that:

(i) a watchful eye be kept on the weather forecast for sudden cold spells, and

(ii) that the feeding rate be arranged such that water quality does not suffer.

If flow rate has been reduced over the winter months, then this may need to be increased slowly as water temperature and feeding levels rise.

Unheated ponds are still liable to wide temperature fluctuation caused by night-time frosts, so maybe any feeding should be with small quantities of easily digestible food such as brown bread (broken up and rolled between fingers to produce small balls which, when thrown into water, will sink to the bottom). Feed sparingly to allow bacterial activity in your filter to re-establish itself gradually to prevent hitting your fish with an ammonia or nitrite surge.

Water quality is of paramount importance at this time of year when Koi are at their weakest after a long British winter. Regular checking of water quality is, I believe, a must, as poor quality can cause severe damage to, for instance, the gills of Koi, leading to stress and distress for both fish and owners alike.

NEW KOI GROUP

Once again, I have the pleasure of mentioning another new group of Koi keepers. The **North Lincs** was formed in June of '92 with 10 founder members. This figure had already increased to 41 household memberships, and I understand from Secretary **Anne Mawer** that they have got a great committee together and have arranged some excellent speakers for their forthcoming meetings. Keep an eye on the **Calendar** below! Anne can be contacted on **0472 826605.**

THEFT INSURANCE

Recent correspondence advised me of more Koi thefts from both indoor and outdoor ponds and asked if insurance cover is available.

Yes it is. A policy, underwritten at Lloyd's of London, offers cover against all risks of mortality and loss of Koi up to a limit of £25,000 per individual fish, or £250,000 for any one collection.

The scheme has the approval of the BKKS, and a special discount has been negotiated with Lloyd's underwriters for members of the BKKS and other approved Koi societies. I suggest that anyone interested should contact **Farmer & Clark (Bristol) Ltd,** on **0594 564444; Fax: 0594 564084.**

AQUALIFE UPDATE

It is now only four weeks away from the first show of the season: **AQUALIFE 1993** on 3 and 4 April.

Although this show is billed as a "complete and unforgettable aquatic experience, with something for absolutely everyone interested in any and all aspects of the hobby of fishkeeping", from a Koi keeper's point of view, the centrepiece will be the **International Koi Show** (at the time of writing, pledges have been received from the UK, Europe, USA, South Africa and Japan) in which some of the best fish in the world will be on display.

Aqualife will feature some of the finest Koi outside Japan.

Hall 3 at the National Exhibition Centre, Birmingham (junction of M6 and M42) is where all this will be happening. There will be a lot going on for Koi keepers, so make a note of the date. The Koi show will, of course, attract many over the weekend, but so will the lectures. These are being presented on Saturday by **Dr David Ford** of 'Aquarian', **Dr David Pool** of Tetra and **Dr Andrew Worthington** of Cypriculture. It is also hoped to have an American Koi keeper to give a lecture on *Keeping Koi in the USA*.

A 420-seat arena has been arranged for the lectures and, in addition, for the 1,000-plus lots in the Koi Auction on Sunday, a rotating stage, TV camera and monitors will provide for all-round viewing of fish to ensure that nobody is disappointed.

More than 50 aquatic manufacturers will be in attendance, with stands designed to show off their latest products to full advantage. This event is being organised by **Shirley Aquatics** who can be contacted on **021 744 1300.**

WHAT'S ON IN MARCH

1 — **East Riding Section BKKS.** 7.30 pm, Grovehill PH, Holme Church Lane, Beverley. Contact **Brian Hebden** on 0482 711546.

Kennet Valley Section BKKS. Speaker is **Wayne Smith** of Clearwater Koi. 8 pm at Newbury Rugby Club, Pinchington Lane, Newbury, Berks. Contact **Bob Thompson** on 0734 713640.

North Lincs Koi Society. Speaker is **Peter Oakes** of A1 Garden Aquaria Ltd, with a talk on *Siporax and Nitrate Filtration.* 8 pm at the Brackenborough Arms Hotel, Fotherby, Nr Louth. Contact **Anne Mawer** on 0472 826605.

2 — **Yorkshire Section BKKS.** The Holme Leas Inn, Ossett, Nr Wakefield. Contact **Fred Harston** on 0226 722578.

New Forest Section BKKS. Monthly meeting is *AGM* at Tiptoe, Nr Sway. Contact **Mrs Chris Middleton** on 0425 272732.

3 — **Suffolk & North Essex Section BKKS.** 7.45 pm at the Prince of Wales PH, London Road, Marks Tey, Colchester. *AGM.* Contact **Dennis Preou** on 0371 856450.

Plymouth & District BKKS. 7.45 pm at the George Hotel, Plympton, Plymouth. Contact **Trevor Ridley** on 0752 690087.

4 — **Middlesex & Surrey Borders Section BKKS.** Contact **Joy Fraser** on 0737 844338.

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

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

7 — **Worthing & District Section BKKS.** Preston Scout Hall, Bognor Regis, Sussex. Contact **Steve Willard** on 0234 267893.

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

North Lincs Koi Society. Speaker is **Pete Chapman,** Chairman of the Yorkshire Bonsai Society. 9 pm at the Brackenborough Arms Hotel, Fotherby, Nr Louth. Contact **Anne Mawer** on 0472 826605.

9 — **Chiltern Section BKKS.** Speaker is **Wayne Smith** of Clearwater Koi. Contact **Ann Howard** on 0462 679315 or **Mike Reed** on 0525 375418.

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

10 — **Merseyside Section BKKS.** Speaker is **Peter Reeder** on *Spawning and breeding.* Millbrook Manor Restaurant, Knowsley Village. Contact **Phil Adamson** on 051 220 2970.

South Hants Section BKKS. Speaker is **Dave Rice** from Worthing Koi. 8 pm, Denmead Church Hall, Hambledon Road, Denmead, Hants. Contact **George Rooney** on 0420 473169.

11 — **East Pennine Section BKKS.** Monthly meeting. 8 pm at The Phoenix, Platts Common, Barnsley. Contact **John Timmis** on 0206 289507.

13 — **Heart of England Koi Society.** Warwick. *Koi Appreciation.* Contact **me** on 0926 495213.

14 — **Mid-Somerset Section BKKS.** *Dealers' Coach Trip.* Contact **Alan Purnell** on 0458 72132.

Central Section BKKS. Speaker is **Bernice Brewster** on *Fish Diseases.* T. P. Riley Community Centre, Bloxwich. Contact **Martin Lefevre** on 078571 5242.

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

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

Lea Valley and Harlow Section BKKS. Speaker is **Andrew Richards.** 3 pm in Halling Hill Common Room, Harlow. Contact **Barry Ford** on 0279 419101.

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

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

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

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

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

British Koi Keepers Society. *Annual General Meeting.* The Moat House, Northampton. Contact the General Secretary, **Mrs E Donlan** on 061 643 9107.

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

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

South East of England Section BKKS. Monthly meeting starts at 2.30 pm at the Community Centre, Chelsfied, Kent. Contact **Mick Wright** on 0634 7128943.

Herpetology Matters

(Continued from page 83)

CRESTED NEWTS

Aquarist & Pondkeeper reader **Alexander Ewing** has recently contacted me regarding a pond survey he is conducting in Kent. Alexander has visited a total of 32 ponds recorded on Ordnance Survey maps in the Tunbridge Wells area to evaluate them as potential amphibian breeding sites. Out of these ponds, only 21 were suitable for the following reasons:

Six ponds had dried out;
Two ponds were choked with vegetation;
Two ponds had been drained for building development;
One pond had been drained for agricultural purposes.

This loss of natural ponds confirms the increasing importance of garden ponds as havens for amphibians.

During his survey, Alexander was particularly interested in the occurrence of newts. Britain's two smaller indigenous species, the Smooth Newt (*Triturus vulgaris*) and the Palmate Newt (*T. helveticus*) were fairly widespread, being comparatively frequent colonists of garden ponds. However, our largest species, the Great Crested or Warty Newt (*T. cristatus*) was only present in one pond surveyed.

Alexander would be grateful for the help of fellow *A & P* readers in assessing the current distribution of Great Crested Newts. He would be grateful for the following information:

(i) Positive identification of *T. cristatus* colonising and breeding in artificial garden ponds;
(ii) Details of the approximate length, width and depth of the pond;
(iii) Description of any vegetation present;
(iv) If any species of fish are present.

Send your details to **Alexander Ewing, Crested Newt Survey, c/o Aquarist & Pondkeeper, 9 Tufton Street, Ashford, Kent TN23 1QN.**

All information will be treated confidentially and will be incorporated into the National Amphibian Survey which is being co-ordinated for English Nature by Leicester Polytechnic.

Regular readers may remember that I drew attention to the National Reptile Survey in October 1990's **Herpetology Matters.** Many *A & P* readers provided invaluable information for this survey and your continued support would be much appreciated.

Letters

Bangor's Captive-bred Plans

The fish and crustacean nutrition research unit based at the School of Ocean Sciences here at Bangor, has spent many years developing techniques for the culture of marine organisms for the aquaculture industry. In particular, the School is a leader in the development of new techniques for the feeding of tropical prawn larvae.

Several prawn species have been successfully spawned in the School's tropical facilities which have been largely funded by industry. For instance, during the last 12 months an excellent broodstock system has been established for the Indian Prawn, *Penaeus indicus*, which now supplies the research teams with literally hundreds of thousands of larvae on demand.

In recent months I have noted that your publication and several others have carried articles that have mentioned the lack of UK breeding programmes for marine tropicals and the problems encountered by some hobbyists who witness unexpected spawnings of exotic species in their home aquaria. Given the success of our work in breeding tropical species for aquacultural-orientated research, my colleagues and I have decided to initiate a research programme into the breeding of specific species of interest to the aquarist trade.

My own work frequently takes me to countries such as Indonesia which, as you will be aware, supply the aquarium trade with considerable quantities of animals every year. Last year, in South Sulawesi, I surveyed a large number of coral reefs to find a suitable site for the production of Giant Clams (*Tridacna*). The devastation of the reef communities was enormous. Although much of this damage was due to dynamiting the reefs for food and building materials, the collection of reef animals for the aquarium trade was clearly another source of pressure on an already highly stressed environment.

You may appreciate that when a coral reef is over-exploited for one particular industry, the additional pressure from several other, more minor, forms of exploitation become more important with regard to sustainability of the reef system.

Irrespective of the 'environmentally green' collection methods that some livestock importers might impose on their suppliers, it will be extremely difficult, if not impossible, to actually implement such regulations in many Third World Countries. Therefore, I believe that the aquarium trade will continue to have a significant impact on the natural resources of coral reefs to the detriment of both the reefs and the majority of people who are directly dependent upon such areas.

This may be particularly so when you consider the current growth rate of the hobby in Europe alone. Is it feasible that the import of tropical marine invertebrates and fish species will eventually become restricted by self-imposed regulations of the airlines themselves? After all, public pressure was quite effective in curtailing a proportion of the exotic bird trade to Europe.

In order to partially counter the sometimes adverse comments about the marine fish and invertebrate trade, I believe that considerably more effort should be applied to generating production of marine species in the UK. There is an enormous wealth of knowledge and facilities available at Menai Bridge which could be used to exploit an area of research with considerable commercial potential for those companies currently involved in this trade.

My own personal interest would be to use the expertise gained at the expense of the aquaculture industry to promote R&D (Research & Development) with a potential conservation goal. Hopefully, this should be of interest to everybody who participates in the keeping of marine tropicals.

I should be most interested to hear the views of any readers who may be able to help us with our project.

David J Fletcher (PhD),
School of Ocean Sciences,
University of Wales,
Bangor.

JOHN DAVIS

Captive-bred clowns (two species) on show at Florida's Seaworld.

Bishop Auckland & Wear Valley Thanks

On behalf of Bishop Auckland & Wear Valley Aquarist Society, I would like to thank you for your help with and donation for our Auction.

At the end of the very first National Aquatic Charity Auction (held on 15 November), our society raised a grand total of £1,900. The money was presented to the BBC Children in Need Appeal, Newcastle.

We would also like to take this opportunity to request that you publish a thank you in your next issue to all the aquarists and companies who supported us in this great event.

John Corrigan,
Show Secretary
(BAWVAS)

Aquarian/ Aquatop 'Expert' Competition

Thank you so much for fulfilling my wish, as a result of which I have a new tank with Fancy Goldfish. I am so lucky to have won your September competition and be advised by an expert (Dr David Ford) — so wise — who set up the tank with rocks and plants, filter and pump, and a light to enhance the overall scene.

A nice aquarium! Thanks to **Aquatop** and **'Aquarian'** as well.

Jackie George,
Nottingham.

The Mail Order Debate (Part 2)

Don't Blame Mail Order

It would seem that the Mail Order debate is losing direction. Not only are we accused of discounting dry goods and making sales to the detriment of retail aquatic shops, but we are now also being held responsible for fish losses and unhygienic operating procedures by some less professional and amateurish aquatic dealers. This is

absolute nonsense!

We are also accused of being a non-caring and mercenary branch of aquatics. This is far from the truth. Much of my day is spent on the telephone answering customer queries on every aspect of fish keeping, both on equipment and fish problems — a job, incidentally, which I enjoy.

With regard to the time-honoured discussion regarding the pros and cons of centralised systems versus individual tank filters, surely Mail Order companies such as ours cannot be blamed for whichever system is used successfully or otherwise as indirectly suggested by Mr Lee-Son (**Letters,** Jan '93). The fact that dead fish are seen in some shops has nothing to do with the type of filtration used, but is more likely due to the lack of essential maintenance of the system concerned.

On the question of supporting the livestock side of the aquatic trade, Mr Lee-Son could also not be further from the truth. Although I am not able to speak for other Mail Order companies, Top-Up Aquatics does have a retail fish side to its business and, although only small, with approximately 60 tanks, it is to be increased to some 200 tanks in its new shop to open shortly. We purchase our fish from an OFI affiliated supplier and pay a 1% levy on all fish stocks purchased. Perhaps Mr Lee-Son also does!

So, come on, don't blame Mail Order companies for the inadequacies of failing aquatic shops. We are here to offer a respectable and professional additional arm to the trade and, in some isolated locations, are the only practical way some aquarists can obtain supplies without undertaking long and expensive journeys.

Graham Pear,
Proprietor,
Top-Up Aquatics,
Congleton,
Cheshire.

Rare as Hen's Teeth

In response to the ridiculous assertions made by Animal House (**Letters** — Jan '93) that companies such as theirs do no harm to the genuine aquatic trade, please consider the following reality.

Of the four million plus people in this country who own fish, only some have the good sense to read *Aquarist & Pondkeeper*. The point is self-evident: the bulk of the market remains one-gallon goldfish bowls, one-foot plastic tanks, and a 'disposable' attitude to livestock. This side of the 'business' should be ended, and if fish had fur, it would have been many years ago.

The market which The Art of Fishkeeping represents is, by definition, a very small proportion of the total, in the order of a few per cent. This market is concerned with *real* fishkeeping, with no tanks of less than ten gallons, proper power filtration, and no novices let loose without a lecture on the nitrogen cycle. This type of shop is being murdered by the 'less than one per cent' of trade taken by the Mail Order companies, which translates into a massive loss of dry goods sales and margins in our market.

Such companies take practically all marine salt sales in the UK. Indeed, it is interesting that no Mail Order company is interested in purchasing any of the many struggling or successful purely aquatic shops of today. The reason is one of economics, not "concern for the future of the hobby". The cost basis of a shop that incurs the cost of supplying fish, is far higher than a big shed that does not. The argument from a warehouse is a hollow one. Good aquatic shops are as rare as hen's teeth, and are run by fanatical aquarists for the love of fishkeeping. It is wrong that, for the sake of a quick buck, their future should be jeopardised.

From a personal point of view, our shop reached a level of livestock quality that will never be matched by a Mail Order company that has operated for years without even a fish sales tank. Our shop has never received a complaint on such matters. It is widely regarded as 'immaculate', and has gained great respect for its concern and professional advice. Its running has entailed great personal sacrifices for myself and Elsa, and as a successful entrepreneur elsewhere, and an honours University graduate, has hardly suffered from a lack of business knowledge.

The reality is that the present market structure is a con, and must be changed. There is no such thing as a free lunch, and typical £200 p.w. electricity bills for even relatively small shops, plus labour and feed charges, must be paid for in the long term. The cost should be spread evenly over all real aquarists who wish to see the continued existence of good-quality fish and advice from local aquatic shops. The welfare of fish must be paid for, or the EEC will be fully justified in regulating the trade out of existence.

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

Co-existence is the Key

Having read the letters published in *A&P* in January '93 on the subject of Mail Order, I fail to see why "personal shopping" and "postal shopping" cannot co-exist. They seem to work well enough in other areas of commerce.

As a hobbyist, I believe in supporting my local supplier. You don't need to be 'Brain of Britain' to realise that this is commonsense. However, we are not all fortunate enough to live close to reputable suppliers who carry large and varied stocks sufficient to our needs.

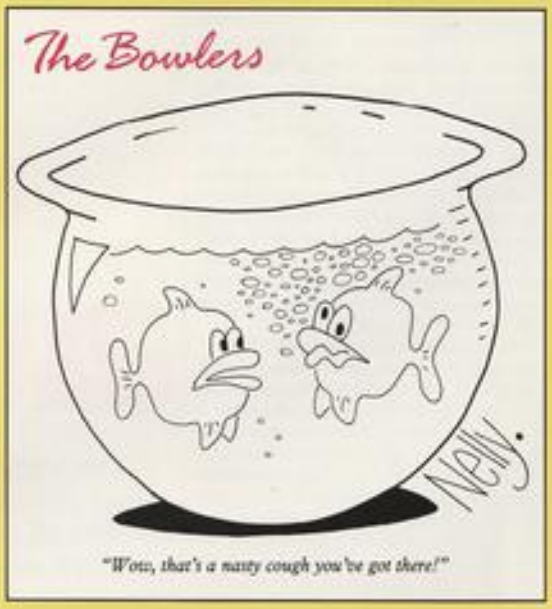
Take, for example, one instance last year when I required some not-very-unusual items. I live in the middle of Norfolk, my nearest worthwhile suppliers being about 20 miles away. So off I went. My first and second ports of call produced nothing. The third was slightly better. It didn't have what I was looking for, but I purchased an alternative to one of my requirements 'just in case'.

After one more fruitless stop, I decided enough was enough and returned home, having completed a round-trip of over 60 miles.

As a last resort, I telephoned a well-known Mail Order company (one which advertises on green pages in this magazine). The gentleman at the other end of the phone was very pleasant, very helpful, and understood exactly what I wanted. The whole discussion took only three or four minutes, and the actual stuff arrived by post two days later.

Now, I am not suggesting that this sort of performance is a regular occurrence, but it isn't unique either. Of course, we must support our local dealers; unless we do, they will disappear. On the other hand, don't let's get pious about it. Mail Order has got me out of a muddle more than once, and I will continue to use it when my local aquarist shops fail to provide.

Alex Stephenson,
Dereham,
Norfolk.



"Wow, that's a nasty cough you've got there!"

A BAGFUL

Thailand-based **Galen Harris Valle** found himself the owner of a collection of fish he didn't expect. However, they sparked off an unusual, fascinating and eventually rewarding trek in search of the elusive 'truth' about Fighters.

Paintings by Thai artist John Gallery — Photographs by the author

"Tell him my fish don't die." "His fish don't die." "Tell him these Discus are selected." "He selected those Discus." "Tell him if there is something wrong with them to bring them back and I'll fix them." "His fish have a one-year limited warranty."

The guy bought the fish. I expected the proprietor of my local fish shop to be so grateful that he would finally break down and sell me a 100-gallon aquarium on credit, with no interest, to be paid for in easy monthly instalments. He gave me a bag of Bettas . . . !

'HATEFUL' BETTAS

"These are for you," he said, with approximately the same expression on his face as that of my last landlord when he returned the deposit on my apartment. "These selected Bettas are beautiful!"

Looking into the large bag of slowly moving shimmering bright colours, I had only one thought: "I hate these fish!"

Having lived in Thailand for several years, I have had a great deal of experience with Bettas. A male Betta is an exceptionally beautiful fish with a sour, petulant, nasty expression on its ugly little face. It is a fish that will often kill its mate — and sometimes itself — when spawning. It is so aggressive with other males of the same species that it will occasionally inflate itself like a balloon and splatter itself over all of the sides of its tank if you even show it a picture of one.

It is a fish that is so timid with fish of other species that it can be killed by Guppies. The Betta spends days doggedly guarding its eggs so it can turn around and eat its young. Many of those bred in Thailand eat only mosquito larvae, which is the most annoying — and potentially dangerous — of all live foods.

EVERY HOME SHOULD HAVE ONE

Everyone should have a Betta (*Betta splendens*). Not being one to turn down anything that is free, I was then faced with the problem of where to house 60 Bettas that were currently trying to playfully disembowel each other inside a plastic bag. In a rare moment of co-operation, the benevolent aquarium shop proprietor suggested I buy a large earthenware pot of the kind used in rural Thailand to store water. They hold about 40 gallons and look rather like a gigantic salad bowl with a dragon painted on the side.

"They won't kill each other?"

"My fish don't kill each other."

I bought the pot from him. I added a Pleco, some gravel, a lot of rocks, and some plants. He suggested I used old water, so I filled it with very old water from my household storage tank.

The pot and the fish were then placed in a shady part of my yard. No filtration; no aeration. Bettas can live in nearly stagnant water, and the water movement at the surface caused by the fish trying to kill each other would provide what little oxygen was needed!

OF BETTAS

According to many Thais, the more rotting plant matter in the tank, the better the conditions will be for breeding. Much to the disdain of my shopkeeper friend, I did provide partial water changes every couple of weeks, and made it a point to replace any water lost to evaporation (a substantial amount).

This set-up was a success. The key was to have enough plants and rocks for the less dominant fish to hide, combined with the fact that the fish were less than a month old when put together.

A three-month-old Betta can spawn, and in order to avoid a possible blood-bath in my salad-bowl-cum-aquatic environment, I went back to my friendly fish shop for advice.

"My fish will spawn anywhere!" he pronounced.

Thank you very much.

ROAD SEARCH

I decided to take my queries on the road to some of the mountain villages near the Burma border where fish fighting — all fighting, actually (!) — is still common. Although not nearly as popular in the northern parts of Thailand as it is in the central area, fish fighting is well known — especially among the villagers of Chinese origin — and I did find some answers to my questions.

The advice I received ranged from practical to barely lucid lunatic ravings. The more interesting advice follows.

Male Bettas in Thailand are generally kept in one pint whisky bottles. To most Westerners, the idea of keeping any fish in a whisky bottle would be considered inhuman and could be compared to being forced to spend the rest of one's life living in a low-priced Tokyo hotel room.

However, contrary to the cramped conditions in which they are kept, these fish spawn, and this practice is by far more common than the usual western practice of keeping one male and several females together in a large tank. Although this "Western Way" is not unknown among more modern-thinking, small-scale and commercial breeders, the "Traditional Way" is generally preferred. In any local aquarium shop, one can see rows of whisky bottles — sometimes hundreds — each housing a single male Betta.

CHOOSING AND TRAINING 'FIGHTERS'

Regarding the care and breeding of 'fighters', there are as many opinions among breeders as Bettas have colours. However, the ground rules seem to be universal.

Fighters are selected by the formation of the mouth and the shape of the tail; a large upturned mouth, and a well defined web-shaped tail are the characteristics of a champion. The long-finned varieties are vulnerable to fin biting, and the round-tailed fish are known to be timid.

Colour is not generally taken into consideration. However, some breeders do have

individual preferences — a breeder named Dang (Red) would naturally favour a fish of the same colour, or one may choose a fish of the same colour which was outstanding in a recent dream.

To begin training, a fish should be less than one year old, and it should not have been allowed to spawn. Training consists of teasing (tormenting?) the fish with a black-tipped rod. If this is done daily, the fish will soon learn to attack anything — even Guppies — without hesitation.

A few days before a fight, dry banana leaves are put in the fish's bottle. Reportedly, this practice makes the fish more aggressive. One possible explanation for this is that the chemicals present in banana leaves could dramatically alter the water's pH, resulting in a crankier than usual fish.

UNEXCITING FIGHTS

The actual fights take place in cylindrical glass tanks which hold about two gallons. The fights are generally small affairs attended by the principal bettas, with few other spectators. Fish fighting is rather unexciting when viewed from a distance, and the venue could be anywhere from someone's sitting room to a shop, with several fights going at the same time.

Fights begin with the kind of erect fin displays and side rubbing often seen between male cichlids, and last until one fish stops fighting and assumes a submissive position at the bottom of the tank. Biting is focused on the tail fins and gill area, and few fights are to the death, although many fish die afterwards from shock.

After a fight, the fish must rest for several weeks before fighting again. Reportedly, a true champion can fight for years if sufficient R & R (rest and recovery) is given between fights.

THAI BREEDING TIPS

When it comes to the breeding of these fish, it is widely known in Thailand that a female will begin egg development at the mere sight of a male. Therefore breeders are almost universal in suggesting that the male and female be kept in separate bottles placed side-by-side for three weeks, giving the female time to develop her eggs.

Nothing should be done during the three-week period, with the exception of adding food. No water changes. During this time, another bottle should be prepared with water and rotting plant matter to provide the soupy, semi-stagnant environment that Bettas prefer for spawning. When the eggs have visibly developed, both fish should be put in the breeding bottle. The separate bottle is necessary to avoid territorial problems which often result in the death of the female.

My over-sized 'salad bowl' Fighter breeding set-up. So far, it's working pretty well.

The female should be removed after spawning, leaving the male to care for the eggs. The eggs will take about four days to hatch and no food should be given during this time. [*This is over twice as long as for 'aquarium'* Betta splendens. *It is therefore possible that the four-day period may include both hatching itself, plus the time taken for the fry to become free-swimming.* Ed]

Two days after the eggs have hatched, the male should be removed, and *Daphnia* should be fed to the fry three to five times a day. Successful spawning with Bettas is quite difficult and the pair often kill each other. However, Betta spawning behaviour is some of the most interesting of all aquarium fish, and it is well worth the effort.

Alternative Approach

In my experience, the method above is the most successful. However, there is a common variation that I am somewhat (read: very) sceptical about. This method is the same as the one above, except that during the three-week egg development period, a life-like drawing — of whatever colour one chooses — is substituted for the male fish.

Typical shop-window scene in a Thai shop offering Bettas for sale.

A male is then added for the spawning. Reportedly, the fry will have the same coloration as the drawing, regardless of the colour of the male used. This may well be worth a try for open-minded aquarists interested in selective breeding!

Hormone Manipulation

There is another practice which I will describe for information's sake. However I do not recommend it. Bettas have enough personality problems, and they should not be subjected to the additional strain caused by hormone manipulation.

The thought has crossed the mind of virtually anyone who has seen a male Betta, that it would be nice to have a whole tankful, if it were not for the fact that they would rip each other's throats out and explode all over the place. Females can be kept together, though, and it is possible, through the use of hormones, to breed females with the same coloration and finnage as males, but retaining all the other aspects — sexual and behavioural — of a female fish.

A mixture of 10mg Hydrotestin (a male hormone) is added to 50ml sterilised water and kept in a refrigerator. When the fry are three days old, 1ml of the mixture is added to 1 teaspooon of *Daphnia* (or other fry food) once a day for 10 days. After 10 days, the dosage is doubled to 2ml, twice a day, until the fish are 16 days old. The result of this Frankensteinesque practice is female fish which physically resemble males, and can reportedly be kept together (See also **Dr Ian Winfield's** item on non-aggressive Bettas in this month's instalment of **Paper Round.**)

[**Note:** *I got this information from a Thai who did not speak English, and I have been unable to find this drug in any reference books at my disposal. Thais often do not pronounce the "d" sound, so it could be Hyrotestin or Hydrotestin. The correct spelling (I suspect) can be found in a current Physician's Desk Reference.* **G.H.V.**]

The general consensus from the breeders I spoke with was to leave the fish alone, don't worry about water quality, and remove the female after spawning. These other practices are interesting to know about, and may lead to some more refined variations from western enthusiasts. Meanwhile, spawning is occurring in my over-sized salad bowl with — so far — minimal bloodshed, and I am still trying to work out a way to get that 100-gallon tank on credit . . . **asp**