

FEBRUARY 1988 95p

AQUARIST

AND PONDKEEPER

FISHKEEPING AT ITS VERY BEST. ESTABLISHED 1924

COMPREHENSIVE
SUPPLEMENT ON
TROPICAL
FRESHWATER
AQUARIA

Concrete
and Koi

GOLDEN
THICK-LIPPED
GOURAMI

Octopus
at the zoo

£500

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AQUARIST

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FISHKEEPING AT ITS VERY BEST. ESTABLISHED 1924

FEBRUARY 1988

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COVER STORY

Photograph by David Sands
The Giant Red Tail Catfish (*Phractocephalus hemiokephalus*) is one of those relatively few large fish that appear to be just as colourful when adult as when young. This species can, reportedly, grow to around 48 inches and is regarded as an important food fish in its native South America. In the aquarium, Giant Red Tails will feed on prawns, crabs, large worms and whole or chopped up fish. According to correspondence between David Sands and Dr. M. Boeseman (former Curator of Fish at the Rijksmuseum of Natural History in Leiden), it seems that the proper name for the Red Tail should be *Pirarara*, rather than *Phractocephalus*.

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HUSA ZUKAL

If only my *Nannacara*s had behaved like this . . . but they didn't!

AND THEN THERE WAS ONE

Amanda Grimes completes her "anomalous" saga.

Whether Scrapper was simply a "rogue", or whether his aggression resulted from his long isolation, can only be left to the experts; suffice it to say that he became the bully of the community tank. If he was an excellent dancer, he was also a hoodlum — and Nan was suffering.

Reluctantly, we gave him to a friend and installed a new male who was so lacking in personality that he never got a nickname. He was the very opposite of Scrapper — quiet, unassuming and a good breeding fish.

He and Nan set to with determination. They bred in coconuts, flowerpots and on large rocks — always in the community tank. When installed in a breeding tank, they didn't want to know, so we resigned ourselves to taking the eggs from them. And each time we did this, the eggs fungused . . .

Then we took Nan with the eggs, reasoning that it was her lack of cleaning and sweeping the eggs with water that caused the fungus. Nan and eggs would be placed carefully in the raising tank — where she would either eat or ignore them.

After months of frustration, we noticed that Nan and her male were carefully cleaning a huge piece of bogwood; for small

fish, they think big! This wood could only be placed in and removed from the tank by virtually dismantling the top cover — and removing it with a covering of water to protect the eggs would have been impossible. It was then that Colin had a brainwave . . .

The fish were favouring a ledge of the wood on the lower, smaller side. He removed the wood, sawed through just beyond the ledge, drilled two horizontal holes in either side and hammered in two short lengths of stainless steel rod. He then improved the ledge by levelling and enlarging it. He eased the wood together using the concealed rods (to enable us to separate the "egg shelf" from the main body of bogwood) and returned it to the community tank . . . The fish spent the next five months cleaning everything in sight — except their "shelf".

We had almost given up hope and were busy setting up another four-foot tank when a frenzy of activity drew our attention to the wood. The male *Nannacara* was seeing off any fish that dared approach, while Nan was laying a tightly-packed clutch of small, brown eggs on the "shelf". We left the male fertilising them and collected bags, nets, siphon pipe and watering can. A desperate bid to save the eggs began; with me catching Nan and lowering the severed shelf

into a large bag of tank water, while Colin feverishly siphoned water out of the community tank and into the raising tank, which was about 24in x 8in x 8in. We installed Nan and wood and waited.

Nan lost her bearings completely and it took her an agonising 40 minutes to find her eggs. The wait was worth it. Gone was a rather dull, brown fish and in her place a glowing black and white checkered mother in full brood colours; she was gorgeous!

We sat back in delight, well pleased with ourselves and full of admiration for this tiny mother. We watched her clean her eggs. We watched her wander off to investigate the tank, racing back at any movement on our part to defend her brood. We watched her lose her colour when she forgot where they were, and then flush black and white when she found them again. We watched her lose interest and, finally, ignore them . . . We removed her.

The eggs started to fungus. With infinite care, I removed them, clearing a way for those that were still brown. One by one, the eggs were removed until there were a bare dozen left. Then, overnight, they went white and furry and, with a sigh, we set about cleaning the wood.

It was Colin who found the one empty egg case. With a magnifying glass, we worked slowly round the small tank — and there, under the heater, was one tiny pinhead of *Nannacara* life.

At this point you might think that turning over a tank to one minuscule fry was a waste of time and a disappointment. Well, yes, there was a sense of dismay that we wouldn't see any brood care, but so many months had gone by that the sight of this one tiny life had an instant result — I went black and white checks all over.

My only child was spoilt something rotten. She was treated to the very best of foods, couldn't have had more attention — or room — and grew so fast that she was a full-sized female before Nan had tried another two broods. She developed into such a friendly, happy fish that you only had to walk in the room and she'd come flying over to see what was going on. She took food from the hand and swam happily with a small, young shoal of Silver-tipped Tetras I'd put in her tank to keep her company.

Fishkeeping has brought me many emotions — despair, elation, amusement, confusion, hilarity and frustration. But there is only one fish that has brought me such a feeling of pure, parental love — Nan's daughter.

I would like to thank those readers who wrote in about my feature "In Sickness and In Health" (October 87). The subject of the humane disposal of fish is, we feel, so important that I will be writing a follow-up feature, including your letters and comments from the experts as soon as possible. If, in the meantime, you still have something to say on the subject, please write to me c/o the magazine —

Amanda Grimes.

PRODUCT ROUND-UP

By Dick Mills

PUTTING ON THE AQUARIUM FURNITURE STYLE

Not too many years ago, no matter how hard you tried to disguise it, an aquarium was always an angle-iron clad glass box. Nowadays, since the introduction of all-glass aquariums, it has become much easier to house them much more elegantly and there is a rapidly growing number of suppliers of aquarium-furniture. The following review looks at what's available in the decorative style of tank enclosures, but does not cover those 'total systems' in which the entire aquarium technological hardware is also built in. Another point to consider is that all these units are ready-built, not sold as 'flat-packed', so some financial allowance will have to be made for transportation to your home. Although some indication of likely prices is given these may vary and should not be taken to be absolutely accurate.

WOODCRAFT

The easiest method is simply to add decorative surrounds or a tank stand to your existing aquarium, and this is well catered for by D. A. WOODCRAFT who provide decorative stands for 'standard-sized' tanks — 2, 3 or 4 foot long by 12 inches front to back. The

range covers a basic decorative stand, and 1 or 2 cupboard variants. Matching hoods are also available and can be in either a basic or a hinged form. Finishes for the all-wood constructions are plain, satin-finished or varnished, the last two being made to special order. Prices for the stands start at around £50.00 with the hoods starting at around £12.00. Free-standing LIVING LANTERN units, complete with lights and tanks, are also available in heights of 16", 18", 24" and 30". Other dimensions range from 8" x 8" (16" high), 12" x 12" (18" and 24" high) and 15" x 15" (30" high — does not include lights).

Full details from: D. A. WOODCRAFT, 225 Folds Road, Bolton BL1 2TW (Tel: 0204 34343).

LORRAND

LORRAND is a relatively new name to aquarium furniture but aquarists will have seen their products at the BAF and Sandown Park ('Aquarian') shows last year. Made from formica-covered or wood-veneered high density fibreboard, they have the advantage of minimising the swelling effect likely to be found in the damp conditions surrounding the normal aquarium. The interior of the cabinets is a neutral beige colour and matching hoods are glass-lined, again a precaution to cut down condensation damage, and with easy access for lighting wires, etc. The range is quite large, starting from a 2ft size at £80.00 up to the hexagonal, 30-inch diameter, 50-inch high at £402.00. Details (including enquiries from prospective agents) from LORRAND, Unit 24a, Osborne Mill, Osborne Street, off Featherstall Road, Oldham, Lancs. (Tel: 061 627 0538)

JOHN ALLAN

JOHN ALLAN, after much investment research, have also entered into this expanding

market with decorative vinyl-coated chipboard stands, aquariums and hoods. The range of finishes includes Teak, Mahogany, Oak, Dark Oak, Black Vinyl and Walnut. Sizes range from 24" to 72". Height of stands is 24". Non-standard shapes available such as a 5-sided Delta and 6-sided Panorama. Multilux hoods are available in matching finishes. Details from JOHN ALLAN AQUARIUMS LTD, Eastern Way Industrial Estate, Bury St Edmunds, Suffolk IP32 7AB. (Tel: 0284 5051/2/3.)

TAHITI

TAHITI AQUARIUMS' MARINA CONCEPT is developed from their popular, smaller, aquarium range. Three, as yet to be formally named, ranges are available — the BASIC (24"-48" in six sizes, £78.40-£129.50), STANDARD (30"-48" in five sizes, £122.50-£171.50) and DELUXE (36"-72" in twelve sizes, £149.60-£294.00). The Basic range comprises a tank mounted on a simple carved stand, the Standard has a central storage cabinet, while the Deluxe has two storage cabinets. The larger sizes in the two bottom ranges and most Deluxe aquariums are subject to order and 2 weeks delivery. Contact TAHITI AQUARIUMS, 60 Stockport Road, Ardwick, Manchester M12 6AL. (Tel: 061-273 7555) for full details.

AQUA JOINERY

AQUA JOINERY LTD has twelve magnificently furnished tanks. Ranging from the 19" eight-sided KENT, through the 21" cube-shaped DEVON, the 36" L-shaped HAMPSHIRE, to the 48" bow-front SURREY and beyond to the ultimate 54" BERKSHIRE, CORNWALL, LINCOLN or DERBY. The beneath-tank storage space is available in various wood trims and, depending on model, with hinged or sliding doors. Tank finishes are to match and come

complete with hinged hood and sliding cover glasses. Full details from: AQUA JOINERY LTD, 8 Boulton Road, Reading, Berkshire RG2 0NH. (Tel: 0734 312077).

CASTLEMERE

CASTLEMERE have unashamedly gone for the higher-quality top end of the market with their AQUATIC CLASSIC range. Their cabinets feature Old Oak, Mahogany and Yew wood veneers on a reconstructed wood base. Construction features include in-built recess for polystyrene cushioning, and bevelled edges to the tanks. Tank sizes are 39" and 48", each cabinet being an individual item not being mass-produced. The standard design is for a double-cupboard and centre-shelf configuration forming the beneath-tank support. Above-tank hoods can be ordered either as standard depth or extra-deep to accommodate the Tunze filtration system. Naturally, the superlative finish and craftsmanship are reflected in the prices; the 39" Tunze compatible model retails at around £620.00 while the 48" Yew set will set you back £763.60. Watch the Company's future advertising for developments or write for full details to: CASTLEMERE, Homeead Farm, Ongar Road, Standon Massey, Essex CM15 0LD. (Tel: 0277 824011)

SEABRAY

SEABRAY aquariums have been setting standards in aquarium furniture building for many years and may be instantly recognised (apart from their consistently high quality) by the discreet gold sticker fixed on the top trimming. A further distinguishing feature is that there are no heavy separate hoods to the tanks; the decorative top trim is stuck directly onto the top few inches of the tank itself; a matching trim is stuck to the bottom inch or so all around the tank, and both



AQUA JOINERY

The Norfolk, one of Aqua Joinery's many attractive County Collection designs.

these trims effectively hide the give-away line of sealant. The hinged lid conceals the sliding, buffer-stopped cover-glasses and fits neatly into the tank top. Single or double cup-boards, shelves, matching handles and black trims are all well known Seabray trademarks. The six available wood finishes include Medium and Light Teak, textured Medium Oak, Black Ash, Rosewood and Mahogany, and there is also a trim available in hammered Copper.

Five-sided and L-shaped corner cabinets, free-standing Cube and Hexagonal designs are exciting additions as is a slope fronted variant in the DOLPHIN range (ideal for



Seabray's free-standing hexagonal aquarium and stand.

'flash-free' photographs?). As a refinement to the design of the DOLPHIN range, the GEORGIAN range offers extra decorative mouldings fixed to cabinet and tank trims in the same wood finishes. For the aquarist with amphibious or reptilian interests a Seabray vivarium is also available.

Much concerned with both the technology and safety of aquarium furniture, all Seabray tanks are glazed with correctly-sized glass (up to 19mm glass is used from stock to make larger tanks and 6mm glass is limited to tanks with a water depth of 17" maximum). Similarly, useful practical advice is always readily given — for instance, the use of

expanded polystyrene slabs as 'cushions' is much preferred to the sheets of 'bubble-plastic' sometimes recommended. Full-colour brochure available from: SEABRAY, Unit 1a/1 Tunnel Estate, 726 London Road, West Thurrock, Grays,

Essex RM16 1LS (Tel: 04026 4425).

Finally, with our Editor breathing down my neck, an advance apology for no more than a brief acknowledgement that AQUATOP are also very much

involved in aquarium furniture, but with deadlines more than just looming (!) it wasn't possible to track down sufficient information for this particular Round-Up. Details will, hopefully, be furnished (pardon the pun) in a future issue.

NEW PRODUCTS



COLOURFUL SLEEVES

Fed up with trying to hide the aquarium hardware, especially that heater/thermostat unit? ALMAC SLEEVING SYSTEMS have come up with the answer by providing shrink sleeving decorated with a six-colour photographic representation of water plants, rocks, etc. These have been fitted to SPRINGFIELD'S Mariner 2000 combined heater/stat units. A small window in the covering allows for visibility of thermostat contacts and neon indicator lamp. The heat-resistant sleeves will accommodate three different sized units and a three-colour bubble-pack display should make them unmissable at your dealer.

ALMAC SLEEVING SYSTEMS, Church Lane, Bisley, Surrey GU24 9DR (Tel: 04867 88005).

SPRINGFIELD ELECTRICAL CO., Dean Street, Marlow, Bucks. (Tel: 062 84 71213)

UNIVERSAL FOOD

We all appreciate that fishes' nutritional requirements are quite likely to be different to our own, but how different are they to each others? According to research carried out by WATERLIFE RESEARCH INDUSTRIES, fishes have the same basic needs whether they be freshwater or saltwater, tropical or coldwater when it comes to flaked food — only the relative quantity needs to be



adapted, depending on temperature and species.

This startling discovery has led to a new flake food being developed by WATERLIFE RESEARCH INDUSTRIES LTD. Named UNIVERSAL, the flake food is specially formulated to promote growth, health tone and disease resistance; it contains only the 'finest, tastiest and freshest ingredients' and is specially packed to prevent botulism occurring even in the most humid conditions, such as a space-heated fish-house. The non-water-fouling food is de-

signed to be well accepted by all flake-eating fishes. A sachet of silica gel included in each pack ensures total freshness and eliminates the need for the aquarist to keep a number of different pots of food, each slowly decomposing with the risk of botulism occurring. Recommended retail prices are, 20g size £1.25, 50g, £2.52, 100g, £3.75 (all plus VAT). Full details from WATERLIFE RESEARCH INDUSTRIES LTD inc SEAQUARIUMS, Bath Road, Longford, Middlesex UB7 0ED (Tel: 0753 682487)

NEXT MONTH

As spring hits the air, we welcome in the coldwater season with special Focus features on the world's most popular pet, the Goldfish.

- What is a Goldfish? This deceptively simple, but intriguing question is tackled by John Dawes
- The secrets of successful Goldfish fry rearing are revealed by Pauline Hodgkinson.
- The ever-popular and 'controversial' Oranda forms the subject of a stimulating Spotlight feature by Stephen Smith.

In addition we have part one of a superb £2,000 competition sponsored

by Lahaina in which you can win a spectacular and revolutionary



KAILUA Living Reef Aquarium System.

Don't miss it! Then there are special features on reptiles, amphibians and Koi plus a host of other top quality contributions, including our ever-popular regulars to round things off. So place your order early and enjoy the opening of the coldwater season in style with A&P.

News

Brighton Festival date

The historic Corn Exchange in Brighton is to be the venue of the Brighton Festival of Fishkeeping on 29-30 October, 1988.

This show is being sponsored by Interpet Ltd., on behalf of the Mid Sussex Aquarist Society, one of the leading aquarist societies in the UK under the dynamic Chairmanship of John Smith, with support of the Federation of British Aquarist Societies (FBAS). The show is being professionally organised by a team from Dog World, who are responsible for the highly successful British Pet Industry Exhibition which has just moved after 25 years from the Harrogate Exhibition Centre to the NEC in Birmingham.

The Brighton Festival of Fishkeeping will have several unique features designed, both

ADVANCE NEWS

to encourage new people to enter the fascinating world of fishkeeping, and to give a helping hand to existing fishkeepers. This will be combined with the Mid Sussex Aquarist Society's Open Show which will be open to entries from all over the country, and with the FBAS Jubilee Dinner. There will also be a limited number of trade stands and a heavy demand for these is anticipated.

Brighton is an ideal venue for this festival and its surrounding events. The town is well served by good roads which make it accessible for the whole of the South East of England. The journey time by train from London is less than an hour, so making an attractive day out for anyone living in the Capital.

The M25 provides ready access for any aquarist travelling from the North and there is adequate accommodation in Brighton over a wide price range for anyone wishing to stay. The FBAS has selected Brighton for its Jubilee Dinner at the same time as the Fishkeeping Festival since there are good banqueting halls there which give far better value than is available in London.

Further details will be announced shortly. Societies wishing to participate should contact John Smith at 27 East-hill Drive, Portslade, East Sussex, BN4 2FD. Companies interested in exhibiting and requiring accommodation should contact Mike Boulding or Jenni Godfrey at Dog World Ltd., 9 Tufton Street, Ashford, Kent, TN23 1QN. Tel: (0233) 36656.

BAND



Winter Koi show

Japanese Koi breeders have long recognised that, while playing with water (and fish) is much more fun in summer, winter is the all-important time for Koi enthusiasts. One of the major reasons for this is that specimen fish marketed at this time of year are at the end of their growing season. They are also easier to transport overseas in cold, oxygen-rich water.

For the UK Koi-keeper, winter usually results in a lower level of activity in and around the pool. Yet, this time of year, as mentioned above, also coincides with the availability of new stocks from Japan.

Therefore, putting these and other factors together, some of the UK's leading Koi professionals decided to stage BAND '88, a very special winter show at which all the fish entered and judged in competition would be owned by the dealers themselves. Furthermore, all the fish on display will also be for sale. Yet another bonus is that the dealers will be prepared to look after the bought fish until spring arrives.

The show, which is the first of its kind ever mounted in the UK, will be held between 27 and 28 February at Bingley Hall, a superbly equipped venue located within the Staffordshire Show Ground, close to Junctions 13 and 14 of the M6. The 80,000 sq ft. site includes ample parking, and is easily accessible from a number of routes. There will be refreshments, bars, exhibition and trade stands, and even a special weekend package (hotel, dinner dance, etc.) available.

For further details, ring one of the following Hot Line Numbers: (0484) 605504, (0959) 33567, (0942) 724896.

F.F.P.S. conservation design project

In a bid to introduce new ideas to inform people about wildlife conservation, as well as help young artists and designers to gain a career foothold, the Fauna & Flora Preservation Society — the world's oldest international wildlife conservation society — has linked up with students from Middlesex Polytechnic in a series of conservation design projects.

As part of their degree courses, students from the Polytechnic work with the Society to produce posters, booklets, models and other educational resources, which the Society then seeks to develop with the aid of funding from successful businesses.

The first project is two new posters for the general public, to make Britain's threatened reptiles and amphibians (herpetofauna) more familiar, and to encourage responsible and balanced attitudes towards them. The posters are timed to coincide with the revision of the list of specially protected animals and plants in the UK, and the FFPS is urging for further protection of Britain's herpetofauna.

The posters are available

from the FFPS c/o London Zoo, Regent's Park, London NW1 4RY, price £1 each (£1.50 pair), plus £1 postage and packing in a strong tube.

Special discounts are available to conservation groups.

Further information from Tom Langton, FFPS, 01-387 9656 (address above).



Sera distributor

Better Water Garden Products are delighted to announce that they have acquired the UK distributorship of the Sera range of aquatic foods and treatments.

This comprehensive range with its excellent packaging has been highly successful in the German home market where competition is very stiff.

The Sera range includes a wide choice of foods for tropical, marine and freshwater fish.

Turtle and cichlid foods, medications and cures, water conditioners and test kits have been developed to a high standard using modern sophisticated technology.

The Sera range is available throughout the UK. For further details contact: Better Water Garden Products, Blagdon Water Garden Centre Ltd, Bath Road, Upper Langford, Avon, BS18 7DN. Tel: (0934) 852973.

Spotlight

THE GOLDEN THICK-LIPPED GOURAMI

(*Colisa labiosa*)

The Golden Thick-lipped Gourami is the first non-wild-type variety of *Colisa labiosa* to make an appearance in the hobby. Will others follow? **John Dawes** focusses our Spotlight on this, one of his all-time favourite, species.

Photograph: **Arend van den Nieuwenhuizen**

About two years ago, a new fish started appearing in aquarium shops in the UK. It was imported from Singapore and was often sold as the Golden Dwarf Gourami.

Yet, if you took the briefest of second looks at this fish, you'd immediately notice that its body shape was more elongated than one would expect from a Dwarf, the dorsal fin was longer, the head was larger (so was the whole body of the fish), the lips were thicker (at least in the males), the swimming movements were more energetic... and so on. In fact, everything about the fish was different to what one would expect in a Dwarf Gourami. To all intents and purposes, the fish was a Thick-lipped Gourami — except that the colour was all wrong.

Since we had already got used to Red/Sunset/Blue/Neon and some other types of Dwarf Gourami in recent years, it was, I suppose, understandable to a certain extent, to expect yet another colour variation of this popular species. It was probably this, as much as anything else, that led to the fast, but inaccurate, "spreading of the word" that there was a new Dwarf about. Yet, inaccurate it most certainly was.

The fish in question is no other than that odd stalwart, and great favourite of mine, the Thick-lipped Gourami (*Colisa labiosa*) in disguise.

Don't misunderstand me — I'm not knocking the newcomer. In fact, I think that the Golden Thick-lipped Gourami has become a very attractive fish now that the golden colour has been further developed and is, therefore, deeper (with a "smoky" appearance on the back of the fish and on the dorsal and anal fins). What I think is a shame is that the true identity of the fish was not made as clear as it could have been at the outset.

Relationship with other *Colisas*

As a *Colisa labiosa*, the Golden Thick-lipped Gourami will, of course, interbreed with its "wild-coloured" counterpart. I don't, however, know what the offspring will be like, though they should, naturally, be fully fertile. Perhaps some readers could help out in this department.

As far as its relationships to the other *Colisa* species is concerned, the situation is as per the "normal" Thick-lipped Gourami.

Several years ago, I carried out a series of experimental crosses between the various *Colisa* species and came up with some very interesting results.

1. *Colisa labiosa* x *Colisa fasciata* (Giant, Striped, Red, Banded or Indian Gourami) This cross, whichever way round it was carried out, always resulted in fertile hybrids of both sexes.

2. *Colisa labiosa* x *Colisa lalia* (Dwarf Gourami)

The hybrids took an unpredictable, and differing, period of time to sex out (up to one year). When they did, though, they all ended up as large, robust, and very energetic, males.

3. *Colisa labiosa* x *Colisa chana* (now *C. zota* — the Honey Gourami)

I never managed to succeed with this cross. In fact, I couldn't cross Honeys with any other *Colisa* species.

4. *Colisa labiosa* x *lalia* (hybrid males) x *C. labiosa* females

The hybrid males built superb nests but never managed to fertilise any eggs. The same results were obtained with *C. lalia* and *C. fasciata* females. The males were, therefore, apparently sterile.

By taking the above results into consideration, and combining them with a number of other factors, I came to the con-

clusion that the Thick-lipped Gourami is most closely related to *C. fasciata*. In fact, it could well be possible that these two species may be more closely related to each other than even their current, separate, specific status indicates. Next in proximity appears to be *C. lalia*, and, furthest away in terms of genetic relationship, is *C. zota*.

Aquarium Care and Breeding

The Golden Thick-lipped Gourami requires basically the same aquarium conditions as the wild-type. Chemical conditions are not critical, but extremes of pH and hardness should be avoided. The temperature should be between 24-28°C (75-82°F), and the diet as varied as possible. (*Colisas* are omnivorous and will therefore eat both plant and animal matter).

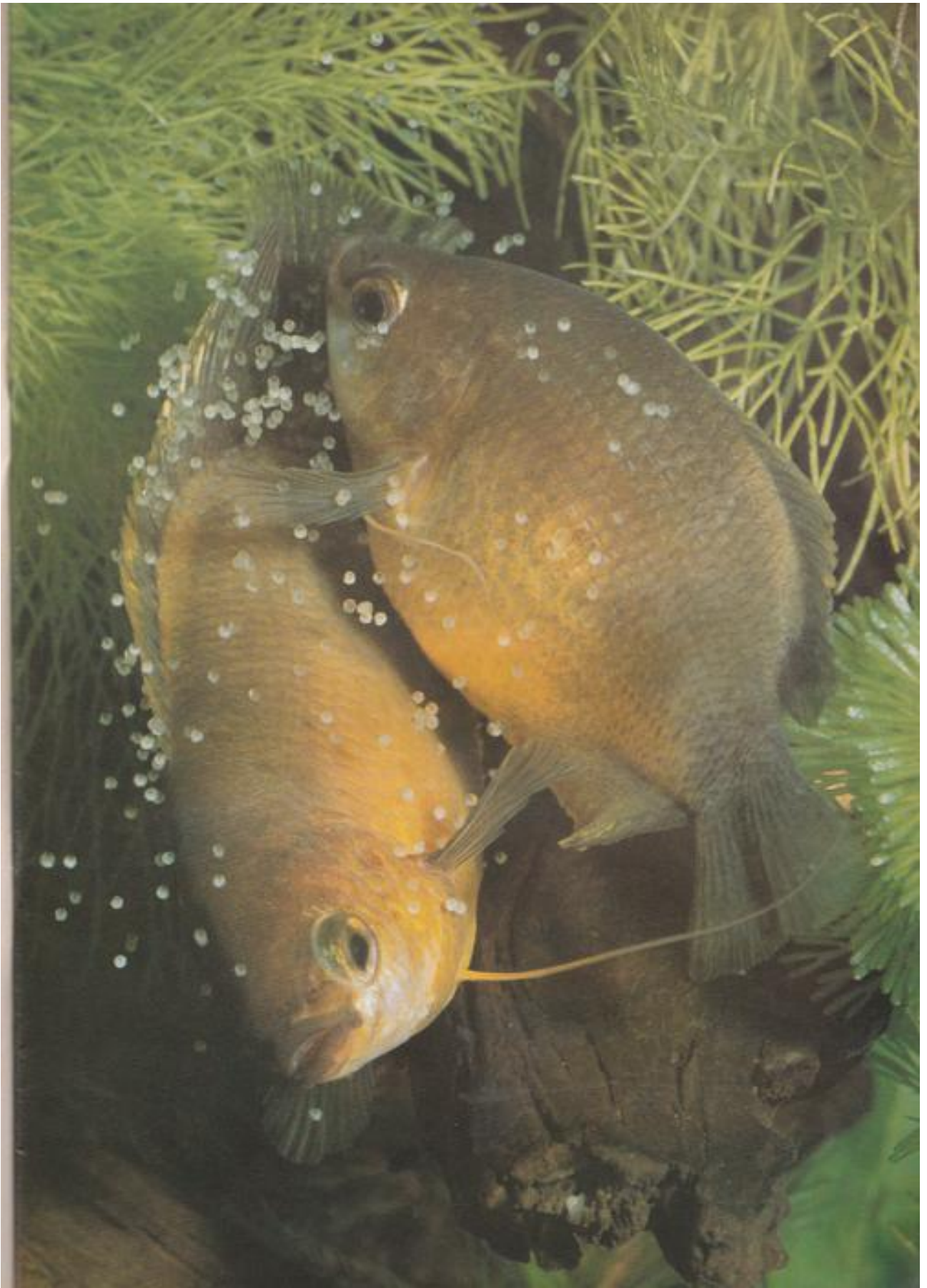
Breeding will take place within the whole temperature range and follows the same general pattern found in other Gouramis, but in *C. labiosa*, the nest is usually built under a broad floating leaf. The male will embrace the female under a bubble nest and will guard the eggs, one laid, until they hatch. This period can be as short as 24 hours at the higher temperatures. The female should be removed as soon as spawning is complete to protect her from attacks by the male, and to protect the eggs from the female, who will eat them, given half a chance.

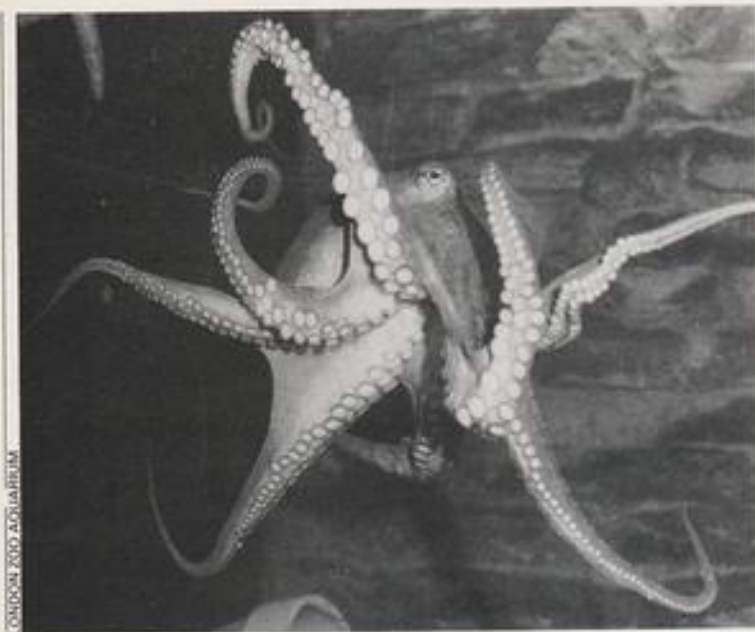
The fry become free-swimming after a couple of days, at which point, the male should be removed, if this hasn't already been done. The labyrinth organ becomes functional at around the 10-12-day mark. It is at this stage that I tend to lose the largest numbers of fry. Gentle aeration (to break up the water surface) is undoubtedly helpful at this critical period, but do expect quite heavy losses in any case.

Those fry which successfully overcome this dangerous stage (over 50% in some cases) stand a fairly good chance of subsequent survival, as long as water and food conditions are well taken care of, and as long as supplementary aquarium space is provided as it becomes necessary.

Further Information

For further information on all Labyrinth Fishes, why not join the Anabantoid Association of Great Britain? Write, enclosing an S.A.F., to Ron Wright, Secretary (A.A.G.B.), 143 Military Road, Colchester, Essex CO1 2AT.





LONDON ZOO AQUARIUM

What has eight arms, three hearts, two eyes and a beak? Why *Octopus vulgaris*, of course!

OCTOPUS AT THE ZOO

Dr Chris Andrews, Assistant Curator at London Zoo Aquarium, tells the story behind one of the Aquarium's most popular exhibits.

As Assistant Curator in charge of Britain's largest and most varied public aquarium, I have a very varied set of duties and responsibilities — one of which is stock acquisition.

Many of the fish on display in the London Zoo Aquarium originate from fish farms, either in this country or as far afield as Florida and the Far East, while most local freshwater species are often obtained as a result of fisheries management operations by the nearby Thames Water Authority. However, when fish are obtained direct from the wild, every effort is made to obtain juvenile rather than mature (breeding) stock, taking care to select species which are not endangered and which we can reasonably expect to keep successfully under prevailing conditions in the existing Aquarium. As time goes by, however, the captive breeding of endangered fish, either on fish farms or in aquaria, is likely to become more important — and rightly so.

In the Aquarium at the Zoo, we keep far

more than just fish, including an impressive collection of aquatic invertebrates, and a small but varied collection of amphibians. As you might imagine, obtaining certain animals for display is much easier than obtaining others, and soon after taking up my new job at the Zoo it became clear that getting some octopus was going to prove more than a little difficult.

There are something like 150 species of octopus distributed throughout the oceans of the world, and they range in size from the tiny *Octopus arborescens* from Sri Lanka, which measures only two inches across its arms, to the giant Pacific Octopus (*O. apollyon* = *O. dofleini* and *O. hokkougensis*), which may measure 20 or 30 feet across!

In British waters, the Lesser Octopus (*Eledone cirrhosa*) is quite common and easy to obtain. However, it tends to be rather shy in the aquarium, and requires seawater chilled to around 50°F (10°C) if it is to do well.

By comparison, the Mediterranean Octopus (*Octopus vulgaris*) makes a much more

impressive display, and actually prefers fairly warm water. In fact, London Zoo has an excellent record of keeping and even breeding the Mediterranean Octopus, although it is not particularly common in British waters, being primarily restricted to the warmer southern coasts.

Putting any plans for obtaining giant Pacific Octopus to one side (for the time being), it was clear that *Octopus vulgaris* was the species that we wanted. But the question was: "How do we obtain some?" After contacting local suppliers of marine specimens, lobster fishermen (octopus enter their pots to prey on their catch), various sub-aqua clubs, and a number of research laboratories, it was obvious that they were unlikely to be able to guarantee a small number of specimens in time for the Zoo's busy summer season. Hence the search had to be extended further afield.

Following a sheaf of letters, numerous telephone calls, and even having to decline an offer of specimens of *Octopus maya* from a research laboratory in Texas, it appeared that a laboratory in southern Italy had a ready source of *Octopus vulgaris*. As its common name suggests, *O. vulgaris* is particularly common in the Mediterranean region, and many British holiday-makers (me included!) may have dined on this rather tasty cephalopod from time to time!

Having located a source of live, ready-caught *O. vulgaris*, we were doubly fortunate that a visiting English research worker was willing to pack and despatch some specimens to London, via British Airways in Naples. Despite a minor hiccup (that is to say that no direct recognised cargo link existed between Naples and Gatwick or Heathrow, and British Airways were particularly helpful in overcoming this), three *O. vulgaris* were eventually sent to Gatwick Airport — complete with a health certificate from an Italian veterinarian. (How do you tell if an octopus is healthy and fit to travel?)

Following their two-hour flight from southern Italy, the octopus were promptly collected from the airport and brought speedily to London Zoo, where they were quickly, but carefully, released into waiting tanks. Much to everyone's relief, all three specimens settled in very quickly, and were soon feeding on fresh crabs.

Our main "Octopus Display" at the Zoo is a 400-gallon seawater tank containing a number of flowerpot hideaways. This tank has its own (albeit rather simple) filtration system, and is well aerated, with a temperature around 68°F (20°C). Regular partial water changes with natural seawater are carried out, and this display tank also contains large Green Starfish (*Marthasterias*) Cushion Stars (*Asterias*) and Opelet Anemones (*Anemonia*). Low but attractive lighting is provided by a combination of fluorescent tubes and a tungsten spot lamp. Using this system, the keepers in the Aquarium have become very successful at keeping the Mediterranean Octopus and, as indicated above, even breeding them. In the past, this 400-gallon tank has proved adequate for at least two *Octopus vulgaris*, although since they can be rather territorial and aggressive, it is usual to keep only one individual in the

display tank at any one time.

Octopus vulgaris has a hearty appetite and crabs are a favourite food. Growth can be quite rapid, and their behaviour at feeding time is particularly interesting to watch. When they do not rise to the surface of the water to take food from your hand, they will often glide up to their prey on the tank floor and then pounce on to it with a jet-propelled leap. The prey is then drawn towards the hidden, beak-like mouth and killed by the "cephalotoxin" poison from the octopus' salivary glands.

It is said, that in the wild, octopus go on "hunting expeditions", bringing back their accumulated prey to their cave or rocky home for eventual consumption. Weighing perhaps about half a pound when we obtained them (and measuring about 12 or 18 inches across — 30 to 45 cm), we hope that they will grow fast, and weigh three or four pounds — 1.5 to 2 kg (and measure a yard, or a metre, or so) within a year.

It is interesting (although at the same time disappointing!) that female octopus rarely survive spawning, and hence the majority of females (and probably males too) die at the end of their second year. In the wild, mature octopus migrate into shallow water during the spring of their second year. There then follows quite an elaborate courtship between the male and female octopus, with the female eventually laying many thousands of eggs in strings on the roof of her preferred cave, with the male octopus returning to deeper water. The



Octopus maya, the Mud Flat Octopus sheltering in its "cave".

female then broods the eggs for several weeks, rarely leaving them or feeding. Once the eggs hatch (often in the late summer or autumn), she, sadly, dies. The resultant young octopus spend a short time in the sea plankton, before assuming the shape and lifestyle of their now-deceased parents.

In the display aquarium, *Octopus vulgaris* makes a marvellous exhibit. Once settled they rarely eject their "ink" (the original

artists' "sepia"), and readily respond to movement in or around their tank. Their subtle colour changes, which may be used for camouflage or, perhaps, to reflect the "mood" of the octopus, are a delight to watch — although with their well-developed eyes you sometimes wonder who is watching whom!

Further reading: "Octopus" by M. J. Wells (Chapman and Hall, 1978).



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OUT AND ABOUT

with John Dawes



Hambridge Haven

It was a cold, miserable and wet Somerset morning. In fact, a typical late autumn/early winter day in the UK — the sort that makes you dream of hot, sunny, tropical far-off places... and I was heading for one. Well, not exactly sunny or far-off, but certainly one with a distinct tropical feel and the promise of a visual feast consisting of all the well-known, and some of the less commonly seen, aquarium fish species.

I had heard a lot about Peter Penfold's thriving and fast-expanding Hambridge Fisheries. As I soon discovered, every bit of praise was well-deserved.

Peter has had over twenty years' experience in different areas of the aquatic trade, and it shows.

The dry goods section has an extremely comprehensive range of products aimed at catering for the needs of every aquarist. Yet every product stocked is chosen for a specific reason, having first gone through Peter's rigorous selection process. This applies just as much to the choice of foods and remedies as to the books and artificial tank ornaments. As this may indicate, Peter and his staff are very well-informed and can therefore offer sound advice on individual products, suitable combinations for specific set-ups, problems (and how to avoid them), and so on down the line.

The same can be said on the fish front. In fact, the choice and excellent condition of the fish (all fully quarantined) speak for themselves. The tropical marine section, in particular, is a superb spectacle in itself. It is a dazzling display of well-fed, healthy fish kept in optimum condition by expert handling and a large Tropical Marine Centre water treatment system capable of turning over the complete volume of water several times per hour. In fact, the system is never run at its full potential. The reserve is there to allow for future expansion — something that is bound to come before long.



JOHN DAWES'S



JOHN DAWES'S

Hambridge boasts a spectacular display of top quality tropical marines.

The extensive tropical and coldwater freshwater sections are run along similar lines, while the outside coldwater display was undergoing a complete overhaul and re-design at the time of my visit, in response to increased demand during last season.

One particular feature that attracted my attention in the outdoor section was the design of the holding troughs. Peter has installed a false floor in all of them to allow wastes to drop through (to be carried away to the filters) while, at the same time, keeping the fish in a large

volume of water but bringing them closer to the surface, both for clients to take a really good look, and for the staff to net the selected individuals more easily.

Going back indoors, a very useful touch involves the use of a "traffic light" system of labelling. The name (and price) of each fish are written on an adhesive circular label which is green for community fish, orange for those that need to be regarded with a bit of caution (or which require specialist advice), and red for the loners, difficult or aggressive species. Strategically placed notices explain this colour code quite clearly to customers. In view of the large selection of a less common species available at

A corner of the extensive and spacious freshwater section.

Hambridge Fisheries, this simple idea is worth its weight in gold.

Then there's the Hambridge Fisheries Sunday Club with over 800 members who can visit the Fisheries on Sundays. The Club has a strict set of rules, including several exclusive ones, such as that which restricts Sunday visits and purchases only to members, who must produce their membership cards prior to each purchase. Occasional talks and discussion meetings are also arranged for Sunday Club members whose annual subscription fees (25p!) are donated to charity.

Fancy long-finned Koi? Well, Hambridge Fisheries has those too!

So, for a visit to a really good supplier of quality fish and goods, take a trip to Somerset — you'll not regret it, I assure you.

Opening Times: Tuesday-Saturday, 10.00 am-6.00 pm (Closed on Mondays except Bank Holidays).

For further details, contact Peter Penfold, Hambridge Fisheries, Underhill, Ilminster Road, Hambridge, Nr. Langport, Somerset. Tel. (0458) 251879.

Books

Reef Fishes of the Indian Ocean (Pacific Marine Book 10)

By Dr. Gerald R. Allen and Roger C. Steene

Published by: TFH Publications, Inc.
ISBN: 0 866 22-386 X
Price: £24.75

The continuing Pacific Marine Fishes series from TFH Publications, Inc. has now reached double figures, but the tenth volume might be seen as a bit of a misnomer for it is entitled REEF FISHES OF THE INDIAN OCEAN. What cannot be denied however, is the enormous amount of work that went into its creation — 650 man-hours underwater, 65,000 kilometres travelled, 1,200 photographs — to highlight just three 'milestones' passed by the authors, Dr Gerald R. Allen and Roger C. Steene.

Assembling over 1,000 illustrations into a single volume and then finding room for captions and text was the final barrier to overcome. The layout of the book is slightly unusual, the descriptive text and captions being arranged around a central core of 144 pages of stunning colour photographs. In addition to the reef fishes themselves there are views of habitats and artwork of some of the larger 'game' fishes — imagine chasing Swordfish and Marlin with a camera!

Each group of fishes has a separate chapter which outlines its general characteristics (feeding, sex differentiation, colour changes, shoaling, etc) together with details, where known, of reproductive behaviour. Interspersed with these descriptions are

sections which make for intriguing reading about Environments, reasons for Colour Variation, Mimicry and Camouflage, Symbiosis and Commensalism, The Reef at Night, Feeding Habits, Predators of the Reef, Territoriality, and Reproduction.

Caption material, in the main, is limited to fish size and details of where, and at what depth, the photograph was taken, although occasionally, extra tidbits of information about the fish's particular characteristics are given. Nomenclature is right up to date, the Damselfishes being a good example with *Chrysiptera* and *Stegastes* being prominent.

A Bibliography and two Indices conclude the work, either Index being particularly useful in separately guiding you to text or illustration, whatever your whim. After all, you've the entire Indian Ocean to browse through, and all for £24.75. Marine fish-keepers will welcome this book with open arms, fish identification suddenly becoming less of a problem.

Dick Mills

Textbook of Fish Health

By: Dr. George Post
Published by: T.F.H. Publications, Inc.
ISBN: 0-87666-599-7
Price: £24.75

Over recent years, several books, both on general aquarium care and, specifically, on the wellbeing of fish, have adopted a positive approach to the subject, emphasising the "health" aspects of a fish's life and describing methods of disease prevention.

On receiving this substantial, comprehensive and extremely competent volume, I (perhaps not unnaturally) assumed that the main drive would also lie, as the title suggests, on the health/disease prevention side. In fact, this is not the case. Instead, the *Textbook of Fish Health* represents the best broad-ranging work on fish diseases, their causes, diagnosis and treatment that I am aware of.

The first edition of this book appeared in 1983 as a replacement for the out-of-date, but otherwise still valuable, classic by Dr. Erwin Amlacher, *Textbook of Fish Diseases*. The latest edition represents an up-dated version of the 1983 volume. It is "solid" and informative, and has the advantage of containing 188 colour photographs which are quite useful as identification and educational aids.

The language and format used throughout are uncompromising and, therefore, not ideal for the casual hobbyist. However, for the serious hobbyist and/or student, the *Textbook of Fish Health* is a most worthwhile acquisition. It certainly is the best in-depth work of its kind currently doing the rounds and, as such, will serve as

Revised and Expanded

TEXTBOOK of FISH HEALTH



Dr. George Post

an extremely useful and reliable source of reference for all the common, and many of the more uncommon, diseases that occur in both ornamental and other types of fish.

John Dawes

The Biology of Fish Growth

By: A. H. Weatherley and H. S. Gill
Published by: Academic Press
ISBN: 0-12-739055-3
Price: £37.00

As every aquarist and pondkeeper knows, there are some basic 'rules' that govern the rate at which fish grow. Space, food, stocking levels, water quality, temperature, genetics, and many other factors all play their part.

In many cases, we know that certain conditions are desirable, while others are not, purely as a result of experience or trial and error. Facts and figures, as well as sound biological background knowledge are, however, often lacking from our everyday considerations.

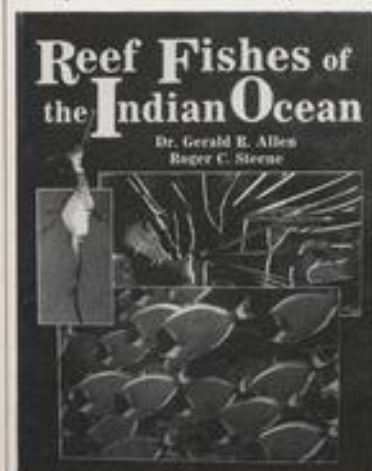
The Biology of Fish Growth provides all this in abundance. The language is uncompromisingly technical, but the information is there for anyone with the scientific background to interpret it.

Fishfarmers and aquaculturists should certainly make sure that they have a copy. Equally, anyone involved in the manufacture of foods, or the public displaying of fish, would benefit from the wealth of data contained in this volume.

Topics covered by the 13 chapters include Digestion, Nutrient requirements for growth, Protein, lipid and caloric contents, Influence of hormones, Determination of age and growth, The problem of population increase, Predator-prey relationships, Fish culture, and many more.

The expert knowledge of the authors, allied to the extensive References section at the back, both guarantee that this well-written book will serve as an invaluable source of information on this complex but fascinating subject.

John Dawes





This simple bridge incorporates a cast concrete arch which had Fibromix added to the basic formula.

CONCRETE AND KOI

Take some cement, gravel, sand and 'magic fibres' and, according to John Cuvelier, you're on the way to a perfect Koi pool.

For many years there has been much suspicion about the use of concrete in the construction of ornamental pools; feelings which, to be fair, have often been justified. Stark tales of disaster caused through frost damage, invisible leaks, etc., have tended to frighten off prospective builders who usually end up using a liner of some description. I do not intend to argue the relative merits of the different materials but would like to acquaint the reader with modern techniques in the use of concrete. To achieve this aim I must hit you with a little theory, but it is only a little, so read on!

The basic raw material of concrete, Portland cement, is a very fine powder, which when mixed with water, suffers a chemical change of state, ending up as a hard, but very brittle, stone-like material. During the process of drying, shrinkage occurs, along with hairline cracks. Depending upon the use the material is to be put to, various mixes of gravel and sand are used which, not only strengthen the finished concrete, but also inhibit the formation of cracks. Unfortunately, the addition of these various additives does increase the porosity of the finished material. Let me hasten to add, for the benefit of the more knowledgeable in these matters, that the foregoing is only a very simple outline of the mechanics of concrete based upon my well-used 'need-to-know' philosophy.

In a nutshell then, the more sand which you add to a mix, the less waterproof is the finished material. Therein lies the problem! That, then, was the state of play until the advent of modern plastics technology in the form of tiny fibres which, when added to a cementitious mix, enabled much less sand to be used, virtually abolished the problem of cracking, and increased the finished



The rendering for the whole of this "partitioned" filter system contains Fibromix.

strength and waterproof qualities many times over. These benefits are most obvious in the use of the material as a finishing coat of rendering on a pool, but that is by no means the end of the story, as the addition of these fibres to a sand/gravel/cement mix (concrete), is also very advantageous to the quality of the finished material.

The fibres in question are marketed under the label FIBROMIX and are becoming available through one or two retail outlets but, should any difficulty be found in obtaining either the material or more information on it, I shall be giving source details at the end of the article. My enthusiasm for this material merely stems from the fact of my having used so much of it,

and not through any connection with the manufacturers. In fact, as you will see later, I never use cement for any purpose now without adding some of this magical stuff, particularly where there is any risk of frost damage involved.

If a major construction such as a pool is proposed, then I would advise the purchase of an electric cement mixer as the cost of hiring a machine can escalate remarkably quickly. Do not be put off by this prospect as the resale value of a mixer which has been well cared for and cleaned out after use will more than compare with the cost of hiring. A mixer is a must, as hand mixing of the fibres does not produce a satisfactory end product.

The quantity of fibre used is well described in the literature which arrives with the fibres, but roughly speaking, 30 grammes of fibre are used for every kilo of cement powder. The type of sand used is very important, the ideal being SOFT building sand. The normal mix for a pool render is 2 buckets soft sand, 1 bucket Portland cement and 250 grammes fibres.

I'm suffering my usual problem of lack of space for going into greater detail, but the following is a list of some of the projects on which I have used Fibromix, some of which have been purely experimental but, nonetheless, successful: concrete base for pools, rendering for pools, rock pools and cascades, artificial streams and watercourses, filter partitions, cast arches for bridges, walkways for bridges, attaching ornamental rockwork to pool edges, 'in-pool' table for providing shelter for fish, and a platform for lily baskets. The list is virtually endless and I'm sure some reader somewhere will think of other uses.

Now what about drawbacks? Well, of course, there must be something! The main snag is easily overcome. With an end-product containing such a high level of cement, alkalinity must be an important consideration as we all know how toxic to fish the lime from cement can be. As far as Koi are concerned, your pool can be any colour you wish, as long as it's black! (Apologies to Henry Ford!) Black is the best colour background for both observing your Koi and for preventing fading of their colours. So the answer is to paint your pool using one of the proprietary paints which are available, thereby killing two birds with one stone. It must be said that anywhere pool water comes into contact with cementwork, protective paint must be applied.

The accompanying pictures illustrate some of the results of using the fibres, but do remember that depending upon what you are building, the proportions are varied. For instance, filter partitions and bridge walkways require less sand, the mix being 1 part sand, 1 part cement. This mix dries to an extremely strong and durable material capable of being jumped upon... should you so desire!

For further information, contact Fibromix Ltd., Clifton Hall, Ashbourne, Derbys. DE6 2GL. Tel. (0335) 42265. If you ask to speak to Derek Davies you will find him an absolute mine of help and information. Happy building!

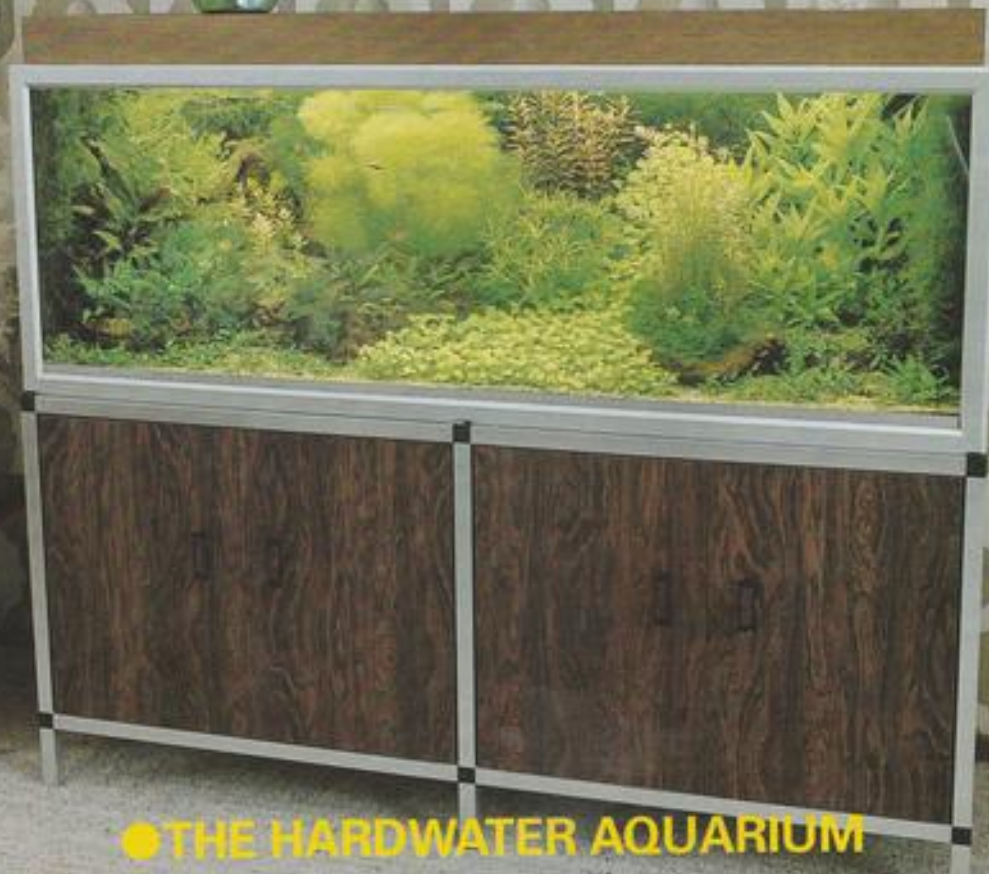
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- THE HARDWATER AQUARIUM
- VITAMINS AND MINERALS IN THE DIET
- SOFT WATER TROPICALS
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FRESHWATER TROPICAL AQUARIA

THE HARDWATER AQUARIUM

Dr David Pool of the Tetra Information Centre, gives expert guidance on setting up and stocking an aquarium for species of fish and plants which prefer hard alkaline conditions.

Most aquarists start their fish-keeping career by keeping a community aquarium containing some of the more popular, and widely available, fish and plants. For many fishkeepers, however, there comes a time when they want to try something a little different. The choices are numerous. You could try breeding the fish, keeping a 'species' aquarium or keeping fish from a particular region of the world. In this article I would like to look at a further possibility, that of keeping the fish

and plants adapted to a particular set of conditions: hard, alkaline water.

What is hardwater?

The hardness of water varies from region to region and reflects the quantities of dissolved mineral salts. When water falls as rainfall it contains very few salts and, so, is termed soft water. However, as it flows over rocks and soil, small amounts of salts are dissolved which increase the hardness. If these rocks are limestone or chalk, large quantities of salts are dissolved and the

water is classed as hard.

The quantities of salts in the water can be easily measured using a test kit, which gives the water hardness in German degrees of hardness (°dH). Water which has a value of around 15-20°dH can be regarded as being moderately hard, and over 20°dH, or so, as hard.

Water hardness is conveniently divided into General and Carbonate Hardness. General Hardness is a measure of the quantities of magnesium and calcium salts (and is very close to the Total Hardness), whereas the Carbonate Hardness is a measure of the metal carbonates and bicarbonates.

The General Hardness is usually the value that is quoted in the literature when the needs of the fish are described. However, the Carbonate Hardness is also important as it acts as a buffer to prevent sudden changes in pH. Consequently, in hardwater where there are large amounts of Carbonate Hardness the pH is very stable.

The pH of a body of water and its hardness are closely related. This is largely because many of the metal salts which cause the water to become hard also tend to increase the pH (ie they are alkaline salts). So we find water that is soft and acidic, or hard and alkaline.

How to make hardwater

The water flowing out of our taps varies considerably from region to region. Some aquarists live in areas where the water is naturally hard and has a high pH. For them keeping hardwater fish and plants is the obvious. The alternative is to try to adjust the hardness and pH to suit more acidic, soft water species. Where the tap water is too soft it is a relatively simple matter to increase the water hardness. The following methods are widely used.

1. Introduce limestone chips, coral and cockleshell into a box filter or onto the base of the aquarium. As the water comes into constant contact with these alkaline, 'hard' substances, salts will dissolve in the water and increase its hardness. The water will usually reach saturation point when the hardness is between 15 and 25°dH. If it rises above this value, or you require a lower value, the quantities of alkaline substances should be reduced, or removed when the desired values are reached.



Guppies are good fish for the hard alkaline aquarium.

FRESHWATER TROPICAL AQUARIA



Left, although *Pseudotropheus zebra* and its relatives from the African Rift Lakes evolved in very alkaline waters, they are now being bred in Singapore in slightly acid conditions, following very gradual acclimatisation of the brood stocks. Right, Sailfins (*Poecilia velifera*) like both alkaline conditions and a little salt in the water.

2. Add sodium bicarbonate into the water. If this method is selected the Carbonate Hardness will be increased. Such hardness changes are very rapid and, so, should never be undertaken in aquaria where fish or plants are present. Instead, alter the hardness in a container before adding the water to the aquarium.

3. Adding marine salts or cooking salt will increase the hardness of the water. Care should be taken if you keep Rift Lake Cichlids as there is evidence to suggest that adding salt can increase the incidence of the disease, 'Malawi Bloat'. As with sodium bicarbonate, the salt should be added to the water before introducing it into the aquarium.

4. Use commercially available pH and hardness adjusters. If used correctly, such products will successfully adjust the hardness. However, they are very strong and will cause sudden changes when added to the water. Therefore, only use them outside the aquarium.

As with any change in water quality, hardness changes should always be undertaken very slowly if fish and plants are present. A gradual change of, say, 2°dH each day should prevent fish becoming stressed and susceptible to disease.

Problems with hardwater

Before describing some of the fish and plants that can be kept in hardwater, it will be useful to mention some of the problems that are specific to this type of aquarium, and how to avoid them.

Water pollution is a problem in all aquaria, but is particularly troublesome in hardwater aquaria. To understand why, we have to consider the first stage in the Nitrogen Cycle which involves the breakdown of organic waste (eg uneaten food, fish waste and dead fish) into ammonia (very toxic) or ammonium (non-toxic).

These two compounds can easily change from one to the other, with the ratio of ammonia to ammonium being largely dependent on pH. Above a pH of 8.0 there are increasing quantities of toxic ammonia. For the aquarist with a hard, alkaline aquarium, this means that even small quantities of organic waste will form toxic ammonia and

cause serious problems to the fish. For this reason careful tank hygiene must be observed with regular partial water changes and cleaning of the gravel and filter media. Some aquarists also use equipment such as protein skimmers which remove dissolved organic waste before it begins to decompose.

Maintaining a constant pH and hardness within the water is important. Particular care is needed in order to do this if you are having to raise the values artificially, as even slight changes can adversely affect the plants and fish. Once an aquarium has reached the desired hardness and pH, all water that is added subsequently should have the same values. This obviously means altering the water chemistry before adding the new water to the aquarium.

Regular testing with pH and hardness test kits will allow you to maintain constant conditions within the aquarium. Such testing is far better than allowing the fish to become distressed due to incorrect water quality. Rapid changes or incorrect water quality may result in the fish producing a thick protective mucus coating, gasping at the water surface, showing rapid gill movements, shimmying (swimming on the spot) and rubbing against objects.

Frequent water changes have already been mentioned, but they are particularly important if you have dense and healthy plant growth. Many plants (such as Java Fern and Java Moss) have the ability to absorb carbonates from the water. If the

aquarium is left for a long period without change this can result in a gradual decrease in the Carbonate Hardness, and the consequent reduction in the water's ability to buffer changes in pH.

Decorating the aquarium

The choice of aquarium decor is up to the individual aquarist and depends upon personal taste and the needs of the fish being kept.

Rockwork is always popular in aquaria, and is particularly suitable in a hardwater aquarium where, if anything, it will help to maintain the high pH and hardness. Consider the fish you intend to keep before introducing the rockwork. Some species, such as the Mbuna Cichlids from Lake Malawi or the Blind Cave fish from Mexico, benefit from plenty of rockwork with abundant caves. In these cases the rocks can be built up until they reach the surface. Silicoating the rocks together is a sensible precaution to prevent them falling and smashing the glass, particularly if you are keeping cichlids that dig. Rainbowfishes and livebearers, on the other hand, prefer large areas of open water for swimming and so, fewer rocks should be added.

Certain plants are well suited to living in hardwater conditions and can be included in the aquarium. A list of suitable species is included in Table 1, although your choice of fish may limit which plants can be added. The algae-eating Mbuna from Lake Malawi, for example, will readily consume soft-leaved plants as a part of their vegetable diet.

The use of bogwood is not advisable, unless it has been carefully treated to prevent the release of peat extracts and humic acids. Several coats of a non-toxic waterproof varnish should seal the bogwood, making it safe.

Fish for the hardwater aquarium

There is a surprising number of fish which can successfully survive in hard, alkaline water conditions. Some of the more popular species are listed in Table 2. Further details on those not covered in this article can be obtained from the suggested further reading.

Rift Valley Cichlids have become increasingly popular in recent years largely due to their intense coloration, interesting be-

Plants Suitable for the Hardwater Aquarium Table 2

- Indian Fern (*Ceratopteris thalictroides*)
- African Spear Leaf (*Anubias barteri*)
- Java Fern (*Microsorium pteropus*)
- Java Moss (*Vesicularia dubyana*)
- Vallisneria (*Vallisneria* spp)
- Hornwort (*Ceratophyllum demersum*)
- Amazon Swords (*Echinodorus* spp)
- Onion plant (*Crinum natans*)
- Sags (*Sagittaria* spp)
- A few Crypts (eg *Cryptocoryne ciliata* and *C. affinis*)

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JOHN DAVIES

Brachyogobius, the Bumblebee Goby, is a small slow-moving bottom-living species that does well at high pH and hardness levels.

Table 2
Fish Suitable for the Hardwater Aquarium

Fish Species	Common Name	pH	GH	KH
<i>Poecilia sphenops</i>	Black Molly	7.5-8.0	10-18	5-10
<i>P. latipinna/velifera</i>	Sailfin Molly	7.5-8.0	10-18	5-10
<i>P. reticulata</i>	Guppy	7.5-8.0	10-18	5-10
<i>Xiphophorus helleri</i>	Swordtail	7.5-8.0	10-18	5-10
<i>Melanotaenia maccullochi</i>	Dwarf Rainbowfish	7.5-8.0	10-18	5-10
<i>Bedotia goayi</i>	Madagascar Rainbowfish	7.5-8.0	10-18	5-10
<i>Telmatherina ladigesii</i>	Celebes Rainbowfish	7.5-8.0	10-18	5-10
<i>Brachyogobius xanthozona</i>	Bumblebee fish	7.5-8.0	15-18	5-10
<i>Chanda ranga</i>	Indian Glassfish	7.5-8.0	10-18	5-10
<i>Astyanax fasciatus mexicanus</i>	Blind Cave fish	7.5-8.0	10-18	5-10
<i>Pseudotropheus zebra</i>	Zebra cichlid	8.0-8.5	4	7
<i>Melanochromis auratus</i>	Golden Nyasa cichlids	8.0-8.5	4	7
<i>Lamprologus brichardi</i>	Lyretail cichlid	8.5-9.0	9	17
<i>Julidochromis marlieri</i>	Golden Julie	8.5-9.0	9	17

haviour and the relative ease with which they breed. The cichlids living near the rocky outcrops in Lake Malawi, or the Mbuna as they are known, make particularly good aquarium inhabitants.

These cichlids are very territorial and will aggressively defend a small area within the aquarium. To overcome this problem it is often recommended that the tank be slightly overstocked. In this way the dominant individuals spread their aggression over a greater number of victims, preventing any single fish being excessively attacked. Introducing one male and one female of a particular species can also lead to these troubles with the male constantly courting or bullying the female. It is therefore wise to stock one male and 2-3 females. Adding more than one male is also asking for trouble, unless the aquarium is sufficiently large.

In the wild the Mbuna live around rocky outcrops and will defend small holes and caves in these rocks. In the aquarium it is advisable to have more caves than fish so

that each fish can have its own cave to escape into.

The Mbuna feed on algae, and the invertebrates contained in them, in the wild. To keep them in good condition it is important to reproduce this diet, and, in particular, to ensure that there is a vegetable component in the diet. The use of vegetable-based flake foods or lettuce leaves and peas, together with the regular diet of specialised flaked cichlid food, will keep the fish healthy in captivity.

The choice of cichlids is very wide and the aquarist should consult a knowledgeable local dealer for advice. Other fish can also be introduced. Many aquarists keep *Synodontis* species such as *S. multipunctatus*, *S. angelicus* or *S. nanae* with their Mbuna collection. These species are some of the few that can withstand the aggressive behaviour of the cichlids.

Most of the Mbuna cichlids are mouth-brooding species which means they raise the eggs and fry to the free-swimming stage in

their mouths before releasing them. Not only does this improve the survival of the fry, but also provides a very interesting spectacle for the aquarist. Spawning usually occurs in the caves, with the eggs being taken into the mouth of the female immediately. If the aquarist wishes to raise these fry it is advisable to remove the female and fry to a different aquarium. Otherwise the constant contact with other fish can cause the female to eat her fry.

A more peaceful selection of fish for the hardwater aquarium could include the Rainbowfishes. These fish, from Madagascar and Australia, include the Madagascar Rainbow (*Bedotia goayi*), Celebes Rainbow (*Telmatherina ladigesii*), New Guinea Red Rainbow (*Glossogobius aureus*) and the Dwarf Australian Rainbow (*Melanotaenia maccullochi*). All are peaceful schooling fish which can be kept together or with other fish species.

The Rainbowfishes are particularly susceptible to raised levels of ammonia, nitrite and nitrate in the aquarium. Even low levels of pollutants result in the fish being very lethargic and susceptible to disease. Careful aquarium hygiene and regular water changes are therefore essential. In the wild, considerable quantities of algae and vegetation are consumed. This vegetable component is important if the fish are to remain healthy. Fish that are not given such a diet are known to behave unusually not breed and, in severe cases, may even die.

If the diet and water quality are correct, it is relatively straight-forward to spawn the Rainbowfishes. The fish tend to spawn in groups, with the eggs being scattered among plants and on the substrate. In most cases the parents are not great egg eaters, but it is advisable to remove them soon after spawning to help maintain perfect water quality.

A hardwater community need not concentrate on one group of species as in the previous two examples. A mixed community containing livebearers such as Sailfin Mollies and Swordtails, together with Blind Cave Fish and Rainbowfish will happily live together and provide an interesting aquarium. Other communities are possible. If you are in doubt about the compatibility of certain fish ask your local aquarist dealer who will be able to suggest numerous possibilities.

Further Reading

Obviously, the aquarist should read around the subject before setting up a hardwater aquarium. The following books will provide a useful starting point.

Rainbowfishes of Australia and Papua New Guinea by G. Allen and N. Cross (TFH Publications, Inc.)

African Cichlids of Lake Malawi and Tanganyika by Dr H. Axelrod and W. Burgess (TFH Publications, Inc.)

A Fishkeepers Guide to Livebearers, by P. Scott, (Salamander — distributed by Interpet).

The Cichlid Aquarium by P. Loisel (Tetra).

LITTLE THINGS MEAN A LOT

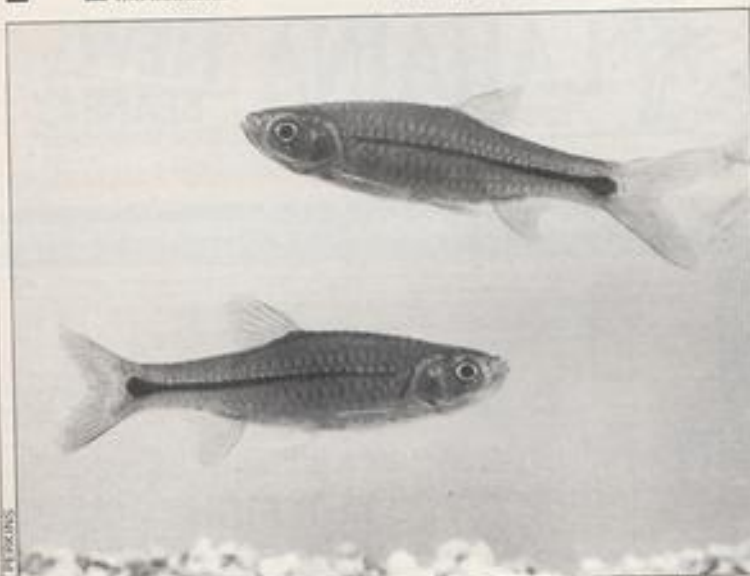
Certain components of a fish's diet are only required in very small quantities. Yet, deprive a fish of these essentials, and the consequences could be quite catastrophic. **John Dawes** looks at some of the vital roles played by vitamins and trace elements in a well-balanced nutritional programme.

A great deal has been written over the years concerning the roles played by proteins, fats and carbohydrates in fish nutrition.

Proteins, for example, are well-known as providing the building blocks for proper growth and the maintenance of health. Fats, despite their bad reputation when used in excess, are nevertheless essential sources of

energy and must be present in certain minimum amounts in any healthy diet. The same, of course, goes for carbohydrates.

Yet, despite their fundamental importance, Vitamins and Mineral Salts do not normally receive the same coverage as their better-known counterparts. The text that follows is, therefore, intended as a step towards rectifying this imbalance.



These Golden-line Rasboras (*Rasbora daniconius*) have perfectly straight, well-formed backbones — a certain sign that they have received a diet with, among other things, the correct level of Vitamin C.



Both these species of cichlid (*Cichia ocellaris* — above — and *Cichia temensis*) would be unable to produce their yellow pigments (particularly obvious around the ocelli or "eye-spots") without an adequate supply of folic acid.

Vitamins

Even if a fish's diet is perfectly balanced in terms of proteins, fats (lipids) and carbohydrates, serious problems will arise if one or more vitamins are either lacking or present in insufficient quantity.

For example, a diet low in Vitamin A can lead to defective vision, while one low in Vitamin D will affect bone formation through the disruption of the processes involved in calcium and phosphorus assimilation. Lack of pyridoxine (Vitamin B₆) will impair both protein and fat metabolism. Carbohydrate metabolism will be likewise affected if there is insufficient riboflavin (Vitamin B₂). Lack of ascorbic acid (Vitamin C) has been shown to be responsible for bent/curved spine deformities (Scoliosis) in certain species.

Clearly, then, no diet can afford to be deficient in vitamins for any length of time. Yet, despite their undoubted significance, fish only require small amounts of vitamins in their food.

Since vitamins perform such a wide range of functions, some of which overlap considerably, it is very difficult to present a complete picture of all their effects. However, as a guide, some of the main functions of seventeen vitamins are presented below. It will be seen from the table that many of the reactions influenced by vitamins are fundamental to growth, tissue repair, respiration and other vital metabolic processes, thus underlining their central role in health and survival.

Mineral/Inorganic Salts (Trace Elements)

Minerals are also referred to as Trace Elements because they are required in very small amounts by both aquatic animals and plants. Although we know what many of the

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Vitamins (In Alphabetical Order)

Vitamins (In Alphabetical Order)	Some Metabolic Processes Affected
A	Formation of visual and other pigment; protein metabolism
B ₁ (Thiamine)	Oxidation of sugars; proper functioning of nervous system
B ₂ (Riboflavin)	Oxidation and respiratory reactions; essential in carbohydrate, fat and protein metabolism
B ₃ (Pantothenic Acid)	Energy release/transformation; balanced functioning of nervous system
B ₆ (Pyridoxine)	Fat and protein metabolism
B ₁₂ (Cyanocobalamin)	Protein metabolism; formation of red blood corpuscles (cells) and nucleic acids (found in nuclei, including carriers of genetic information)
Biotin	Fat metabolism
C (Ascorbic Acid)	Oxidation and respiratory processes; tissue repair; collagen synthesis (white connective tissue fibres — also found in bone and scales, hence its connection with Scoliosis — Bent Spine)
Choline	Efficient functioning of the nervous system
D	Absorption of calcium and phosphorus from the intestine
E	Oxidation and respiratory reactions
Folic Acid	Production of yellow pigments; oxidation and respiratory reactions; glucose regulation
Inositol	Formation of cell membranes
K	Formation of blood clotting factors
Lipoic Acid	Energy release/transformation
P (Nicotinic Acid or Niacin)	Oxidation and respiratory reactions
Pyridoxal Phosphate	Involved in complex reactions linking proteins with carbohydrates and fats

Minerals

Minerals	Some Metabolic Processes Affected
Calcium, Fluorine, Magnesium, Phosphorus, Silicon	Bone formation
Chlorine, Potassium, Sodium	Osmoregulation (water balance)
Iron, Sodium	Blood
Calcium, Cobalt, Copper, Iron, Manganese, Molybdenum, Zinc	Formation and action of enzymes
Iodine, Tin	Formation and action of hormones
Potassium	Nerve action
Iron, Phosphorus, Zinc	Energy transfer
Sulphur	Incorporated into proteins and vitamins

twenty five or so minerals are required for, details of actual, individual amounts are very difficult to estimate. One of the main reasons for this is that aquatic organisms absorb minerals both from the food they consume as well as from the water itself.

This last point is very significant in that it illustrates the importance of correct water chemistry. If a species lives in a particular type of water in the wild, this, obviously, means that it has evolved to survive under a particular set of conditions. These conditions include a certain, possibly unique, complement of mineral salts, some of which will be absolutely essential for the continued survival of all the species found in that environment. Two well-known, contrasting examples are the soft, acid (often) humus-stained waters in which many South American Tetras are found, and the normally clear, hard, alkaline conditions which exist in the African Rift Lakes where Mbuna Cichlids live.

It is quite easy to provide all the mineral salts that aquarium fish need by matching pH and water hardness conditions as recommended for each species and combining them with a balanced diet. Failure to comply with such guidelines can result in a lack of one or more essential trace elements which, in turn, will lead to some deficiency-associated breakdown or disease.

For example, lack of calcium and/or phosphorus will inhibit bone formation (among other metabolic processes). At best, fish suffering from such a deficiency will exhibit retarded growth. In extreme cases, so many enzymatic processes may become affected that the fish can die. Iodine is necessary for balanced hormone activity, while iron is essential for oxygen transport, energy transfer and the formation of haemoglobin (the red blood pigment) itself. Even chlorine, which is highly toxic when present in excess, is necessary, along with sodium and potassium, in controlling osmoregulation (the maintenance of an adequate salt and water balance in the body tissues).

If an aquarium is maintained efficiently, with adequate plant and fish stocks, an appropriate feeding regime and regular partial water changes, the chances are that there will always be sufficient trace elements present to meet the needs of both fish and plants. If a deficiency is suspected, however, supplements may be added, at least, until a more satisfactory balance has been worked out.

Interestingly, fish appear to use trace elements in a very similar fashion to humans. This can be seen quite clearly in the accompanying table which also demonstrates how critical individual elements can be to the survival of an individual.

Closing remarks

Fish nutrition is both complex and flexible, with the various pieces of the jigsaw fitting together in more than one permutation. As long as we as aquarists are aware of this and take the necessary steps to avoid major oversights, our fish will respond accordingly. However, if we ignore the basic rules, results will (distressingly) speak for themselves.

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SOFT IS SOMETIMES BETTER

Many hobbyists will be aware that 'soft, acid water conditions' are mentioned in the requirements of some of the fish that they keep. Dr Chris Andrews of the London Zoo Aquarium takes a look at the meaning of this frequently-used expression, and explores in a little more depth what these aspects of water quality mean to the fish — and their owners.

The 'acidity' of water is expressed in terms of its pH value, on a scale from 0 to 14. Pure water has a pH of 7.0 and is said to be 'neutral'; more 'acid' water has a lower pH, and more 'alkaline' water a higher pH value. Of course, the pH scale is a logarithmic one, so for each unit scale in pH value, there is a ten-fold change in acidity of alkalinity. Therefore, what seems to be a small pH change to the aquarist can have a far more drastic effect on the fish, which can be sensitive to even small shifts in pH.

Water hardness is related to the amounts of dissolved salts which are present in the water, and is often measured in degrees of German hardness (°dH). Water hardness is actually made up of two components: the General Hardness (or GH), which is related to the amounts of calcium and magnesium which are present, and the Carbonate Hardness (or KH), which is related to the amounts of carbonate/bicarbonate present. The General Hardness can have a direct effect on the survival and well-being of fish and their eggs, whereas the Carbonate Hardness is particularly important as a 'buffer' in preventing marked changes in pH.

Water hardness

°dH	Designation
0-3	Soft
3-6	Moderately soft
6-12	Slightly hard
12-18	Moderately hard
18-25	Hard
Over 25	Very hard

To convert °dH to ppm (parts per million) CaCO₃ (another water hardness unit), multiply by 18.

A better understanding of water hardness is obtained if the GH and KH are thought of as completely separate components, and not linked together as they sometimes are in the published literature.

What is soft water?

Soft water contains relatively few dissolved salts, and is usually neutral to slightly acid in pH value. In nature, such water is often low in nutrients, and may contain various plant extracts (which are washed into the water during heavy rain).



Above, Black Phantom Tetras (*Megalomphodus megalopterus*) do extremely well in soft, acid conditions.



Right, peaty, soft, acid water such as this (Rio Negro), is ideal for fish such as Cardinals and a host of other species.

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Such plant extracts, which may be acidic in nature, can also impart a brownish, tea-like tinge to the water.

As will be seen below *some* fish do need soft water if they are to thrive in the aquarium, whereas a great many of the so-called 'soft water species' will actually live at a range of pH and water hardness values — so long as the fish are acclimated to these conditions slowly, and so long as fluctuations are kept to a minimum. However, soft water conditions are usually important when it comes to breeding these fish, as excessively hard water may prevent or hinder egg development.

Soft water brings with it one or two problems though. To begin with, very low KH values (less than 1 or 2°dH) will mean that there is very little buffering capacity in the water, and hence it may be prone to sudden changes in pH, which can be dangerous to fish. Hence, when water is softened for aquarium use, it is important not to soften it too much, or at least to check the pH value regularly. Commercial buffer solutions are available, and can be added to the aquarium, although this must be done carefully in the presence of fish.

Nitrification, the conversion of nitrogenous wastes such as ammonia to nitrite and then nitrate, proceeds best at a slightly alkaline pH value, and does not proceed very well at acid pH values (below 5.0 or so). Therefore, in a tank containing soft, acid water, a watch should also be kept on the ammonia and nitrite levels, which can suddenly peak following overfeeding or an overnight fish death. Fortunately, ammonia is rather less toxic at an acid pH, when compared to its toxicity in alkaline water.

Softening water

Hardwater can usually be made more soft



The Discus is the classic soft/acid water fish.

(and acid) by diluting it with clean rain water, and allowing it to stand in contact with aquarium peat for a few days. As a rough guide, allow about two handfuls of aquarium peat for every 2-3 gallons of water, and check the effect and extent of the water quality alterations before keeping any fish in the water. Remember that fish are quite sensitive to changes of even 0.3 pH unit, and that pH 5.0 is probably the lower safe limit for most fishkeeping.

Various chemical water softeners are now becoming more easily available to hobbyists. The typical domestic ion exchanger systems are probably not ideal for fishkeeping, as they usually exchange 'soft' sodium ions for the 'hard' calcium and magnesium ions

which makes the water *feel* soft, but it can then contain unnaturally high levels of sodium.

Using a two-stage demineralisation water softener is probably better for aquarium use, and these are usually based on disposable cartridges which remove calcium, magnesium and carbonate/bicarbonate from hard water. In fact, the resultant water can be so pure that it has to be mixed with a little hardwater before it is suitable for fish! Ask a local aquarium shop for details on water softeners for aquarium use.

What is vital to remember is that, whenever prevailing water conditions are modified, they should be done so in the absence of fish (checking the results with a test kit), and then the fish must only be exposed to very gradual changes over a few days or longer. Similarly, it is difficult to produce precise 'recipes' for making water more soft and acid, as the prevailing local water conditions vary from region to region. What this necessitates, therefore is experimentation — in the absence of fish, of course! Fortunately, reliable tests make such experiments quite straightforward.

Which fish?

The table lists the water quality preferences of a range of commonly-kept aquarium fish, and is largely self-explanatory. Remember that many of these fish will live quite happily in water which is different to that indicated, but for successful breeding, the preferred conditions may have to be provided.

With this in mind, it is important to establish whether your fish really do need soft water — since once you start providing it, the softening of local hardwater will have to become part of your routine tank maintenance prior to every water change.

Some recommended soft water species and their requirements

Common Name	Scientific Name	GH (°dH)	KH (°dH)	pH	NO ₂ content (max) (mg N/l)	NO ₃ content (max) (mg/l)	Heavy Metals
Butterfly Cichlid (Ram)	<i>Microgeophagus ramneszi</i>	0.1-5	0.1-3	6-7.5	0.05	20-40	Very low - extremely low
Silver Shark	<i>Balantiocheilus melanopterus</i>	0.1-5	0.1-3	6-7.5	0.05	20-40	Very low - extremely low
Clown Loach	<i>Botia macracantha</i>	0.1-5	0.1-3	6-7.5	0.05	20-40	Very low - extremely low
Ornate Tetra	<i>Hyphessobrycon ornatus</i>	0.1-5	0.1-3	6-7.5	1.0	20-40	Very low - extremely low
Cardinal Tetra	<i>Paracheirodon axelrodi</i>	0.1-5	0.1-3	6-7.5	0.05	20-40	Very low - extremely low
Neon Tetra	<i>Paracheirodon innesi</i>	0.1-5	0.1-3	6-7.5	0.1	20-40	Very low - extremely low
Congo Tetra	<i>Phenacogrammus interruptus</i>	0.1-5	0.1-3	6-7.5	0.1	20-40	Very low - extremely low
Suckermouth Catfish	"Plecostomus"	0.1-5	0.1-3	6-7.5	0.1	20-40	Very low - extremely low
Angelfish	<i>Pterophyllum scalare</i>	0.1-5	0.1-3	6-7.5	0.05	20-40	Very low - extremely low
Piranha	<i>Serrasalminus</i> spp	0.1-5	0.1-3	6-7.5	0.1	20-40	Very low - extremely low
Harlequin Fish	<i>Rasbora heteromorpha</i>	0.1-5	0.1-3	6-7.5	0.05	20-40	Very low - extremely low
Discus	<i>Symphysodon</i> spp	0.1-5	0.1-3	6-7.5	0.05	20-40	Extremely low
Killifish	<i>Aphyosemion</i> , <i>Cynolebias</i> , <i>Epplatys</i> , <i>Nothobranchius</i> , and others	0.1-5	0.1-3	6-7.5	0.05	20-40	Very low - extremely low

(Table based on data supplied by Tetra)

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AQUARIUM PLANTS: THE KEY TO SUCCESS

The key to long-term success with aquarium plants lies in an understanding of all their basic requirements. **Barry James**, of Everglades Aquatic Nurseries, explains some of the more common reasons for failure and illustrates these with reference to some well-known aquarium plants.



Cryptocorynes are usually found in shady places in the wild. The brown, detritus-covered species in this Malaysian stream is *Cryptocoryne griffithi*. (Photo: John Dawes).

A familiar complaint from aquarists trying to maintain a well-planted aquarium is that although the plants grow well for the first few months, they subsequently behave poorly, with growth becoming elongated, loss of lower leaves, and yellowing and deformation of the whole plant.

In the case of fast-growing species such as the *Ludwigias* and *Hygrophilas* this is quite a natural process. Such plants do not grow permanently submerged in their natural habitat.

Most tropical areas have well-defined wet and dry seasons. Aquatic plants have adapted to this situation and so have two distinct periods and forms of growth. In the dry season when water levels are low, the plants grow emerged with stiffer stems and leaves. This foliage is specially adapted to resist desiccation. At this time the sexual reproductive cycle occurs, with the plants flowering and setting seed.

With the rising water table which occurs at the onset of the wet season, these seeds germinate producing new plants, while the parents either perish or adapt to the new situation by producing soft, flacid foliage commensurate with their new surroundings.

Those people adhering to the "Dutch" system of planting aquaria recognise this fact and replace many of their plants on a regular basis to maintain the effect. The followers of the other school of thought hardly use such "temporary" plants but concentrate on other species which are capable of growing permanently submerged.

Of course, no two areas of the tropical world have exactly the same climate. Rainfall may be sporadic or may occur on a daily basis throughout the year. Soil composition will differ substantially depending on the local geological formations from which it is

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derived and other factors, including the influence of man in damming lakes or removing forest cover, will all affect the local conditions. Other very important factors are the conditions pertaining in the actual body of water inhabited by particular plant species. It may be a small stagnant ditch or pond, a small stream, a torrential river or a large lake. The light levels too will vary, from the dense shade experienced by a jungle stream, to the intense sunlight of open water.

It is hardly surprising then, that when one attempts to maintain a planted aquarium containing several species, that the conditions will not be ideal for all the different plants involved. It may be that special attention to their particular needs will be needed if certain plants are to thrive over a long period. I shall attempt to give an insight into various plant species and possible reasons for failure.

Echinodorus Species (Amazon Swords)

About fifty species of *Echinodorus* are known to exist. They range from the Southern United States, through Central America, down as far as Argentina. Nearly all are marsh dwelling and amphibious. However, few will spend 12 months of the year growing entirely submerged, so it is to be expected that specimens will deteriorate after nine months under aquarium conditions.

Echinodorus, like their counterparts in South-East Asia, the *Cryptocorynes*, show a great deal of polymorphism of their leaves, depending on growing conditions.

Temperature is often a deciding factor with *Echinodorus*. I suspect that many people keep them at far too high a level. Many will be happiest in the high 60°F (c.20°C) and few will tolerate temperatures higher than 80°F (27°C) for any length of time. In general, 72-78°F (22-26°C) is probably an ideal range for these species. Lighting should be moderate and the water slightly acid to slightly alkaline. *Echinodorus* species are greedy feeders and will need plenty of iron in their "diet" to show their naturally brilliant leaf colour.

Cryptocoryne Species

A typical *Cryptocoryne* biotope would be a small Malaysian river. In contrast to the conditions discussed for *Echinodorus*, *Cryptocorynes* are happiest with rather higher temperatures; 72-82°F (22-28°C) would be to their liking. pH would nearly always be on the acid side; 6.4 to 6.8 would be normal, although many species will tolerate more alkaline conditions, particularly *C. affinis* and most species from Sri Lanka.

Although *Cryptocorynes* grow in deep shade, in some cases, they will be happier with higher light levels.

"Cryptocoryne Rot" is a familiar and distressing disease among serious plant growers. While certain bacteria have been



Despite its luxuriant and permanent-looking lily growth, this West African pond most probably experiences considerable fluctuations in water level throughout the year, periodically exposing certain plants (which are normally submerged) to aerial, emerged conditions.

isolated as possible culprits, it is now thought that an abundance of nitrate, or sudden changes in pH, CO₂ content, iron superabundance, or a sudden permanent change in light intensity or quality can trigger the disease. However, in my experience the plants nearly always re-grow from the roots, if they were strong plants to begin with.

Tuberous Plants

These plants cause much joy in beginners, when seemingly lifeless tubers spring into growth and make spectacular plants in just a few weeks. However, over the following months the plant (after flowering) goes into a steep decline, finally ending up as an impoverished, depauperate specimen with a few stunted leaves.

Aponogeton, *Nymphaea* and *Barclaya* are the main tuberous species imported. All live in areas with well defined wet and dry climatic periods. The tubers are their mode of survival when the pools in which they live become dried up and then baked by the relentless sun. These tubers are storehouses of nutrients which the plant uses to get a

headstart over other seed-setting species when the rainy season returns.

It is therefore essential to feed these plants well during the growing season. Basic and trace element fertilisers should be administered at regular intervals. When the plants have finished their growing cycle, they should be removed from the aquarium and stored in damp peat at a temperature of 55-60°F (13-15.5°C) for at least 4 months. I have successfully cultivated *Aponogeton ulvaceus* in this way for several years.

Growing Temperatures:

Asian <i>Aponogetons</i> and <i>Nymphaeas</i>	78-82°F (26-28°C)
Madagascan <i>Aponogetons</i> and <i>Nymphaeas</i>	72-75°F (22-24°C)
<i>Barclaya</i>	77-82°F (25-28°C)

Aquatic Ferns

There are three genera of true ferns used in aquaria at the present time, the commonest being *Ceratopteris* or Indian Fern. This cosmopolitan genus is the subject of heated argument among taxonomists as to how many species there actually are. The reason is the fact that this is the most polymorphic

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species known.

Ceratopteris thalictroides, for instance, has at least three different foliage types. As a marsh plant it produces very finely divided upright fronds resembling fennel. When submerged, the foliage is broader but still finely divided. Finally, it has a floating form with almost entire fronds lying flat on the surface and trailing roots. All three forms are freely interchangeable. *Ceratopteris* requires moderate light and a carefully balanced supply of nutrients to succeed.

Bolbitis has several species, the commonest one being *B. hesdelotii* hailing from Africa. This rhizomatous plant attaches itself to peat, rocks and driftwood. It (strangely for a fern) prefers hard, alkaline water; even brackish water doesn't upset it. As it is often found in fast flowing rivers or under waterfalls, it should be positioned near to the outlet of a power filter for success.

Java Fern, *Microsorium pteropus*, will also tolerate hard water and a high pH. It likes a shaded position in the tank, or the leaves will become translucent at the tips, and the plant will remain stunted. Again, it grows attached to the aquarium furnishings.

Fine-Leaved Foreground Plants

Plants, such as the Hairgrasses, *Lilaeopsis*, and Dwarf Echinodorus are often troublesome to get established. The reason, often lies in the substrate which is normally too coarse for such delicate little plants. Gravel

should be about 1/16th-1/8th particle size, and a layer of laterite clay under the roots will work wonders. Light should be moderate, or algae will soon choke up their leaves.

Milfoils

Plants of the Genus *Myriophyllum* require very special conditions for success. Water must be crystal clear with no floating debris which will choke up the finely divided leaves. All species require very bright light, but to avoid infestation by thread algae, a solid layer of floating plants, such as *Salvinia*, needs to be established before introduction. *Myriophyllum elatinoide* is the easiest species to grow in aquaria, in my experience.

Lighting

Lighting is a pretty controversial subject at the present time. There's a plethora of different types of fluorescent tubes, tungsten filament lamps and discharge lamps on the market. Many were designed for industrial, amenity, or horticultural use, but none were built solely for the use of the aquarist. This means that, although the spectrum may be right for satisfying chlorophyll absorption, it may be unsuitable for the visual spectral curve of the human being. Put simply, they are OK for plants, but may not suit our eyes, often giving the aquarium a most unnatural appearance.

In this respect one should study the

characteristics of the wavelengths given out by the tubes. Those in the blue/red area of the spectrum will suit our plants, but these should be balanced by a lamp, such as Truelight which has the advantage of a high Colour Rendering Index (CRI)*. Although expensive, these full spectrum tubes are well worth the money, as their spectrum corresponds closely to natural daylight, and they have a life of around 24000 hours, as opposed to other tubes normally rated at 6000 hours.

Don't forget that, with several tubes in a lighting canopy, they will not all last the same length of time, and so the light output will steadily deteriorate over a period of time. It is best to change one lamp at a time; a sudden change in intensity can upset the delicate balance that you have striven so hard to achieve.

Finally, don't forget the importance of correct and balanced feeding of your plants. Farmers and horticulturists are deeply concerned about the fertility of their land. Poor fertility = poor crops. The same is true of aquaria, but this does not mean simply adding a few drops of some dubious mixture when you feel like it. Regular balanced feeding is essential, and, like the farmer, you should know what are the compounds you are using. Otherwise, you are simply shooting in the dark.

*CRI (Colour Rendering Index): this is a measure of how close, or otherwise, a source of light is to sunlight. Sunlight has a CRI value of 100.

Left, *Echinodorus paniculatus*, like all other Amazon Swords, like iron in their "diet". Centre, All *Myriophyllums* (this is *M. latinoide*) require crystal clear water and high illumination. Right, Many fine-leaved foreground plants, such as *Eisocharis xingus*, one of the Hairgrasses, prefer a relatively fine rooting medium with a layer of lateritic clay underneath.



BARRY JAMES

Letters

In-tank Brine Shrimp Culture Problems

I have read several recent articles promoting the idea of hatching *Artemia* cysts directly in the marine aquarium. I feel that now is the time to discourage this bad practice and I give my reasons herewith.

The dried cysts of *Artemia* lay host to various types of dormant bacteria spores, *Vibrio parahaemolyticus* and *Vibrio anguillarum* being the main ones.

Vibrio bacteria have been linked with *Artemia* cysts for several years, attaching themselves to the shell cases and becoming active when placed in the correct conditions, i.e. when the cysts are placed in the hatching medium.

Suggesting to the hobbyist that dried *Artemia* cysts should be placed into the marine aquarium for hatching is 100% bad practice. While the nauplii are hatching, then so are the various bacteria. Pathogenic bacteria multiply very fast and become extrapolative in numbers, i.e. 20 become 40, 40 become 80, etc. After 24 hours' incubation bacterial numbers are quite staggering as each individual shell can contain thousands of spores (each single gram of cysts can contain as many as 250,000 eggs).

Vibrio bacteria have the capabilities of penetrating the skin/flesh of fish or even worse, can be ingested, causing disease or death, with certain antibiotics being the only cure/remedy. The hatching of cysts directly into the fry tank is also to be deterred as the cyst shell is

composed mainly of chitin, an indigestible product which has caused larval deaths due to blockage of the digestive system.

Decapsulated cysts which are now readily available, obviously do not carry a 'loaded shell' and therefore transmission of bacteria is virtually nil. However, the hatching of decapsulated cysts/embryos in the marine aquarium should also be discouraged as the embryonic fluids are composed of glycerol, a bacterial substrate.

With amounts of glycerol in any marine aquarium, this will act like a magnet, causing all present bacteria to enjoy a free supply of enriched food, boosting the quantities of both good and bad species.

In Japan during the sixties, the idea of hatching *Artemia* directly in the culture tanks was widely practised, until the aquaculture stocks suffered high mortality through bacterial contamination.

The four golden rules of tackling *Artemia* are: Wash, Hatch, Wash and Feed. Following these rules drastically reduces the risk of bacterial infection/contamination of the fry tank, thus increasing fry survival.

G. Penney
Yorkshire Brine Shrimp Supplies

Red Devil "First" for Malta

Up to four years ago, I only knew the Red Devil, *Cichlasoma labiatum* from books. But, luckily for me, I managed to order four from a local petshop — but it took two whole months

before I had the fish in my home aquarium. At the time, they measured 2in (5cm). Sadly, one specimen died.

I had prepared the one-metre tank with two inches of gravel, three undergravel filter plates, rockwork and some slate. After one week's quarantine, I put the three survivors in their tank and they immediately established their own territories. Six months later, they had grown to 6in (15cm) and this was the time they declared World War III!

Two of them began sharing a territory, while I was at work, and attacked the third specimen so badly that they completely blinded it and ripped all its fins. In the end, I had to put it down.

By next day, the tank was like an excavated field and both fish were clearing a piece of slate. I was lucky enough to observe the pair mating over a period of four hours.

You can imagine how happy I was, since this was the first time that this species had been bred in Malta.

I checked them again the following morning at 6.00am and everything was fine, with both parents cleaning and fanning the 600-700 eggs. Sadly, this didn't last — I received a call at work to say that all the eggs had disappeared and that the fish were fighting. Disaster! By the time I got home, the female was dead, but the male was still trying to mate with her!

By this time, one of my friends (a member of our local club) had a female and he agreed to loan her to me. I promised him the first fry in

return.

This time round, I put a glass partition in the tank and left it in place for a day, while the fish displayed to each other and dug up the gravel. During the night, I removed the partition and, by the next morning, spawning was taking place. On this occasion, it was 100% successful — so were two later attempts.

As a result, I am proud to know that Malta is now fully stocked with *Cichlasoma labiatum*.

Charles Grima
Fgura, Malta

Oscar Varieties

In last September's *A & P* article on Oscars (*Astronotus ocellatus*), Dr. Robert Goldstein states that there are four varieties of this species: the wild Marble-green Oscar, the Red Oscar, the Tiger Oscar and the more recent variety, the Long-finned Oscar.

While I agree that these varieties are the most popular, there are two others available to the aquarist: the Bronze Oscar (which is a plain, almost metallic bronze colour) and a strain of the Tiger Oscar which has no vermillion scales, just dark green patches and bands on a lighter base.

Are these fish true varieties? I would welcome any comments on the subject from other *A & P* readers.

As Dr. Goldstein stated in his article, the Long-finned Oscar is grotesque and does nothing to enhance the reputation of this beautiful and intelligent fish.

K. Ball
Norwich

FRED THE PIRANHA.

CANNIBALS! THAT'S WHAT WE ARE, SAVAGES!



ONLY YESTERDAY, I SAW MY BEST PAL EATEN ALIVE, RIGHT IN FRONT OF ME!..



...BY MY OWN FAMILY! ;*;*!.. CANNIBALS!



© 87 PETER McGEOUGH.

AND I DIDN'T EVEN GET A BITE!



Coldwater jottings



Stephen J. Smith

Insufficient Neglect . . . ?

I am sure we all like to think that we pamper and cosset our pet fish. But, strangely, there is one major element which, all too often, passes unrecognised in successful fishkeeping . . . insufficient neglect.

Now, just before you all reach for the telephone and a copy of Yellow Pages for the number of your nearest RSPCA centre, let us ponder awhile this remarkable statement.

How many times in the past year or so have I encountered the problem of many a goldfish keeper with the Oranda types of Goldfish — the main characteristic of which is a fleshy 'hood' growth?

The problem lies with the profusion of mucus which is created by a healthy coldwater fish. Within the pitted hood is a greater surface area than on a smooth skin; thus the accumulated mucus appears as small white fluffs or globules — mistakenly diagnosed as *Saprolegnia* or Fungus.

And, before the seasoned aquarists among us begin to scoff, it may surprise many to hear that I have, more than once, seen quite vigorous Orandas disqualified by show-judges for "signs of *Saprolegnia*", when in fact the fish in question were only displaying a sure sign of a healthy specimen.

Medication under such false circumstances only leads to stressful fish and a plethora of complications.

So, leave well alone. It often



JOHN DAVIES

Orandas are often the victims of insufficient neglect.

does pay not to over-protect your fish. And, if you are in any doubt, do seek advice from any of the half-dozen coldwater aquatic societies in the UK.

Marine goldfish . . . ?

No apologies for another quizzical "jotting", but within a matter of days of writing the above piece, I heard the following story of an over-enthusiastic newcomer to the coldwater scene. (I have been assured that the tale IS genuine!!)

Having "tried tropicals" with apparently little success, the fellow in question turned his attention to a Goldfish and a couple of Koi. In an effort to ensure that he should make no mistake this time, he called an experienced Koi-keeper to set everything up for him.

So far so good. The Koi man visited the novice's house, set the aquarium up, and returned the following day, having allowed the water to stand and to join the novice on his trip to the aquatic centre.

A Fantail and two brutal-looking Koi were duly checked and purchased, and subsequently installed in their new home.

Safe in the knowledge that everything should be fine, the Koi man departed with the instructions: "Don't overfeed — and if you need any help, ring me."

The following weekend — Sunday afternoon in fact — the Koi man received an SOS by telephone: "My fish look a bit off," exclaimed the novice. "Can you come and have a look at them?"

The sight of three sad and bloated fish, apparently stuck

onto the surface of the water, greeted the Koi man. Puzzled as to what fate had befallen the fish, he approached.

Caeked solidly around the rim of the aquarium was a quarter-inch rim of salt! A "finger analysis" revealed that, after this, even the Dead Sea might be habitable!

"They looked a bit off-colour when I was watching them yesterday," explained the novice, meekly. "One of the books said that salt would be a tonic so I put a few tablespoons in. When they started scratching against the sides of the glass I put some more in today to get rid of the flukes . . ."

His voice trailed away in response to the sight of the Koi man's obvious horror.

Insufficient neglect? Not half!

Tail-piece

I thought you'd be interested to see my favourite holiday snap from last summer. It was taken on board a Japanese battleship on a courtesy visit to Portsmouth harbour.

Members of the public were given conducted tours around three such vessels, one of which was "JDS Yamayuki".

Naturally, I was curious about the ship's emblem, which was featured on publicity literature from the Japanese Navy, as well as around the decks.

So it wasn't long before I attempted to strike up a conversation with one of the Japanese Naval guides.

My opening questions — in slow English — were, of course, not understood. However, summoning the ONLY Japanese word in my vocabulary, I uttered: "Nishikigoi?"

Open sesame! The sailor's face beamed and we were joined by two of his shipmates. Goodness knows how, but we found ourselves talking about fish — despite the fact that I knew no other Japanese and they spoke little of no English.

However, I somehow learned that the Koi illustrated in the emblem was indeed part of the insignia of the vessel, the name of which translated loosely means "Rising Carp".



STEPHEN SMITH

Tomorrow's aquarist

By Alan Balfe



Plastic plants can be arranged in spectacular displays with a little thought and creativity.

Plastic plants in the Aquarium

I have had a letter from A. N. Milne of Ballymena, Northern Ireland about the benefits of plastic plants. Unfortunately, I haven't got enough room here to print the letter in full, but here are the main points that he raises.

“Why use plastic plants in an aquarium when real ones are so readily available? I feel that there is a great need for them, whether it is to plant an aquarium containing ‘vegetarian’ (herbivorous) fish, or to add decor to a hospital or breeding tank. The main advantages of plastic plants over real ones are, in my opinion:

- 1) They are longer-lasting than the real thing. (Plastic is highly durable and should last for a lifetime. There is no fear of the plants disintegrating or dropping leaves in normal usage.)
- 2) You can move them around without fear of damaging roots or leaves. (Plastic plants have no root system and therefore can be moved with ease. ‘Re-planting’ is easy and causes no problems.)
- 3) Fish cannot eat them. (At least they shouldn't, unless you have not fed them for a long time and even then the fish would probably die first!)
- 4) Undergravel filter problems are eliminated. (This is really an adjunct to (2) above, but for those who have experienced problems with growing real plants using undergravel filters, the use of plastic plants is certainly a viable alternative.)
- 5) Algae will grow on them just

like the real thing. (This will, of course, remove their plastic look and help them to blend in with any real plants that are in the aquarium. [Personally I find that plastic plants tend to become encrusted in algae as the fish are usually disinclined to clean them up. They can, however, be scrubbed clean — quite unlike their real counterparts].)

6) With the use of modern techniques the new ranges of plastic

plants look more realistic than ever before, and for those who have difficulty in growing real plants (for whatever reason) they are a great advantage. Anyone can have a tank that appears fully planted and highly decorative. A very useful effect is to combine real plants with their modern counterpart. The plastic plants can be used to protect the real ones and the combination of the two can look spectacular.”

Thanks very much for the letter, Mr Milne. It certainly raises some points that are worthy of discussion. We'll shortly be sending you a copy of “An Interpet Guide to Aquarium Plants” by Barry James, published by Salamander, and distributed by Interpet Ltd, with our compliments . . . to help you look after your real plants as well as your plastic ones!

Nigeria calling

We have had some letters from three boys in Nigeria who have decided to take up fish-keeping. Unfortunately, they are

experiencing huge problems getting equipment and books and this is something with which we are unable to supply them with.

One of the ways in which we could help them is by finding them some pen-pals, so if anyone would like to take up the invitation, then let us have your letters and we will pass them on (and give you their address, of course!). The boys' names are: **Princewill Ikegwuonu, Chidozie Anyanwu and Kelechi Ogbuagu.** They are all about 10 years old and are extremely keen aquarists. So, over to you T.A. readers — we look forward to hearing from you as soon as possible.

Princewill Ikegwuonu



Tyro's Diary

Spent a happy hour (?) repairing the damage to the tank and getting it all to look the way I wanted again. The female Guppy doesn't seem to be unduly worried about the beard; maybe she is supposed to have it. Could it be a desired characteristic of that particular type of Guppy? I don't know and I don't know where to go to find out. Off to the library.

Managed to find a great book, the **Hamlyn Colour Guide to Tropical Fish**. It's chock-a-block full with colour pictures of lots of different fish, including their minor variations. Thanks to this book I finally managed to identify the catfish. She, yes “it” is definitely female, is an *Ancistrus* or Bristle-nosed Catfish. “A nocturnal catfish that can be exceedingly active”. The author wasn't joking. Every day for a week I am destined to find the tank in complete disarray.

The book is superb. It gives you no end of information about

the fish; gestation periods, temperatures, water hardness, source locations, size variations, scientific names, the lot.

One morning I find the Guppy dead so I rang the shop she came from and they offered to replace her for me. Turned out that she had a bacterial infection in her gills, they must have been damaged well before I got her. Fortunately, it doesn't seem to be infectious, so I won't have to treat the entire

tank — so that's alright.

While I was in the shop I got a breeding pair of Orange Platies; they are a nice deep orange with silver eyes. Nice.

Once I got home I carefully placed the new fish into the tank and left them to settle in. There didn't seem to be any territorial problems with the others so I assumed they would settle down easily.

Next time: Tyro cleans the aquarium!

Tyro's Aquarium Atlas Competition Winner

The winner of our December competition is:

G. J. Smith, 12 Mill Road, Aylsham, Norfolk NR11 6DU. who will receive a copy of Rudiger Riel's and Hans Baensch's superb **Aquarium Atlas** donated by the sole UK distributor **Rolf C. Hagen (UK) Ltd.**

The correct answers were:-

Name of Fish	Country/Region of Origin
Neon Tetra	AMAZON
South African Mouthbrooder	ZAMBIA
Siamese Fighting Fish	CAMBODIA
Zebra Danio	INDIA
Swordtail	MEXICO

Congratulations to the winner, and sincere thanks to **Rolf C. Hagen (UK) Ltd.** for their sponsorship.

Your questions answered

Having problems? Send your queries to our panel of experts who will be pleased to be of service. Every query receives a personal answer and, in addition, we will publish a selection of the most interesting questions and responses each month. Please indicate clearly on the top left hand corner of your envelope the name of the expert to whom your query should be directed. All letters must be accompanied by a S.A.E. and addressed to:
Your Questions Answered, The Aquarist & Pondkeeper, Buckley Press Ltd, 58 Fleet Street, London, EC4Y 1JU



TROPICAL
Dr David Ford



COLDWATER
Pauline Hodgkinson



PLANTS
Barry James



KOI
Roger Cleaver



MARINE
Graham Cox



DISCUS
Eberhard Schulze

Tropical

Hong Kong Pleco

Would you please give me some details about the Hong Kong Pleco? I've recently bought one but don't even know its proper name.

The Hong Kong Pleco is *Pseudogastromyzon myersi*, a peaceful fish that has no special water requirements, so it is ideal for the community tank.

It will not grow beyond 5cm but generally escapes bullying because of its catfish shape and habit (although it is not a catfish, but a Hillstream Leach). In the wild (Hong Kong Island) it feeds on algae, so vegetable flake is necessary if the tank is kept clean.

Spawning kribis

Please help me. I have recently decided to attempt to breed Kribensis (Pelvicachromis pulcher) but am not having much success.

Pelvicachromis pulcher used to be called *Pelmatochromis kribensis*, hence its common name of Kribensis. A pair of similar size will breed readily and frequently, but they do like privacy. So you should set up a separate breeding tank and give them a plant pot "cave", with the opening away from the front glass. Normal "tropical" water conditions are quite adequate.

You will see when spawning time is due by the female developing vivid colours, more-so than the male, and swelling

with eggs. Within a few days the "happy couple" will swim from the cave with anything from a few dozen to a few hundred hungry fry. They are good attentive parents and the young are large enough to accept crumbled flake straight away. Some freshly hatched Brine Shrimp helps rapid growth too.

Within a few weeks the pair will develop breeding colours again and the female will swell with roe. This is when they must be moved to another tank, or the fry removed, because this great need for privacy will make the fish drive away the old family to make way for the new. In the confines of the aquarium the fry will not disperse so the parents may kill them before spawning again.

Blooming water . . .

I have a 3-ft tank which has had eight complete water changes already, but the water is still cloudy (yellow-green). What is wrong?

It sounds as if you are getting a bacterial bloom complicated by some plankton (yellow-green

is probably chlorophyll) — all of which indicates absence of maturity. The fact that you keep emptying and refilling means that the "bloom" will keep re-forming.

Keep the system running with nothing more than 1/4th water changes weekly and nitrifying bacteria will take over, replacing the "bloom".

Marine

To dehalogenate

. . . or not

I have been using a popular brand of dehalogeniser to take the poisonous chlorine and fluoride out of the tapwater which I use to dissolve my synthetic sea salts. Unfortunately, I have found that the usage of this product to treat my tapwater prevents the foam in my protein skimmer from collapsing as it used to do previously. Is there any way around this problem?

This is a difficult one. All the better-made brands of dehalogenisers contain one or more organic chemicals which are added to the formulation to

protect the new fishes' dermal tissues from chemical damage caused by the new, "raw" tapwater. All these organic compounds are SURFACTANTS in varying degrees. That is to say, they change the tapwater's SURFACE TENSION characteristics so that air bubbles reaching the surface are much more stable and don't collapse so easily.

The best way to avoid this problem in future may be not to use the Dehalogeniser but instead do one of two things as follows:—

1. EITHER: aerate the tapwater vigorously for 24 hours prior to using it to dissolve the sea salts;
2. OR: use sea salts which already contain NON-SURFACTANT DEHALOGENISERS in the formulation as supplied, eg. Ultramarine.

Freshwater baths . . . useless, dangerous and cruel?

I have been keeping marine fishes and a few invertebrates for over four years now. I have read all the books on the subject except yours which don't seem to be available round this part of the country.

My problem is that I am still losing a lot of fish all the time. My favourite method of preventing diseases is the fresh water bath which all the books, and my local dealer, seem to recommend. Yet all my fishes keep dying.

Kribis like to spawn in caves but a flower pot will provide a suitable alternative.



Please help me. I have lost so many fish that I am thinking of going back to tropical freshwater aquaria.

I'm afraid, that you have been listening to (and reading) too many false prophets. I use the word "prophets" only very loosely, since some of those who have turned their redundancy money into pet shops may think that easy "profits" can be made by ripping off gullible hobbyists.

Please allow me to discuss your disasters in the hope that this will help stop people killing off the Almighty's creatures.

I believe that freshwater baths are useless, dangerous and cruel. My reasons for this statement are as follows:—

a) **USELESS** because ALL of the pathogens and parasites which the infamous freshwater bath seeks to eradicate are already ENDEMIC within the sea aquarium which you next place the fishes into.

b) **USELESS** because almost all the pathogens and parasites which you seek to control are actually MORE RESISTANT to freshwater immersion than are the corals themselves.

c) **DANGEROUS** because if you left the fishes in the freshwater bath long enough to create substantial OSMOTIC DAMAGE to the pathogens and parasites, you would also do irrevocable PHYSIOLOGICAL DAMAGE to the fishes themselves.

d) **DANGEROUS** because after you have realised that freshwater baths are useless and dangerous, (and having carefully read your 3-page letter, I think that this realisation is beginning to dawn on you), you are next likely to be seduced into trying the even more lethal FORMALIN BATH, or FORMALDEHYDE BATH as some books have it. This is analogous to progressing onto heroin because hashish no longer gives you the kicks it once did!

e) **CRUEL** — 'nuff said! Please read a) to d), above, one more time and then make up your own mind.

Coldwater

Red Cap info

I have just bought a Red Cap which I am keeping in a 3-foot tank at 80°F. How large will my



Red Caps, like all other goldfish varieties, prefer cooler, rather than warmer, temperatures.

fish grow, what is the best food for it, and how do I sex it?

A good quality flake food and a variety of the freeze dried foods such as Tubifex, Shrimp and Bloodworm would be excellent, but your fish will also appreciate the occasional feed of live foods such as White-worm, Earthworms, Mosquito larvae, Glassworm and Daphnia.

I was concerned to learn of the temperature at which your fish is kept because 80°F is much too high for a member of the carp family. Natural temperatures are best; there is no need to keep these fish in artificially high temperatures. In actual fact they are happiest when temperatures are about the mid-60°F range.

The size which your fish will grow to will depend on several factors: feeding, the environment in which it is kept, and variety are all contributing factors. However, it may be capable of attaining about 4 inches in body size.

Sexing goldfish is relatively easy in adults as the male has a

serrated edge on the front ray of the pectoral fins. Small white pimple-like growths will develop here when the fish is in breeding condition. These tubercles may also develop on the gill plates.

Moving pond fish

We will be moving house before long and would like to take our pond fish with us. Your advice would be greatly appreciated.

If you have a large number of fish it might be wiser to catch them on the day before your intended move. This will give you time to net them all as catching fish is not always too easy, and it is better to allow plenty of time so that the job can be done with patience and care.

A temporary holding pond can be made from a wooden crate or stout cardboard box lined with polythene. If a cardboard box is used, tape it well with broad packing tape to give it strength. It should also be netted against any predators.

Also, set aside buckets or containers lined with black plastic bags filled with clean water. This will give the new water a chance to mature and tem-

peratures to equalise.

On the day of the move the fish can then be placed into the containers, in clean water, and the bags tied securely. Providing that the fish are well spaced out and not crowded, all should be well.

On arriving at your new address, temporary accommodation for the fish can be made from a child's paddling pool, providing that it is well netted against would-be predators. Alternatively, the wooden crate can, once again, be called into service. These are often available from wholesalers who are normally only too happy to have them taken off their hands. . . . Or a handyman can soon knock one up without too much effort.

Plants

Nitella basica

Would you please give me some information on Nitella and its cultivation?

Nitella is a large genus containing some 80 species, of world-wide distribution, found in both fresh and brackish water.

However, the species most commonly found in aquaria is collected in Malaya. It prefers soft, acid water and is therefore a somewhat difficult species. Light should be moderate but it should not be exposed to direct sunshine, otherwise it may become overwhelmed by algae. The plant grows in tangled masses and any piece may be broken off and pushed into the bottom when it will grow freely. I would aim for a pH of 6.8-7 and total hardness of 70-80 mg of CaCO₃ per litre.

Tanked Up!

BY
Phil Baber.



Seaview

by Gordon Kay



Black problem

A month or two ago, I had a weird problem in my 70-gallon fish-only aquarium. I say weird because the symptoms were just that. The fish started to scratch themselves on the rocks, and went on to lose their colour, while their breathing became very heavy. One or two of them also started to skulk in corners, although at no time did their appetites diminish. Although I've never experienced *Oodinium* in all my time as a fishkeeper, I knew enough to think that I was seeing the first signs of this now.

Reluctantly, I started to use a copper treatment. I wasn't keen on this because I don't particularly like using copper (I keep Butterflies and a pair of *Centropyge bicolor* in the tank and they react very badly to this type of treatment). However, despite the known effectiveness of copper against parasites, the treatment didn't work.

After a week, things had become much worse. Some of the fish had developed red patches and my Vagabond Butterfly was looking terrible. It had developed a cloudy eye and had really bashed itself about trying to rid itself of whatever it was. Curiouser and curiouser (and distressinger!). When my *Chaetodon multicinctus* croaked, I was 50% greyer, my eyes were bloodshot through sleepless nights and I was twitching more than the fish were. I was about to give up!

Then, late one night (read 'early one morning') I noticed a few minute black specks near the tail of my Yellow Long-nosed Butterfly. Strange, none of the other fish had any tell-

tale signs of parasites and, through it all, this was one fish — except for the Bicolour Angels — which hadn't seemed bothered by all the goings-on. I was grateful for this because the Longnose is a *Forcipiger longirostris*, which is rare even in the wild. With it and my beloved Bicolours in the tank, is it any wonder I wasn't sleeping?

Anyway, I was contemplating these little marks when I remembered an article I'd read in 'SeaScope' — the quarterly freebie issued by Aquarium Systems of America. It was about what the Americans call 'Black Spot Disease', a parasitic turbellarian (Flatworm) first reported in 1976. I dug out the article and read how they were easy to spot on yellow-bodied fish but impossible to see, without a microscope, on any others. The symptoms were identical to those of *Oodinium* and so treatment for that ailment was recommended for a week. If no improvement was noted then Black Spot should be suspected.

Like most ectoparasites, this one has a life cycle of a stage on the host, a reproductive phase off the host, and then a stage when the parasites are free-swimming and looking for more hosts (there are millions of them by this stage, of course). Because of this, one has to treat the whole tank. Copper treatments don't work for this and the author recommended either a. Formalin, b. Dylox or c. Lowered Salinity.

It's not so much mucus but sugar that protects clownfish from the stinging tentacles of anemones (See Snippet No. 4).



Formalin was out — can you imagine renewing 70 gallons of seawater three times, then having to re-establish the biological filter you've killed (formalin will kill anything in a strong enough dose). I don't know what Dylox is (this was an American article) and the lowered salinity seemed a bit hit and miss to me. I decided to use *Waterlife's* well-known proven parasiticide which has been on the market for years. I also thought it would help to use a product, made by the same company, which is sold as a general tonic and bactericide. This may sound a bit drastic but with the Vagabond's bacterial problems, I thought it worth the risk — this second product is only added once a fortnight, anyway.

I'm glad to say that this did the trick. It took a while and every dose of the parasiticide knocked the Butterflies for six for an hour or two but — touch wood — everything is fine now.

I'm sorry for taking up most of the page with this, but I think it important enough to justify it. If anyone else has had similar problems then I would like to hear about it. Anyway, *Seaview* will be back to normal next month. Meanwhile, let's end with a few Snippets.

Snippets

1 BY far the most important algae on the reef are the symbiotic algae within the tissues of corals and anemones. These animals cannot survive without

these algae — called Zooxanthellae — which consume waste products and produce sugar, which feeds the animal. Throughout the tropical seas this single-celled alga is the same species — *Gymnodinium microadriaticum*.

2 ON Caribbean barrier reefs, the drop-off meets the sea floor at a depth of between 60 and 150 metres. It is an unexplained fact that Caribbean reef corals grow actively to depths of 100 metres in clear water whereas, in the Pacific, corals cease active growth at about 60 metres, where the predominant forms are sponges and gorgonians — including the precious Black Corals.

3 MANY ancient reefs lie buried under the ground in areas that are now cold and have been found to be a source of oil and natural gas. Since we know that coral reefs are found only in tropical and sub-tropical waters, we can assume that, in the distant geological past, the wintery reaches of the northern parts of Asia and Canada must have been at one time washed by the warm waters of a tropical sea filled with luxuriant coral reefs.

4 IT was once thought that Clownfishes were able to live within the tentacles of their anemones because they slowly coat themselves with mucus from the anemone so that the anemone cannot detect the presence of a foreign body. It has recently been shown, however, that Clowns have a polysaccharide coating and, because the stinging cells of the anemone are fired in response to protein, the Clown's sugar coating renders it safe.

5 THE Thorn-Back Cowfish (*Lactoria fornasini*) male hums to the female before mating. He keeps a harem of females and mates with each of them every night! Of course, he can only maintain that pace in the spring.

6 A Blue Whale, 8 metres long and 15 tons in weight at birth, increases by 500 kilos a week. Two years later, it will weigh 75 tons. Scientists have established this by the use of whale-weigh stations!

Until next time . . .