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COVER STORY — CLOWN PARROT FISH

Photograph: Max Gibbs, The Goldfish Bowl, Oxford

The Clown Parrot Fish, *Cetoscarus bicolor*, is also known as the Bicolour Parrot Fish. Like other members of its family — the Scaridae — this species has its front teeth fused into a powerful 'beak' which is used, largely, to feed on stony (hard) corals. Other items in the diet will include hard-shelled invertebrates, such as clams and crustaceans.

Owing to constant feeding by Parrot Fish on such calcareous foods (the hard parts of which are indigestible), the various Parrot species contribute, in a significant way, to the creation of coral sand on tropical reefs.

At night, Parrot Fishes produce a mucus cocoon within which they sleep in caves and crannies. In this way, they resemble some of those other well-known reef fishes, the Wrasses. Also like Wrasses, many Parrot Fishes, including the Bicolour Parrot, change colour as they mature.

Cetoscarus bicolor can grow to around 24in (60cm) in length, so nothing but a sizeable aquarium will provide adequate accommodation. An invertebrates/Bicolour Parrot Fish combination is, of course, out of the question.



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Dissolve 1 lb of dishwasher salt into 1 gallon of water. Syphon water through unit over a period of 1½ hours. Connect unit to water supply and rinse through with 2 gallons of water before collecting for the aquarium again.

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EHEIM

Editorial

CAMELS AND COMMITTEES

The camel, we are often told, is an animal "built by a committee". The undeniable implication is that it is badly put together, ungainly, and has different bits which appear to have been 'stolen' from a variety of other animals.

Frankly, I don't share this view. I happen to think that a camel is beautifully put together, allowing it to survive admirably in a hostile environment of shifting sands and permanent drought where most other mammals would (and do) perish. It is, in other words, a masterpiece created by evolutionary forces.

I also disagree with the underlying implication that the involvement of a committee necessarily results in a substandard product.

Over the years, I have had direct experience of many committees. Some, to be truthful, have been quite awful — lacking in strong leadership and, consequently, suffering from an almost total absence of any sense of direction. On the other hand, I have also experienced great committees in which there hasn't been any political in-fighting, and in which a strong commonality of purpose has reigned supreme.

Debate there will always be . . . and a good thing it is, too. Differences of opinion will always exist. Again, this is no bad thing . . . as long, that is, as respect for 'the other' point of view is not cast aside, as it sometimes is.

In recent months, I've come across several examples of committee work which do the hobby proud. Please don't read anything into the omission of your own committee if I allow myself the luxury of singling out two shining models: the committee of the British Aquarist Festival and that of the Yorkshire Aquarist Festival (which will be taking place as this issue of *A & P* appears in

the shops). I know that the discussions at the various committee meetings range far and wide and elicit strong feelings on all manner of subjects. Yet, at the end of the day, each member knuckles down to his/her own responsibilities and pulls in a common direction to the benefit of, both the organisations themselves, and those of us who attend their respective Festivals.

How sad it is, therefore, to be made aware that some other committees seem to be involved in bitter 'faction warfare' which can result in no benefit to any party . . . and probably even less to the hobby itself. Every side is, of course, as fully convinced that it is right, as it is that the other is wrong. There would be no dispute otherwise, would there?

The shame is that so much time, talent, energy and effort need to be dedicated to such activities. Would it be too much to hope that the various hatchets be buried (in the nicest possible way, of course!) and that the 'abundance of riches' that undoubtedly exists be directed towards the positive, constructive creation of a few more camels? Perhaps . . . perhaps not.



John Dawes
Editor

News Desk

Legal Proceedings Concluded

The following letter from the Association of Aquarists (A of A) marks the conclusion of proceedings between themselves and the Federation of British Aquatic Societies (FBAS).

It is hoped that publication of appropriate extracts will help to discourage similar circumstances arising in the future, either intentionally or unintentionally, and thus avoid any subsequent acrimony, which benefits neither the hobby nor the individuals involved.

*FBAS size rule imperial.

*FBAS size rule metric.

*FBAS pointing disc for fish size pointing.

*FBAS size rule double sided metric.

*We as chairman and secretary, respectively, of the Association of Aquarists hereby irrevocably and unreservedly declare the

following on behalf of the Association of Aquarists, an unincorporated body consisting of individual members and of Aquatic Societies with the intent to bind its committee which acts on behalf of the members of the Association, both now and hereafter.

*Certain litigation has proceeded in the High Court of Justice, Chancery Division between the Federation of British Aquatic Societies and the Association of Aquarists concerning copyright subsisting in the design of the above refraction rules and size pointing discs.

*It was alleged by the FBAS in these proceedings that the Association of Aquarists, some of whose prominent members were previously judges for the

FBAS in which capacity they would have been issued with a refraction rule and size pointing disc for use in the course of their judging for the FBAS, was producing and selling articles made in infringement of such copyright as long ago as October 1984.

*It has not until now been admitted by the Association of Aquarists that each such refraction rule and size pointing disc produced and sold by or on behalf of the Association of Aquarists was an infringing copy of the copyright works in respect of which the FBAS has the rights conferred on them by Section 18 of the Copyright Act 1956. By dealing with the infringing copies in a manner which is inconsistent with the rights of the FBAS we admit that as officers of the Association of Aquarists charged with the duties of production

and sale of the infringing copies we have converted them to the use of the Association of Aquarists which has caused loss and damage to the FBAS for which we unreservedly apologise.

*We have already submitted to an order of the Court, undertaking to deliver up all infringing copies and plates within our possession and have submitted to an order of costs."

Malcolm Goss,
Chairman;
Clive Hinton,
Secretary.

Ruby Celebration for Corby

In celebration of their 40th anniversary, Corby and District Aquarist Society will be entertaining aquarist guests from their twin towns of Weibert, in Germany, and Chatellerault, France, during the

weekend of their Open Show on 17 May.

"Corby as a town has a strong relationship with its twin towns but, unfortunately, has not had an association with their aquarists," remarked society chairman David Page. "With the German society, Zier-fischfreunde Roter von Rio Hattingen, itself celebrating its 30th anniversary next year, we felt that now would be an appropriate time to get together."

An anniversary introduction to the show's format is the inclusion of speakers, with *Aquarist & Pondkeeper* contributors Mary Bailey and Derek Lambert providing talks on *Starting with Cichlids* and *Endangered Species* respectively.

Benching is from 9.30 am to 12 noon prompt, and the event will incorporate the FBAS open competition. Eligible to enter this section is any fish which, in 1991, achieved a top three placing in FBAS championship classes, or achieved an Interpet Best in Show award.

Further details are available from Corby and District AS Show Secretary, Alan Henderson, 5 The Nook, Corby, Northants NN17 1XA. Tel: 0536 68269.

Go With The Flow

Interpet have received high praise for the durability of their range of powerheads in a marine systems application.

Maelstrom Lancaster have been using Interpet's PH4 powerheads in reef surge simulators, developed for use in marine aquaria. Such simulators set up secondary currents in the aquarium in order to avoid deadspots and improve circulation of oxygenated water. According to Mike Eydemann, proprietor of Maelstrom Lancaster, a powerhead is installed at each end of the aquarium, and these are switched on alternately by the system at predetermined intervals to create pulse currents.

A number of Interpet PH4 powerheads have been given rigorous testing by Maelstrom Lancaster for use with their reef surge simulators, and they have found the Interpet product to be extremely reliable, despite such heavy use.

"We are very impressed," remarked Mike. "The impellers are usually the Achilles heel of

any pump used in such an application, but these are very well engineered.

"During testing, the powerheads were set to pulse every ten seconds, and therefore effectively underwent 12 days' use in just one day; the test models have already clocked up the equivalent of no fewer than three years' continuous use, and are still going strong."

News for Cichlid Enthusiasts

Cichlid News, a full-size, full-colour magazine devoted entirely to cichlids has been



launched. The quarterly publication began life as a one-page newsletter but, according to editor Jeffrey Taylor, interest has been such that it was felt the time was right to launch a full-size magazine aimed at the individual cichlid enthusiast.

The first issue in the new format (January 1992), is heavily weighted with articles on Tanganyikans, with reports on new Mbuna from the Tanzanian coast of Lake Malawi, breeding rare *Apistogramma*, the protozoan parasite *Hexamita*, and the curious 'bugle mouth' condition of *Lamprologus compressiceps*.

Jeffrey Taylor explains that the magazine is intended as a popular hobbyist-orientated publication, rather than as a scientific journal: "Descriptions of new taxa proposing formal names will not be used", he remarked. "We encourage the use of names, especially for genera, that are in wide usage in the trade; while, for new varieties, we favour the proposal of descriptive 'handles' that reveal something about the taxon's origins, appearance, and/or projected relationships."

One of the highlights of this first issue is a feature by Mary

Bailey which is acknowledged as first appearing in *Aquarist & Pondkeeper* (October 1991) on the pitfalls of judging at fish shows. Looks like this publication could go a long way!

Unlike some of the previous specialist aquatic publications which have come and gone over recent years, *Cichlid News* appears to have a bright future. There is a massive cichlid following in the USA, where the magazine is published, as well as in the UK; while the publication's owner, Laif DeMason, has a high reputation as a concerned cichlid enthusiast and commercial breeder.

Subscription is \$13 per year, or \$25 for two years, with an additional \$4 for overseas subscribers (US funds only).

Further information is available from Jeffrey N Taylor, Editor, *Cichlid News*, Aquatic Promotions Inc, PO Box 960297, Miami, Florida 33296, USA. Fax: 305 383 0771.

Fish You Were Here . . .

What do you do with your Goldfish, your catfish, or even your pet octopus, when you go on holiday? Thanks to a Yorkshire-based holiday accommodation agency, aquarists who might wince at the thought of leaving their piscine charges in the capable hands of their well-meaning neighbours might like to consider packing their aquarium along with the sleeping bags and binoculars.

According to Audrey Goodall, of Dales Holiday Cottages, a holiday accommodation agency based in Yorkshire: "After receiving enquiries about bringing Golden Retrievers, guinea pigs, parrots and Goldfish, the company decided to make pets and their families especially welcome wherever possible in the majority of cottages we operate."

The agency claims to cater for all tastes and pockets, providing isolated farmhouses or enchanting rose-clad cottages, stretching from the Pennines and Herriott country, to the Northumbrian and Yorkshire Coast.

Cottages for pets and four people start from £150 per week, and further information is available from Audrey Goodall on 0756 799821.

Now then. . . Don't we always get those spawnings just

when we're on holiday? Can we get 2,000 Oranda eggs, half-a-dozen brine shrimp cultures, and six three-foot tanks in the back of the Volvo . . . ?

Reef Information

Coral Reef Technology's recent successes in the marine field have led the company to expand into providing products for freshwater fishkeepers, explains director Paul Davies.

For those of you who may not have heard of Coral Reef Technology, the company was founded in 1990 by Paul Davies, specifically to distribute products for the reef tank owner. The company was soon afterwards appointed as distributors for Thiel Aqua-tech, an American company which produces additives, water systems, and filtration systems. Israel-based Red Sea Fish pHarm subsequently appointed them to distribute their products in the UK, and their synthetic sea salt has proven extremely popular.

Coral Reef Technology has also become distributors for Lettuce Clip which is just what it says it is (Tangs and many other marine fish love lettuce!), and has introduced its own range of electrical lighting equipment to its product range; while the company also distributes books on marine and reef subjects, published by Aardvark Press.

Further information from Paul Davies at Coral Reef Technology, 62 High Road, Byfleet, Surrey KT14 7QL. Tel: 0932 355121; Fax: 0932 349718.

Aquatics On Air

Shirley Aquatics' proprietor John Cooke, Interpet chairman Dr Neville Carrington, and aquatic journalist Steve Windsor put themselves in the firing line recently in the first of a series of live aquatic radio phone-ins organised by Interpet.

Broadcast during the Ed Doolan Show on BBC Radio MW, from Pebble Mill studios in Birmingham, the live phone-in attracted callers from across the West Midlands during the hour-long feature, and included questions on all aspects of fishkeeping, from ailing pond fish, cures for blanket weed, and choosing community tropicals.

"Radio WM proved to be the

ideal launch for the phone-in series," remarked Dr Carrington. "According to the presenter of the show, the station is the most popular in the region, including any of the national networks, as the amount of calls demonstrated."

Interpet is in the process of organising further phone-ins at local radio stations throughout the country, some of which are planned to feature personalities from *Aquarist & Pondkeeper*, so get your dialling fingers at the ready.

Company Move

Ozone systems specialist Triogen has moved premises. Among its high-profile activities, Triogen was responsible for the installation of the ozone generator in the Beluga Habitat at Vancouver Aquarium's new Arctic Canada Pavilion (see *News: Aquarist & Pondkeeper*, May 1991).

Triogen's new address is: Triogen House, 117 Barfillan Drive, Craigton, Glasgow G52 1BD. Tel: 041 810 4861; Fax: 041 810 5561.

Cyripak Cleans Up Fish Farm Effluent

The use of a high specific surface plastic medium, combined with fine-bubble aeration, has helped to overcome problems associated with recent dry summers at one of the UK's largest trout farms.

Filtration specialists Cyripak were commissioned by Wansfield Trout Farm to provide a solution to increased ammonia levels at their establishment, situated on Driffild Beck, South Humberside. The farm produces in excess of 300 tonnes of trout and salmon per annum for the table market, but has found that recent successive dry summers have resulted in substantially reduced river flows, making such a sustained production level virtually impossible.

According to Carl Burnett, director of Cyripak, previous sedimentation facilities provided at the farm succeeded in removing suspended solids, but reduced river flow caused a build-up of ammonia. Normally, waste passing through the farm would mix with river water to dilute the ammonia level to well below that which would be harmful to the aquatic



Cyripak — the plastic medium used by Cyripak to clean up Wansfield Trout Farm.

environment. However, low flows during successive drought summers meant that the ammonia was becoming less diluted.

Following a detailed feasibility study, Cyripak were able to produce Cyripak filters designed to reduce the average effluent ammonia concentration to below 0.3mg/l and installation was completed during July of last year. Subsequent samples have indicated average and maximum ammonia values of 0.20 and 0.40mg/l respectively.

The filters incorporate 550 cubic metres (over 19,400 cu ft) of Cyripak high specific surface plastic media in what is believed by the company to be the largest installation of its type in the UK. Carl Burnett explains: "The biological conversion of ammonia through nitrite to nitrate (nitrification) consumes large quantities of oxygen, and the treatment of 10 million gallons (c 45m litres) of effluent per day produced at Wansford requires an oxygen input capability of 0.5 tonnes per day, which was provided by incorporating an extensive system of fine-bubble aeration".

Cyripak biological filter medium is used by Cyripak throughout their extensive range of external pond filters including their SC3P Guaranteed Performance systems. Cyripak can also be purchased separately from most aquatic shops in 1.6m (6ft) and 25 litre (approximately one foot) bags priced at £45 and £10 respectively.

For normal ponds stocked at up to one inch of fish per 10 gallons (c 45 litres) of pond

volume, the company recommends between one and one-and-a-half cubic feet (0.03-0.04 cu m) of Cyripak per 1,000 gallons (c 4,500 litres).

For further information, contact: Cyripak Limited, Eastgate Mews, 131-133 Eastgate, Deeping St James, Peterborough PE6 8RB. Tel: 0778 344502; Fax: 0778 348093.

Major Speakers at Sparsholt Conference

Conservation, legislation, and initiative business ideas are the main areas of discussion at this year's Aquatic Trade Conference at Sparsholt College, 29/30 June.

Speakers at this year's conference include: Willem Daleman, an official of the European Commission, Department of Agriculture, who will be speaking about legislation on fish movements; Steve Broad, of TRAFFIC and David Morgan of the Joint Nature Conservatory Council, on legislation affecting trade in wild animals; and Gordon McGregor Reid on: freshwater conservation.

'Aquarian' are sponsoring Mari Court, of Sea Life Aquarium Services and Ed Taylor of Florida Fish Farms, who will be speaking on their respective subjects: unusual business ideas (including setting up aquaria for MacDonald's and other establishments) and fish farming in Florida.

Peter Wheeler will also be talking about the future for Israeli Koi in the UK; while additional speakers are being

arranged on topics including marine conservation, water lily production, the Pet Animals Act, environmental health and financial advice for recession recovery. It is hoped also that a speaker from the Veterinary Medicine Directorate will be able to provide information on the Medicine Act.

Applications are also being invited for full-time courses in **Aquatics and Ornamental Fish Management** at Sparsholt College, while retailers and wholesalers who wish to employ graduates from either the certificate or diploma courses are being urged to contact course tutor Jane Lloyd.

For further information, contact: Jane Lloyd, Sparsholt College Hampshire, Sparsholt, Winchester, Hampshire. Tel: 0962 72441.

A Plug for Powerheads

As *News Desk* went to press, recently-launched aquatic equipment suppliers Independence announced that they have, themselves, launched a new range of filters and powerheads — complete with a plug.

Marketed under the brand-name Shark, the powerheads incorporate a flow monitor and air compensation system with dial flow control, as well as a directional head with wide mouth output to deliver maximum agitation at the water's surface.

Independence UK was launched only six months ago by Derek and Sandra Shankland. They have already enjoyed considerable success, having been appointed as agents to a number of companies, including Cagex Accessories (manufacturers of Penn-Plax plants), Rena (power filters), New World Aquatics (Selerstone Rocks), and Aquarium Pharmaceuticals.

For further information, contact: Derek or Sandra Shankland, Independence (UK) Ltd, Units 9 & 10 Lady Ann Mills, Lady Ann Road, Batley, West Yorks WF17 0DC. Tel: 0924 422644; Fax: 0924 422652.

ITEMS FOR THESE PAGES SHOULD BE ADDRESSED TO THE EDITOR CLEARLY MARKED 'NEWS DESK'.

PYGMY ANGELS *Part 1*

Max Gibbs, of the Goldfish Bowl in Oxford, begins a two-part review of some of the best and most interesting species of these beautiful tropical marine fish.

Photographs by the author

The large family Chaetodontidae, which embraces the Angelfish and Butterflyfish, includes the genus *Centropyge*. Popularly known as Pygmy Angelfish, the *Centropyges* are often ideal home marine aquarium specimens with diverse bright colours, attractive markings and a ready appetite for a varied diet. They are also frequently of a small size, a feature which suits them to even modest-sized aquaria. The last-mentioned quality sets them aside from their larger Pomacanthid cousins.

DISTINGUISHING CHARACTERISTICS

There is occasionally confusion on the part of some marine fishkeepers as to whether they are observing an 'Angelfish' or a 'Butterfly' as, being members of the same family, there are instances where a casual glance is not sufficient to give that identification.

In Angelfish there is a preopercular spine prominent at the base of the operculum (gill cover); this spine is not present on Butterflyfish. From the practical point of view, this 'check spine' is sometimes a hazard when netting Angelfish should it become caught in the mesh with the nose of the fish firmly stuck in one corner of the net.

Care must be taken not to damage this

spine while disentangling the fish from the net; at the same time, care must also be taken not to damage the mouth of the fish... not always an easy exercise!

AQUARIUM CARE

Some 20 to 30 species of *Centropyge* are offered to the marine hobbyist from time to time, but only about half that number will be regularly available and within the pockets of most collectors.

Of the species offered on this basis, there are a few which are easy to keep and cater for, a few which are decidedly fussy feeders and whose success hinges largely on their individual temperaments in this direction, and the 'in-betweeners' which might be placed in

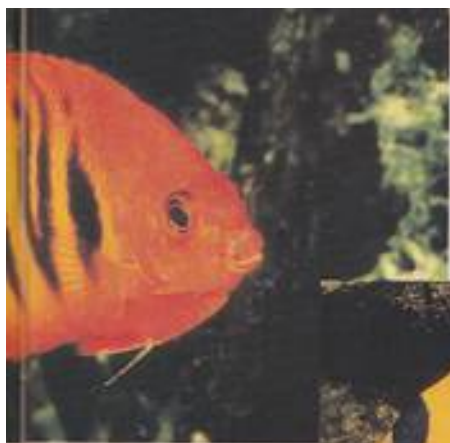


either category. But, whatever the species, two factors are of paramount importance: a good, varied diet, and faultless water quality.

Compatibility

The usual care taken over mixing with compatible tankmates must, of course, be observed. *Centropyges* are usually entirely peaceful with other species, but care should be taken when mixing them with other Chaetodontidae. Species of similar colouring and size are more likely to be quarrelsome than those which are distinctly different.

Unless they are matched pairs, *Centro-*



tant part of diet and should not be omitted. It is essential to offer a varied diet for, although a preference might be shown for one particular food, there are very good reasons for encouraging the taking of a variety of foods. Not least, are the nutritional benefits required for the well-being of the fish which are more likely to be provided from several sources rather than the one food.



Another advantage is that Angelfishes generally have a tendency suddenly to refuse food. While this might be a reaction to such factors as water quality, their tankmates, lighting variations, and so on, once the problem has been put right, there is no guarantee that the hunger-striker will

immediately resume proper feeding. There is a better chance of tempting it back to feeding by offering a variety of previously acceptable foods. Frozen foods such as *Artemia*, Mysis, lance fish and Mussel meat, are fine for the purpose. Flake foods are less likely to satisfy more than a very small part of the Angelfishes' diet, but well washed lettuce leaves are highly beneficial and they, or some other suitable form of green food, should always be given on a regular basis.

Sexing

Sexing *Centropyges* is difficult, if not impossible, from outward appearances, and this is true of most other Chaetodontidae. A ripe female will be rounder, possibly, but this is about the only indication of sex difference you might discover.

In view of the belligerence of most species towards each other, it could be a damaging experience to try various specimens together to find compatibility. In any case, Pygmy Angels are mostly solitary fish, except when breeding, which only further reduces one's chance to succeed in persuading two to live together. The safe option is to go for just one specimen for the collection.

Health warning

Treatment of common ailments should be done with great care. For example, Oodinium is commonly encountered by marine fishkeepers and some will choose not to quarantine their new purchases, holding the view that to cure this scourge with a copper-based cure is a relatively simple matter.

However, *Centropyges*, in common with other Chaetodontidae, react badly to copper-based cures and dosages have to be calculated most carefully in order to avoid problems. A lower dosage rate than usual is advised on the understanding that the cure will take correspondingly longer to achieve.

Water

The aquarium and its filtering system should be well matured before a *Centropyge* is considered as an occupant and, as always, regular part-water changes are absolutely essential in order to maintain the quality of seawater necessary for success.

Unlike so many of the larger Angelfishes, the Pygmies do not usually become as tame and trusting of their keepers, but their need for space is so much less demanding that this 'minus point' might be dismissed. In addition, they are less likely to be finicky feeders; nor are they likely to be dominant within the community. All in all, with a few exceptions and with due regard to individual temperaments, the *Centropyges* are to be recommended as ideal aquarium fishes.

pyges are likely to be scrappy with others of their own species and it is usually better to opt for keeping just one in a community accommodated in anything other than very large aquaria.

Diet

With the good selection of excellent frozen foods readily available to the fishkeeper today, providing a sound varied diet for *Centropyges* is no problem. New specimens which initially show reluctance to feed in captivity, will usually respond to live adult Brine Shrimps, and, once taking those, it is often an easy step to wean them onto the frozen foods. Green food, such as well washed lettuce leaves, is also an impor-

Far left (facing page), Pearl Scaled Pygmy Angels (*C. wooliki*) may not be spectacularly coloured, but they are beautiful nonetheless.

Centre (facing page), Potter's Pygmy Angel (*C. potteri*) is usually imported pretty well full-grown.

Top centre, the Flame Angel (*C. loriculus*) is one of the best-known and easily kept species.

Top centre (lower), Rusty Pygmy Angels (*C. ferrugatus*) are quiet and unassuming and generally settle in easily and peacefully into a suitable community.

Above left, the Black Pygmy Angel (*C. tibicen*) — an occasional import.

Top right, Bicolor Angels (*C. bicolor*) are not for the unadventurous.

Above, the Cherub Angel (*C. argi*) is a small species from the Caribbean which is one of the easier ones to care for.

Note: Details of the species illustrated in this article will appear in Part 2.

(TO BE CONTINUED)



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BETTER BY DESIGN



POWERFLOW

POWERFLOW

Did you know that Chancellor Kohl of Germany is reputed to be a fishkeeper? It's only hearsay, but I have heard it said, so it could be true. As every serious aquarist reads this magazine, it is sensible to assume that Mr Kohl is reading this right now — which is quite something! ... which means that I'd better start writing something interesting. ...

This link with Germany is not tenuous — well, not entirely. Let me take you to a park lake, closer to home; in fact, here in England. That's where I was not long ago, watching a young girl 'fishing' with a small net on a length of bamboo. She crouched on the bank of the lake, eager and hopeful, and her eyes scanned the water in front of her for any sign of movement. Evidently, she hadn't been successful, as her plastic lunchbox (the holding tank) was full of water ... and nothing else.

Then, suddenly, her expression turned deadly serious; she concentrated on the water and made a swift swoop with her net. She quickly transferred her catch to the lunch box. Being the original Mr Nosey Parker, I went over to look. A tiny Stickleback darted back and forth, watched closely

by the little girl.

"What have you caught?" I enquired.
"It's mine," said the girl jealously. "It's a fish," I smiled.

"Do you want to know what type of fish?" I asked.

The little girl eyed me suspiciously then nodded. "It's called a Stickleback," I said.

The girl said nothing but picked the box up, and, clutching it, walked over to someone who must have been her mother and was chatting to another lady close by. I listened.

"You caught one!" said the girl's mother in surprise. "What is it?"

The little girl glanced towards me and said to her mother, "It's a fish — but that man says it's a (she hesitated) ti-ck-lestak."

The mother looked at me and I think I heard her say, "Stupid fellow".

Of course, it was the girl who was stupid, and I almost said so; indeed, I would have done had I not been so mature and had the girl not started talking again. (Stand by for the German link): "I'm going to keep him mummy, and his name is Chancellor Kohl," she stated defiantly.

I was amazed at her eloquence — she couldn't say Stickleback, yet she could pronounce Chancellor Kohl better than any

BBC news reader! Her mother looked at her and said softly, "Yes dear, but you'll have to take care of him and then I think we should come back next week and put him back in the Lake — Chancellor Kohl wouldn't like to live in our kitchen forever, would he?"

It was like watching something from a surreal film — suddenly fish and world politics were combining — in the kitchen of a suburban terrace! My mind wandered: I pictured Chancellor Kohl in a lunchbox on top of someone's fridge and then imagined a fish by the name of Mr Ticklestack holding talks on the German Economy in Bonn. (No, I wasn't on magic mushrooms, but the effect was similar ... I imagine.)

I suddenly realised that the little girl who put the images in my mind wasn't so stupid after all; her innocent brain had no preconceived ideas implanted in it — so why not call her fish a Ticklestack — or name it after a famous politician, or keep it in a lunchbox for observation? Children learn that way, without interference from biased and often confused adults, and in my opinion, should be given a free rein to express their thoughts and findings. They learn from adults who don't always set a good example.

I am reminded of the time when (in my younger fishkeeping days) I was emptying a tank of water using a length of hose; I had the help (or in my view at the time, hindrance) of an even younger young person. As the water rose dangerously close to the top of the bucket on the new carpet, I panicked and contemplated what to do. While I was having hysterics and water spilled over the top of the bucket on to the carpet, my young friend calmly lifted the other end of the hose out of the tank. The water ceased to flow immediately — of course — and yet, I hadn't thought of doing that. It had taken a very young person to point out something very very simple to one of his elders.

Turn over the page (not yet!) and every month you'll see a feature entitled *Tomorrow's Aquarist* — read it, and listen to the views of young fishkeepers — we can and probably will, learn a lot by listening to their new ideas. Sure, they have much to learn from us too, but after all, they will be responsible for improvements in tomorrow's fishkeeping.

As the revelation struck me in the park, I saw quite clearly that the little girl was not ignorant, but I probably was! I was glad she had caught her 'Ticklestack'; I hoped she would learn from watching it, and I felt sure that Chancellor Kohl was going to enjoy his stay with her.

There are no hard and fast rules in this world, despite the fact that we try to make them, and it's refreshing to remind ourselves of that from time to time — and so good to see the young questioning what we tell them. Let's encourage them to express themselves freely and *let's listen to them*, to their fresh unpolluted minds — we might just learn something; it might even lead to improvements without our hobby.

Well, so much for this month's German link anyway. Yes, it was a bit tenuous, but I hope you'll forgive me for that — especially you, Mr Kohl, if you're still reading this. ...



Chancellor Kohl and the Ticklestack

Have you ever thought what a German politician and fishkeeping have in common? Well, neither had **Jason Endfield** ... until a little girl put him right!



Tomorrow's Aquarist

By Gina Sandford



First, roll call to see if our regular readers are all here. Winchester... here; Bolton... here; Crawley, Crawley...? Where are the 'terrible twins', Tyne and Wear? Ah, there you are! Yes, it seems that all the regulars are with us.

I hope that TA will continue to be a 'fun' column through which we can all enjoy the fruits of the fishkeeping hobby. So, anyone caught not enjoying themselves will be severely reprimanded! Persistent glumness will be punished by the perpetrator having to write "I must make regular water changes," 100 times... at least!

As I am new to this column, taking over from David Sands who has left to follow other projects, I thought you would like to hear a bit about my personal background.

I am married with three children, all girls, and have been involved in fishkeeping for more than twenty years, during which time I have kept all kinds and sizes of fresh and brackish water fish. I have not yet tried keeping marine aquaria, but who knows, maybe the shared experiences that, I hope, we'll enjoy through TA may be

the catalyst to this.

Over the past year, I have become involved with the breeding and raising of many different species of Rainbowfish. In the course of this, I have been experimenting with filtration systems to maximise the number of fry raised to adulthood.

I am interested in all fish, especially catfish (I am the editor of the *Catfish Association of Great Britain* magazine).

I am sure we will get to know each other more over the coming months.

OUTINGS

In the dim, distant past, some aquarists' clubs used to organise annual Conventions. These were a delight to attend, as they afforded the opportunity to meet with like-minded fishy people of all ages. So I was delighted when the postman dropped a couple of letters through my door giving details of one such event.

Over the past months, many of you have expressed a wish to join a fish club. Well, Conventions and Shows are ideal opportunities, so go along and see what your local society has to offer. Check through the **Diary Dates**, which we publish every month, for events in your area and go along and see for yourself.

It still delights me to see some of the killifish keepers demonstrating the hatching of annual species. A bowl of what appears to be dry, lifeless peat has water added and, by the end of the lecture, there are small fish appearing — instant magic!

I am going to make every

effort to attend Ilford's Convention on 25 April; maybe you can come too and say Hello.

AFTER DARK

Have you ever wondered what happens in your aquarium when the lights go out?

One night, awoken by the sound of the neighbourhood cats fighting in our garden, I went downstairs to send them packing. I switched on the tank lights in passing and glanced in. To my surprise, some of my fish had taken on a strange colour pattern.

My Golden Pencilfish (*Nannostomus beckfordi*) were showing two oblique dark bands instead of the normal single dark horizontal band present during daylight hours. What was happening? Were they sick?

Consulting several books I found no mention of this but, delving further, a scientific paper by Weitzman and Cobb (1975) revealed that my *N. beckfordi* were not the only Pencilfish to have this nocturnal variation in their colour pattern. Several species exhibited the same sort of changes. These night-time colours are sometimes referred to as 'vegetal coloration'.

This set me thinking. Does this phenomenon occur in any other groups of fishes? Are there any other things that change?

After further bouts of late night fish watching, my Whip-tail Catfish (*Sturionoma panamense*) revealed that the lobe which partially covers the fish's eye during the day was withdrawn at night. This lobe cuts

down the amount of light entering the eye, thus protecting the fish's retina from damage by strong sunlight as it feeds in shallow waters.

At night, however, the fish needs to make the maximum use of any available light, so the lobe is withdrawn.

FOR THE FUTURE

I would appreciate hearing from all young TA readers — 'mature students' are also welcome to write.

I still remember being somewhat overawed by my first visits to fish clubs, Shows and Conventions. I also remember that one of the senior members of my local fish club was an excellent, if eccentric, teacher. He had the ability to let others learn by example, by suggestion, and even by mistakes.

In my case, one of the mistakes was going fishing with him in a Kent river. We were up to our thighs in water, rooting through the weedy bank to see what we could find. He carefully moved upstream and I blindly followed; then, I disappeared from view.

As I rose from the water, he laughed uproariously, sucked on his pipe and said, "That'll teach you to feel your way upstream!"

I had fallen into a hole in the riverbed that he had carefully avoided. Most of all, I learned the art of the naturalist... to see what you are looking at. This practice of observation is free and anyone can participate. All it takes is a little time and then perhaps, some help in interpreting what you see.

So, get fishwatching!

See you next month...



Take a close look at this Whiptail Cat. See the top of its eye lobe? This protects the eye from excessive sunlight.



In this specimen (with its back half 'shaded' by a leaf, the eye lobe is missing. This shot was taken after one hour of darkness.



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Blue Toads and Dodos

Scientists believe that evolution over the last few million years has been the result of a selection process based upon the survival of the fittest. Every living thing produces variations when it reproduces, but most of these variations are so slight as to have no noticeable effect upon the species. Occasionally though, differences occur which can have far-reaching consequences.

Whether these variants survive or perish depends mostly on their suitability for the lifestyle of the species. For example, a blue toad on green foliage would be easily seen by a predator and would therefore be unlikely to survive, whereas a spotted toad may camouflage well and have a better chance of growing up to produce more spotted toads. Such is the principle of Natural Selection.

The fanciful idea that "Mother Nature will provide" is pure myth. "Mother Nature" has sharp teeth, long claws, and no conscience!

There is sometimes a balance of sorts, if you can call it that. It's the balance of supply and demand; the supply of food available, versus the demand of those wishing to eat it. This process has continued for a very long time, giving rise to all the various life forms on this planet... except, there is another factor now... man. Our species has interfered in many areas, partly by our own demands for food and living space, and partly by directly changing the selection process for certain animals.

Our method of doing this is entirely different to Nature's way. Instead of eliminating the less 'fit', we select the most useful, or the most pleasing, and promote their survival by protecting and caring for them. All of our domestic animals are the result of this desire to produce animals to our own specification.

Before contemplating the rights and wrongs of all this, ask yourself, "Should we let the only blue toad in the world perish?"

Critics of man's intervention are seldom consistent. Some will condemn the breeding of a short-legged, long-backed dog which, hopefully, will be loved and cared for throughout its life, while not condemning the breeding of a short-legged, long-backed pig, which we simply slaughter and use for bacon!

Very few people would criticise all of man's interferences, what is acceptable and what is not being simply a matter of personal taste. The majority might say it is only the extremes they are critical of. So what about the great Shire Horse... that's a pretty fair jump from the original!

What has all this to do with fish? Just this... many fishkeepers condemn the breeder who produces variants, yet the fact is that all fishbreeders practice selection, choosing the most pleasing specimens to become the parents of the next generation. This means that all captive-bred stocks are in some way different from their ancestors. Even without

Alex Stephenson
continues his 'occasional
ponderings' with some very
original thoughts on
natural and artificial
selection.

Illustration by the author



*Shame about the Dodo!
It could have been exotic if it wasn't extinct.*

selection, changes in environment will allow, and often cause, changes in the captive stock.

The patterns of size and shape for living things are not fixed; when circumstances change, patterns will change. It is enough merely to keep fish or any other creature in the relative safety of captivity to allow maximum opportunity for successful variation. Further, with systematic selection, we can even accelerate and direct these changes.

There are many man-influenced fishes about these days, some being just colour variations, while others have extended finnage, or whatever. Because work on the selection of goldfish started so long ago, the results are well advanced and many variations are available. At first, it was the selection of gold-coloured individuals occurring among a type of carp kept for food. These fish were attractive, so instead of being eaten, they were kept. This eventually gave rise to the ancestors of today's goldfish.

Some time much later, someone noticed

that one young fish had what looked like two tails. This one received special attention to ensure its survival. Eventually, it was bred and, in due course, produced more twin tails. The first strain of Fancy Goldfish was, thus, established.

Since then, many more variations of colour and form have come about in exactly the same way, by the sudden appearance of one or more individuals that were different. They weren't produced by surgery; they weren't deformed by chemicals; they weren't mutated by radiation (at least, not intentionally); they were just born that way. Man's part in the process was to spot them and encourage their survival. I don't think this is necessarily a bad thing.

Suppose a bird breeder produced canaries with large, fat bodies and stumpy little wings, so that they couldn't fly. Critics would brand the breeder "a monster". But, there are some birds which have done just that... all by themselves.

One species in particular, a kind of pigeon, must have had ancestors which flew as well as any other pigeon. These birds lived on Mauritius and, having a comfortable existence with few predators, didn't 'see' the need to fly (in evolutionary terms), so they stopped doing it. Wings became smaller and smaller until they couldn't possibly fly even if they wanted to. Now that power-to-weight ratios and aerodynamics were no longer factors in their survival, their bodies became bigger and heavier. The result was a big, fat, happy, Dodo.

Eventually a predator did come along... yes, you've guessed it... man. We found the Dodo good to eat. Being large and flightless, the birds were no match for a man with a musket, and they were hunted to extinction in just a few years. It is a great shame that no one decided to domesticate and breed flightless fat pigeons; better a dozen varieties of Dodo, than no Dodos at all. I see nothing wrong with selecting and promoting the survival of variations which we like, providing we assume responsibility for their continued wellbeing.

Bringing the focus back to fishkeeping, I have no valid objection to the keeping of wild-caught fish; that is, providing all the safeguards such as the maintenance of wild populations, appropriate methods of collecting, and so on are in force. On the other hand, I do have a personal preference for farm-bred, or better still, aquarium-bred fish, my choice being based upon the notion that a fish born in a captive environment is already conditioned to it and doesn't have to suffer the stressful transition from the wild.

We must be fully aware, of course, that once these fish are removed from the wild state and developed, they cannot be returned. With few exceptions, they could no longer survive in that competitive world. This is true not only for fish, but also for all domestic animals... even blue toads! Sadly, it's too late to do anything for the Dodo.

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Helping Hand

By Kevin Fox



Hello again, and a warm welcome to **HH**. I've been absolutely underwhelmed with mail, sitting next to the letter box day after day. The result? Nothing! Come on, there can't be just the one disabled aquarist in the country willing to put pen to paper! I know (even though I was in hospital at the time) that many people rang me when my original letter appeared in *A & P*. So, where are you now? We've also had a very encouraging response by phone and personal comments to the first instalment of **HH**. But where are those letters...?

Jane Lloyd (hope I have the spelling correct: my wife wrote it down in Serbo-Croat and Latin). I rang your college as soon as I could, but missed you by a few minutes (we also missed the April deadline). Please write to me care of the *A & P* office. I'm ever such a nice guy, honestly; you just ask my cat Spitz. She sits on my knees watching my fishes with me, and will slowly turn her head, smirk and purr:

"One day, sunshine. One day."

MYSTERIOUS DEATHS

Seeing as no one else has a particular problem for us to chew over in this month's column, here's one of my own.

I recently set up a demonstration tank, initially for photographic and illustrative purposes for my book, but once I'd done that, it was to become the family's community aquarium. As part of the decor, I bought what I thought then was a large piece of bogwood, various fishes and other bits and bobs from this same garden centre; all the fish died within a day.

Many books on tropical fish-keeping advocate polyurethane varnish for bogwood. I don't agree with this at all, not when

you think what chemicals are involved with the manufacture of various varnishes, which, even when completely dry, are not inert. With bogwood, I simply boil it, scrub it clean and allow it to soak in a mild aquatic disinfectant for a week.

So the tank was assembled with 3in (c 7.5cm) of gravel. Plants were, well... planted, and a nice boulder was positioned to form a browsing ground for algae-eating catfishes. Filtration was by external power filter. I added the bogwood, filled the tank, switched on the electrics and then left well alone for two weeks.

After this I bunged in a couple of Guppies (which lived), and then built up the 30in (75cm) tank to around half the maximum stocking level. For a month, everything worked well: the water was crystal clear, neutral pH and medium-soft. But then a curious thing began to happen. It started with the death of two female Guppies — then my female Honey and Dwarf Gouramis died.

Of course, during this catastrophic period I was desperately checking items such as pH, hardness and making up various combinations of media for the power filter, but all to no avail. My female fishes kept on dying at a distressing rate and I couldn't find out why.

In desperation I stripped the tank completely, and it was at this stage that I discovered what I can only assume to be the problem, as its removal has made the tank safe.

On taking out the large piece of bogwood, I noticed a really terrible smell coming from it; so bad, in fact, that it made me physically sick! Whatever this wood was, it certainly was not genuine bogwood. But I'm still left with the mystery of why it killed only female fishes while leaving all the males in general good health!

Close inspection of the bodies under the microscope revealed absolutely nothing. Neither did they at any time display any apparent breathing difficulties while in the tank, nor other abnormal behaviour. They all simply died.

Anyone out there got a possible explanation for this? I'd



Beautiful tank... shame about its effect on my fish!

certainly be relieved if I could find some scientific explanation for this episode, rather than simply write it off to 'experience'.

FUTURE VISITS

When the weather picks up, I plan to visit some of the larger aquatic outlets and garden centres to find just how well they cater for disabled people. I can hear their knees knocking now!

We, disabled fishkeepers, have a saying: *"Where there's a ramp, there's no need for steps"*. Everyone can use the ramp.

How many buildings have you seen with both ramp and steps? Daft isn't it?

TALKING THERMOMETERS

Some of my own ideas for manufacturers to ponder over:

Who's going to be the first to produce a talking thermometer? It would certainly save partially sighted people a lot of headaches, and give the gadget collector something new to demonstrate 'at the club'.

Further, how about a power filter which is easier than the current crop to clean out, and which also uses pipe clamps that even people with severe arthritis in their fingers can release easily?

When I clean my current power filter approximately once per month, it takes me around four hours. Most of this time is taken up releasing the pipe work from the clamps, scrubbing the filter and replacing the cleaned media, then replacing everything. And that's assuming that I have no work to do within the actual tank itself

(very rarely the case).

If any manufacturer reading this (and I know that they do) has some aquatic device which has particular application to disabled fishkeepers, then please tell me about it. If it does what the makers claim, then I'd be delighted to give it a plug in this column.

AND FINALLY...

Of course, I realise that the first **Helping Hand** column probably came as a complete shock to your system, but you really should have recovered sufficiently by now and started putting pen to paper.

I don't want any of that "What's the point; nothing will change", attitude either. Things can, will and *must* change for the betterment of all aquarists, but only if enough pressure can be applied in the right quarters. The pressure begins by you writing to me here at the *A & P* office.

So there you go, that's it until next time. Remember; this is *our* column, so if you want it to you must write to me. If you don't, how can I convince the editor that **HH** is a much-needed platform for the disabled aquarist to voice his/her opinions and wishes?

[You don't have to, Kevin. I know there is a need... and that our readers (both within the trade and the hobby) want the column. We just need them to start writing, rather than tell us at shows, at lectures, over the phone, and so on. Ed.]

The future of **HH** lies completely in our hands, but I can only waffle on for so long before the editor susses me out! Bye, and happy fishkeeping.



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The patches of colour visible on the side of the body of this *Bradypodion* identifies it as a male.

SUCCESS WITH CHAMELEONS

Part 3

Robert and Valerie Davies conclude their series with a close look at breeding and rearing some egg-laying and live-bearing species.

Photographs by the authors

In these days of habitat destruction and possible future legislation regarding importation, captive breeding should be the aim of every reptile keeper. Also, for us at least, the sight of a miniature replica of the adult is an incalculable reward.

SEXING

In species such as *Chameleo johnstoni*, the sexes are obvious at a very early age. Males begin to grow tiny horns from about four weeks. *Bradypodion* males tend to show a coloured lateral patch from as young as seven weeks.

In all species, maturing males will develop a swelling containing the hemipenes at the base of the tail and are easily distinguishable, although they may not necessarily be big enough for breeding. Females, especially, should not be allowed to breed until approaching adult size and weight.

MATING

Mating is initiated by the male which usually assumes a more intense coloration and approaches the female, either shaking or nodding his head. An unreceptive female will usually threaten with open mouth, flattened body and a swaying movement.

If the male goes too near, she may even lunge at him, but a determined male will persist and climb onto the female and manoeuvre his tail until his cloaca aligns with that of the female. The female may continue to struggle even then and could try

to bite the male's forelegs to dislodge him.

We have observed matings which lasted anything from four minutes to two hours. If mating occurs more than once, the fertility rate would seem to be higher. When chameleons have been placed outside on a sunny day, this has often stimulated mating behaviour.

Sometimes, a male will continue to attempt to mate the same female which may become very intolerant towards him, so it is better to separate them. With some species,

the male, after mating, makes repeated efforts to get out of the vivarium — possibly because the female signals her unwillingness for further matings, so he decides to try his luck elsewhere.

EGGLAYERS

Obviously, for egg-layers, a suitable site for oviposition must be available. For this we have used about 20cm (7-8in) of peat at the back of the vivarium, placed in a box or retained by cork bark, stone, etc. A plant may be used to provide some concealment in front of this site. The medium must be kept reasonably moist.

Gravid females will usually eat well for a time, but then the appetite reduces gradually as the eggs/young develop. Vitamins and calcium are very important for gravid females. We have also noticed that they spend long periods with their underparts and sides exposed to Tru-lite tubes (or sun if outside).

Egg-laying species may have one or two trial digs before actually depositing their eggs. In captivity, the Jewel Chameleon (*C. lateralis*) is well-known for just dropping the eggs onto the substrate although, in nature, they dig a tunnel 10cm (4in) deep. Even after such rough treatment, we have managed to hatch these eggs.

As soon as possible after the eggs are laid, they should be placed in a plastic box containing 8-10cm (3-5-4in) of moist vermiculite and supplied with a few fine ventilation holes in the lid.

Incubation temperatures and periods vary from species to species. For example, *C. johnstoni* eggs at 24°C (75°F) take 10 to 12 weeks — higher temperatures may cause the eggs to 'explode'. However *C. lateralis* eggs need about 45 days at 25°C (77°F), then 40 at 10-12°C (50-54°F), after which the temperature must be raised to about 27°C (81°F) until they hatch which, for us, was a further 92 days. The whole process took 178 days but can take from 160 to as long as 378 days.



A mating pair of High-casqued Chameleons (*C. hoehnelii*).

Eggs must be inspected daily, and any which are shrivelled or covered in fungus discarded. This inspection also helps to refresh the oxygen supply. Observed hatchings have taken up to two hours. The young are then removed to a small vivarium where they rest for about an hour before climbing onto a small twig.

LIVEBEARERS

With livebearers, the young may emerge in a sac from which they have to break free, or as free-moving individuals with no sac attached. In the *Bradypodion* species we have noticed that any babies emerging in a sac have been either under-developed or malformed and have not survived. These females have also produced varying numbers of apparently infertile, yellow eggs. The sacs or young have always been deposited on a branch. However, our female *C. allisoni* and *C. binaisiam* dropped their young (each in a sac) as they moved about the vivarium, some from a height of 45cm (18in).

In the base of each sac there is a small amount of fluid which seems to act as a shock absorber. Within a few seconds the babies wriggle free of the sac and make their way up onto branches. Again, the babies are removed to a small vivarium with branches. It is interesting to see that, even when new-born, the young will threaten with open jaws as you remove them.

An important point to note is that a female having given birth (or laid eggs) should regain her appetite almost immediately and, since she has depleted her reserves, it is vital to supply vitamin and calcium supplements at this time.

CARE OF THE YOUNG

Baby chameleons of both types require the same treatment. A clutch is placed in a small 25 x 15 x 15cm (10 x 6 x 6in) aquarium with a tight-fitting lid consisting of a wooden framework and nylon curtain. This allows maximum ventilation and prevents the escape of tiny livefood.

A few thin twigs, some with leaves on, are placed in the aquarium in such a way that the babies can reach even the top corners where fruitflies and other prey tend to congregate. A small piece of fruit placed in the centre of the aquarium will help to concentrate fruitflies where they can more easily be captured.

Three or four thicknesses of moist paper towel are used as a substrate. The paper towel must be kept moist, since the babies easily dehydrate if the humidity is insufficient. A fine spray (twice daily), concentrated on the glass sides and leaves, provides a drink and keeps the towel moist.

The temperature for babies must be slightly lower than for adults — we usually aim for a maximum of 25°C (77°F), but the room often gets warmer.

Food consists mainly of wingless fruitflies (*Drosophila*), tiny crickets and tiny waxworms. When in season, greenfly and aphids are taken readily. The insects provided must not be too large because it is possible for the babies to choke.



A female Jewel Chameleon (*C. lateralis*) exhibiting gravid coloration. This specimen developed these characteristics within one day of mating.



Top view of a heavily gravid *C. johnstoni* female. This specimen later laid 20 eggs.



A Jewel Chameleon in the process of hatching. At this stage it measured a mere 4.8cm (1.9in).



The same Jewel Chameleon shown as it was hatching, attained a size of 7.5cm (3in) within one month.

Some babies will feed a few hours after birth, others take longer. Once the young are feeding well, they are removed to a vivarium large enough to house a Tru-lite tube. On warm, sunny days they are placed outside in lidless vivaria for an hour or two. The vivaria are placed in half-shade but a careful eye is kept on the young. If they start gasping, they are removed to somewhere cooler. To prevent attack by birds, cats, etc, a 1/2in (1.3cm) wire mesh cover is placed on the tanks.

At this stage, we also get the young chameleons used to taking multi-vitamin drops in water from a syringe (keep a separate syringe for the babies). After about two weeks, food items can be dusted with multi-vitamin and calcium once a week.

Growth rates vary from species to species and even within a clutch. It is not uncommon for one or two out of a large clutch to be runts, even if removed and given extra food. *C. johnstoni* and *C. lateralis* have, in our experience, been particularly fast growers. *Chameleon allisoni*, and *C. binaisiam* are about 4cm (1.6in) at birth (total length), *C. lateralis* is about 4.8cm (1.9in) and *C. johnstoni* slightly larger. It is advisable to separate youngsters before maturity commences to avoid accidental in-breeding.

HEALTH

As we are not qualified veterinary surgeons, our knowledge of animal disease and treatment is rudimentary, but we pass on the following information based on our experience. Obviously, to obtain treatment with antibiotics, etc, one must contact a veterinary surgeon. Pevidine (mentioned below) can be purchased from some specialists in herpetological supplies.

As stated in Part 1 (January 1992), wild chameleons may be carrying a lot of undesirables when they first arrive, so steps must be taken to eradicate these.

To get rid of intestinal worms, the food items are given a good dusting of Panacur 4% Pigwormer, when first obtained, and then again two weeks later. A third dose may be given after a further two weeks if desired, and, thereafter, on a yearly basis, unless worms are detected in the faeces.

It is often worthwhile having a laboratory examination of faeces samples, since this will also show if harmful bacteria, flagellates, etc, are present.

Bacteria and protozoans can be responsible for gastro-enteritis. This frequently occurs in newly imported chameleons and is a common cause of death. Symptoms include loss of appetite, listlessness, loss of weight, diarrhoea and, sometimes, blood in the faeces. Analysis of the faeces is necessary to determine the precise cause, but a prophylactic dose of Metronidazole (100mg per kg body weight) and a broad-spectrum antibiotic is useful as laboratory reports may take several days and death can be rapid.

Protozoan parasites can be eliminated as mentioned above by adding Metronidazole to the drinking water, with a second treat-

Continued on page 27

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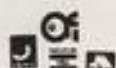
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BOTTOM DRAINS — TOP PRIORITY

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Illustrations by the author

Many newcomers to Koi keeping are daunted by the plethora of products available and the abundance of conflicting advice from different sources. Unfortunately, if you are the 'victim' of unreliable advice, you will then probably make some very expensive mistakes before you have finished. In some areas of pond design these errors can be corrected without too much heartache, but the method you choose to transfer the water from the pond to the filter is something you should get right first time, because it is very difficult and expensive to alter later.

OPTIONS

There are two main ways of sending water from the pond to the filtration system for purification: pump feed and gravity feed. The former is used predominantly in small ponds and in special situations, but gravity feed is by far the better way.

Pump-fed Filtration

If the filter is pump-fed, the pump will be located in the pond if it is submersible, or beside the pond if it is an external model. In either case, you have the choice of sucking the water from the bottom of the pond or from mid-water.

If you choose the latter then there will be an accumulation of droppings and debris on the bottom of the pond which must be vacuumed or siphoned out at regular intervals. If, however, the pump is placed on the bottom then it will suck up much of the mulm and send it to the filter.

Unfortunately, the pump will have the effect of breaking up the droppings into very fine particles which are very difficult to remove at the filtration stage and, since most pump-fed filters do not have provision for removing this matter, it will find its way back to the pond and, eventually, you will have a pollution problem. Another hazard of this pump location is that the inlet to the pump will become clogged and will require cleaning at regular intervals.

Gravity-fed Filtration

Feeding the filter by gravity is recognised as being much the better way, but it is important that the design of the system is suitable because, unlike the pump-fed sys-



P.V.C. Bottom Drain — popular and effective when properly installed and operated.



Base pickup to fit wall drain.



Part of Glass-Reinforced Plastic (G.R.P.) filter showing inlet and waste outlet fittings.

tem, this installation will be permanent and you therefore have only one chance to get it right.

The first thing to consider with a gravity-fed system is whether you are going to draw the water from the base of the pond (bottom drain), or from mid-water through the side wall (wall drain).

If you use a wall drain you will then still have to remove the mulm from the pond bottom. This is normally done with one or more bottom drains which run to a discharge box. In the discharge box there will be a standpipe for each bottom drain which will be pulled at regular intervals to clean the pond.

If you feed via one or more bottom drains then the water is constantly drawn from the base of the pond and all the mulm therefore goes with it to the settlement stage of the filter, where it will collect in one small area until it is flushed away to waste during regular maintenance.

WHICH METHOD SHOULD YOU CHOOSE?

The wall drain/discharge box method is suitable only for extremely large ponds. With this method, the water around the drains is static and so, the droppings will accumulate in this area until the drain standpipe is pulled. Meanwhile you will see an unsightly pile of mulm in the pond which will be disturbed if a large fish swims over it. You will also occasionally notice that the Koi will eat some of it if they are hungry. This is one of the main causes of the transfer of infection from one fish to another. When the standpipe is operated, the 'pulling power' of each drain may be only 15in (38cm) from the edge of the dome and, therefore, anything beyond this limit will remain decomposing in the system until the standpipe is pulled again.

If the filter is fed via bottom drains, then the waste is constantly being transferred from the pond to the filter and, therefore, the pond will always be clean and the fish will not have access to the droppings, thereby minimising the risk of cross-infection.

Besides the operational pros and cons of feeding from bottom or wall drains, the difference in cost of the two systems is considerable. Take, for instance, a pond 12 x 12ft (c 3.7 x 3.7m). This could be serviced quite happily by one 3in (7.6cm) centrally located drain feeding the filter. Alternatively, with the discharge box method, you will require four 4in (10cm) bottom drains and a wall drain, and you will need to construct a discharge box. This method will cost at least five times more than the first method and will not be as efficient.

Winter/Summer Operation

In the winter it is preferable to draw the water to the filter from just below the surface of the pondwater and for it to be returned at the same level. The reason for this is that there is a phenomenon called temperature inversion which can occur in the winter. This is when the water is less cold at the

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bottom of the pond than at the surface. Obviously, the fish will tolerate the winter more easily if they are not subjected to extreme conditions but, in practice, the temperature difference between the deepest point in the pond and just below the surface will not be more than a few degrees.

The benefit gained from altering from bottom feed in the summer to middle feed in the winter is only minimal and I feel that one should take account of this only if other more important considerations such as filtration, pond construction and husbandry have been given the attention they deserve.

My advice would be that if you are building a pond on a budget, then have only bottom drains which feed the filter, but if you want to be 'posh', then include a wall drain so that the bottom drain or drains are not used in the winter. One point to watch here is that if a bottom drain is not used for a long period of time, it should be flushed out to waste periodically and especially just before it is put back into service, because, inevitably, there will be an accumulation of rotting debris underneath and around the bottom drain cover and in the pipe.

If you have a bottom drain, but not a wall drain, in the winter, the anti-vortex cover can be removed and a length of pipe can be stood in the bottom drain up to about 15in (38cm) below the water level. By doing this you will have in effect both a wall drain and bottom drain in one. This can only be done if the bottom drain is designed so that it will accept a pipe in this way.

Pipe Choices

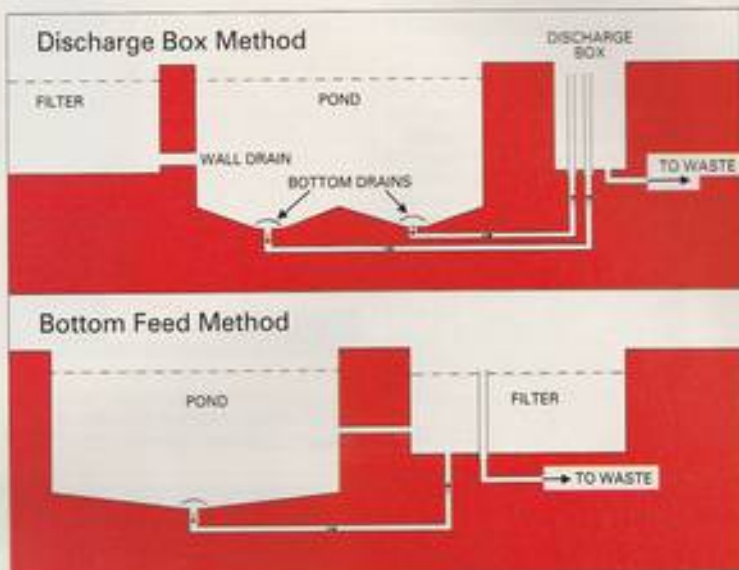
The diameter of the pipes that transfer the water by gravity from the pond to the filter or discharge box must be chosen with care. The

criteria which influence this decision are: pond size, number of bottom drains, the flow required, the depth of the transfer pipes below water level, and the complexity of the route.

In general, if you are having a drain which feeds a discharge box, then 4in (10cm) pipe should be used. If the drain(s) are feeding the filter, it is more important to select the correct size of pipe. If the bore of the pipe leading from the drain is too small to cope with the flowrate of the pump which is drawing water from the filter, then the pump will eventually suck the filter dry or, at least, there will be an unaccep-

table height differential between the pond water level and the water level in the filter. If the pipe bore is too large, then the water will travel so slowly that droppings will settle in the pipe, thus making it possible to get a build-up of harmful bacteria which could be detrimental to the health of the fish.

It is a very common mistake for people to use 4 or 6in (10 or 15cm) bottom drains on small ponds. At a depth of 4ft (1.2m) a 4in (10cm) diameter pipe can transfer 3,500 gallons (15,900 litres) per hour with a small height differential between the pond and the filter. A 6in (15cm) pipe can transfer 7,800



Filter chamber under construction showing the inlet from pond wall drain. The bottom outlet drain will be opened periodically to remove accumulated waste.



This photograph shows the efficient waste collection (at the settlement stage) of a well designed gravity-fed filtration system.

g.p.h. (c 35,500 litres) quite comfortably. This means that, in practice, only large ponds require pipe sizes larger than 3in (c 7.6cm).

ADDING DRAINS TO EXISTING PONDS

If you have an existing pond which does not have any drains at all, and you wish to add one, you may find that the difficulties presented by the installation of a bottom drain are insurmountable. For this to be done, the pond has to be drained and then a trench dug from beyond the edge of the pond to the drain location.

If the pond is made of concrete then, of course, this will have to be broken up to accommodate the pipe and the drain. When the concrete is reinstated it may look cosmetically correct but, in fact, the structure of the pond could be irreparably weakened. (If the pond is coated with G.R.P. — Glass-Reinforced Plastic — this may be less of a problem.)

Another difficulty may be the shape of the pond base. Usually, a drain will be located at the lowest point in the pond and there will be a gentle slope from the edge of the pond to that point. If the chosen drain location does not correspond with the existing base con-

tours, then major reshaping will be necessary because a bottom drain will not attract waste from a lower point in the pond.

If your pond is made with a liner laid directly onto the excavation, the risks of trying to install a bottom drain may be even greater because if you interfere with the side walls, there is a danger that they will collapse. Also, if the job is done with the liner in-situ, it is likely to be damaged. If you remove the liner and then replace it after the drain has been installed then, once again, it is highly likely that it will be punctured before the alteration is complete.

An alternative to having a bottom drain is the installation of a wall drain. This is fitted horizontally through the wall of the pond, as opposed to a bottom drain which is situated beneath the base of the pond. One major advantage of wall drains in established systems is that it is possible to fit them to an existing pond without removing the fish.

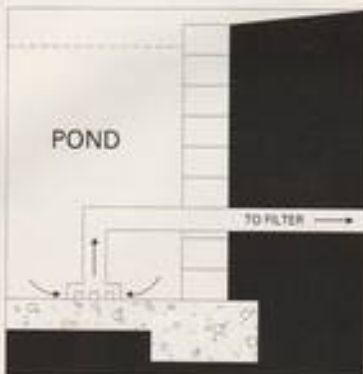
If the water is lowered to just below the wall drain location, the fish should still have enough water to survive while a hole can be made in the wall to accommodate the new drain. (This can only be done if the pond is relatively deep and the alteration is not going to take long.)

If the drain is being fitted into a lined pond, it is, of course, important that no earth and stones are allowed to fall down behind the liner. To prevent this from happening, pressure must be applied to the liner from inside the pond so that the liner is held tightly against the wall of the pond.

The best way to do this is to obtain a piece of plywood about 2 x 2ft (60 x 60cm) and cut a hole in the centre of it a little larger than the pipe size of the drain. Affix some foam to the back of the plywood and then place the whole thing against the wall of the pond so that the hole in the centre corresponds with the drain location. Pressure now needs to be applied to the plywood to hold it in place.

Once this plate is secured in place, digging

WALL DRAIN WITH BOTTOM PICK-UP
(ALSO KNOWN AS TOP-BOTTOM DRAIN)



can begin from outside the pond towards the centre of the plywood without fear of debris falling behind the liner when you break

through. Once the drain has been installed, the earth can be packed back into the hole from outside the pond.

If it is impractical to install a bottom drain but you still want all the pond-cleaning benefits that such a drain would afford, an alternative is to install a wall drain but, rather than terminate the pipe where it meets the wall of the pond, it can be continued across the pond for a short distance and then a 90° elbow should be fitted so that the pipe can continue down to about 1in (2.5cm) above the bottom of the pond. As long as there is a constant and fairly rapid flow through the pipe, it will suck up any waste from the bottom of the pond.

Don't forget to put some kind of mesh or basket on the end of the pipe, otherwise small fish may go on an unpleasant journey!

CLOSING THOUGHTS

It is vital that adequate consideration is given to deciding which method of water transfer you will choose, because when your pond is concreted, or the liner is installed, it is a very difficult operation to alter the installation. Even if you plan to 'pump-feed' your filter, it is a good idea to install a bottom drain, even if you blank the pipe off at the edge of the pond, because you may wish to change your filtration arrangements at a later stage. This small extra operation at the construction stage of the pond will save a major upheaval and considerable further expenditure in the future.

Beware of Imitations

This 60" x 24" x 24" tank is planted entirely with interpet Plantastics artificial plants. The fish (real) were supplied by Coral Bazaar.

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Continued from page 21

ment repeated two weeks later. Obviously, this is administered orally by syringe and, since the chameleon only takes a comparatively small amount, some mathematical calculations are necessary.

Even after treatment, we know of a male *C. johnsoni* which died three months later and was found to be carrying an enormous flagellate load, so, obviously, they had not been eliminated. It is therefore a good idea to repeat treatment after two months.

Antibiotics will help eliminate harmful bacteria. After several deaths in one consignment of chameleons which we received, a post-mortem showed that *E. coli* and *Proteus* were present. The survivors were treated with an oral antibiotic containing Cephalixin (approx 25mg per kg body weight). It is important to note that antibiotics tend to make animals thirsty, so plenty of water must be supplied.

Injuries, lesions and sub-cutaneous abscesses may respond in the early stages to swabbing with Povidine. If this does not work, they may require injections of a suitable antibiotic. In a number of cases some of our chameleons have been successfully treated with Cefazidime which is usually used on humans. In particular, this antibiotic has cured a mysterious disease which caused one eye to swell and sores to appear all down the front of the face. Another common ailment is an infection which starts in the jawbone and spreads up towards the eye.

This responded well to Cefazidime. The site of infection in the mouth can be swabbed with Povidine.

Antibiotics are also necessary in cases of respiratory infections. The main symptom is laboured breathing which is often audible.

Following previous remarks about stress, a newly-obtained chameleon should be left alone until well settled in (apart from feeding, watering and administering medication). Unnecessary handling will only increase stress which may well accelerate the onset of disease. As with all reptiles, a sick chameleon should be isolated from the others and kept at the upper end of its temperature range as antibiotics, etc, work more quickly when the animal is warm. Even so, cures can take quite a long time to work.

A sick chameleon which is unable to catch food may need to be hand-fed. Since most specimens will usually gape when handled, dead prey can be placed in the mouth. It may be rejected, but is usually crushed and swallowed. If the chameleon doesn't gape, the mouth can sometimes be opened by gentle, backwards pressure on the gular pouch or at each side of the mouth. Water and medication can be administered in a similar manner. We know of no known cure for sub-cutaneous worms.

Working on the old adage that prevention is better than cure, many problems may well be avoided by administering early prophylactics. In addition, the surroundings must be kept clean. Chameleons produce quite copious amounts of droppings and may often

pick up faeces when capturing crickets, etc, on the vivarium floor.

As already mentioned, regular vitamins and calcium can also prevent problems. A watchful eye has to be kept on chameleons, since the early stages of diseases are not always visible and death can come very rapidly. Cessation of feeding may mean that the animal wants a change of food but, if other types of food are also refused, it usually means that the specimen is sick.

CONCLUSION

Chameleons obviously take a lot of time and effort and should not be kept unless one is able and willing to provide this. Their rather unfortunate history of captivity only gives fuel to the 'ban everything brigade', so the establishment of successful colonies is highly desirable.

Chameleons are fascinating creatures and deserve every chance of survival. A few years ago, snake breeding was a hit and miss affair but, today, large numbers are being bred in captivity. Why not chameleons?

Care and Breeding of Poison-Arrow Frogs

Robert and Valerie Davies have recently had the above title published by Rushmere Publications, price £8.95 (ISBN: 1 8745177 00 7). Contact the publishers at 13 Upper Crofts, Alloway, Ayr, Scotland KA7 4QX. Tel: 0292 43999.



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Books

Book News from Underworld

The following three books are now available from Underworld Products, Units 1 & 2 Belton Road West, Loughborough, Leicestershire, LE11 0TR. Tel: 0509 610310; Fax: 0509 610304; Telex: 311995 SHARET G.

1 Lower Animals (Stone Corals, Disk — and Crustacean Sea Anemones)

By: Peter Wilkens
Published by: Engelbert Pfreim Publishing
ISBN: 3 921677 15 7
Price: £19.50

The author, assisted by A. Arnold, J. Birkholz, R. Marbé and F. Tognola, has gathered together a good selection of varied and interesting marine invertebrates. More than 25 years of personal experience, both in keeping marine organisms in aquaria and in observing them in the wild, have gone into this well-illustrated book. Important advice about correct water conditions, lighting, feeding and parasites, should help aquarists with the aquarium care of these creatures.

2 Invertebrates (Tube-, Soft- and Branching Corals)

By: Peter Wilkens and Johannes Birkholz
Published by: Engelbert Pfreim Publishing
ISBN: 3 921677 14 9
Price: £19.50

This 'companion book' to *Lower Animals* takes a similar picture/text approach in which the authors concentrate largely on coral species which are available to marine aquarists. Details of aquarium maintenance are included, both in a chapter entitled, *Environment: Reef and Aquarium*, and in an Appendix.

3 Damselfishes of the World

By: Dr Gerald R. Allen
Published by: Mergus
Distribution by: Aquarium Systems
ISBN: 3 88244 008 2
Price: £33

This long-awaited publication by Dr Gerald R. Allen, provides a unique synthesis of scientific and popular literature, and incorporates his own research. The world's reefs have served as Dr Allen's laboratory for the past 20 years, and his diving and

collecting expeditions have nurtured a unique knowledge of this group. In addition, he has studied damselfish collections in most of the world's major museums. He is also an accomplished underwater photographer and has contributed most of the photographs appearing in the book.

Now for the first time, nearly every species (all, but one) is illustrated in colour in a single comprehensive volume. There are about 500 photographs, most of which were taken underwater in the natural habitat, including first-ever shots of many of the species. Several paintings of relatively rare species by natural history artist, Roger Swainston are also included.

The informative text provides current information on behaviour, ecology, zoogeography, and classification of damselfishes. Special sections on anemone hosts and the breeding of damselfishes are also included. Extensive easy-reference tables summarise the distribution, depth, temperature requirements, maximum length, tank size, availability and type of care required in captivity.

This comprehensive book is ideal for aquarists, divers, and professional ichthyologists alike. It is an up-to-date and concise treatment of this highly fascinating, colourful, and diverse family of fishes.

Encyclopedia of Marine Animals

By: Dr Neville Coleman
Published by: Blandford
ISBN: 0 7137 2289 4
Price: £25

I think quite a few people are going to be more than a little surprised when they pick up this large (31 x 24cm — 12.2 x 9.5in) heavily illustrated (and heavy) book. It seems almost impossible that a publisher can produce a volume such as this, incorporating 1,000 colour photographs, and still be able to sell it for a mere £25. Yet, this is precisely what Blandford have done...

The photography is of a high quality throughout, with only a few pictures, such as that of the Olive Sea Snake falling short in terms of sharpness of focus. But then again, photographs of this venomous sea snake are not what you could regard as easy to come by! So, a slightly 'soft' picture is immeasurably better than no picture at all.

The full list of contents reads as follows: Introduction, Using the Book, Glossary, Sponges, Cnidarians, Flatworms, Segmented Worms, Sea Mosses, Crustaceans, Molluscs, Echinoderms, Sea Squirrels, Fishes, Reptiles, Mammals, Bibliography, Index of Common Names, Index of Scientific Names and, finally, Index of Family Names.

Excluding the preliminary and reference sections, there are 305 pages making up what is a hugely impressive collection of sea creatures. Some of the pages (too few, in my opinion) have either large or full-page photographs. The rest are made up of smallish pictures measuring, on average, about 6 x 6cm (c 2.4in), accompanied by technical information consisting of Class, Family, Scientific Name, Common Name, Distribu-

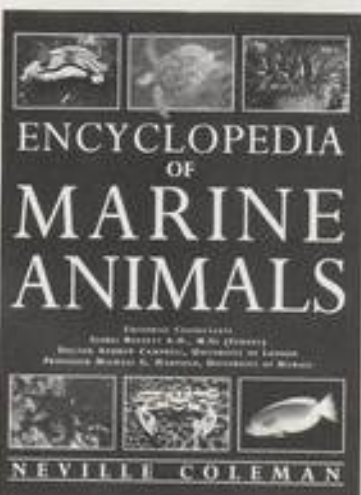
tion, Habitat, General Water Depth, Food Habit, Size and Description for each species.

Inevitably, this provides the pages with a bit of a 'samey' look in that a double spread on, say, crabs, looks very much the same as one for sponges, or corals, or groupers... or whatever. This, in turn, gives the layouts a less-than-exciting feel. However, the high quality of the pictures — their small size notwithstanding — saves the day, while the details supplied are full of essential and, at times, absorbing information.

To have made the layouts more eye-catching and appealing by varying the sizes and positioning of the pictures and, perhaps, inserting coloured/tinted boxes with particularly interesting information or advice, e.g. the effects of Scorpionfish or Sea Snake venom, protective/remedial measures following stings or bites, etc. would certainly have enhanced the overall impact of this extremely useful book even further. However, it would also have made it both bigger and more expensive... which brings me back to its unsurpassable cover price.

If the aim of the publishers was to produce a comprehensive, sound, colourful, desirable and very useful book at an unbelievable price, then they've succeeded handsomely. Whether a more excitingly designed, more expensive, book would have proved just as successful or not, we'll never know. My guess is that it would have.

John Dawes



The Interpet Bumper Guide to Garden Ponds

Compiled by: Dick Mills
Published by: Salamander Books
ISBN: 0 86101 636 X
Price: £9.96 hardback.

This is a book which means business — and, once you have read it, I promise that you will be eager to get out with spade and wheelbarrow and get stuck into the business of getting your own pond project underway.

This compilation, expertly undertaken by Dick Mills (familiar, of course, to regular readers of *Aquarist & Pondkeeper*), incorporates the best of Interpet's previous volumes on garden ponds and coldwater fish — and loses none of their impact. Where else could you find so much practical advice, accompanied by superb photographs and magnificent colour diagrams — in one book, and all for under a tenner?

The four main sections of the book each provide detailed and practical guidance on everything you ever needed to know about garden ponds — and more. The essentials of pond and water garden design are covered in Part 1, which guides the reader through different types of pond construction and also looks at moving-water features, as well as at water gardens.

Planning and building the pond is



Interpet's latest release, *The Interpet Bumper Guide to Garden Ponds*, will be of interest to specialists and browsers alike.

covered in such comprehensive detail in Part 2 that it almost looks easy(!), with advice on the use of materials, methods of construction and, most importantly, the use of electricity in the design of the pond. The mysteries of filtration are also revealed with some very useful and easy-to-understand diagrams of a range of filter systems.

Having built the pond, then what? With which types of plants and fish should we stock the pond, and how should we look after them? The answers to all these questions, and more, are offered in the second half of the book, colourfully presented and providing detailed advice on all aspects of planting the pond, and choosing and stocking fish.

Advice on feeding and fish ailments is complemented by a look at the history of the Goldfish and its breeding (though I would not recommend Ranchu for the average garden pond).

Just about every popular variety of Koi is also illustrated, together with an explanation of the varieties and their names, while very useful chapters are dedicated to 'other pond fish', and 'other pond livestock' (the latter even includes aquatic pests!).

A seasonal diary for the pondkeeper is likely to be a well-thumbed section of the book, while a question-and-answer section is usefully devoted to pond problem-solving.

It looks as though Salamander have again come up trumps with this latest volume, which provides the perfect 'kick-start' to the new season. As Interpet themselves exclaim: "This volume represents exceptional value and will be of interest, not only to the specialist pondkeeper, but also to gardening enthusiasts, fishkeepers, and anyone who enjoys an informative browse".

I can't argue with that!

Stephen J Smith

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1 x H Polyperma, 1 x Needle Leaf Ludwigia,
1 x Water Wisteria

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CANADA

TROPICAL FISH HUNT . . . IN THE ROCKIES?!

Peter Burgess tracks down some well-known tropical fish in one of the most unlikely 'tropical' locations you could imagine

Photographs by the author

It was the early hours of a September morning when I woke to the growls and barks of a nearby dog. Peering out of the tent I could see the outline of a large creature confronting a German Shepherd. Realising it was no match for the aggressor, the dog retreated under its master's camper van and the creature, having lost interest, wandered off into the surrounding conifer forest. It was windy and snowing. A gust of chilled air rushed into my tent, but I was oblivious to the cold, for I had just sighted my first bear and my mind was preoccupied with the thoughts of its return.

The tent, now abandoned in favour of my bear-proof(?) car, had been pitched in the Rocky Mountains Park, Alberta. My main reason for travelling to this part of Canada was to explore the beautiful mountain terrain and observe its wildlife. I was also in search of something a little unusual for this part of the world — wild tropical fishes!

INTRIGUING REFERENCE

Wild tropics in the cold Canadian Rockies? Before you accuse me of having imbibed too much dury-free spirits, allow me to explain. Soon after my arrival in Alberta, I treated myself to a copy of Scott and Crossman's mammoth work on the freshwater fishes of Canada. I discovered that, for its size, Canada is not rich in its diversity of fishes: Scott and Crossman list a total of 177 native species, spanning 24 families (Alberta itself has 51 native species). Salmonids, minnows, shiners and dace comprise a large proportion of the fish fauna, with only a couple of species of ornamental interest: the Brown Bullhead Catfish (*Ictalurus nebulosus*) and the Fathead Minnow (*Pimephales promelas*), usually sold as the orange form.

Browsing through the book, I came upon something that intrigued me. The authors made passing reference to a lake in one of the Rocky Mountain parks which is fed by hot springs and into which were deposited several species of tropical fishes, including livebearers and cichlids.

However, the book was published back in

1973, and so I wondered whether or not these fish might still be there. Could they have survived the harsh Canadian winters? If so, which species remained, and had they bred? There was only one way to answer these questions. I managed to pinpoint the hot springs site on the map and located what I assumed to be the relevant lake, one of three so-called 'Vermillion' Lakes which form a marshy overflow area for the Bow River.

FIRST IMPRESSIONS

I arrived at Vermillion Lakes after a few days excursion along the Icefields Parkway. Sightings of wildlife, including beaver, coyote and moose, had been excellent, but now I wanted to add exotic fishes to my list! The lakes were situated in Banff National Park, one of four mountain parks (the others being Jasper, Kootenay and Yoho) which, together, form a contiguous region encompassing a massive 7,800 square miles — over 20,000 sq km (about the size of Wales).

Vermillion Lakes lay in a beautiful forested region dominated by three snow-capped mountains, two of which reached almost 10,000 feet (over 3,000m). The lower montane and sub-alpine zones were covered with Douglas Fir and Spruce, and on the flat terrain, grew honeysuckle and blackcurrant. The local guide book lists Brook Trout (*Salvelinus fontinalis*) as the main fish inhabitant, whereas Rainbow Trout (*S. gairdneri*) are absent owing to their intolerance of the low winter oxygen levels (caused by decaying aquatic vegetation, starved of sunlight by the thick ice which seasonally forms on the lake).

Two of the lakes are little more than giant beaver pools, the water levels being controlled by small dams constructed by these large rodents. In the middle lake was an Osprey's nest built upon a broken tree trunk, with an adult pair and fledgling in residence.

I skirted around the lakes observing the wide variety of aquatic plant life, which included submerged species and marsh plants such as reeds, sedges, grasses and swamp horsetails. Along the edge of one lake



Above, the hot-spring cascade — lifeblood to the tropical fishes. The water is stained yellow with sulphur.

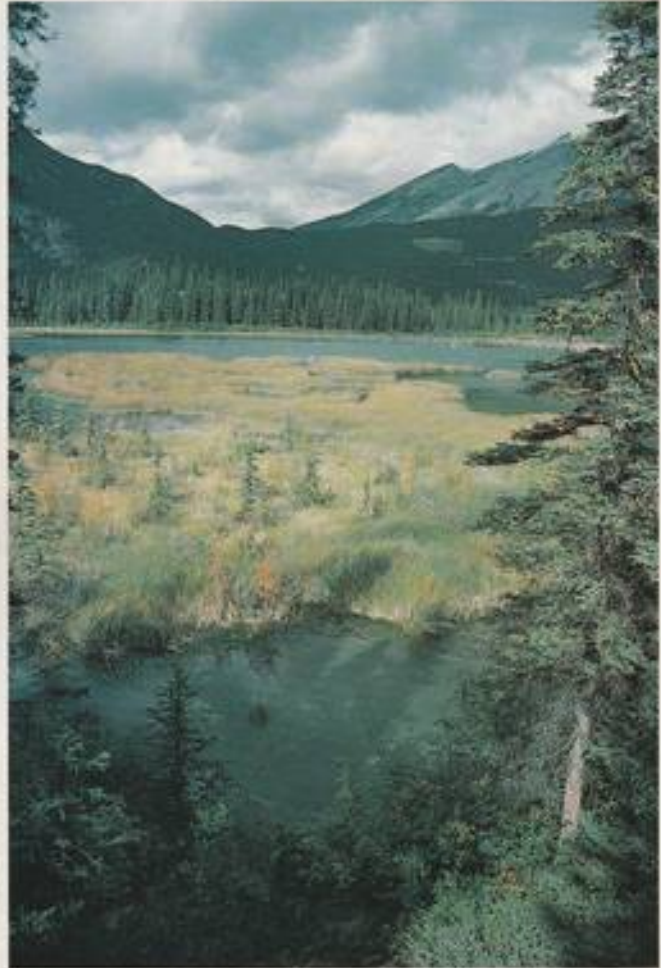
Top centre, Vermillion Lakes and surrounding terrain. From a distance, there's no sign of the 'tropical' delights in store for the visitor.

Top right, Vermillion Lake's self-appointed water engineer: the beaver.

Middle, out of Africa — and into Canada: the Jewel Cichlid.

Near right, wild Jewel Cichlids living among the dense aquatic vegetation.

Far right, the marshy waters of Vermillion Lake lie among beautiful conifer forests and mountains.



had been erected some wooden boardwalks built on scilts.

FIRST 'TROPICAL' CLUES

Walking halfway along one of these raised walkways I came upon the first clue to the possible existence of tropical fishes in the region. Down the slope of the wooded bank ran a waterfall, steaming and smelling strongly of sulphur. An information plaque revealed this to be part of the Cave and Basin Hot Springs, discovered in 1883.

The yellow-stained water emerged at 91-93°F (c 33-34°C) and cascaded under the boardwalk where it ran off into the lake. Further along, the walkway opened into a wide viewing platform which extended out and over the clear, marginal waters of Vermillion Lake. Here was a swampy region, with shallow water just a few inches in depth, over a muddy substrate. A flourishing aquatic plant life bathed in this warm, mineral-rich environment.

TROPICAL SECTION

Leaning over the handrail, I glimpsed numerous small creatures darting among the submerged reed stems and plants. The lake was teeming with fish! I thought at first these might be minnows, but after kneeling down on the platform edge to get a closer view, I realised these fish looked somewhat familiar to me. In fact, very familiar . . . Mollies! Some were silver in colour, others golden. Viewed from above, I could see the bulging outlines of heavily gravid females — obviously the fish were successfully breeding here.

Even more numerous were smaller pale coloured fishes which I thought might be female Guppies, though I could not see any brightly coloured males. I could not identify these fishes from above — try looking over your tank at home and you'll realise just how difficult it is.

However, the third species I sighted was easily recognisable. About three inches (7.5cm) in length, and definitely cichlid-like in shape and behaviour, this orange fish with its black spots along its flanks was unmistakably a Jewel Cichlid (*Hemichromis bimaculatus*). Several specimens were present, both adults and juveniles. It was an incredible sight, for here were wild cichlids, healthy and presumably breeding — above a latitude of 50° (equivalent to central England).

I watched a pair of Jewels which had made their home among a clump of reed stems and were busily defending it against the numerous livebearers foraging nearby. This part of the lake appeared devoid of submerged rocks or other large structures, and so the fish presumably relied on the spatial positions of aquatic plants and reed stems in order to map out their territory.

The whole scene resembled a vast, shallow fish aquarium. I noticed that the tropical fishes inhabited only the region of the lake near the spring outlet. Presumably, the only barrier against their access to the rest of Vermillion was that of temperature. The waters around the hot springs offered com-



The information plaque shows four of the lake's fishes: Gambusia, Molly, Jewel Cichlid and the endemic Longnose Dace.



The rare Longnose Dace.

fortable 'tropical aquarium' temperatures of 70-80°F (c 21-27°C) but further out, the lake became progressively cooler and, eventually, icy cold. It felt strange to think that this same lake was home to an African cichlid and the cold-loving Brook Trout, yet the two species probably never meet up!

Further along the viewing platform were more information plaques. The story was beginning to unfold. Apparently, several species of tropical fishes were introduced into Vermillion Lake by a local aquarist society around 1954. I could not see two of the species listed by Scott and Crossman, namely Swordtails and Convict Cichlids, nor were they mentioned on the plaques, so I presume they had died out.

However, the habitat was obviously just right for three other species which continue to survive over numerous generations and several harsh winters in the lake: the Jewel Cichlid, the Molly (apparently introduced as the black form) and the 'guppy-like' species which I had difficulty in identifying, the Mosquito Fish (*Gambusia*). I subsequently read that *Gambusia* were introduced into the Lake in 1924 to control mosquitoes.

EXOTIC THREAT

The release of these tropicals many years ago had been an experiment which continues to provide a fascinating and unusual sight for visitors. But, sadly, these exotic fishes were destined to cause an ecological disaster.

The information plaques illustrated one other fish species inhabiting the warm marshy waters, namely the Longnose Dace (*Rhinichthys cataractae*). Scott and Crossman

describe this three-inch (7.5cm) fish as a native to Canada, where it lives as a bottom dweller in swift-flowing streams and lakes, feeding mainly on aquatic insect larvae.

The population of Longnose Dace has, over many years, adapted to the warm waters and, in doing so, formed a distinct race, *R. cataractae 'smithi'*, which occurs nowhere else. The introduced tropicals have adapted so well to their new habitat that they are successfully competing with 'smithi' to a point where it could face extinction.

I returned to the lake on three successive days to scan the marshy waters in the hope of sighting 'smithi', but without success. On the fourth day fresh snow was falling and it was time for me to catch my homeward flight. Perhaps I had simply been unlucky in my search. I would like to think that 'smithi' is still out there somewhere, sharing its unusual lake with the Brook Trout, the beavers and all the other wildlife that have a rightful place in this beautiful wilderness.

FURTHER READING

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THE AQUARIUM MARINES REVIEW

Part 6

Molluscs

Andy Horton introduces those 'usually-shelled' invertebrates which are often confusingly referred to as 'shellfish'.



Some gastropods have been around for a long time. This limpet (*Patella mediterranea*) and the smaller terrestrial snail — both species are extinct — were found in Pleistocene deposits in Gorham's Cave, Gibraltar.

Molluscs constitute a large phylum of animals that vary in appearance from the common Garden Snail, *Helix aspersa*, to the intelligent Octopus, with its complex behaviour and an ability to learn. Molluscs are often referred to as shellfish, because most species have their soft, often edible, innards protected by a hard external shell. This colloquial term is confusing because prawns and crabs are also called shellfish. After the Arthropods (jointly-limbed invertebrates), the Mollusca comprise the most numerous phylum in the metazoan (multi-celled) animal kingdom; both in variety of species and sheer numbers.



Dogwhelk and eggs on a mussel shell. To the left is a second Prosobranch mollusc — a periwinkle.

TAXA (GROUPS) OF MOLLUSCA

Molluscs first appeared on this planet at the beginning of Palaeozoic Era, during the Cambrian period, about 500 million years ago.

They can be divided into the following groups:

CLASS	SUBCLASS
Monoplacophora — limpet-like deep-sea relics	_____
Polyplacozomorpha — chitons (= Amphineura)	_____
Aplacophora — solenogasters, offshore worm-like molluscs	_____
Gastropoda	Prosobranchia — univalve (snail-like) gill-breathers
	Ophisthobranchia — sea-slugs, etc external shell lost, or reduced
	Pulmonata — snail-like terrestrial lung-breathers

Scaphopoda — tusk shells	_____
Bivalvia — two-valved species e.g. cockles (= Lamellibranchia)	_____
Cephalopoda — squids, cuttlefish, octopods, etc	_____

MORPHOLOGY

By far the majority of molluscan species are found in the sea. The shell has evolved as a necessary protection, and is a distinguishing feature of this phylum of unsegmented creatures. The shell is formed in several layers, the outermost known as the horny *periostracum*, and grows by the addition of new shell material excreted by the mantle. This can be seen most clearly in large species like the Common Whelk, *Buccinum undatum*, where the new growth appears cleaner, before it is colonised by algae, or collects a layer of dirt. All exclusively marine molluscs obtain oxygen and some of the growth minerals by drawing in seawater.

The study of seashells is known as *Conchology*. Molluscs are fascinating to observe in aquaria, because their various parts perform different functions. Important organs include:

- (1) the horny shell (usually external);
- (2) a muscular foot;
- (3) gills, called *ctenidia*, for absorbing oxygen from the water.

Other parts are present only in certain classes, or can only be discerned by dissection, and are not of direct interest to the aquarist.

GASTROPODA

① Prosobranchia

Gastropods are the most numerous molluscs, and, with their asymmetrical snail shape, represent the typical form. The pointed end, known as the apex, and the whorls, almost always spiral clockwise, as in right-handed or *dextral* snails. The shell itself is comprised of several different types of calcium carbonate (limestone) which is obtained, in part, through the intake of food, as the protein *conchiolin* is a component.

On the rocky shores of Britain, tens of thousands of a small black mollusc called the Periwinkle, *Littorina littorea*, can be found all over the rocks and groynes. When dislodged, they are able to withdraw into the shell, and are protected from desiccation by a thin plate called an *operculum*.

Most species of Gastropod glide over the rocks or burrow through sand on the fleshy muscular foot that moves by contraction and relaxation. Sensory apparatus involves at least one pair of feelers. In the scavengers, the whelks and Nettle Dogwhelks contain a long retractable siphon called a *proboscis*. This organ inhales water into its mantle where the *osphradium* chemically senses the water, being able to detect dead and decaying matter, and orientates the mollusc towards its food.

Almost all Gastropods are active searchers for food. The herbivorous types, including the conical Limpets, *Patella* spp, use a *radula* to rasp algae from rocks. Many species are

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MARY GIBBS - OCEANARIUM BLOW, OXFORD

Nudibranchs (Sea Slugs) are among the most beautiful of all marine invertebrates. This is *Chromodoris elizabethina*, one of the smaller species fairly regularly found on sale.

carnivorous, including the European Dogwhelk, *Nucella lapillus*, which uses the *radula* to drill tiny holes in mussels mechanically and then suck out the flesh.

Prosobranch Gastropods are found in all the oceans. In the multiple habitats of the tropical reef, the variety of species runs into thousands. Decorative shells have been brought back by sailors for over a century, and dead specimens of *Murex* adorn many tropical aquaria. Live specimens have not achieved much popularity. Colourful cowries are imported, but these are not always a good choice, because many species have a specialised diet. They will tend to hide under rocks and risk being attacked by aggressive fish.

Opportunistic carnivores and scavengers are likely to be the easiest to keep. Cone shells are notorious because their armament employs the feeding *radula* shaped into a barbed spine containing a deadly toxin which can be used to kill fish; on several occasions that has proved fatal even to man. *Conus textile* is the most common on Indo-Pacific reefs.

The largest Gastropod in the world is probably the False Trumpet Shell, *Spirex*, of north Australia, which reaches 70cm (c 27.5in) in length. The Triton, *Charonia tritonis*, the well-known species that feeds on the Crown-of-Thorns Starfish, *Acanthaster planci*, attains 45cm (c 18in). The largest British Gastropod is the uncommon North Sea Buckle, *Neptunea antiqua*, with occasional 'monsters' up to about 20cm (8in) in length.

② Opisthobranchia

For the sheer dazzling array of different colours, the Opisthobranch molluscs, especially the order of Nudibranchs, or Sea

Slugs, exceed any other animals, individually expressing more colour than both sea anemones and marine fish of the tropical reefs.

In the course of evolution, members of this group (sub-class) have lost their protective shells, becoming thin and transparent in the order of Bubble Shells (Cephalaspidea or Bullomorpha), retained as a small internal shell in the Sea Hares (Anaspidea or Aplysiomorpha), or have disappeared entirely in the Nudibranchia. Because of their spectacular brilliance, it is not surprising that the last of these are seen fairly frequently at aquarium retail outlets.

Although the life history of these creatures is not well documented, it is known that many species have short life spans, breeding after one year and dying immediately afterwards. Almost all the hundreds of tropical Sea Slugs have a specialised diet, often a single species of coral, sponge, bryozoan, tunicate or hydroid. Smaller species are often first discovered when introduced with their prey.

Only species known to feed on algae are to be recommended to anyone other than the dedicated specialist. Of these, the yellow-brown Caribbean Sea Hare, *Aplysia dactylomela*, the Indo-Pacific Saccoglossan Sea Slug, *Cyerce nigricans*, or the temperate Atlantic Sea Hare, *Aplysia panacea*, are known to eat algae, but they are still extremely difficult.



Piddocks (bivalves) can burrow into certain types of rock. Two specimens in situ, plus a number of empty 'burrows' can be seen in this shot.

The external gills are visible in the Sea Slugs. In British species they are used as definitive identification, because the same species may sport different colours.

③ Pulmonata

This sub-class consists of terrestrial and freshwater species, with primitive lungs for air-breathing. They are therefore of no direct relevance to marine aquarists and will not be further dealt with here.

POLYPLACOMORPHA (AMPHINEURA)

Chitons look like woodlice without any legs, clamped tightly to the underside of rocks. They are only very small, and are easily overlooked. For precise identification of each species, a magnifying glass is neces-

sary. A fleshy girdle surrounds eight chitinous plates.

Although widespread in all seas, including the tropics, chitons are rarely, if ever, offered for sale.

BIVALVIA

Bivalves are characterised by two flattened shells hinged together. They are sedentary animals that lack the feelers of the Gastropods. The muscular foot also has a slightly different function, used in some species, like the cockles and tellins, to burrow just below the surface in sand or mud.

Although bivalves constitute the second most numerous class of molluscs, their abundance is not clearly observed because, with the exception of the mussels, almost all the species are hidden from view. Species like the various piddocks, for example, can bore into sedimentary rocks like clay and limestone. On the south coast of England, the Common Piddock, *Pholus dactylus*, honeycombs into the soft chalk.

Mussels use their foot for a different purpose. In aquaria, the chocolate-brown organ can be observed protruding for the purpose of emitting byssus, long white threads which are used to fasten the mollusc to the rock. On the shore and in the shallow seas, beds of millions of individuals form a dense mass attached to rocks where the current or tides bring their food of diatoms, microscopic phytoplankton, the plant life of the oceans.

Other bivalves are detritus feeders, like the razor-shells, which can burrow with their foot at great speed, and the tellins, some of which have limited powers of movement on the surface. The Peppery Furrow Shell, *Scrobicularia plana*, remains stationary and extends its pair of long siphons in search of organic particles.

All bivalves possess these two inhalant and exhalant openings. In the mussel, these are situated inside the shell and can only be seen when the mollusc opens the two halves of the shell to draw in the large amounts of water from which the phytoplankton is filtered out. In practical terms, this means that unless the aquarium is connected to the sea and continually pumps in seawater (the Open System), culture of these molluscs is very difficult. Mussels are the principal prey of the Common Starfish, *Asterias rubens*, and when introduced in aquaria to provide a natural diet for this echinoderm, they will remain alive for a few weeks without feeding.

Even detritus feeders are not very successful, because they favour dirty aquaria, and, in any case, are not very popular because they remain hidden in the substrate.

Giant Clams, *Tridacna* spp, are available to aquarists and can live for several months without feeding on phytoplankton. They also obtain nutrition (glycerol etc) from zooxanthellae algae in their mantle tissues. Algae cultures are available from marine biological laboratories, but it seems likely that most species of plankton-feeding bivalves, including the scallops, will die of starvation in home aquaria sooner or later. Over-collection in the wild is reducing the



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numbers of the long-lived centurion, the Giant Clam, of which the largest specimen found measured 110cm (c 43in) and weighed 333kg (734lb).

CEPHALOPODA

For advanced aquarists, the octopods, cuttlefish and squids, provide the ultimate challenge, since it is possible to keep the smaller species successfully if the water conditions are absolutely perfect. Complete



Three types of mollusc: a mussel (bivalvia), a nudibranch (opisthobranch gastropod) and a top shell (prosobranch gastropod).

books have been written about these complex and interesting animals.

In cephalopods, the foot has evolved into a funnel in which a flow of water is maintained by rhythmical contractions. Rapid movement is possible via a stream of expelled water. Oxygen also passes over the gills¹ at the same time, and saturation levels of dissolved oxygen² are essential in aquaria housing these invertebrates. The surface of the water can be agitated to maximise gas exchange, but a large aquarium is usually required, and supplementary mechanical (adsorptive) filtration (e.g. activated charcoal, protein-skimmers) should also be used. Water changes should be small (up to 10%) and frequent (weekly).

Crabs provide the staple diet for all octopuses³, which they are able to capture in their eight suckered arms, subdue with poison glands⁴ and break up with their horn-like beak. Squids feed largely on prawns, and cuttlefish will extend the longest of their ten tentacles to entangle benthic (bottom-dwelling) shrimps.

In the warmer seas (over 20°C - 68°F), octopuses are common. A tropical species, *Octopus cyaneus* is available, but it will usually need a 100-gallon (450-litre) aquar-

ium as a single species feature. The octopus also needs to be provided with plenty of hiding places in a tank with a secure lid.

Cephalopods should not be induced to discharge their ink, which pollutes the water. The Common Cuttlefish, *Sepia officinalis*, is the species most often seen displayed in Public Aquaria, where it can usually be seen feeding, and is spectacular with its colour changes. The Curled Octopus, *Eledia cirrhosa*, found in Scottish waters requires cooled aquaria⁵.



Among the cephalopods, various species of octopus can be kept... but only in excellent water conditions and by expert aquarists. Both criteria apply to this superbly healthy specimen photographed at The Windsor Aquarist.

Among the squids, we can discover the largest invertebrates, those fabled sea monsters, the Giant Squids, *Architeuthis*, which can weigh 2 tonnes and reach 17 metres (57ft) in length, including the long tentacles. The common squid of inshore English seas is *Alloteuthis subulana* which grows to 15cm (6in) long, but the Little Cuttle, *Sepiella atlantica* (5cm - c 2in) is frequently captured in shrimp nets.

REPRODUCTION IN MOLLUSCA

Molluscs breed in many different ways. The sexes are usually separate, but some species, like the Oyster, change sex several times during their lives. The Common Whelk, *Buccinum undatum*, lays big clumps of eggs, the empty cases of which are washed up on the shore. The eggs of the Dogwhelk, *Nucella lapillus*, form a single layer of yellow capsules on the rocky shores of Britain. White spirals or coils of spawn will have been laid by Sea Slugs.

Cuttlefish eggs are marble-sized, black, and laid individually. Squid eggs, on the other hand, are found in long white strings. Eggs of other species are discharged into the sea.



Chitons are small interesting molluscs that are only rarely seen.

Gastropod eggs usually develop into veliger⁶ larvae which are common in the plankton, but some of the shore Periwinkles, *Littorina*, give birth viviparously⁷.

Bivalves, like the mussel, which are found together in large congregations, discharge their gametes (sexual products - eggs and sperm) into the sea, where fertilisation occurs. Trochophore-like⁸ larvae subsequently develop.

NOTES

① For more information and references, please write to Andy Horton, via *A & P*, specifying interest.

② Details of the Conchological Society are also available from Andy.

③ For details on Cone Shells, see 'Glory of the Sea' by Peter Elphick *A & P* October 1987.

④ Text Notes

¹ Some octopods diffuse oxygen through their body surface.

² Oxygen in the Marine Aquarium, *A & P* April 1990.

³ Octopuses is plural. Chambers says that 'octopi' is wrong, although this word seems to have acquired common usage and is included in the Merriam-Webster American Dictionary. Octopods refer to the order Octopoda: all cephalopods with eight arms. Squid are included in the order Decapoda.

⁴ Painful, but not dangerous, except in the attractive Blue-ring Octopus, *Hapalochlaena maculosa*, found intertidally in tropical Australia, which has a poisonous bite that has proved fatal on occasions.

⁵ Cooling Units for Aquaria, *A & P* November 1989.

⁶ veliger larvae develop into a twisted spiral shape, like the adult, and live in the plankton. (See *Ballad of the Veliger - Garstang*). Shore species may omit the planktonic stage.

⁷ viviparous: eggs develop within the female which then gives birth to live young.

⁸ trochophore larvae are also known as wheel or hoop larvae (oyster larvae contain rudiments of bivalve-shell).

IN SEARCH OF THE 'TRUE' FIGHTING FISH

Finnish aquarist Tor Kreutzman visits Malaysia to hunt for a very special fish . . . with a little help from his friends.

Photographs by the author

I have always found Singapore a very nice place to visit. I have many good friends over there and it is also the centre of the Asian tropical fish export trade. Another advantage is that Malaysia is very close and there you can still find places where nature is untouched. Unfortunately, at the speed with which it is being destroyed, this won't last long.

When I was planning to visit my friends in Singapore and southern Malaysia, I naturally also included some field expeditions in my schedule.

For a long time I had been trying to find out where different *Betta* species were to be found. Some are known to exist in Malaysia so, since I was going there, I decided to try and find some, preferably *Betta pugnax*.

This fish could very well be considered the 'true' Fighting Fish. The name 'pugnax' refers to fighting or hitting, but I had heard that this species is not particularly aggressive.

'NO PROBLEM' FISH

I contacted all my friends and told them about the 'pugnax hunt'. Everybody answered, "No problem". That was certainly a surprise to me because this fish had never been imported to Finland and I had therefore considered it either hard to find or difficult to catch.

When I arrived in southern Malaysia (in Johore) I soon found out that it was true that *B. pugnax* was easy to find. I spent my first night on a plant farm belonging to Lim Kim Kiat of South Island Aquarium, where I found the first Bettas in the shallow ditches around the farm. Simon (Kiat's nephew) helped me locate the fish, and we caught them with a piece of thread and a worm on the end.

These were the first fish I found but, because I was going to travel around the state of Johore for some days, I could not take them with me. In between fishing, I had a good time on the farm and the other plant farm owned by the same company, where they showed me around and took me to places I never would have found on my own.

From here I continued to Kulai and spent a few days up there without seeing any Bettas but, instead, saw lots of other fish. I also had



Typical *Betta pugnax* habitat.



As can be appreciated from this photograph, *B. pugnax* streams are usually small and found in heavy undergrowth.

the opportunity of meeting different fishermen, studying their techniques and taking some nice pictures of various ways of catching fish.

I then continued to Peking Nenas, a beautiful village where I was hoping to catch some Bettas to take with me back home. I moved into the hotel in the busy village centre, the only hotel around here.

My friend Lim was breeding beautiful Angels on his farm just outside the village and he was starting a Discus breeding project which looked very promising.

He also told me that the Bettas were no problem. "But they are ugly and bad tempered so nobody wants them", he told me. Close to his farm, behind the dense vegetation, was a small spring from which some water was slowly running towards the jungle.

I started fishing in these shallow streams in the way Simon had taught me. I took a fishing line and tied a worm to the end of it. To make it more elaborate, I also tied a stick to the other end.

I then carefully lowered myself close to the stream and threw the line into it. Moving it close to the banks I soon had my first fish clinging on to the worm.

In this way I had soon caught seven Bettas which I took to the fish farm. There, we packed the fish into a plastic bag and I took them to the hotel.

EXCELLENT JUMPERS

I put the bag into a bucket in my bathroom and untied it. There was well over half a metre of plastic bag between the water surface and the upper end of the bag, so I felt quite sure the fish would do well. It proved to be all wrong.

These wild Bettas, as I found out, are excellent jumpers!

In the morning, I found the bag empty of fish. They had all jumped out in the night; they were all over my room. Some had travelled a long way, up to the door to the



My 'on-site' photographic studio.

hall, while I was sleeping.

I had to contact Lim again and we decided to catch some more fish. The catching was easy, and now I had learned never to keep the bags open. The fish were kept in good condition by regular water changes.

I had managed to do what I came for. I had found the 'true' Fighter. Now I just had to get them back to Finland alive. Before I even started my trip homeward, I had more fish with me; some beautiful *Trichopsis vittata* (Croaking Gouramis), a few unknown (to me) 'Glowing Gouramis' and some barbs.

I realised that I could not get all these with me in the plane so I had to turn to my friends once more for help.

Fong Ching Loon of International Aquarium kindly promised to arrange for the fish to come to Finland with one of his regular shipments. At the same time, I had the opportunity of buying some of the most beautiful Discus I have ever seen. These were bred by a friend of Fong Ching Loon and are truly marvellous, but that is another story...

NATURAL vs AQUARIUM CONDITIONS

Betta pugnax, which is generally considered very dull looking, is really very beautiful when you see it in good conditions.

The water quality in its native habitat varies considerably, depending on the time of the year. The places where I found fish were flooded during the rainy season, while during the dry season, the water got very low, sometimes totally disappearing.

The pH was a little below neutral in all streams at the time I was there. Therefore I have reason to believe that these fish will do very well in a tank containing water in the 6-7 pH range. I keep my fish in 6.1-6.5 which seems to suit them well.

The temperature was surprisingly low in the streams, probably because of the strong fast water flow. In my tank, I keep an average temperature of 24°C (75°F) which seems good. The locations I found were probably cooler than the average streams in the country because they were very heavily shaded by big trees.

A few degrees hardness was estimated in these locations but that was not measured. It probably varies quite a lot, too, depending on the rains. The streams where I collected



Newly-collected specimens.

these fish were very small. All locations were in deep vegetation, even those in the old rubber plantations were overgrown and always in the deep shade.

The Bettas were always found in places where the small vegetation reached almost down to the water and sometimes even into it. All fish were hiding beneath the plants and were always lured out into open water by my fishing line. I learned very quickly to judge in what places the fish probably were and, towards the end of my trip, I seldom made a mistake. I threw my fishing line in front of their noses and caught them.

The streams where I caught the fish were also very shallow, 10-20cm (4-8in) deep. During the rainy season the water rises much higher, and I was told that it was quite normal for it to rise over the land beside the streams. The water was moving swiftly, though it was low, so in every locality, it was very clear. The bottom of these rivers was

sandy, with vegetation only on the banks and the sides of the stream. The fish were quite often found in the small backwaters, where all sorts of leaves and twigs were floating, offering the fish good hiding places.

Betta pugnax is found in streams in a large area covering parts of Malaysia, Indonesia and Cambodia. Although it has been known in the hobby since 1905, when it was first imported to Germany, it is a species still fairly unknown to most aquarists.

It is not one of the most colourful Bettas and is therefore often left out when these fish are discussed. My experiences from keeping the species in a community tank are very encouraging and, if you can find this fighter, why not give it a chance?

One thing about it has made me a little disappointed, though. It is not a fighter. In fact, the fish I have are very peaceful and never seem to bother the other fish keeping them company.



A magnificent wild-caught male photographed in one of my aquaria in Finland.

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HERPETOLOGY

CASQUE-HEADED PROBLEM

*I am interested in breeding Casque Headed Iguanas (*Leamancus longipes*) but can find no information on this species. Can you help?*

I would also like to know if it would make a difference to the amount of UV that gets through to my Iguanas if I place my fluorescent tube outside the vivarium.

Undoubtedly, one of the best reference books covering the species of Iguana discovered to date is:

Iguanas Of The World: Their Behaviour, Ecology and Conservation.

Edited by: Gordon M. Burghardt and A Stanley Rand.

Published by: **Noyles Publications**, New Jersey, USA in 1982.

ISBN: 0-8155-0917-0.

This book contains 12 colour plates of males of different iguana species so as to be consistent in helping with their identification. (A 13th colour plate shows a female iguana at a nest site.) Unfortunately, in the 472 pages of text which describe the classification of the different genera and species, their distribution, food

requirements, reproductive strategies and growth, behaviour and communication, social organisation and finally, conservation and management, there is no mention of the Casque Headed Iguana (*Leamancus longipes*), the species you requested information about.

Regrettably, this incidence illustrates the point that I made in the April 1991 edition of **Herpetology Matters** about the use of 'non-standard' common and scientific names, particularly by some of the dealers who supply reptiles and amphibians.

As this reference book is relatively expensive, £55, you could first check its contents by borrowing it from your local public library. Although they are unlikely to have a copy of this specialist textbook on their shelves, they will be able to get a copy through the inter-library loan system if you fill in a request card at the inquiry desk, stating the publication date and other details given above.

The colour pictures might enable you to make a positive identification of the species in question. In addition, the information in the book about feeding, courtship, mating and egg laying will prove invaluable

to anyone intending to breed any species of iguana in captivity.



Green Iguana — the most common type of true Iguana maintained in captivity.

A less expensive book which might also prove helpful is:

Lizards Of The World
By: Chris Mattison.

Published by: **Blandford Press** in 1989 and priced at £16.95.

ISBN: 0-7137-2012-3.

This book contains a great many colour pictures which will help with the precise identification of the different groups of lizard, including those which might have been inaccurately called 'iguana's'. The book, 192 pages in length,

also contains a wealth of information about feeding, reproduction and the habitat requirements of lizards. There is also a short chapter on maintaining lizards in captivity.

Natural sunlight is very beneficial to all iguanas. Unfortunately, the useful ultra-violet (UV) rays in sunlight, which help to make vitamin D in the skin, are filtered out by the glass in windows and the glass of the vivarium. Thus, an alternative source of illumination and ultra-violet might be provided for these reptiles during the day. One such source is from a True-Lite fluorescent tube.

Further details about these tubes can be obtained from:

General Acoustics Ltd,
Salter Road,
Cayton Low Road
Industrial Estate,
Scarborough,
North Yorkshire YO11 3UZ.

However, in the same way that glass filters the UV wavelengths out of natural sunlight, so it will do the same with the UV rays emitted from fluorescent tubes. Therefore, fluorescent tubes used to provide ultra-violet must be fitted inside the vivarium to be of practical benefit.

PLANTS

AQUATIC MOSSES

I am interested in obtaining some specimens of aquatic moss, both for my tropical and coldwater aquaria. What are the best-known species and how do I cultivate them?

Although there are thousands of species of mosses

worldwide, few are capable of growing in a submerged state. It is also certain that many unknown species wait to be discovered and tested for their suitability for aquaria. However, two species are available commercially at the moment:

Fontinalis species are common denizens of our watercour-

ses, growing in both flowing and stagnant waters. It attaches itself initially to stones or pieces of submerged wood and then grows profusely to form, in favourable circumstances, vast tangled masses. The colour can vary from a deep lustrous green, to pale ochre. Used in a temperate aquaria, it grows best if

the bunches, when purchased, are attached to a rock by elastic bands. By the time the elastic has rotted away, the moss will be firmly attached.

The same technique may be used with *Vesicularia dubyana*, a tropical moss, often called Java Moss in the freshwater tropical hobby.

MARINE

COOL NATIVES

I have a 20-gallon (90-litre) aquarium containing native marine invertebrates. However, since having cavity wall insulation added to the house, the temperature of my aquarium is now averaging 24-26°C (75-79°F) and the inhabitants are starting to show signs of stress. Could you inform me of where I could obtain a cooling device?

I change 50% of the water every three weeks with seawater from Northumberland and the aquarium readings are ammonia 0, nitrite 0. Your advice in this matter would be greatly appreciated.

You have hit on the greatest single problem involved in the keeping of native marine creatures, i.e. seawater temperature control — especially in summertime. The fact that you are experiencing this problem early in the year bodes ill for your aquarium later on.

Unfortunately, I know of no firms producing seawater chilling units specifically for aquarium use in the UK, but suggest that you could avoid the problem in two ways as follows:

① *Keep Only Littoral-Zone Creatures*

The littoral zone is that area of the seabed between the high-tide and low-tide levels. The creatures which inhabit this

zone have evolved metabolisms which enable them to cope with one of the most changeable habitats on Earth. Every day they are exposed to air temperatures varying from sub-zero in winter, up to the high 80°Fs (around 30°C) in summertime. Additionally, getting trapped in a rockpool may mean having to survive huge changes in salinity due to rainfall, hail and snowfall. Ultra-violet radiation exposure can also be very high at low tide in summertime... and so forth.

As a result of being able to survive such a hostile environment, littoral zone creatures make ideal occupants of native marine aquaria in the home. Simple undergravel filtration underneath coral sand and



ANDY HORTON

Native marines are generally very sensitive to high temperatures. Rockpool inhabitants, like many anemones, are, however, more tolerant than most.

operated by either an airpump or powerhead(s), together with regular partial seawater changes, are the only forms of water management needed. It is not strictly necessary to use synthetic seawater, since these creatures are so incredibly hardy that they can stand quite a lot of coastal pollution and native disease organisms which tropical marine animals certainly wouldn't tolerate.

② *Adapt Commercially Available Refrigeration Equipment*

You could use a pub beer-chiller of the type one sees standing on public-house shelves with lager bottles stacked on it. I have never seen these units on sale to the general public, but I would think that a letter to a local brewery would put you in touch with the manufacturers.

In 1967 I mounted a native marine display of two 125-gallon (c 570-litre) tanks in summer in the West End of London for British Gas to celebrate the introduction of North Sea gas to domestic consumers. Clearly, such huge tanks were far too large to stand on beer chillers, so I had to approach the problem in a different way. In the end, I used two different commercial refrigerator units feeding the refrigerant into nylon-coated copper pipes

which were immersed in the seawater and located up against the rear glass of the aquarium. To hide these obviously unsightly plastic-coated coils, I made up two fibre-glass panels of simulated rockwork, i.e. simulated rock-texture, as well as rock-colour, which also sat inside the aquarium against the back wall and hid the coils. The whole exhibition had to last 14 days and the equipment performed superbly, enabling me to exhibit sub-littoral zone fishes and invertebrates, as well as the easier littoral zone animals.

Using a standard refrigeration thermostat glued to the outside glass, the temperatures never rose higher than 10°C (50°F) throughout the whole exhibition, despite powerful quartz-halogen lighting and an air temperature in excess of 27°C (80°F) caused by both the lighting and the large number of visitors. We didn't lose a single creature throughout the duration of the exhibition.

[Readers may also be interested in an article on temperature control which we published as part of Andy Horton's Environmental Health for Native Marines in the February 1990 issue of A & P. Ed.]

COLDWATER

COARSE COLLECTION

I wish to start up a tank for three or four species of coarse fish found in Britain. The tank I have in mind would measure 3 or 4ft (90-120cm) by about 18-24in (45-60cm) deep.

Will my fish grow to full size in such a set-up?

I will probably be illuminating the tank. Will I need to switch the lights off at night?

Generally, fish kept in aquaria, where there is limited swimming space, will in no way attain the size that they would if kept in a pond, even if they were to be fed as well as they would be in open waters. Whether this stunting would reduce their life expectancy or not, I cannot say,

though I would imagine that, in most instances, it would.

I would certainly think that the light over the aquarium would be better to be switched off during night time hours for the sake of the fish. After all, like us, they need to have some rest from bright lights.

What your aims should be, I feel, when keeping these fish in captivity is to create a small piece of river or pond bed in your own living room. Therefore, you must attempt to create a situation as near to natural conditions as you can, by furnishing your tank with appropriate pebbles and plants.

I have seen this done many times and it can look quite

magnificent. You will have to choose plants which thrive in cool conditions; planted in clumps as they would be found in nature, they look very



LILA SIM

Most coarse fish will not grow to full size in aquaria. Some, like the Perch (*Perca fluviatilis*) are also predatory.

natural. You will have to experiment with the amount of light to ensure that what you provide will stimulate good plant growth.

There are many excellent books on the market which give good advice about plants and the water conditions they prefer, temperatures, etc.

A point I ought to make about some of the fish you might have been thinking about keeping, such as perch or pike, is that these are carnivorous and would not only eat other fish, but would also eat smaller members of their own species. Trout need plenty of oxygen and are not in any way suitable for tanks, or even small ponds.

DISCUS

SOFTENING v REVERSE OSMOSIS

I have been keeping tropical fish for several years now, but I would like to have a go at keeping Discus. I have read Bernd Degen's book on Discus and I am quite confident that I will be able to keep them without any difficulties.

The only problem I will have is getting hold of soft water. I have been told by my local shop that I need a water softener and some of my fishkeeping friends have advised me that I ought to have a Reverse Osmosis unit.

Would you please be good enough and tell me whether I should get a water softener or an RO unit, since my local tapwater is rather hard and unsuitable for keeping these fish?

Although one used to say that successful Discus keeping could only be achieved in a very soft water, I feel that, over the last few years, many more hobbyists have realised that Discus can also be kept in a 'hard' water. Very soft water contains little or no 'life', and often is also very unstable (because of

the lack of carbonate hardness, the pH often becomes dangerously acidic).

Baby Discus, or even young Discus, can be kept in a water with a total hardness of up to 12 dGH without any problems. In fact, they seem to grow equally as well, show the same coloration and will reach sexual maturity at the same time. It is now even sometimes suggested that Discus kept in such water are better, since the mineral



Discus may be kept quite adequately in hard water, if they are adequately acclimatised. For breeding purposes, though, soft water is a must.

content benefits the fish more than mineral-free water. I have kept Discus in both very soft water and also very hard water (up to 20 dGH) and, frankly, would not like to say which were better-looking or healthier fish.

To breed Discus, however, one will need soft water, about 2 to 3 dGH; it cannot be done successfully in hard water. But to raise up a school of youngsters I've always felt that 'around' 10 dGH would be ideal, and I have always done it like that; it works.

The choice between a water softener or RO unit must be left to the individual. (I presume that you really mean a deioniser rather than a water softener. A water softener is not suitable for keeping fish. In a water softener, calcium and magnesium are exchanged for sodium, and the water will show the same hardness if measured electrically.)

As the costs are basically the same for a deioniser or RO unit, I prefer the use of a deioniser. It has a larger output per hour and

needs no maintenance, while regeneration costs are minimal and, if the resins are prevented from drying out or freezing, will last for very many years — up to 20 years.

An RO unit will only produce about 5% of the through-put as RO water, the other 95% is waste water. (If your house is already on a water meter, think of the cost of the waste water.) The actual output of RO water is very slow, but my main dislike is the cost every year or so for replacement membranes. Although the membranes have a 'life' of about two years, in very hard water, they might have to be exchanged as often as every six months or so, and their costs at present are approximately 50 to 60% of the total price.

Having said all this, to produce water with an RO unit is clean, while to regenerate a deioniser involves the use of chemicals. Some hobbyists do not like to handle such chemicals in the home, especially if young children are present, so the final choice must be yours.

TROPICAL

SHORT-SIGHTED REDTAIL

Do Red Tailed Catfish have normal eyesight (in relation to most other cats)?

I have a 9in (c 23cm) specimen called 'Baty' ... because he appears to be 'blind as a bat'. I've had 'Baty' for some months now, feeding 'him' on a diet of live goldfish which 'he' must actually touch before grabbing them. 'He' certainly knows the goldfish are there when I put them in the tank

but has to swim around continuously in order to find them.

The Red Tailed Catfish, *Phractocephalus hemiliopterus*, lives in murky waters, where its eyes are only secondary organs for locating food. The barbels are linked to special sense organs that are used to locate food by a combination of scent and vibration. Therefore, the behaviour you describe is quite normal.

It is cruel to feed live Goldfish ... it is also unneces-

sary because, in a survey of



Young Red Tailed Cats — short-sighted, but highly predatory.

members of the Red Tailed Catfish Club, 98% reported that the fish could be fed strips of fresh trout flesh, earthworms, prawns and crab sticks. Only 2% still fed live fish.

The fish needs chunky food and, with its short gut, excretes sudden bursts of excreta that raise the ammonia levels in the tank to dangerous levels, so normal filters cannot cope. The Red Tailed Catfish Club deals with these sorts of problems in their newsletter.

KOI

DEEPWATER KOI

I have a stone-lined spring-fed small reservoir measuring 120 x 30 x 15ft (c 37 x 9 x 4.6m) in my garden. It now has a layer of silt about 5ft (150cm) thick on the bottom which does not appear to affect the fish. The stone walls leak but they can be repaired.

I would also like to develop the reservoir as a Koi pool and would

therefore appreciate your views.

You certainly seem to have landed yourself with a delicate series of problems with your reservoir which, I have to admit, fills me with envy! It's difficult to know where to start without discouraging you too much, but we'll try anyway.

Starting with the bones of the matter, a depth of 15ft is, frankly, much too deep for anything

except its original purpose. For instance, catching any fish would be impossible by any means, apart from drag netting; no good to man nor fish.

Unless some very expensive filtration system was installed, seeing your fish would be problematical also, particularly if the 5ft of silt was left in situ, as large Koi would delight in stirring this up, together with the

inevitable 'nasties' which years of neglect will have allowed to gather.

I also have reservations regarding the overland spring which you say feeds the reservoir. It would only require a long spell of acid rain or a mishap at a local farm to lead to a catastrophe, as many fish farmers have found to their cost!

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M J QUINLAN
South Wales,
CF48 4BZ.

Dear Sir or Madam,

I've just recently set up a tropical aquarium and, having introduced fish from several different shops, I've acquired a terrible outbreak of whitespot. I've spent a considerable amount of money on cures but none were effective until I was recommended to use WATERLIFE 'PROTOZIN' which I am very pleased to say has done the trick perfectly. Thank you for a wonderful product.

Yours sincerely,
M J QUINLAN (Mr).

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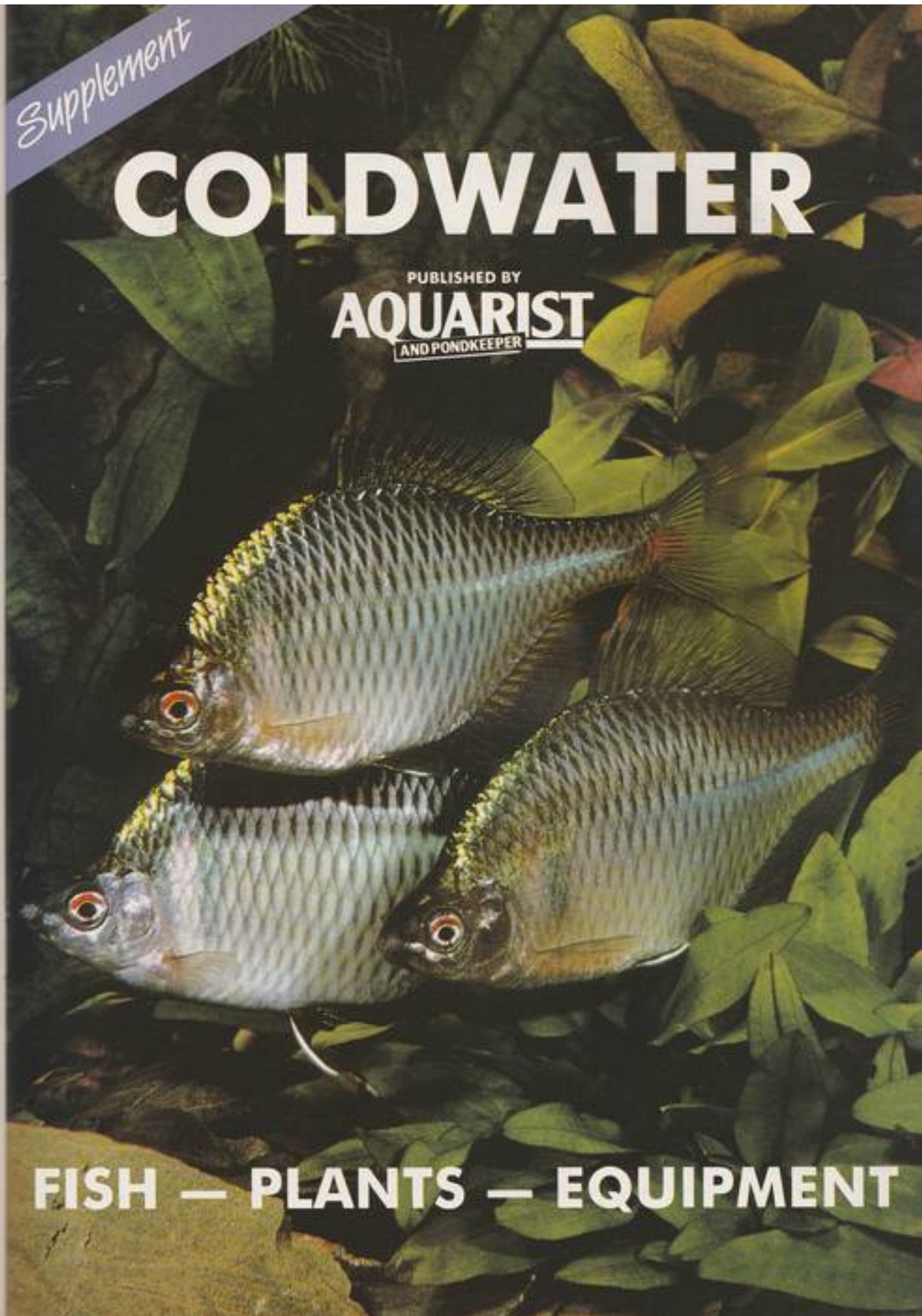
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*Photograph of Japanese Tanago
(Rhodeus ocellatus)
by Max Gibbs, The Goldfish Bowl, Oxford*

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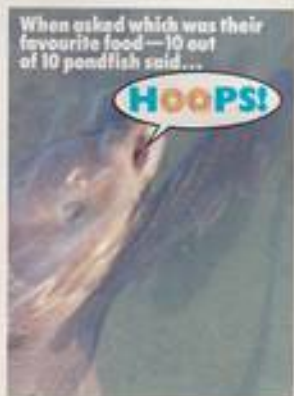
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With a little care and flair it's not too difficult to create very attractive settings for coldwater fish like these Shubunkins.

The Basic Principles

Thinking of setting up a coldwater aquarium? If so, then Pauline Hodgkinson offers you the perfect start.



Artificial plants (the 'vine-coloured' bunch) and their natural equivalents can live comfortably side by side in coldwater aquaria.

There seems to be an upsurge of interest in keeping fishes that live their lives in cold or temperate water temperatures. Perhaps this might very well have something to do with economics, due to the ever-increasing cost of electricity and the tighter

budgets many people face with the ever-heavier demands put upon the family's purse strings. After all, the costs involved in running coldwater systems are decidedly lower than those for tropical and marine set-ups and there is now a large number of attractive and interesting coldwater species



Avoid overcrowding at all costs; it will only cause serious problems sooner or later... almost certainly sooner!

and varieties which can be kept, studied and enjoyed by the aquarist.

The good news is that retailers are responding to the interest, offering more choice of coldwater species than ever before. Apart from the goldfish and its varieties, a few others to consider are Bitterlings, Gudgeon, Killifishes, Loach — such as the Weather Loach, Medakas or Ricefishes, Sunfishes, Red Shiners, White Cloud Mountain Minnows; even many of our own native species make wonderful tank subjects (see David Poof's article for further details).

Their needs, as far as suitable environment and water quality are concerned, are just as critical as for any other species, so it is important to provide all the necessary living conditions for their survival and quality of life.

TANK SIZE

It is important before taking the initial steps to consider carefully all the aspects of aquarium keeping, particularly the variety of



Make sure that the gravel grain size you use is not so small that it will clog, and not so large that it can't be spat out easily by 'grubbing' fish.

fish to be kept. When you have decided which fish, consider their welfare; make sure that they are compatible if you choose to make your aquarium a mixed species display.

When choosing the size of aquarium, you must consider the eventual size the fish will attain. Some may only grow to 4cm (c 1.6in) so they are suitable subjects for small aquaria measuring less than 24 x 12in (60 x 30cm). However, for larger fish, it is really only practical to start with the largest aquarium you can afford, or the largest which is able to fit in the chosen location.

There are several factors which come into maintaining an aquarium in relation to its size. For example, small volumes of water can experience dangerously rapid temperature fluctuations. In small aquaria, the water can become much too warm for the types of fish being kept there to tolerate during warm weather spells.

Some coldwater fishes also consume more oxygen than their tropical cousins, and water of a higher temperature contains less oxygen than that of lower temperatures, so the fish may be starved at some point of vital oxygen supplies.

Yet another point to be made in favour of larger tanks is the fact that small volumes of water pollute more quickly than larger ones, so, unless a perfect balance is created within the tank, the small aquarium will require much more intensive maintenance.

SITING THE TANK

Before you even start to get to work actually setting up your tank, its location must be planned very carefully. Avoid a position which would be in a direct draught, or close to radiators, or in direct sunlight. All these positions could mean that the water is likely to suffer rapid temperature fluctuations. Also, a position in the direct rays of the sun could lead to excessive light encouraging plant growth, particularly algae, turning the water green and covering all surfaces — rocks, glass, equipment and gravel, with an unsightly green coating.

A position where the display can be appreciated and enjoyed might be in the lounge, where one can sit and relax, soaking up the therapeutic effect that fish in aquaria seem to have on the observer. A dark recess is ideal, for there the right amount of light from the tank's own lighting system can be controlled to benefit both the fish and the plants.

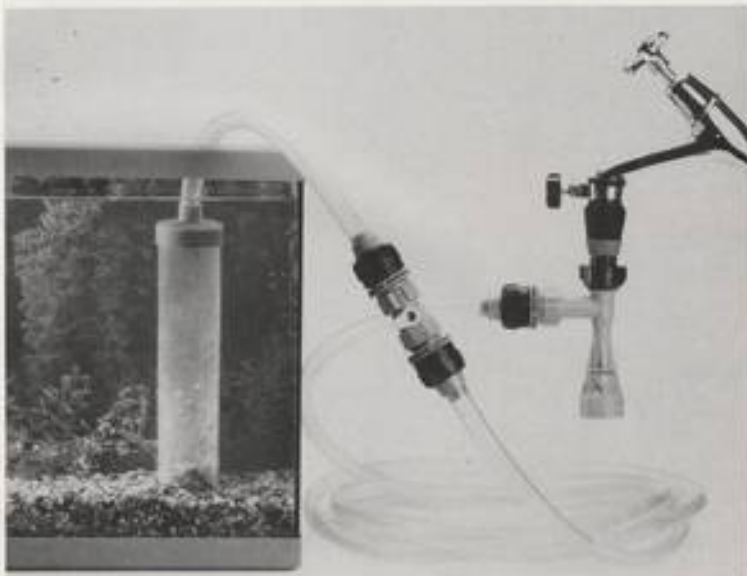
The tank must be stood on a surface which is capable of comfortably taking its weight. Once set up and filled with water, it will be tremendously heavy; 1 gallon (4.5 litres) of water weighs approximately 10lb (4.5 kilos). Add to that the weight of the tank, plus rocks and gravel, and you have a very heavy item indeed.

There is a good choice of cabinets on the market which are specially made to take an aquarium, with cupboard space provided to house items of equipment, though less expensive staging might be a sturdy metal stand, also available from aquatic retailers.

Give a thought to the actual floor where your tank is to stand. If the floor is a wooden

structure, then it is advisable to distribute the weight across the floor joists. Stands with legs should be placed onto wood or metal plates which will protect the floor.

Having an electrical power point close by is also advantageous and do not forget that it really is important that you have easy access around the tank for maintenance. Siting the aquarium a few inches away from the wall so that you have enough space to run the electric cable, etc, out of sight behind, is also a good idea and keeps things looking neat and tidy.



'No-spill' gravel cleaners are excellent when it comes to aquarium maintenance.

When you have chosen the tank and the location, check to make sure that the surface is level. It is so disappointing to find that after setting up and filling the tank with water, the surface is at a sloping angle, with the water nearer the top at one end than the other, thus spoiling the whole effect; a spirit level comes in useful here.

The actual tank itself should be placed onto a sheet of polystyrene or polystyrene ceiling tiles cut to the same dimensions as the tank. This will act as a cushion, absorbing any unevenness and avoiding any stress on the glass which might crack as a result, or leak, with disastrous consequences.

ACCESSORIES

Unless you are content with a really basic set-up, you must give quite a bit of thought to the extras, such as filter systems, pumps, lighting, hood and furnishings like base covering, rocks, ornaments, etc.

Filters

While a filter system is not absolutely essential, it aids the fishkeeper in controlling water clarity and, more importantly, water quality. To maintain good water con-

ditions without a filter would certainly mean low stocking levels, dense plant growth and more frequent water changes. In actual fact, early aquarists relied on regular water changes to maintain suitable conditions for their fish; perhaps it was less risky in the days before treated tapwater.

Aquarium filtration need not be the seemingly complex subject it might first appear to the newcomer, particularly when contemplating keeping the variety of fish referred to earlier in this article. Of course, there are so many types, variations and brands that it is

little wonder that the novice becomes confused.

New ideas are continually appearing on the market and this is, clearly, a good thing for the hobby. If new ideas mean that the hobby can progress, making it easier to create ideal habitats for the fishes we keep, then it surely must mean more satisfaction, more enjoyment and, certainly, a better existence for those fish.

It might make the subject of filtration a bit more easily understood by explaining that there are three types, each working in a different way.

Mechanical filtration removes suspended material from the water.

Chemical filtration removes dissolved materials.

Biological filtration uses bacteria to convert toxic substances into relatively harmless ones.

Some of the filters on the market operate only one of these factors, while others bring into operation a combination of two, or all three.

You must realise that clear water does not necessarily mean that it is safe. Ammonia is perhaps the number one killer of aquarium fish. The fish continually excrete ammonia which is produced mainly from protein

Talking fish?

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metabolism by the fish's body. It is also released through bacterial action on uneaten foods in the aquarium, rotting plants or other decomposing foreign matter.

Although a few fishkeepers still rely on their skills of fish husbandry to maintain healthy conditions without the aid of filtration, for most of us the filter plays an important part in our set-up. One word of caution, however, filters should be left running 24 hours a day. They should only be switched off when they are being stripped down for cleaning during tank maintenance.

When stopped, the bacteria which live upon the filter medium and which do all the good work breaking down toxic waste, will be starved of oxygen. Over a period of hours, this would mean that they are unable to survive and will, in fact, cause an adverse effect on conditions, being, in themselves, a source of pollution.

A filter can be one of the simple box or sponge mechanical types, or an undergravel plate model, or one of the motorised canister filters, either the type which sits inside the tank or one which is situated outside. It really is a question of paying your money and taking your choice.

Aerators

If you are going to have a filter (and I strongly recommend that you do) then you may not need to have an air-stone unless, of course, your filter does not aerate the water adequately... or unless you like to see streams of bubbles cascading to the surface of the water, which can be quite an attractive feature in itself.

It must be understood that aeration does not actually force oxygen into the water but encourages oxygen to enter the water through surface turbulence. It also creates currents of water throughout the aquarium, the bottom water being pushed up to the surface, thus expelling carbon dioxide gas in the process.

Did you know that early aquarists — before air-pumps and such-like were available — used tyre inner tubes fully inflated to run an air-stone? The gradual escape of the air (I am told) lasted about a week before the tyre needed to be refilled.

Hoods, Lights and Trays

The next item to consider is the hood. Again, there is a choice of designs and may be constructed either in wood, metal or plastic. You decide which suits your own particular decor.

The aquarium needs light, not only for the benefit of the fish, but also for the plants. Using light to its best advantage and effect means that it must be directed from above. To achieve this, the lights are housed inside the hood; there will also be a compartment inside the hood where the choke (or an auto-transformer) needed to run the lights, can be fitted.

It is important to install a drip tray, which is a simple transparent plastic tray that may either be fitted into the hood, or simply allowed to sit on top of the tank. This simple

piece of equipment is needed to prevent water splashing onto the lights and their fittings. In addition, the condensation caused by the heat of the lights will fall back into the tank.

SETTING UP

1 Before putting your tank into use, rinse it out with warm water and then polish up the glass inside and out; paper kitchen roll comes in handy for this job. (Do not use a household polishing or shining agent, though!).

2 If you have chosen undergravel filtration this is the first item to go into the tank.

3 Next is the gravel which should be thoroughly washed, even if it was labelled pre-washed. You will find that there is a great deal of dust and dirt still clinging to the gravel and this must be washed away; otherwise, the water within the tank will be cloudy and, even if the sediment settles, it will be easily stirred up once the fish are introduced.

Take your time washing the gravel; make quite sure that every last speck of dust is removed. This job is best done by washing small amounts using a bucket and a wooden spoon or stick. Stir up the gravel while it is submerged in boiling water; the debris will then rise to the surface and can be poured off.

Change to cold water, continue to stir, allowing the water to overflow, thus taking the dirt with it.



Aquarium ornaments of every kind are available to suit every taste.

4 When you are satisfied that the gravel is clean, you can begin to fill the floor of your tank. Enough gravel is needed to give a depth of around three inches (c 7.5cm) at the rear, sloping to around two inches (5cm) at the front of the tank.

This is sufficient to root the plants, but it will also serve two other purposes: first, the slope will also encourage dirt and waste to

collect at the front of the tank, where it can be more easily removed; secondly, it also gives the picture a sense of perspective.

Make sure that the grain size of the gravel is not too small, otherwise it tends to clog, preventing the roots of the plants from spreading, and resulting in poor growth. Perhaps the most suitable size of grain to use is around 1/8in (0.3cm); if it is larger than this, small particles of food may fall between and cause pollution when they rot.

5 There is a very wide choice of decoration for coldwater aquaria. I personally like the idea of a natural-looking picture with an attempt to re-create an environment which might be found in the species' own habitat.

If you wish to use real rocks, then Westmoreland Granite, water-worn sandstone and slate are safe, but make sure that they do not have any sharp edges. Some other types of rocks are not safe to use because they can give off toxic substances (e.g. from metal ores) which will poison the fish. A good test to detect if the rock is safe is to place it in a bucket and add vinegar; if there is no bubbling reaction then there is no lime present.

If you intend to use several pieces of rock, perhaps to form a cave or rocky ledge, then a good idea is to stick them together with aquarium sealant which you can purchase in tubes from your aquatic dealer. This will also prevent the rocks from being accidentally disturbed and spoiling the scene.

On the other hand, you can choose some of the fantastically realistic-looking items produced in the shape of sunken logs, branches, rocks, etc. As with the plastic plants on the market now, once a thin coating of algae has formed over their surface, they do certainly look very realistic.

There are, of course, many more items to be found, such as water wheels, divers, frogmen, sunken galleons, clams and boxes of sunken treasure. These, I think, appeal more to the younger hobbyist, as do the small ruins of castles and bridges.

A word of warning concerning some of the cheaper plaster or cement decorations: make quite sure that they are sealed before they are introduced into the tank, otherwise they will leak lime into the water.

6 Added to the tank next will be the internal filter, if you have chosen one of the box, sponge, or internal power filter types.

The inlet tube of power filters is best placed near to the gravel, where it is able to draw up some of the waste. The outlet tube, which can be a spray bar, is fitted at the top of the glass so that the returning filtered water is dispersed the full length of the tank over the water surface and so is not able to cause too strong a current from a single jet.

Power filters come in several sizes and you must choose one that is suitable for the size of tank you have. Your dealer will be happy to advise you on the correct size, but choosing one which is capable of filtering the volume of water contained in your tank about three or four times per hour would be ideal.

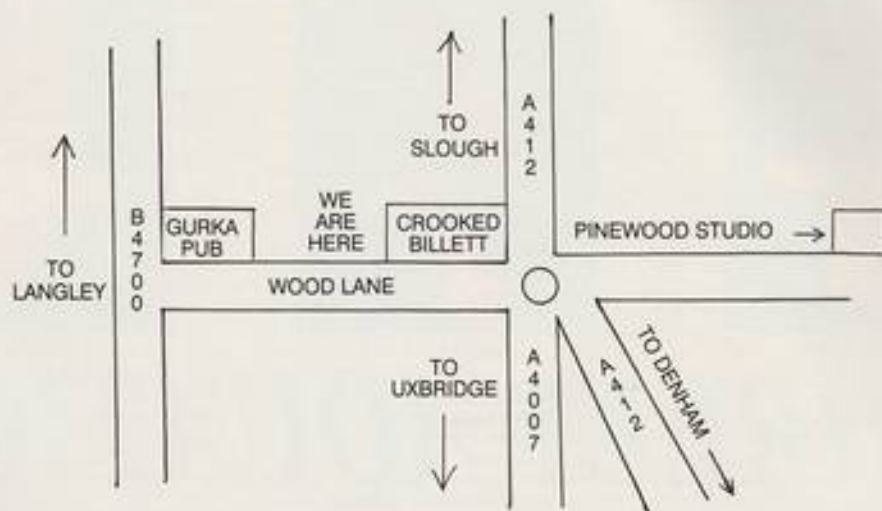
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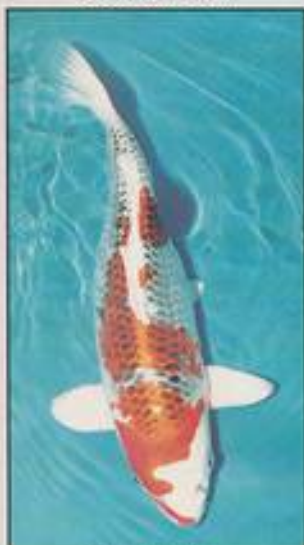
SHOWA 50 cm.



KUCHIBENI KOHAKU 43 cm.



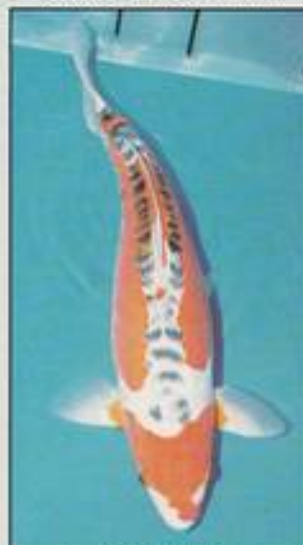
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7 Planting the aquarium will need careful thought. You can have all plastic plants, or you might prefer the real thing. In fact, a combination works quite well, but real plants are perhaps better added later when the set-up has had the chance to settle down.

Real plants do have a very beneficial effect by helping to produce oxygen, but their role must be considered to be as an addition to other forms of aeration, for they do their work only under the influence of light.

Some plastic plant manufacturers are able to produce some very good realistic-looking replicas of probably most species we might hope to have in aquaria. Plastic plants are a boon to those aquarists who find that their talent in plant cultivation is not as successful as it might be.

A mistake many people make is to attempt to grow plants which are not suitable for the conditions they provide (see Barry James' article elsewhere in this Supplement).

If real plants contribute to oxygen output, then plastic plants also play a role in creating a good balance within the environment of the tank, because they provide a broad area that bacteria which help to break down toxic substances can colonise. Both, then, are useful, in addition to the part they play in offering shade and shelter to the fish.

Arrange the plants in clumps (except for specimen plants). This looks more natural, with the taller, larger specimens at the sides and the back. Leave the centre and the front clear, or add some small dwarf species. In this way you will be creating an arena where the fish can be viewed without obstruction.

Planting is perhaps best done in a few inches of water; then the gravel can be smoothed out a little and a small piece of polystyrene can be floated on top so that the tank can be filled without disturbing the base arrangement.

8 Filling the tank with water is more easily done with the aid of a hose-pipe. A long hose-pipe can be worth its weight in gold because it makes the task of filling and siphoning so much less work, and the job of carrying heavy buckets of water obsolete.

It is particularly useful during tank maintenance when siphoning away waste, since the pipe can be run outdoors into a grid without the risk of spillage from overflowing buckets.

The actual siphoning procedure can be started by adding a siphon starter bulb to the hose, or you might prefer to invest in the Python No-spill Clean and Fill made by Interpet which has a gravel-clean cylinder plus pipe, tap fittings and connectors.

9 The filter, if it is not the type with its own motor, can next be connected up to the pump. This is done with an air-line (plastic tubing), but make sure you fit an anti-siphon valve which prevents any backflow of water which would damage the pump.

Remember: water and electricity simply do not mix!

Anti-siphon valves also safeguard against the off-chance that, at some time, the tubing may come loose from the pump connection,

making it possible for the dangling air-line to siphon the water out of the tank onto your carpet.

Another useful addition is a T-piece with a clamp for a bleed-off system. This allows the desired air-flow with the pump running flat out. Restricting the air-flow by just adding a clamp merely puts back pressure on the diaphragm, and this will shorten the life of the pump.



Fish will always look hungry... but feed them sparingly with a good-quality product (there's a huge range available nowadays).

10 The hood can be fitted into place and connected to the power point. The most popular form of lighting is provided by fluorescent tubes. They give an even spread of light and are cool-running, which is particularly important with the variety of fish to be kept in a coldwater set-up.

The amount and length of time the aquarium should be illuminated will be a matter of experiment, for we must control the right amount for good plant growth. A second very important role which the hood plays is helping prevent smoke, odours, and household sprays, etc, from entering the water which, of course, would be detrimental to the well-being of the fish.

11 After about 24 hours, the chlorine in the tapwater will have dissipated, and the biological filtration process can be started by adding a maturing agent, such as Aquarian Remedy No 1: Tanksafe.

12 Wait about two days more before introducing a few fish; two or three is about right. The following week, if all is well, you may add one or two more.

Stocking levels are very important, but the guidelines appear to be interpreted rather differently, depending on who is giving the advice. Allowing 1in (0.5cm) of fish per 24 sq in (155 sq cm) of surface area has long been the most popular quoted rule though my own personal view is that 30 sq in (c 195 sq cm) is better, giving the fish space to live their lives, develop and grow. A crowded tank not only

looks cluttered, but water quality also suffers, even with a filter. Then, the fish quickly become stressed and outbreaks of disease are commonplace, with frequent losses in the fish population.

AQUARIUM MAINTENANCE

Once the aquarium is set up and operating successfully, it is simply a matter of paying careful attention to proper maintenance to keep it functioning that way. To enjoy the display and the fish at their best, the comparatively short period of time spent each week caring for the fish and their environment is negligible, yet vital.

Gravel

The size of the fish will determine how frequently the gravel should be gently disturbed to free any debris and waste which will have collected there. Where small fish are housed, once a week may be sufficient.

Use a gravel cleaner to assist you in this task; it makes the job so much easier. Siphon away the waste and top up with clean water of approximately the same temperature.

Filter

The filter, if it is a sponge, box, or power canister, will need to be cleaned about every three or four weeks. This, too, is quite a quick and simple task; sponges should be washed clean in a bucket of water which has been removed from the aquarium. This will wash away the dirt but will not kill the bacteria which are needed so that they may continue in their role of toxin eliminators.

The same course of action should be used to clean some of the other materials used in the filters, such as ceramic chips. The clean filter is then put back into service and will function with renewed vitality.

Feeding

Newcomers to aquarium keeping usually make the mistake of over-feeding, the temptation being to add a sprinkle of flake everytime one passes the aquarium. Much of this generosity goes to waste and, eventually, left uneaten by the fish, goes bad, polluting the water, and thus threatening their very existence.

Always feed fish kept in aquaria containing gravel or harbouring places where left-over food may be lodged without being noticed, sparingly. You can feed two or three times per day, but only enough which can be cleared completely within two or three minutes.

Quarantine

My last piece of advice is to quarantine all new fish before they are introduced into your existing stock. They may appear to be in robust health and free from disease or parasites, but first impressions are often wrong. Why risk the lives of your established pets by what could turn out to be a very costly mistake?

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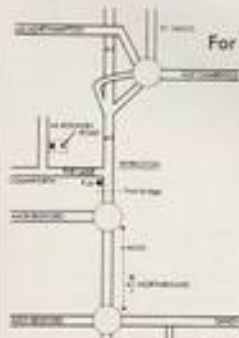
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Goldfish for the Aquarium and Pond

Stephen Smith selects the best varieties of Fancy Goldfish for both indoors and out.



Above, although Common Goldfish are usually considered to be coloured the traditional metallic red — as this specimen — other colourings can also be quite attractive.

Below, you can't beat a really good Fantail. These superb specimens illustrate perfectly the round body form and sturdy fins, as well as the rich metallic colouring, of this hardy and popular Goldfish variety.

One of the most attractive fish in the aquatic scene is, without doubt, the one which is undeniably the most popular: the Common, or Ancestral, Goldfish. No one can deny that a good

Common Goldfish presents a most exciting figure, resplendent in blood-orange red and with a perfectly-proportioned sleek profile. Such a body form has made it equally ideal for the aquarium or the pond, but its derivatives, in their myriad varieties of form or colour, are not quite so versatile.

MAIN GOLDFISH CATEGORIES

Basically-speaking, there are two main categories of Goldfish: round-bodied Fancies, which have been perfected for viewing from the side or top in aquariums; and the more traditional long-bodied varieties, which can be said to be better kept in a pond environment.

A look at the varieties in the latter category will reveal that the long, sleek form of the long-bodied varieties indicates that they require plenty of swimming space and, although they may be kept quite happily in well-maintained aquaria, this space is more readily available in the pond, where they will thrive and grow, to both a good size and for up to two decades or so.

On the other hand, the round-bodied varieties of Goldfish usually have long fins, very short fins, or even lack of some finnage, as part of their characteristics. Thus, not only is locomotion not quite so well-refined as in their long-bodied counterparts, but long finnage in particular can be susceptible to damage which, in a pond, can be more difficult to monitor and control than in an aquarium.

A further difference between these two broad categories is that, in general, the caudal fins of long-bodied Goldfish are single, while a major characteristic of the round-bodied Fancy varieties is that the caudal fin, as well as the anal fin, are usually paired.

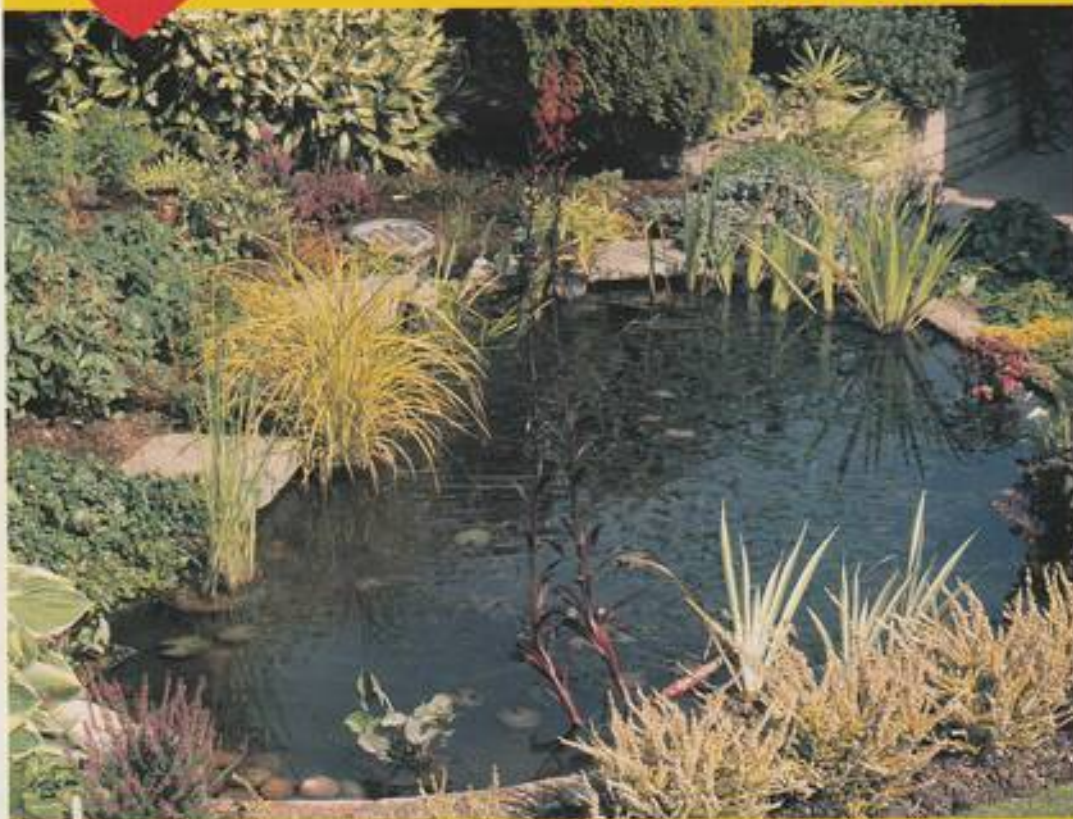
With well over 120 recognised varieties of Fancy Goldfish, and, it would appear, 'new' varieties being introduced from the Far East every year, it would be impractical to identify individually the types which are best-suited to which environment. However, for the purposes of this article, I have listed the varieties into two main sections, as described above. By no means are these groupings intended as a hard and fast rule but, hopefully, they do serve as a general guide.

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STEPHEN SMITH

Top, the unusual characteristics of Bubble-eye Goldfish make them better viewed from above, and although more common as metallic red, they are also attractive with calico colouring.

Centre, identical in shape to the Common Goldfish, the London Shubunkin is, effectively, a calico version of that variety, and is an ideal pond fish.

Bottom, long-finned Goldfish, such as this Calico Fantail (which does not have the 'ideal' Fantail caudal fin), are better suited to the aquarium than the pond, where problems can arise, such as 'gas bubble disease' which is recognised by bubbles in the finnage, usually the caudal fin.



STEPHEN SMITH

Protruding 'telescope' eyes and an all-black colouring give an almost regal appearance to the Moor, a most impressive aquarium fish which normally has finnage similar to the Veiltail.



STEPHEN SMITH

Oranda types should normally have Veiltail finnage, but some of the newer varieties, especially the Chocolate variety, pictured, can be very attractive with a sturdy 'fan' tail.

Having established broadly the types of Goldfish which may be best suited to the aquarium or the pond, let's examine each of these groups a little more closely.

'LONG-BODIED' GOLDFISH

As we can see, this group incorporates mainly the derivatives of the Common, or Ancestral, Goldfish. I use the term Ancestral advisedly: the forerunner of the Goldfish, in its natural surroundings, is olive-brown in colour (Goldfish breeders will be aware that fry are this colour initially, before fading and changing to the traditional 'red' of the Goldfish).

Common Goldfish

The sleek, long body of the traditional Common Goldfish makes it the perfect pond fish, even more so when you consider the bright red hue which is its instant attraction. Despite the myriad varieties of Fancy Goldfish, you really cannot beat a good-quality 'Common', in my opinion.

The scales of the Common Goldfish are bright metallic and, as we have discussed, bright red in colour. However, there are also

attractive variations with yellow scales, silver, and even red-and-white. The finnage of the Common Goldfish should be fairly short and rounded, and with single caudal (tail) and anal fins.

Shubunkin

A further variation is the Shubunkin (not with an *m!*), also a most popular variety and, itself, found in three different forms. The colouring of the Shubunkin is quite delightful, showing matt scales of red, yellow, and brown patches on an all-over background of light blue, while black speckling provides an attractive peppering over the whole fish, including the fins. (Such a colour-scheme is termed calico, and calico



'King' of the Goldfish: the Lionhead. Some of these young Lionheads display excellent potential for hood growth and a perfectly smooth dorsal contour, as well as almost perfect scaling and colouring. One or two — particularly a specimen near the bottom of the picture — will, clearly, not make the grade.

derivatives are a feature of several varieties of Goldfish).

The London Shubunkin is identical in shape and finnage to the Common Goldfish, while members of Bristol Aquarists Society have, over the past three decades, developed a variety known as the Bristol Shubunkin, which is slightly slimmer in the body, has longer finnage, and a caudal fin which has large rounded lobes. Good-quality Bristol Shubunkins are highly-prized by Goldfish specialists and have been achieved as a result of hard work and dedication in selective breeding.

Comet

Often (mistakenly) referred to as Shubunkin by many aquatic retailers is the Calico Comet. This variety displays the calico colouring previously described, but its finnage does not have the refinement of either the London or Bristol types. However, they do make attractive and hardy pond fish, as do the metallic Comet variations.

These fish move with alarming speed, due to their extended caudal fin, which is scissor-shaped. Particularly popular is the Sarassa Comet, which has bright red patches on a white background.

Jikin and Wakin

Two varieties which deserve some attention are the Jikin (pronounced *jee-kin*) and the Wakin, partly because these are two long-bodied varieties with twin tails. I prefer to keep these in the pond environment where, again, their form is better-suited. They do, however, make admirable aquar-



Originally developed in Japan, the Jikin (*jee-kin*) has a twin caudal formation, almost perpendicular to the body, while the traditional Goldfish red is, ideally restricted to the finnage and the lips.



Red-and-white metallic scaling is a most attractive alternative to the traditional metallic red of the Common Goldfish. This is a Wakin, the traditional Goldfish of Japan, which is almost identical to the Common Goldfish except for a twin tail.

ium fish and, although they do not possess the speed of the Common derivatives, do make sure you provide them with plenty of tank space.

Both varieties tend to show a slightly fatter body than the Common Goldfish, and one of the main features of these types are the caudal fins, which are paired.

The Wakin is reputedly the traditional Goldfish of Japan, and is prized for its paired caudal fins, which are fan-shaped. Although not as pronounced as the Fantail-type fancies, the caudal fins should be fully divided. It is a matter of debate whether the anal fins of the Wakin should be paired or not, as the caudal fin is paired.

Colouring of the Wakin is normally the traditional Goldfish red, although Wakins are also very attractive when red-and-white.

Turning to the Jikin, this is a recent introduction to the UK Goldfish scene. Originally developed in Japan, the Jikin has a most unusual caudal formation. The caudal fin is squared and fully divided, and each half is almost perpendicular to the caudal peduncle (tail root), as the accompanying photograph illustrates, while the anal fins of the Jikin are paired.

A perfectly-coloured Jikin is one of the most difficult challenges facing the Goldfish breeder, who can only strive towards the silver-white metallic-scaled body and red finnage, together with red lips. However difficult it may be to achieve a perfect Jikin, imperfectly-coloured specimens nevertheless make attractive fish for the pond and aquarium.

IN THE ROUND

The round-bodied 'fancy' varieties of Goldfish are by far the more attractive for being viewed from the side in an aquarium.

While it is possible to keep these types in a pond during the summer months, it would not be advisable, as they can be susceptible to stress and subsequent diseases. Far better to set up a reasonably-sized aquarium where the beauty of these 'living ornaments' can be appreciated to the full.

The 'traditional' forms of Fancy Goldfish are the veil-tailed types: the Veiltail itself,

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the Oranda, and the Moor. Each has its own set of characteristics and, for the newcomer wishing to breed Fancy Goldfish, I can recommend starting with a pair from one or other of these three varieties.

Veiltail

The Veiltail has beautifully-formed long finnage and good specimens are highly-prized by enthusiasts. The dorsal fin is well-developed and held upright, while the main feature is, of course, the caudal fin, which should be fully-divided and form a long flowing 'curtain', cut square along the lower edge. The other fins are also well-developed and complement the caudal and dorsal characteristics.

Scaling of the Veiltail is usually metallic red, although calico varieties are also very attractive.

Moor

Good-quality specimens of the Moor (often mistakenly referred to as the Black Moor) have an all-over jet-black colouring and characteristic protruding telescope eyes. The Moor normally displays similar finnage to the Veiltail, although 'fantailed' versions are popularly available.

Oranda

Turning to the Oranda, this is a firm favourite among Fancy Goldfish keepers and, in my opinion, is the 'Queen' of the Goldfish. Its 'crowning glory' is its fascinating development around the head (also a major characteristic of the Lionhead), while the finnage and colouring should, ideally, be identical to the Veiltail.

Fantail

Long finnage is not necessarily a characteristic of the 'round-bodied' varieties and, if you do wish to keep such a fish in the pond, then you may be able to 'plump' (sorry...!) for the Fantail.

Short fins and a stocky body make this one of the few varieties which will be well at home in the pond or aquarium. I cannot recall seeing many Fantails which are anything other than all-red (although a recent spawning of some of my own Fantails produced just one red-and-white specimen from all-red Fantail parents).

Just as you cannot beat a Common Goldfish for its unfussy characteristics, in my opinion, you cannot beat a darned good Fantail.

DORSAL-LESS VARIETIES

The many standard varieties of Fancy Goldfish never fail to amaze newcomers to the hobby (or even 'outsiders' taking a peek into this pleasurable pursuit).

The following three types have one characteristic in common: they have no dorsal fin. Now, historically, Goldfish were originally developed as 'living ornaments' by the



The 'Queen' of the Goldfish: the Oranda. A firm favourite among Goldfish keepers, the Oranda display a 'hood' which is the main characteristic of the Lionhead.

Chinese, and were kept as such in shallow ceramic bowls. Thus, Goldfish were viewed from above, and it is therefore not surprising that two characteristics became important: lack of dorsal fin and/or eyes looking upwards (towards the viewer).

Celestial and Bubble-eye

The Celestial is probably one of the first 'fancies' to be produced by specialist breeders. With upward-facing eyes, a smooth back and long finnage, the Celestial is perfect for its originally intended home but, unfortunately, loses some of its attractiveness in the aquarium. Perhaps we should revert to using shallow ceramic bowls for this variety, and for a close derivative of the Celestial, the Bubble-eye.

The Bubble-eye is an almost identical form to the Celestial, except that this variety features two large fluid-filled sacs around the lower margins of the eyes. Such a feature can be, to some viewers, grotesque when viewed in the aquarium, and are thus better appreciated from above.

Both varieties are metallic-scaled and, although I have seen calico and even all-black, Bubble-eyes, I have never encountered any but metallic-orange Celestials.

Lionhead

Last in this brief overview of Goldfish varieties, and certainly not least, is the 'King' of the Goldfish, the Lionhead.

This is a most prized variety, of which there are two main types: the Japanese Rancho, and the Western type. Both fish completely lack a dorsal fin and, thus, should carry a smooth dorsal curve. The Lionhead is highly prized for its soft fleshy 'hood' (also a feature of the Oranda).

Lionheads are usually metallic orange although they are occasionally found in calico, black or red-and-white colourings.

CLOSING REMARKS

Of course, there are exceptions to every rule, and the foregoing summary is intended only as a broad guide to choosing Goldfish for your aquarium or pond. Whichever you decide to keep, remember that you are keeping a live animal which therefore demands your respect and attention to well-being.

Also remember that this is also just a hobby; keep it fun, look after your fish, their environment, and both you and your fish will have unending pleasure.

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Foreground: Eric Da Costa, one of the six top aquarists visiting WALTHAM and Marina Farnes, Head of the WALTHAM Aquacentre.



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Eric Da Costa, top aquarist, - January 1992

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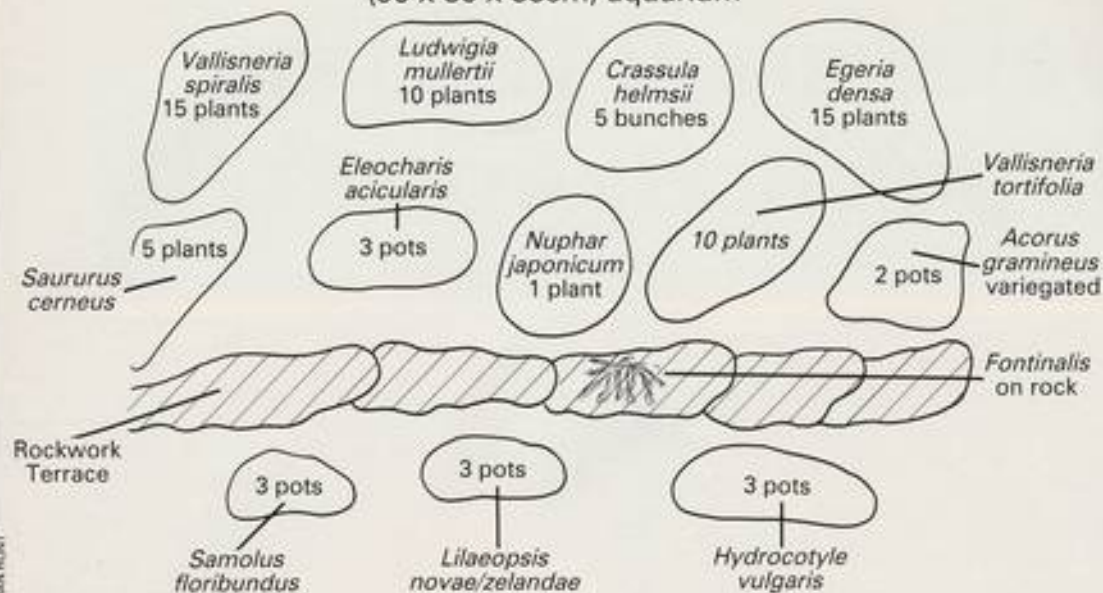
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Suggested layout for a 36 x 12 x 15in
(90 x 30 x 38cm) aquarium



Planting The Coldwater Aquarium

Barry James of Everglades Aquatic Nurseries provides his personal guide to temperate plant cultivation, plus a selection of suitable species for coldwater set-ups.
Photographs by the author

Coldwater fishkeepers — if one includes those having a goldfish in a bowl — outnumber those keeping tropicals. Sales of coldwater plants such as *Egeria densa* (Giant Elodea) to goldfish keepers run to several thousand a week in the UK. It is very much of a consumer product, with repeat sales every two or three weeks. Yet, the same plant will last months, or even years, when purchased by a tropical enthusiast.

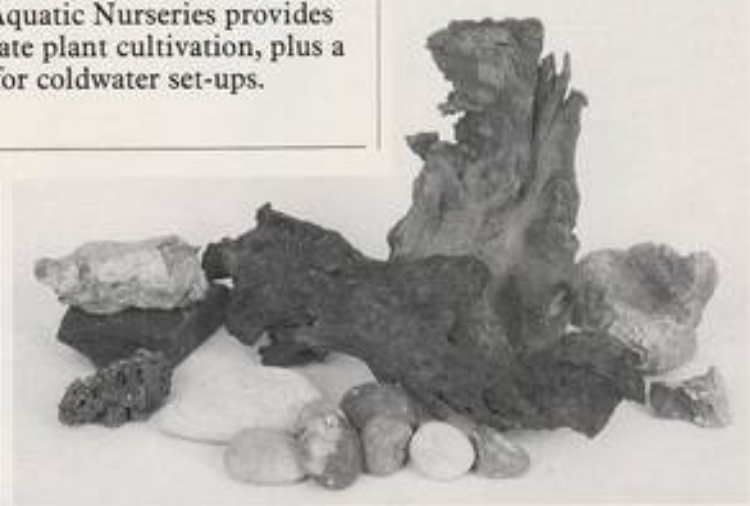
Very few coldwater fishkeepers go to the trouble of providing suitable conditions in their tanks for growing aquatic plants. While it is true that the number and variety of aquatic plants suitable for temperate aquaria is much smaller than those for heated ones, there remain a sufficient number to enable a

beautifully planted goldfish tank to be a realistic proposition.

SOURCES OF PLANTS

Although there are something like 150 species of native aquatic plants, very few are suitable for long-term use indoors. This is because of the longer hours of daylight we receive in the northern hemisphere during the warmer months, a situation that cannot be reproduced in aquaria with artificial lighting without the risk of algal infestation.

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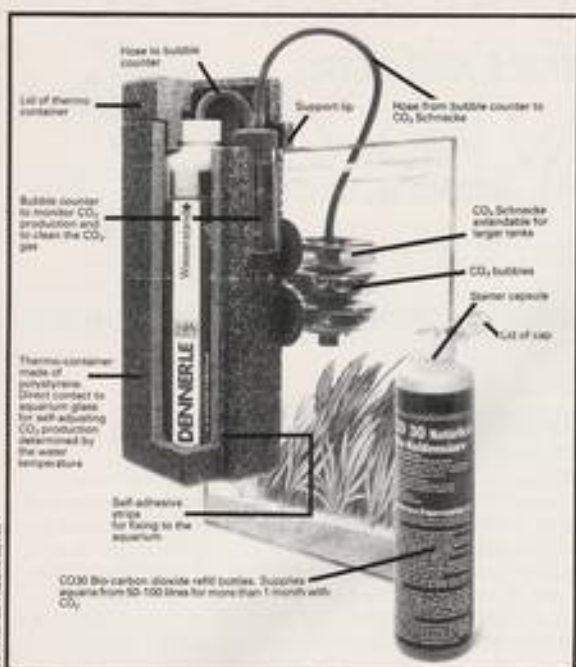
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TANK PREPARATION

Preparing the base of the coldwater tank is much the same as for tropical ones.

Base Mix

I use a mixture of powdered clays which I formulated for garden pool use. However, I



Hornwort is tough and attractive but needs to be weighted down or lodged between rocks.

do not mix them with loam because of the danger of anaerobic conditions developing. (In heated aquaria, a sub-gravel heating cable overcomes this problem.)

I mix the clays at the rate of 17.6oz (500 grams) to 7lb (3.2kg) of 3/16in (0.5cm) Chesel Beach gravel per square foot (900 sq cm) of aquarium base area (i.e. for a three-foot [90cm] by one foot [30cm] wide tank, I would use 2lb [9.5kg] of gravel + 17.6oz

[500 grams] of clay as an adequate covering).

I mix this together with a little water until I achieve a thick, gritty paste. This I trowel over the back 2/3 of the tank, leaving the front 4in (10cm) clear. I cover this substrate with a 'gravel tidy' — essential to thwart the digging instincts of carp-derived species and weather loaches.

I then add a further 21lb (9.5kg) of washed gravel to seal the substrate in. The addition



Pennywort, also known as the Umbrella Plant, is a good foreground subject.



Fontinalis grows best when it is fastened to a rock or piece of bogwood when it is first planted.



An impressive specimen plant for the cold-water aquarium: the Japanese Spatterdock.

of rocks, Simlawood (or equivalent artificial wood or rock) or bogwood completes the preparation of the base.

Water

Most of the plants used in coldwater aquaria are not too fussy regarding the chemical composition of the water so normal tapwater is, generally speaking, quite suitable. The water must be added with care so as not to disturb the base layer — I use a large plastic bag, place it over the base and pour the water on to this.

Lighting

Lighting should be at the rate of 20 watts per square foot (900 sq cm) of surface area as near as possible. I use two 25 watt lamps over a 36 x 15in (90 x 38cm) deep aquarium. Triton, Aquastar or Powerglow are all suitable lamps to use.

When the tank is up and running, the photoperiod should be from 10-12 hours per day.

Filtration

Filtering can be accomplished by any good internal or external power filter. Needless to say, sub-gravel filters should NOT be included in this type of set-up.

PLANTING

Once the water has warmed to room temperature, planting can begin. The temperate tank is planted in the same way as the tropical one, using the plants according to their potential growing heights.

Plant Selection

Taller species should be reserved for the background. These are normally planted in bunches of five cuttings, held together by small lead strips until rooting has been accomplished. Plants which are planted with roots already present — such as *Vallisneria* and *Sagittaria* — are planted individually, but close together.

The 'middle ground' is occupied by plants which do not exceed 6-8in (15-20cm) in height. However, the centrepiece or specimen plant is also planted in this region, and,

being of a rosette-forming nature, should be allowed plenty of space for expansion.

Dwarf plants are placed in the foreground section. These are best purchased as potted specimens, as they are very fiddly to work with when in a loose form.

Maintenance

Once the tank is up and running, regular dosing with balanced fertiliser solutions is essential. For real devotees, CO₂ (carbon dioxide) diffusion will prove enormously beneficial.

Regular pruning will be needed for faster growing subjects to keep their shape.

SUITABLE PLANT SPECIES FOR COLDWATER AQUARIA

Name	Position in tank	Height — inches (cm)
<i>Cabomba</i> (<i>Cabomba caroliniana</i>)	Background	15-18 (38-45)
Japanese Cress (<i>Cardamine lyrata</i>)	Background	15 (38)
Hornwort (<i>Ceratophyllum</i> species)	Floating	Indeterminate
Swamp Stonecrop (<i>Crassula helmsii</i>)	Background	15 (38)
Water Hedge (<i>Didiplis diandra</i>)	Background	12 (30)
Giant Elodea (<i>Egeria densa</i>)	Background	15 + (38 +)
Water Violet (<i>Hottonia inflata</i>)	Background	15 (38)
White-petalled Pennywort (<i>Hydrocotyle leucoccephala</i>)	Background	12 (30)
Water Star (<i>Hygrophila polysperma</i>)	Background	15 (38 — at not less than 70°F, c 21°C)
'Crispa' (<i>Lagarosiphon</i> species)	Background	15 (38)
Red Ludwigia (<i>Ludwigia mullerii</i>)	Background	15 (38)
Creeping Jenny (<i>Lymnachia nummularia</i>)	Background	15 (38)
Milfoil (<i>Myriophyllum elanoides</i>)	Background	15 (38)
Dwarf Sagittaria (<i>Sagittaria tubulata</i>)	Background	12 (30)
Giant Sagittaria (<i>Sagittaria platyphylla</i>)	Background	15 (38)
Tape Grass/Vallis (<i>Vallisneria spiralis</i>)	Background	15 + (38 +)
Japanese Rush (<i>Acorus gramineus</i>)	Background	15 (38)
Japanese Rush (<i>Acorus gramineus</i> var)	Middleground	8 (20)
American Cress (<i>Artemisia aquatica</i>)	Middleground	6-8 (15-20)
Dwarf Hairgrass (<i>Eleocharis acicularis</i>)	Middleground	6 (15)
Japanese Spatterdock (<i>Najas japonicum</i>)	Specimen	12+ (30+)
Lizard's Tail (<i>Saururus cernuus</i>)	Middleground	6-10 (15-25)
Twisted Vallis (<i>Vallisneria spirifolia</i>)	Middleground	6-8 (15-20)
Dwarf Japanese Rush (<i>Acorus gramineus</i> var)	Foreground	4 (10)
Pennywort/Umbrella Plant (<i>Hydrocotyle vulgaris</i>)	Foreground	1-2 (2.5-5)
False Tenellus (<i>Lilaeopsis novae-zealandiae</i>)	Foreground	2 (5)
Water Cabbage (<i>Samolus floribundus</i>)	Foreground	2 (5)
Fountain Moss (<i>Fontinalis</i> species)	Grows attached to rocks	—

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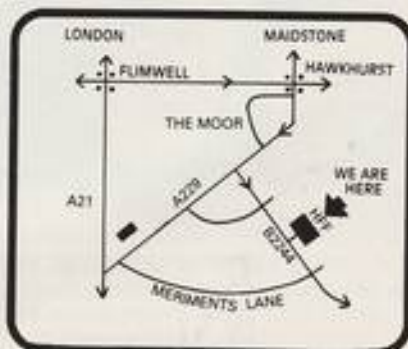
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The Bitterling — as popular and interesting as ever.

The 'Alternative' Coldwater Fish

Dr David Pool of the Tetra Information Centre selects some interesting 'possibles' for coldwater aquaria and ponds.



Sticklebacks are small and hardy . . . and have a fascinating method of breeding. The four black circles enclose — not Stickleback eggs, though, but those of the Common Newt.

Keeping fish in a coldwater aquarium or pond does not necessarily mean looking after Goldfish and Koi. These two species certainly dominate most coldwater fish collections, but there is a very wide range of other fish from throughout the world that can be introduced into coldwater set-ups, be they an aquarium or a pond.

These 'other' coldwater fish are becoming increasingly popular, and examples can be seen in most aquatic and water garden centres around the country. Their popularity is well deserved, with their unusual and interesting behaviour, together with their often-bright coloration rivaling many tropical species.

I will introduce some of the many available alternative coldwater fish species here, but a trip to your local aquatic shop would allow you to view other species which would add variety and interest to your coldwater aquarium.

NATIVE BRITISH SPECIES

Many coldwater aquarists are introduced into this fascinating pastime through their other hobby: angling. Most of the fish that they catch can also be kept in aquaria in their juvenile stages, providing care is taken with water conditions.

The most suitable fish are those which will not outgrow the aquarium, and include species such as Sticklebacks (*Gasterosteus aculeatus*), Minnows (*Phoxinus phoxinus*) and Bitterling (*Rhodeus sericeus*). Larger species such as Tench (*Tinca tinca*), Orfe (*Leuciscus idus*) — though this species is not a true 'native' — Rudd (*Rutilus rutilus*) can also be kept when young, but need a large aquarium, or better still a pond, as they mature.

Bitterling (*Rhodeus sericeus*)

Bitterling (*Rhodeus sericeus*), though not strictly a UK species, but one that is more often than not regarded as 'native', are worthy of a mention because of their unusual reproductive behaviour. These beautiful little fish protect their eggs by laying them in the gill cavities of freshwater mussels.

To do this, the female develops a long ovipositor when ready to spawn. This is inserted into the excurrent siphon of the mussel and the eggs are released. The brilliantly coloured male hovers over the incurrent siphon and releases his milt (see accompanying photograph).

The respiratory action of the mussel carries the sperm into the gill chamber where fertilisation occurs. The fry remain in the mussel until they are free-swimming, when they pass out through the excurrent siphon.

Keeping Bitterling is very simple, as they are tolerant of all but the extremes of pH and water hardness, and will readily accept flaked foods such as goldfish food. In a pond, they tend to be surface feeders and so, will be seen even in the unfortunate event of the water going green with algae.



Minnows are shoaling fish which are native to British waters.

The breeding described above occurs throughout the summer months. During this time the male is very brightly coloured and easily distinguished from the female. Bitterling will breed readily in captivity, providing a mussel is present.

Sticklebacks (*Gasterosteus aculeatus*)

The Stickleback is another coldwater species which is popular because of its unusual reproductive behaviour. Sticklebacks are very common throughout the UK and often find their way into aquaria via children's tiddler catching expeditions to local ponds and ditches.

Sticklebacks are very hardy and can withstand a wide range of water conditions and even slightly elevated pollutant levels.

A Stickleback aquarium does not need to be a large or elaborate affair. A 45 x 30 x 30cm (18 x 12 x 12in) aquarium is adequate for a small shoal. This tank should have a shallow layer of gravel on the bottom and be decorated with one or two rocks and bunches of hardy plants such as *Elodea* species.

In the wild, Sticklebacks consume live foods, but in captivity they will quickly learn to accept flaked foods, often 'attacking' any flakes that are moving.

As water temperatures increase in the



Golden Tench make colourful aquarium subjects, but only when they are small.

spring male Sticklebacks develop their brilliant breeding colours with a bright red abdomen and blue sheen over the upper part of the body. The eyes also become a very bright blue. The females are generally larger and less coloured than the males.



The Golden Orfe is an active shoaler which will grow too large for most aquaria.

When ready to breed, each male will defend a small territory and build a nest out of debris, algae and pieces of plants, cementing them into place with a secretion from the kidneys. This building can continue for several days until the male is satisfied with his work — or until a ripe female shows an interest.

At this point the courtship commences and the female is enticed and pushed into the nest to deposit her eggs. During breeding, the males are very aggressive and will chase and nip the fins of other fish in the tank. They should not therefore be kept with Goldfish and other slow-swimming species.



A good very active North American import — the Red Shiner.

They will also react aggressively to other male Sticklebacks — driving them out of their territory. It is the red colour of the abdomen that prompts this behaviour, which can be stimulated by placing any red object in, or near, the aquarium.

Once breeding is finished, the male guards his nest and carefully fans the eggs and fry with his pectoral fins to provide sufficient oxygenated water. The fry can be fed on powdered fry foods as soon as they are free-swimming. At this stage they should be removed from the tank (or the parents removed) to ensure they are not eaten.

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NORTH AMERICAN SPECIES

There are in excess of 100 species of American fish which are suitable for aquarium life. Among the most popular and widely available are the Red Shiner (*Notropis lutrensis*) and the Sunfish (*Lepomis* and *Enneacanthus* species).

Red Shiner (*Notropis lutrensis*)

This species occurs naturally in the south and south west of the USA. Because of its popularity as a bait for larger piscivorous fish, the Red Shiner is bred commercially in large numbers and so it is often available within the trade.

The intense red coloration which occurs on the flanks of the males during the breeding season gives rise to its common name, together with more misleading names, such as Asian or African Fire Barbs.

Red Shiners prefer neutral to slightly alkaline water, with a medium to moderate hardness. They will survive in softer, more acidic water, but tend then to be more susceptible to parasitic infection.

area of coarse gravel. The male defends a small territory over the gravel, but following spawning, he rapidly loses interest and moves away.

Sunfish (*Lepomis* spp. and *Enneacanthus* spp.)

The most commonly available Sunfish are the Pumpkinseed Sunfish (*Lepomis gibbosus*), the Black-banded Sunfish (*Enneacanthus chaetodon*), the Banded Sunfish (*E. obesus*) and the Blue Spotted Sunfish (*E. glaucus*).

The Pumpkinseed Sunfish is more aggressive than the other three and should be kept with members of its own kind or with other large fish. Given suitable conditions, they can reach a length of 24cm (c 9.5in) and, at this size, will consume any small fish in the aquarium.

They breed in a cichlid-like fashion, with the male excavating a shallow hole in sand or fine gravel, into which the eggs are laid. The male then guards the eggs and fry until they become free-swimming. Because of this territorial behaviour at spawning time, care should be taken not to overstock the pond or aquarium. One male in an aquarium, or for

However, once they start feeding, they will quickly learn to accept dried foods.

'TROPICAL' FISH FOR THE COLDWATER AQUARIUM

Many of the so-called 'tropical' fish species can tolerate cooler water conditions. In the wild, these fish are often subjected to temperatures of 18-20°C (c 64.5-68°F) for long periods of time and will survive for short periods at values of 15°C (59°F).

In most homes, these temperatures are the norm and a non-heated aquarium will tend to remain within this range throughout the year. It is therefore possible to keep 'tropical' fish species such as Guppies, Platies, Sword-tails, Paradisefish, Bronze Corydoras, 'Plecostomus' and certain cichlids (e.g. Keyhole and Convict Cichlids) in unheated tanks.

All of the fish indicated above, and many more, can thrive at temperatures of 18-20°C (c 64.9-68°F) but they cannot withstand sudden water temperature drops. It is therefore important that the fish are slowly acclimatised to these lower temperatures.

When purchased, tropical fish are usually kept in tanks at 23-25°C (c 73.5-77°F). They should be introduced into the aquarium at this temperature and allowed to settle in. After a few days, the temperature can be allowed to drop at the rate of 1°C (1.8°F) every 2-3 days. In this way, the fish will get used to the lower temperatures and show no adverse effects.

BUYERS BEWARE

Whenever you purchase a new fish for your aquarium, be it tropical or coldwater, it is advisable to check on the requirements of the fish, on its diet and on how big it can grow. The many books on fishkeeping and your local aquatic dealer can help here and prevent you from buying fish that are unsuitable for your particular aquarium.

The Channel Catfish (*Ictalurus punctatus*) is one example of a fish that is often wrongly purchased for introduction into a coldwater aquarium or pond.

This fish is widely available in its normal brown colour or as an albino form. In Britain they are often sold as appealing youngsters, 5-10cm (2-4in) in length. But beware — they can reach a length of over one metre (c 39in) in the wild and commonly reach 45cm (18in) in aquaria.

At this size they feed on anything that can fit into their mouths, including other fish. Consequently, they should only be kept with members of their own kind or other large fish.

Having painted a rather black picture of the Channel Catfish, it is only fair to add that they are a very interesting and intelligent fish. They are tolerant of a range of water conditions and, given sufficient space, very hardy and disease-resistant.

An increasingly popular fish among coldwater aquarists is the Koi. Over recent years large imports of small, colourful, impressive specimens have led to a resurgence in interest in these fantastic fish. It must, however, be stressed that



The Pumpkinseed exhibits cichlid-like spawning behaviour.

A wide range of temperatures can be tolerated, but those over 22°C (c 71.5°F) should be avoided if possible, as such conditions will shorten the lifespan (normally around five years). Feeding is straightforward, with flaked and stick foods being readily accepted.

As with the Bitterling, Red Shiners will spawn over a prolonged period of time, given suitable conditions (clean water and a temperature of 18 to 22°C (c 64.5 to 71.5°F)). Because of the brilliance of the males during spawning, it is worth ensuring that these conditions occur as often as possible.

Males can also be distinguished by the presence of an inverted dark triangle just behind the gills and by the breeding tubercles, which occur on the head during the breeding season. Spawning occurs over an

every one square metre of the pond, should not provoke any fighting and damage.

The *Enneacanthus* species are often found together in the same habitats in Florida and the Atlantic coast of America. In captivity, they are also peaceful, although some aggression occurs between the males at breeding time.

As with the Pumpkinseed, they are tolerant of a wide range of water conditions (i.e. pH and hardness) but badly affected by raised ammonia, nitrite and nitrate levels. Therefore, avoid overfeeding and overstocking and ensure good filtration.

The aquarium should contain areas of dense plant growth into which they will retreat when threatened, and to breed. When first obtained, it may be necessary to give live foods in order to tempt Sunfish to feed.

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grow to very large sizes (close to those achieved by Channel Catfish). Therefore, although they are great fish for an aquarium when they are small, adequate provision must be made for them as they grow.

In the end, the only suitable home for these highly desirable fish is a specially designed pond (what a great excuse to start digging!).

As you can see, coldwater fishkeeping is not limited to keeping Goldfish or Koi. There are a very wide range of fish species that can be kept which can appeal to all fishkeepers — whether their interest lies in unusual, beautiful, interesting or even aggressive fish. There's room for all tastes within the coldwater hobby.

Left, Swordtails can be used as unusual 'coldwater tropicals' in some indoor set-ups.

Below, buyers beware! Koi are beautiful ... but they grow far too large for the average aquarium.



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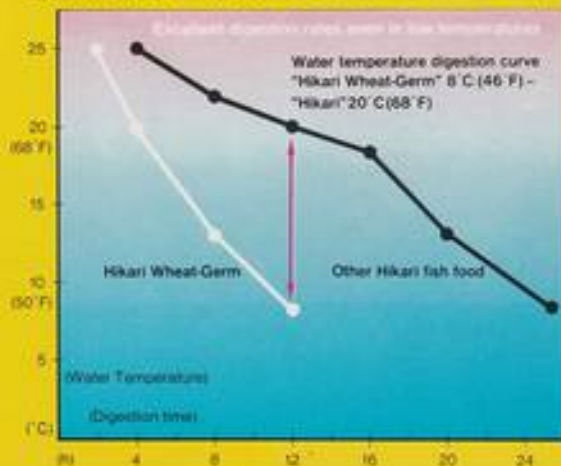
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EQUIPMENT OVERVIEW

By Dick Mills
AA's and PP's

One of the main attractions of fishkeeping is that you can (if necessary) exercise sufficient self financial control to keep it within very exact bounds, and yet still achieve just as much satisfaction as the person who can afford everything at one fell swoop.

This is due in no little measure to the fact that, while the 'basic set-up' is usually quite adequate in maintaining a life-support system, there are many 'optional extras' which can be added to upgrade the system. (In case you're still wondering about the title, it stands for **Aquarium Ancillaries and Pond Peripherals!**)

Because the pond forms part of a greater 'environment' (and embraces two different bio-systems) the amount of bolt-on extras are much larger than those for the indoor coldwater aquarium.

AQUARIA Temperature Control

High-tech accessories for the coldwater aquarium are not generally sought after (or even available), as constant temperature stabilisation is not absolutely necessary.

Perhaps the only really useful luxury in this area might be to install a **chilling system** so that water temperatures don't rise too high, nor oxygen levels fall too low, during what we all hope will be a long hot summer.

Filtration

At a lower (and more affordable) level, upgrading the **filtration system** is always a practicable prospect, and fitting a powerful power filter to the aquarium will ensure both well-filtered and well-oxygenated water for the fishes.

Remember that many coldwater fishes are great foragers around the tank floor; this results in much stirring up of detritus, another good reason for that better filter.

There is no reason why undergravel biological filtration cannot be used success-



Power filters (these are internal models) are highly recommended for most coldwater aquaria.



Undergravel filters can be used quite effectively in coldwater aquaria — but if the fish are of the 'bottom-grubbing' type, a gravel tidy should be used on top of the filter plates.

fully despite the fishes' digging activities; use a **gravel tidy** to prevent them uncovering the filter plates.

Reverse flow systems may seem to be the answer to a lot of filtration needs, but this will not create as much turbulence at the water surface as other forms of filtration and **extra aeration** may need to be provided to keep oxygen levels within necessary limits.

Lighting

Similarly, being indoors, the aquarium is under the strict control (!) of the hobbyist. Here, the use of carefully selected **lighting** will ensure ade-

quate plant growth and illumination by which to see the inmates of the tank (see **Barry James'** article earlier in this Supplement for a good selection of plants).

A reduced level of illumination can be used to 'fish-watch' only, but for tank decoration in this event, you will have to rely on **plastic plants** which need no light at all to maintain them.



If natural plants are being cultivated in a coldwater aquarium, light enhancers will ensure that maximum illumination reaches them.

Plastic plants have one advantage over real-live species — they cannot be nibbled away!

PONDS

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2000	Bioorb 2000	U.V.C. 2000	1000 Max	DOC-2	25mm (1")	25mm (1")	25mm (1")
2500	Green Machine 2500	U.V.C. 4000	1250-1600*	DOC-2 OR DOC-3	40mm (1 1/2") 32mm (1 1/4")	40mm (1 1/2") 32mm (1 1/4")	40mm (1 1/2") 32mm (1 1/4")
3000	Bioorb 3000	U.V.C. 4000	1500-2000	DOC-3	40mm (1 1/2")	40mm (1 1/2")	40mm (1 1/2")
4000	Green Machine 4000	U.V.C. 4000	2000-2070	DOC-7	51mm (1 3/4")	51mm (1 3/4")	51mm (1 3/4")
5000	Bioorb 5000	Tridon U.V.C. 2000 & U.V.C. 4000	2500-3330	DOC-7	60mm (1 1/2")	60mm (1 1/2")	60mm (1 1/2")
6000	Green Machine 6000	Tridon U.V.C. 2000 & U.V.C. 4000	3000-4000	DOC-7 or 2 x DOC-3	60mm (1 1/2")	60mm (1 1/2")	60mm (1 1/2")

* Sizes based upon 4 mtr hose, 1 mtr static lift (from pond water level)



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things you can buy for it; the choice lies between items that go in it or around it.

Fountains, Filters and Pumps

Probably first on anyone's list is a fountain, quickly followed by an external filter. Providing you buy the correct size of pump, both these items can be easily catered for by the one unit.

Pumps come in two guises — submersible and surface types: the former sit in the pond underwater, while the latter are sited above water, usually in a small weatherproof box.

Unlike submersible pumps, surface pumps are not self-priming and won't restart after a switch-off or power cut; they also need a non-return valve in the water supply hose to keep the pump full of water at all times.

The size of the external filter depends, of course, on the size of the job it has to do; a filter for the smaller pond can often be hidden effectively in the adjacent rockery, but one for a large Koi pond may need a carefully planned installation if it is not to look out of place in the general garden scene.

External filters often come equipped with a UV lamp to keep the pond water free from algae. Alternatively, if the pond is of manageable proportions, the use of a treatment such as Interpet's 'Greenaway' is effective. The same company's 'Pond

Left, an ever-growing number of external pond filters now come with in-built UV sterilisers.

Right, pond pumps can be either submersible (as this model) or external.



GREENWAY

Balance' will clear blanketweed and is less labour-intensive than dragging the stuff out with a rake.

A pump can also be coupled

up with a pond-vac device to remove mulm and accumulated debris from the pond. There are other designs which operate under mains water pressure.



PAPETI PICTUS



BEAUBON WATER GARDEN PRODUCTS LTD

Nowadays, fountains can be pretty sophisticated affairs. This particular model makes a wide range of spray displays possible.

Repairs

If you have a falling water level in the pond, the cause should be traced and rectified.

Pond liners can be repaired in situ with the appropriate repair kit but, don't forget, the leak may not be due to a punctured liner at all: a leaking watercourse in the cascade or a fountain leaning over too much (or left running in a very windy day) will also result in water losses.

Spawning Accessories

Naturally, your fish will feel so at home in your pond, that they will want to breed, so why not make it easier for them by providing spawning brushes and ropes?

Apart from localising the spawning activity, the subsequent egg-laden brushes can be easily removed to another site for hatching.

Other Accessories

Still in the pond, what about some **underwater lighting** to add to the spectacle of your fountain?

A **pond net** might not look quite unobtrusive, but it will stop autumn leaves from entering the pond and will deter herons and cats from making off with your best fishes.

There have been recent alternative **heron and cat deterrents**, including percussion caps triggered off by trip wires, imitation herons, low-voltage electrified fences, non cat-weight-supporting imitation lily pads, electronically-programmed loudspeakers, etc.

Low surrounding shrubs might well provide landing-site obstructions and also hide the pond from overhead flying, prying eyes. A heavy screen of marginals will provide safe exit and entry for amphibians, and the new 'hessian-free' **planting baskets** make for easy cultivation and transportation of marginal plants around the pond's built-in shelves.

The only drawback with heavily-planted margins is that



Happy fish will breed and, when they do, a spawning mop will be found to be extremely useful.



A 'pondola' or equivalent, will add a very special touch to any pond surround.

they restrict close views of the pond and impede maintenance; if they also impede intruders from thieving your prize fish then that's a bonus, but an **infra-red area scanning device**, coupled to floodlamps, will do that for you anyway.

Visit any garden centre and there is no let-up from any amount of attractive **pool-side furniture** from deckchairs, sun-loungers and drinks trolleys! The onset of dusk shouldn't be taken as a signal to stop pool-side activity as **solar-powered**, mains-, or low-voltage **lighting** is easy to install around the pond edges or surrounding patio. (Don't forget, with any electrically-powered pond equipment to use a **Residual Current Device** to protect against electrical shocks.)

Every aquarist and pond keeper knows that many Koi originate in Japan but, for any visitor to your garden that doesn't, you can give very substantial clues with oriental **pergolas, fences and gateways**. If this still isn't enough, a glimpse of the occasional stone **Buddha, pagoda and lantern** should leave no doubts lingering in their minds!



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Green water can kill!

Please check the pH (level of acid or alkali) of your pond, particularly if it has green water. There is a strong probability that you will find the pH is greater than 8.5 and the water is not therefore suitable for sustaining fish life without causing undue stress and disease. High pH, in late Spring-early Summer particularly, is caused mainly by strong plant growth or green water, or both. High pH indicates very alkaline conditions and is the main cause of fish loss in the Spring. Green water is caused by minute

free-swimming green organisms proliferating in the water. These organisms are encouraged by increased light in the Spring, combined with a plentiful supply of nutrients in the water.



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Pond Check Tablet test kit

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- 2 Add pH Adjuster for alkaline ponds if necessary. Sufficient for 5675 litres (1250 gallons). Code 2714
- 3 Add Green Away to coagulate the organisms so that they settle to the bottom of the pond — the environmentally safe way to clear green water.
Code Size Treats
2673 250ml 11350 litres (2500 gals)
2674 1 litre 45400 litres (10000 gals)
2686 4 litre 181600 litres (40000 gals)
- 4 Add Pond Trizyme regularly to improve the biological balance. Treats 9000 litres (2000 gals). Code 2715

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Seaview

By Gordon Kay



MORE MARINE TIPS

Here's the latest batch of 'How To' snippets. Not everyone will agree with everything I say, of course, but I can only re-state that these snippets are drawn from years of experience and everything that they contain works for me.

UV and Ozone

Many aquarists use an ultraviolet steriliser or an ozoniser (sometimes both) as an aid to aquarium husbandry, but they both have disadvantages.

The UV steriliser needs crystal-clear water in order to kill parasites as it was intended — best filter the water through a canister filter first — sterilisation efficiency being dependent on the length of time that the water is in contact with the tube. Possibly most importantly, the steriliser can only kill free-swimming parasites with which it comes into contact.

While also only working against free-swimming pathogens, ozone is, in addition, extremely toxic and can kill fishes and invertebrates outright if an overdose is given. That same overdose can also

induce headaches and vomiting in the aquarist. Furthermore, pathogens vary in their sensitivity to ozone so that doses which kill one would have very little effect on another. Oh, and ozone can also blitz a biological filter in a matter of minutes.

All of these things considered, I, personally, tend to regard both UV sterilisation and ozone as being of very limited use.

Oxygen

Because of the quantities of dissolved solids it contains, the ability of seawater to retain oxygen is significantly less than freshwater. As a result of the constant agitation at the ocean's surface, though, this is not a problem for coral fishes in their natural habitat and, consequently, few marine animals have evolved the capacity to cope with reduced oxygen levels.

Because of this, it is important to take adequate steps to ensure efficient gaseous exchange. This is not difficult. An air-diffuser or two, connected to a powerful air-pump, serves the purpose admirably.

Another technique is to position filter outflows in such a way that they break the water's surface, thereby helping to drive off carbon dioxide and take in oxygen.

The real problem arises when summer heatwaves push water temperatures above those normally encountered even on the shallow tropical reefs. High temperatures reduce water's ability to hold dissolved oxygen, while — at the same time — increasing the respiratory demands of the aquarium's

inhabitants. When this latter factor interacts with the already-limited capacity of seawater to hold life-giving oxygen in solution, even the most highly efficient aeration may not be enough to prevent the loss of one or all of your fishes. Isn't life a bitch?

Anyway, this provides all the more reason to use the largest tank possible and be somewhat circumspect when determining stocking levels.

Water Chemistry

Make any changes to water chemistry very gradually. It is often said that the coral reef is the most stable environment on earth ... and you'd better believe it. Coral fishes just don't have the mechanism for dealing with wild fluctuations.

Algae

Green algae — particularly the higher algae — are of great benefit in a seawater aquarium. For example, many fishes need to eat algae in order to thrive; algae also help keep nitrates in check.

However, harvest algae regularly to prevent them from becoming too rampant. Should they die, the resultant pollution could kill your fishes.

Carbon

Most people are aware of the capabilities of activated carbon to 'remove' the phenols and dyes which turn aquarium seawater yellow. However, what many people don't realise is that carbon does not actually remove anything.

Dissolved organic material

merely 'sticks' to it — a process known as ADSORPTION. Once the carbon is saturated with these dissolved organics, all of the stuff which has been adsorbed is just wanged back into the aquarium.

Moral: CHANGE CARBON REGULARLY!

On a fish-only aquarium, I find that it is preferable to use carbon for a day or two, every couple of months, then throw it away. On an invertebrate tank, I use it all the time, but change it every month, at least.

Livefoods

Most coral fishes relish Enchytraeids — whiteworms, grindal worms etc — as food. These can be easily cultured for use in the aquarium, but do not feed them to your fishes too often.

They are very fatty and can cause internal disorders, fatty liver degeneration being chief among these. Bloodworms will also cause similar problems, if fed to excess.

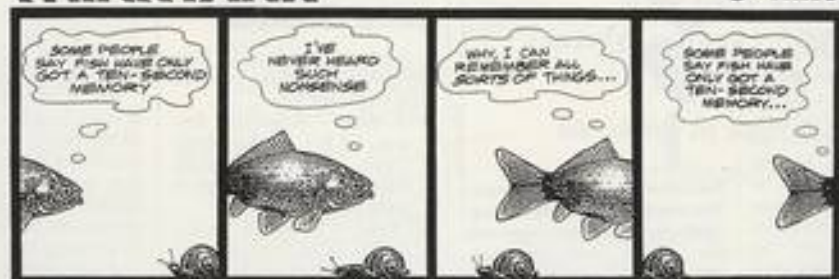
Knocks and Taps

Fishes have a row of perforated scales along their flanks — known as the lateral line — which lead to a pressure-sensitive nervous system. This enables them to detect vibrations in the surrounding water from outside knocks on the glass, other fishes or reflected vibrations of their own movement from rocks, etc.

Take great care not to allow anyone to tap on the aquarium glass. This lateral system is extremely sensitive and, very delicate species, especially, could die of shock.

THINKTANK

© flint



Koi Calendar



By David Twigg

JOBS AND THOUGHTS FOR THE MONTH

Spring is here, water temperatures are rising and our Koi are starting to feed. Unbeaten ponds, however, are still liable to wide temperature fluctuation caused by night-time frosts.

Keep a wary eye therefore on the weather forecast before deciding to feed. My choice at this time of year is a wheat-germ-based pellet and occasional treats of boiled peas or wheat. Feed regularly, but sparingly, thus allowing bacterial activity in your filter to re-establish itself gradually to prevent hitting your fish with an ammonia or nitrite surge.

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

Monitoring of ammonia, nitrite and pH should be carried out as often as is necessary to ensure a healthy pond. It is generally accepted that if any of these readings are out of the normal range, then a partial water change is necessary. There are two schools of thought on the best way of achieving this end: flush to waste some of the water (say 10%) and refill from mains, or secondly 'flush through' the system by slowly running fresh

water into the system and allowing the excess to go to waste.

I favour the second method as it gives a gradual, rather than a sudden, change to the quality of the water and the fish will slowly adapt to this change with minimum stress.

This brings to mind the current enthusiasm for 'home' water filters. Ideally, these units should be used if available, but water direct from the mains can be used if the volume change is not too large and is 'trickled' into the pond.

Yet another area of debate is where to place the hosepipe. I favour the front end of filter, others go for direct into pond. My reasoning is: "Why have a filter if I am not going to use it to its fullest?" and "Why put chlorinated water directly into contact with my precious fish?"

I hasten to emphasise the words used above, "by slowly running" fresh water into the system.

SHOW RETURN

This month sees the welcome return of a Koi Dealers' show. The 'Koi Joy' London Professional Nishikigoi Show is taking place over the Easter weekend (17/20 April) at the Flower and Garden Centre, 2-4 Hale Lane, London NW7 3NX.

This is a chance for us to see all the latest developments in Koi Pond technology and filter systems. Lectures, seminars and demonstrations will also be held for the benefit of those



Koi Calendar — Japanese-style. The two smaller characters (top right) represent 'Nishiki-goi' and the 'vertical' ones spell 'Calendar'.

APRIL

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

thirsting for knowledge.

The venue is a hard-standing site just off the M1, A1/A41 and M25 and has ample parking available. For more details ring 081 959 6845.

RECENT 'JAPANESE' VISIT

A very well attended meeting of the Northants Section greeted a young lady from Japan. Miho Sato spent the evening demonstrating the art of Shuji (Japanese Calligraphy) and talking of Japan. What else, I hear you ask? Well, Miho was inundated with requests from members for their names written in Japanese, and we were all given the opportunity to have a go ourselves.

Have you ever tried painting while holding the brush 4 or 5 inches from the bristles? It is not easy, as I found when I tried to copy Koi Calendar which Miho kindly wrote for me. When I have perfected it maybe our Editor will make it a headline. [Maybe! I'd certainly be tempted. Ed.]

Thanks to Miho, her escort and the Northants Section for a most unusual and educational evening.

Details of membership of the BKKS and its many Sections can be obtained by ringing Mrs Bobbie Barton on 0702 611750.

SHOW CALENDAR

A few more show dates have been notified and the calendar now looks like this:

9/10 May — Merseyside Section BKKS English Style Open Show, Crumleigh Heath Farm, Little Leigh. 5 mins from J10 of M56.

6/7 June — Yorkshire Section BKKS, Open Show, Lotherton Hall, just off A 1 near

Aberford.

13/14 June — East Pennine Section BKKS English Style Open Show, Sheffield Arena.

20/21 June — Lea Valley & Harlow Section BKKS, Closed Show, Van Hage's Garden Centre, Great Anwell, Nr Ware, Herts.

5 July — Lower Thames-side Section BKKS, Open Show, Eastwood Junior School, Rayleigh Road, Eastwood.

11/12 July — Northern Section BKKS, Open Show, Tatton Park.

12 July — Suffolk & North Essex Section BKKS, Closed Show, Free, Roberts Koi, Great Stamford.

26 July — Essex Section BKKS English Style Open Show, Aveley Sports Ground, Aveley. On A13, 2 mins from Dartford Tunnel.

15/16 August — BKKS National Open Show, 'Koi 92', Billing Aquadrome, Nr Northampton.

30/31 August — Midland Koi Association Show.

5/6 September — Mid-Somerset Section BKKS, Closed Show, Royal Bath & West Showground, Shepton Mallet.

September — South Hants Section BKKS, Closed Show. Contact telephone numbers can be obtained from the What's On section below.

During recent weeks I have taken numerous 'phone calls from hobbyists and dealers alike querying the different types of show, how to enter fish, how to take a stand, etc.

Briefly, an OPEN Koi show is one which is normally open to the public for viewing and into which anybody may enter fish, subject, of course, to the rules of the particular show, e.g. entry forms must be submitted by a certain date.

A CLOSED show is one

which is normally open to the public for viewing, but only members of the organising Section or Society may enter fish into the competition.

A **JAPANESE-STYLE** show is one where the Koi are moved from vat to vat as the fish successfully progress through each stage of the judging.

In an **ENGLISH-STYLE** show each entrant has his/her own vat for his/her own Koi and the judges move around the vats to make their judgement.

Entry forms for, and information on, taking dealers' stands and advertising at any of the above shows, can be obtained from the contact telephone numbers given below.

WHAT'S ON IN APRIL

- 2 - Middlesex & Surrey Borders Section BKKS. Monthly meeting at Hampton Football Club. Contact Alan Harington on 0932 845608.
- 4 - Suffolk & North Essex Section BKKS. Monthly meeting, 7.45 pm at the Prince of Wales PH, London Road, Marks Tey, Colchester, Essex. Contact Dennis Preou on 0371 856450.
- 6 - Kennet Valley Section BKKS. *Bonsai Care* by Thamesdown Bonsai Club. 8 pm at Newbury Rugby Club, Pinchington Lane, Newbury, Berks. Contact Bob Thompson on 0734 713640.
- 7 - Yorkshire Section BKKS. Monthly meeting at Holme Leas Inn, Ossett, Nr Wakefield. 5 mins from J40 M1. Contact Fred Harston on 0226 722578.
- 8 - South Hants Section BKKS. *How Kang* talks on *Bagging Koi for Show*. 8 pm, Denmead Church Hall, Hambledon Road, Denmead, Hants. Contact Roy Moody on 0705 450530.
- 8 - Merseyside Section BKKS. Tony and Sue McCann with Mike and Liz Donlan on *The Raising of a Koi Show*. Hare & Hounds, Maghull. Contact Phil Adamson on 051 220 2970.
- 9 - East Pennine Section BKKS. Monthly meeting at The Phoenix, Platts Common, Barnsley (5 mins from M1 J36). Con-

tact John Timmis on 0226 289507.

- 12 - Northern Section BKKS are hosting a *TETRA Talking Fish Seminar* at St James' Hall, Pendleton. This is a Koi-only seminar and the speakers are **Dr David Pool** (Tetra) on *The Importance of Water Quality*, **Dr Jimmy Chubb** (Liverpool University) on *The Important Diseases of Koi* and **Tim Grantham** (Koi keeping Vet) on *Treating Unhealthy Koi*. Contact Tony McCann on 061 794 1958.
- 12 - Mid-Somerset Section BKKS. **Dr Andrew Worthington** speaking on *Filtration of the Koi Pond*. Contact Alan Purnell on 0458 72132.
- 12 - Lea Valley & Harlow Section BKKS. Monthly meeting. Speaker is **Bill McGurk**. Contact Barry Ford on 0279 419101.
- 12 - Scottish Section BKKS. Contact Archie Dick on 0786 832073 for information on venue, etc.
- 13 - Northants Section BKKS. AGM. Contact Keith or Jenny Cross on 0604 765856.
- 15 - Mid-Staffs Section BKKS monthly meeting at the RNA Club, Elmore Green Road, Boxwich. 8 pm start. Contact Don Dyeche on 0543 425178.
- 16 - Wirral & District Section BKKS monthly meeting at the Lever Sports & Social Club at 8 pm. Contact Jean Moffat on 051 678 1769.
- 19 - Yorkshire Koi Society monthly meeting at Wetherby Resort Hotel, Wetherby (200 yards off A1) at 2.30 pm. AGM and chairman's presentation of *Pond Videos*. Contact Frances Bedford on 0423 869484.
- 22 - London Section BKKS. *Gardening*, of interest to most, if not all, Koi keepers. Ruskin House, Coombe Road, Croydon, starting 8 pm.
- 26 - Mid-Staffs Section BKKS. Local pool visit. Contact Don Dyeche on 0543 425178.
- 26 - Essex Section BKKS. Speaker is **Chris Harris** *Purity on Tap*. North Stifford Village Hall at 3 pm. Contact Bobbie Barton on 0702 611750 or Margaret Bishop on 0702 522388.



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Herpetology matters

By Julian Sims

TARGET TURTLE

A joint conservation project between the International Herpetological Society (IHS) and Yarlet Hall School, Stafford, is raising money to help with the conservation of the marine Loggerhead Turtle (*Caretta caretta*) in Greece.

Target Turtle aims to raise enough money to buy and equip a Land Rover — a vehicle suitable for transporting essential scientific apparatus to the inaccessible Mediterranean beaches used for nesting by female Loggerheads. The project has received sponsorship from a number of companies, including the Yorkshire Bank, County Cameras (Stafford), JCB Excavators, The Turtle Wax Company and P & O European Ferries. Later this year, Dr Gareth Evans — Conservation Officer of the IHS, A & P contributor, and Science Teacher at Yarlet Hall — hopes to drive the Land Rover across Europe to Kephallonia in Greece.

Gareth Evans is no stranger to readers of A & P, as he regularly contributes herpetological features including *Drawing Room Dragons* (Iguanas) — February 1989, *Sharper than a Serpent's Tooth* (Adders) — January 1990, *A Much Travelled Toad* (Marine Toads) — January 1991 and (his latest) *A Shocking Tail* (Electric Fish), published in this issue.

Further details about the conservation activities of the IHS can be obtained from:

Dr Gareth Evans,
"Target Turtle"
Co-ordinator,
Yarlet Hall,
Stafford ST18 9SD
Tel: Sandon (08897) 494

Gareth would also like to hear from companies and individuals who can offer financial sponsorship or any other help with Target Turtle.

BOX TURTLE SURVEY

As from 1 January 1984, the mass importation of European Tortoises into Britain ceased when protective legislation — the Convention on Interna-

tional Trade in Endangered Species of Wild Fauna and Flora (CITES), EEC regulation 3626/82 — was implemented.

Additionally, this CITES legislation has also imposed restrictions on the sale or exchange of tortoises within the British Isles. A tortoise owner or breeder wishing to dispose of one (or more) tortoises must now obtain a SALE EXEMPTION from the Wildlife Conservation Licensing Section, Department of the Environment, Tollgate House, Houlton Street, Bristol BS2 9DJ.

Prior to this 1984 legislation, omnivorous North American Box Turtles, including the



A male Mexican Box Turtle (*Terrapene carolina mexicana*): a colourful subspecies sometimes imported into the UK from Northern Mexico.

Three-toed Box Turtle (*Terrapene carolina triunguis*) and the Ornate Box Turtle (*T. ornata ornata*), were imported into Britain in relatively small numbers. For example, anecdotes and information about the maintenance of these reptiles in captivity had been described in *Tortoises, Terrapins and Turtles* by Ivor and Audrey Noel-Hume (*Foyles Handbooks*) and *Living with Reptiles* by Kathleen Pickard-Smith (Nelson) — two books which inspired many herpetologists in the 1950s and '60s.

Given the correct conditions in an escape-proof garden, Box Turtles thrive in captivity, although they are more secretive than 'free range' European Tortoises. A recent account about keeping North American Box Turtles, written by Jim Wright, was featured in the July 1989 edition of *Aquarist & Pondkeeper*, pages 45 and 46.

After 1984, when European Tortoises were no longer readily available, there was an increase in the numbers of North American Box Turtles imported into Britain — they became a 'substitute' for the traditional species of 'garden'

tortoise. However, even though these reptiles should do well when provided with suitable conditions, not all Box Turtles survive for as long as expected.

The Tortoise Trust is conducting a survey to find out exactly what happens to Box Turtles following their importation into Britain. If you keep Box Turtles or have kept these reptiles in the past, then your experiences and views would be welcomed by the Trust. Further details about the American Box Turtle Welfare Survey can be obtained from:

The Tortoise Trust,
BM Tortoise,
London WC1N 3XX.

There is an interesting parallel here with the current proposal to impose a total ban on the importation of North American Red-eared Sliders (*Trachemys scripta elegans*) into Britain. If legislation is introduced restricting the importation of all Red-eared Sliders, not just hatchlings, then it is very likely that alternative species of freshwater turtle will be imported.

These 'substitutes', probably from south-east Asia, might well be less hardy and could also result in greater environmental damage as a result of over-collection from the wild. With this in mind, the full implications of any proposal to stop the importation of all Red-eared Sliders, irrespective of size, must be carefully considered.

LARGE TORTOISES SURVEYED

Wild-caught tortoises belonging to the genus *Geochelone* (sometimes referred to as *Chelonoidis*) are still being imported from South America. These tortoises are frequently given common names which refer to the coloration of their

front legs, for example, the Yellow-foot Tortoise (*G. deniculata*).

The Yellow-foot is found in Colombia, Venezuela, the Guianas and Brazil. Its range does not extend west of the Andes and extends south only as far as Bolivia. Throughout this range, the Yellow-foot is given a variety of local names, for example, 'Morrocoy' in Colombia (and Trinidad), 'Jaboti' in Brazil, and 'Motelo' in Peru.

Off the mainland, this species is found on the island of Trinidad, but its principal distribution is clearly on the continent of South America.

G. deniculata are renowned for the fact that they can grow to become very large tortoises. Adults can achieve a carapace length of over 61cm (c 24 in). This large size has resulted in other common names being used to describe the species, for example, the Hercules Tortoise and the Brazilian Giant Tortoise.

Indeed, the Yellow-foot is one of the largest species of tortoise which inhabits a continental mainland, but it cannot truthfully be compared with the real 'giant' tortoises which have evolved on islands. For example, the well-known inhabitants of the Galapagos archipelago in the Pacific Ocean actually gave their name to these famous islands. Galapagos Tortoises (*G. elephantopus*) can grow to a carapace length of over 1,200cm (47in) but the giant tortoises which inhabit Aldabra, an atoll in the Indian Ocean, can grow to an even greater size in excess of 1,207cm (50in) — more than twice the length of the Yellow-foot. The Aldabran tortoise has been given the very appropriate scientific name, *G. gigantea*.

Now, the Milwaukee County Zoo is conducting a survey of large Yellow-foot Tortoises in captivity. If you keep an example of this species with a carapace length of over 45 cm (17.75in), please send any information to:

Richard A. Sajdak,
Aquarium/Reptile Curator,
Milwaukee County Zoo,
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LIONS, LAMBS AND MEALWORMS *Part 2*

Ron Eddy concludes his two-part review of livefoods for reptiles and amphibians.

In Part 1, published in the March '92 issue of *Aquarist & Pondkeeper*, I took a look at a range of livefoods which can be cultured with a greater or lesser degree of difficulty and success. This time round, it's the turn of their wild counterparts.

WILD-CAUGHT FOOD

Attentive readers will have caught onto the fact that I am a little bit biased on this subject. If the source of supply is 'clean' (i.e. free of harmful chemicals), I am convinced that wild food contributes to greater health and longer life in terrarium animals, and ultimately, to better breeding successes. Obviously, most of my remarks in this section will apply to food for the smaller herpetiles, as obtaining larger prey items poses practical problems in suburban areas, not to mention ethical and legal ones! (Although, if the neighbour's cat messes in my garden one more time, I might have a rethink...)

The first consideration then, is what chemicals are used in your garden or other collecting area. I'm quite fortunate in that one neighbour shares my convictions about organic gardening, and the other shows no interest in his garden whatsoever. This means that I can gather prey items without fear of poisoning my animals. Here is a brief selection of wild foods:

Woodlice

These are very easy to find and collect, and are good sources of all-important calcium. Woodlice can be bred, or stored if desired, in the standard ice-cream tubs on a base of old leaves, and fed on bits of soft fruit and vegetables. They are also very useful in 'natural system' terraria, where they scavenge quite efficiently.

Terrestrial frogs and toads will eat vast numbers of woodlice, so too will newts and salamanders, while terrapins like them crushed. Treefrogs and aquatic frogs don't seem too keen, and most lizards won't touch them, unfortunately.

Grasshoppers

All the remarks for crickets and locusts (see Part 1) apply to grasshoppers, except that wild-caught grasshoppers seem to be more nutritious. There is a theory that the all-important vitamin D used by herpetiles, as by us, to take up calcium (activated by the



Earthworms (these are *Dendrobaena*) are eagerly accepted by the vast majority of reptiles and amphibians



Although cockroaches — this is a male Madagascar Hissing Cockroach (*Gomphadorina portentoaa*) — are eagerly taken by many herpetiles, there could be problems...



While many caterpillars constitute great live food, some species — such as the Hawkmoth caterpillars — will burrow when they are ready to pupate, thus becoming 'unavailable'.

UV component of sunlight), is better supplied by wild-caught food. (Another aspect, of course, is that the guts of wild insects often contain fresh vegetable matter — a source of trace vitamins in itself.)

Certainly, I have never had problems with rickets or other deficiency diseases with any of my own animals, despite using only tungsten bulbs in quite a few of my tanks. To be on the safe side, use one of the newer full-spectrum tubes, though.

Spiders

Virtually all frogs, toads, treefrogs and (especially) lizards adore spiders. They also have the advantage of coming in all sizes, from that of a pin-head up to the big ones found in the house.

I used to worry that I might be depriving my garden of a very useful predator, but I don't seem to have made much of a dent in the local population!

Aphids

The bane of the gardener, aphids are very useful indeed to the 'terrariumist'. They constitute a good basic summer food, together with ants and small spiders for small frogs, and are regarded as a treat by lizards up to the size of anoles and swifts.

Aphids are collected most easily by sweeping them into a bowl or mug with a small paint brush. If the infested plant is not a valued one, the affected part can also just be broken off and placed in the tank. As it wilts, the aphids will begin to move away, and so be noticed by the inhabitants.



Among the aquatic insect larvae, Glassworms or Phantom larvae (*Chironomus*) make very good food items for amphibious or aquatic reptiles and amphibians.

Stick Insects

Not usually sold as petfood, stick insects are still often available from the same places. An excellent supplementary food, they are very easy (although slow) to breed. All that is required is a simple container (I use a propagator) with a water jar in which is placed twigs of privet or ivy as a food plant, changed weekly. The adult stick insects eat vast quantities of this, and produce equally vast quantities of droppings and eggs, dropped together on the floor of the container.

The eggs can be removed and placed on damp peat in a plastic box until they hatch. This can take months, so a lot of patience is required. Once the eggs do start to hatch, it is virtually a continuous process, and the young nymphs can be raised to whatever size is required in similar containers to those used for the parents. Many herptiles seem to relish stick insects.

Cockroaches

Often recommended in American terrarium books, these are even worse (or better?) escape-artists than crickets, and are much worse pests in the home.

Although they are excellent food, I can't really advise you to keep or culture them. However, if by some misfortune you already have an infestation, you know what to do with them!

Slugs and Snails

Slugs will be readily eaten by box turtles and most medium-sized frogs and toads, and are a basic food for slowworms. Nothing else seems to like them very much.

Small-to-medium snails will also be taken by frogs, toads and box turtles, and carry a handy supply of calcium in their shells as a bonus. Larger snails are a basic diet item for some of the skinks, and will also be taken by most tegus and monitors.

Terrapins, clawed frogs, newts and axolotls are very fond of crushed water snails.

Aquatic Foods: Mosquito Larvae, Daphnia, etc

Usually bought from aquatic dealers, these can also be collected from your own pond or water butt.

They can be fed to all of the smaller aquatic herptiles, providing a useful change of diet and some exercise, as the animals scramble to catch them.

Fishkeepers are constantly told never to collect wild food from water containing wild (find some use for it!), but any cool place will

fish. I have never seen any herptile catch a disease in this way, but it is probably better to be safe than sorry and not collect food for captive herptiles from ponds that are the homes of native frogs, toads and newts. I never use *Tubifex* worms, under any circumstances; their potential for passing on disease is well known.

Earthworms

This is the 'star' wild food, eaten by virtually every small-to-medium-large herptile. Even my anoles and swifts, which, I would have thought, can't possibly have eaten worms in the wild, take them with every sign of enthusiasm. They are the basic food for my clawed frogs and form a large part of the diet for my bullfrog and giant toad. Garter snakes, DeKay's snakes, box turtles and skinks thrive on them.



Daphnia can be bought, collected or cultured and are suitable for virtually all aquatic herptiles.

Earthworms carry quite a lot of calcium in their guts, and can therefore be a useful supply of this mineral.

After the first of the recent hot summers, when there were no worms to be found within feet of the surface, I started culturing my own. To do this, I filled a large plant tub (wooden boxes can also be used) three-quarters full with good leaf-mouldy soil. A fairly deep layer of old leaves was placed over this, and the whole covered with wire mesh to exclude predators.

I keep this in our outside loo (well, I had to

find some use for it!), but any cool place will do. Every now and then I put some used tea leaves, grass cuttings or fresh greens on the surface as extra food.

The original twenty or so large worms I put in have multiplied dramatically, and I can find worms of all sizes just under the leaves. I still prefer to catch 'wild' worms whenever possible, but this tub is very useful to fall back on when they are scarce.

Other Wild Foods

All sorts of other wild invertebrates can be used as herptile food: caterpillars, earwigs, flying ants, various beetles... the list goes on. No doubt, many herptile keepers will discover their own.

Obviously, rare or endangered species must be avoided, as well as ones with stings, nasty bites or nasty secretions. Apart from that, any small garden should keep an average collection adequately supplied, at least during the summer months.

ODDS AND ENDS Vitamins

Mention has been made at various points of vitamin powders. Use the ones specially developed for reptiles and amphibians; these should contain vitamin D in the form of D3 rather than D2, as is used mostly for mammals and birds. Various brands recently marketed are designed to stick to crickets and other small insects; these are applied by shaking food and powder together in a jar or polythene bag.

Opinion is divided on such dietary supplements. Some people swear by them, but I have to confess that I hardly ever use them, preferring to rely on wild food and as varied a diet as I can manage.

They are probably most useful with the large lizards, snakes and tortoises, particularly juveniles, but overdoses should be avoided as these can lead to a dangerous deposit of mineral salts in the tissues.

Terrapins, tortoises and egg-laying lizards should be supplied with washed pieces of cuttlebone, which they will eat when required.

Ultra-violet

Ultra-violet 'black light' tubes, often recommended in older terrarium books should, in my opinion, never be used. The danger of permanent damage to the eyes is just too great. The necessary UV is supplied much more safely in modern full-spectrum tubes, sold under various brand names.

Terrapins, tortoises and iguanas also benefit from exposure to natural sunlight, if this can be arranged safely. If put into a secure planted garden enclosure on warm days, they will also find a certain amount of wild food for themselves.

Overfeeding

Overfeeding is as much of a problem for herptiles as it is for fish; but for different reasons. Live food (usually) will not cause

pollution problem; in fact, in a terrarium that is not over-populated, any live food that is not eaten at once will probably establish itself and live for some time until finally caught. The problem is that it is too easy for the herptiles to catch their food. In the confines of the terrarium, no prey is going to go too far, and most herptiles soon learn that food will eventually come to them.

This constant food supply, combined with a lack of stress from predators, means that herptiles become fat very easily. This can shorten their lives and reduce breeding success. One enterprising zoo, faced with fat, lethargic giant snakes, hit upon the novel solution of housing them with Galapagos Tortoises. To avoid being trodden on by the tortoises, the snakes were forced to move and so 'run off' some of their fat!

While engaging, this is probably not a practical solution for the average home terrariums, and the best method is to make your herptiles go hungry occasionally. It won't harm them, and it actually makes them more active and more interested when food does reappear. Commonsense should be used, but a few days, or a week or so, without food once in a while is very beneficial. In any case, snakes should not be fed more than once a week.

Feeding Guide

The accompanying table is a rough guide to feeding frequency, which can be varied according to circumstances. In general,

active herptiles require feeding more often than slow-moving ones. Temperature is important; herptiles that are kept too hot, or especially too cold, are reluctant to feed and can have trouble digesting their food.

Where several animals are kept together, one usually emerges as dominant, getting the best hiding or basking places, as well as the best food. Weaker or lower individuals tend to miss out. If this becomes a problem, the best solution may be to have several feeding stations, or even to feed each animal individually with forceps. This has several advantages:

the food taken by each animal can be monitored, a 'fair share' can be given easily, and it ensures that burrowing food animals, mealworms or earthworms for example, don't bury themselves beyond the reach of the herptiles. Most herptiles learn to eat from forceps very quickly.

I hope that my two articles have proved informative to those new to reptile and amphibian keeping, and perhaps inspired some people who have been in the hobby for a while to experiment with a wider range of foods. The benefits can be seen in a very short time, and trust me, your animals will be grateful!

HERPTILE FEEDING TABLE

Small frogs and toads; newly-hatched lizards	Feed every day. Give occasional fast of a day or so.
Larger frogs and toads; small-to-medium lizards; carnivorous terrapins and turtles; newly-hatched snakes	Feed every other day. Give occasional fasts.
Larger lizards; small-to-medium snakes; crocodilians	Feed once a week. Give occasional fasts.
Large snakes	Feed once a fortnight. Give occasional fasts.
'Herbivorous' tortoises, iguanas, etc	Feed fresh, varied vegetable diet every day. Give livefood 'treat' once a week — more often for baby iguanas.



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Coldwater jottings

By Stephen J. Smith



COLDWATER CORRESPONDENCE

I am delighted to see the Jottings desk becoming more immersed than ever with your own responses to these columns, so this month's musings are dedicated to some of the highlights received over recent months. Many thanks for your letters and faxes — do keep them coming. One of the main purposes of *Coldwater Jottings* is to provide a forum for your own views (I wouldn't expect everyone to agree with me all the time!) so do keep in touch with news of your own ventures and activities in this pleasurable pursuit of fishkeeping.

One hobbyist who has done so is Neil Fry who writes from Kell Gill, in Leyburn, North Yorkshire (yes, Neil does explain that his surname really is Fry, that Kell Gill really is his home town, and he also has a friend called Roe — but I'm not sure: after all, this is April!).

Neil has been delighted with the service received from Goldfish supplier H Tisbury and Sons, based in Romford, Essex. Ken wrote to Tisbury in search of good-quality Lionheads, and was surprised to receive a telephone call from the company almost immediately upon receipt of his letter.

"I was impressed that they had taken the time and trouble to telephone and explain my queries, and I am delighted with their service. Thank you H Tisbury and Son."

Neil also explains that he is in a position similar to Fergie Brown in Glasgow (see *Coldwater Jottings*, December '91) in that the Goldfish hobby is, in Neil's words: "not fully catered for in my area, the North-east and North Yorkshire". Neil wonders if readers in his area would be interested in participating in a specialist regional society. Do write with your thoughts, c/o *Coldwater Jottings*, and I will be pleased to pass them on to Neil.



One of hundreds of specialist breeders, whose establishment is on the roof of his house. Specific areas produce certain types of fish: this breeder specialises in red-and-black Orandas.

Reference to Glasgow brings me nicely to another kind letter, from Alan Stewart, who writes in praise of Brian Paterson's business *Aquarium Management* (featured in *Out and About*, A & P December 1991). Alan writes from Ardrishaig in Argyll, on the West Coast of Scotland, and had himself experienced a lack of support for the coldwater hobby in his region; until he read *Aquarist & Pondkeeper*, that is!

"I had thought that there was a lack of down-to-earth, enthusiastic retailers and, having had a disastrous start to the hobby, was delighted to hear about *Aquarium Management* in Glasgow through the pages of *Aquarist & Pondkeeper*. Just at that time, I was speaking with a Chinese restaurant owner about his own aquarium, and he spoke highly of Brian Paterson, who had maintained his set-up and had saved many fish.

"I spoke to Brian a few days later and he travelled to my home — some 90 miles away. He explained so much in a short time and really put us 'back on the rails'!"

Many thanks for your response and your kind comments, Alan. I am delighted that Brian was able to renew your interest in the hobby; his enthusiasm really is most infectious. I look forward to hearing how your interest develops.

News of a major 'Goldfish Quest' brings details from Mick McNulty, proprietor of Star Fisheries in Sutton, Surrey.

Mick kindly faxed me information about a consignment of "tens of thousands" of Fancy

Goldfish which they have imported from China. Explained Mick: "We have been supplying wholesalers for over ten years, and decided to go to China to select the fish personally. Gerald Kelly, manager of Star Fisheries, travelled throughout China and was able to pick out some very good-quality Fancy Goldfish."

Among the varieties which Gerald brought back, and which are apparently proving extremely successful, are Blue and White Orandas, Calico Redcap Dragon-eye and Red and White Egg-fish, in addition to the range of traditional varieties.

I look forward to bringing you details of these in a future *Jottings*. Star Fisheries, 94a Benhill Road, Sutton, Surrey SM1 3RX. (Tel: 081-643 8162; Fax: 081-643 8166).

NOTE TO SOCIETY SECRETARIES

Don't forget — if you don't let me know, I'm not necessarily going to know. So whether you are secretary of a specialist coldwater or tropical fish society with a coldwater section, or are a member of such societies, do let me know of your forthcoming or recent activities.

Please address all correspondence to me at *Coldwater Jottings*, *Aquarist* and *Pondkeeper*, 9 Tufton Street, Ashford, Kent TN23 1QN. (Please include a stamped self-addressed envelope if you require a reply.)



The roots of the Goldfish hobby: this spectacular vista was taken at a Goldfish farm in mid-China, where breeders specialise in producing high-quality Common Goldfish.

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What's your opinion?

Billy Whiteside,
BA, ACP



FISH SHOWS AND WHISKY

In the January issue I included a letter from Dawn Watkins about her visit to an aquarium show at Perth, in Scotland. Several other readers were not too pleased at Dawn's comments.

Andy Muir is Group Secretary of the Fife B.K.A. Society and lives at 13 Abbotsford Drive, Glenrothes, Fife, Scotland. He says: "I am writing to you concerning Dawn Watkins' item in the January W.Y.O. with her comments about distressed fish that were on display at the Scottish Aquarist Festival held at Perth City Hall last year.

"I would like to say that I was personally involved at this venue in which my own group, the Fife Society of the B.K.A., had a tableau on display, and at no time were any of the killies on show under any type of stress or strain — to the point where many of the fish were spawning. Yes, a large number of fish will shed their eggs if under shock; but in the case of the killies on display, both males and females were partaking in the spawning rituals.

"Many of the other societies involved, i.e. S.L.A.G. (Scottish), Perth Society etc, at no time had any fish with any disease showing. At this event, many of the aquarists who put fish on show spent as much as 15 hours' time caring for their fish. Indeed, there were only four fish lost out of a total of 500 — approximately.

"If the lady in question had felt that things were not right, or if she saw any fish in distress, I'm sure prompt action would

have been taken. All I can say, Billy, is that I do hope the lady enjoyed her holiday and that she will come back very soon. I suggest she stays off the Old Grouse whisky! It certainly does not agree with everyone."

FISH FOOD VIEWS

My next correspondent is a Scottish lady who lives in Edinburgh. She has asked me not to publish her name and address so I'll call her only Carol.

Carol ends her letter with the PS: "My sympathies re your 'Roasting' and 'Scottish complainer' letters. I do correspondence tuition and know how small-minded and humourless some people are."

Carol is new to fishkeeping and writes: "In December 1991 you asked for views on fish foods. As the proud owner of a three-month-old coldwater community aquarium, here are my findings:

① Ants' eggs were a horrible mistake! I bought a small tub from a dealer. They remained uneaten and became covered in a fungus. I mistook these odd fuzzy floaters for pathogens! Result? I netted the little blighters out and poured boiling water over them for days!

② Goldfish flakes? Fine. Ditto goldfish granules and dried *Daphnia*. One shop sold me tropical flake. When I took it back unopened, they tried to argue it was just as suitable. What do you think? I insisted on a refund as some sources suggest tropical food has a higher protein level, less easily digested by goldfish.

③ One of the several books I purchased made out I was all but criminal if I didn't feed live foods. I've been giving my fish chicken, cod roe, prawn or white fish as substitutes for live food every third meal, i.e. a flake, then a dried *Daphnia* meal on day one; a meat then a granules meal on day two.

"Anyway, I bought live brine shrimp for my main tank, and live *Daphnia* for my isolation tank. The shop made out that rinsing them in my net was optional. I know better now.

Result? The Ryukin in the main tank developed fin rot the next day; cured, thankfully, with a patent medicine.

④ One source suggested hanging a piece of white meat into the water on a thread for 30 minutes at a time. The success of this must depend on the confidence level of your fish!

"My shy Moor would approach with great trepidation, then swim away again. The Ryukin, a voracious eater, ate from it warily. My new Sarasa Comet wouldn't go near it at all. When I crumbled pieces of the same meat so that it sank to the gravel floor, all the fish ate enthusiastically.

⑤ Other findings are that carrot and lettuce aren't highly regarded. I believe boiled spinach leaves are, but haven't been able to find any yet. Popeye, where are you?

"I hope all this isn't too banal. If you have any advice on feeding a coldwater Apple Snail I'd be delighted to read it. Should I weigh the food down with plant weights so that the

snail is assured of finding it when it makes irregular treks across the gravel? The problem is, it favours the tank sides, and most food floats.

"This is the first time I've read *A & P* — but it won't be the last."

PLANT MOAN AND WATER LILIES

Harry Hooper is a reader who has been growing and collecting water lilies for some years and he feels this makes him somewhat biased when he passes an opinion about this beautiful group of plants. As Harry's letter is headed Mill Lane Nursery and Water Gardens, Mill Lane, Bradfield, Manningtree, Essex, we must assume he knows his subject.

He writes: "From my experience, a large majority of retail outlets offering aquatic plants do not provide enough advice to the customer, i.e. planting instructions, use of fertiliser, correct names of plants, and enough guidance on the best choice of plants to suit the pond in question.



With a little appropriate advice at the outset, water lilies can be very successfully and easily cultivated.



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"I find the aquatic trade in general seems to put the importance of plants last when giving advice to the public on the subject of 'water gardening' — for example, how the plants play a major role in assisting the natural biological balance of a pond. With the vast assortment of books and other forms of literature easily available that refer to all types of aquatic plants, a retailer should have adequate knowledge when it comes to selling water plants — especially water lilies.

"To my amazement, pond owners are normally dedicated gardeners and can name and care for most of the plants in their garden — from shrubs and conifers, to herbaceous plants and annuals. However, when it comes to water gardening, they just don't know enough about cultivating aquatic plants. This could stem from insufficient knowledge at the garden centre or nursery from which they purchased the pond plants.

"Now I've had my moan, I will change the subject to the cultivation of *Nymphaea*. Water lilies have been produced commercially for years, offering enthusiasts an extremely wide

selection of cultivars from which to choose. Many of the beautiful water lilies available today must be attributed to the Frenchman Joseph Latour Marliac who, from the mid-1880s until his death in 1911, produced some truly outstanding varieties. Due to his devotion over many years spent hybridising hardy water lilies, he was probably the pioneer in the field of water lily culture. There are other water lily breeders who are worthy of credit: they include Lagrange, Dreer, Richardson and Thomas; but unfortunately, they did not have Marliac's methods or secrets.

Growing Interest

"With the growing interest in water lilies, we are fortunate to have several enthusiasts developing new varieties each year. From Germany, USA, and here in the UK, some of the more-recently developed cultivars have larger blooms with better shades of colour and more perfume. The International Waterlily Society will be holding its next annual Symposium in Houston, Texas, in August

1992, and it is expected that many brand new varieties will be on show. There is a rumour that possibly a 'blue' hardy will be unveiled. [See *News from the Societies in the March '92* issue of *A & P* for details of the I.W.S. Ed].

"Occasionally, some gardeners enjoy experimenting with different types of plants; so why not try 'tropical lilies'? There are numerous varieties that produce the most exquisite blooms in some of the most beautiful shades of colour — including blue. Most tropicals hold their flowers well above the water surface; also, the foliage is very attractive. Some tropical varieties open their flowers at night — the so-called 'night-bloomers'.

Tropical lilies are fairly easy to grow; ideally, in a warm greenhouse or conservatory with plenty of sunlight. The best planting medium is a rich, loamy soil with an aquarium heater used to keep the water temperature high enough at night. Tropical lilies are fairly expensive in general, but you could start with *Nymphaea stellata* or *Nymphaea coerulea*, or the nice little yellow semi-tropical

lily *Nymphaea mexicana*. This last plant, unlike most lilies, produces new plants from the rhizome or tuber; but, obviously, the tropical hybrid varieties are the best to grow for their beauty and elegance.

"There must be hundreds of your readers interested in water lilies and other aquatic plants, but they may well be unaware of the existence of the International Waterlily Society. As the UK Branch Secretary I would be only too happy to forward details should anyone wish to join the Society."

My photograph shows a beautiful pink water lily flower in a pond at Carnfunnock Country Park, in County Antrim.

For next time, please send me your opinions on: (a) growing water lilies in your garden pond; (b) water changes in aquaria; (c) breeding Angels; (d) aquarium shows; (e) aquarium clubs in your locality; (f) mail order suppliers of aquarium plants; and (g) starting with marines. I look forward to receiving your letters.

What's Your Opinion? will reach its 25th birthday next month, so I hope you'll drop me a line to mark its Silver Jubilee.



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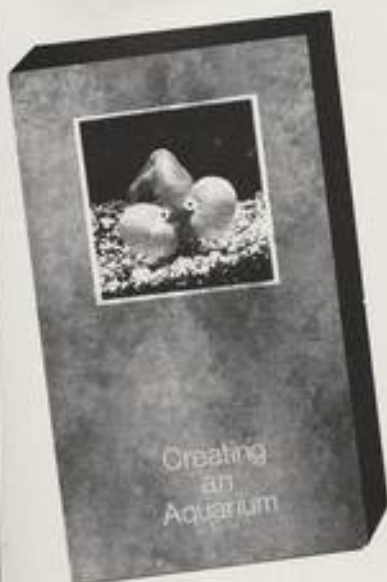
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Creating an Aquarium



A comprehensive source of information for beginners and experienced aquarists alike, this video is also a source of pleasure for anyone fascinated by underwater life.

Written by the Aquarist & Pondkeeper's editor, John Dawes, it draws on the highest level of expertise. Step by step guidance covers all aspects of setting up and keeping three types of aquaria: marine, tropical and coldwater. In addition the video takes us through breeding and selecting fish, choosing tanks and equipment, stocking aquaria with fish, plants and decorations, fish health, feeding and aquarium management.

A joyful experience simply to watch, the video includes stunning sequences shot amidst the colourful world of coral reefs and at the heart of the Amazon. Fine examples of other hobbyists' aquaria are also included. Over 50 minutes of instruction covers all aspects of creating an aquarium, from setting up tanks and stocking levels, to fish health and breeding.

Price (incl postage) £15.99

Order by phoning 0233 621877 giving Access or Visa card details, or write to: Video Offer, Aquarist & Pondkeeper, 9 Tufton Street, Ashford, Kent TN23 1QN. (Allow 28 days for delivery.)

OUT AND ABOUT

WINDSOR'S WINNING WAYS

By John Dawes

Photographs by the author

If someone asks you what the most important limiting factor with regard to stocking levels in aquaria is, the chances are that you'll pick out surface area. Like almost everybody else, I, too, have done this more times than I care to remember.

When you stop and think about it, though, it is not really surface area *per se* that controls stocking levels, but other factors, such as (of course) the amount of dissolved oxygen in the water.

True, surface area does have a direct bearing on oxygen levels, but only in the sense that it is the surface area *made available* to oxygen molecules that plays the key role. Consequently, a large tank with no surface turbulence or aeration can very easily end up being able to accommodate only a fraction of the stock that a smaller, well-filtered, well-aerated aquarium can.

Now, before you start wondering what on earth all this has to do with an *Out & About* feature, let me assure you that, in the case of Windsor Aquarist, it is extremely relevant. You see, some of the aquaria which David Macpherson specialises in could hardly be called 'conventional'.

A man with an excitingly creative approach to aquatics, David has developed a range of highly original aquaria which gives Windsor Aquarist a dimension that no other shop I know possesses.

Take the 'Living Picture' aquarium for a start. It measures some 28 inches in height and nearly 24 inches in width (c. 70 x 60cm). Not bad, one could say, as long as lighting is of a sufficient quality to penetrate down to gravel level. However, look at this 'picture' from the side, and the first *real* surprise will hit you. It's only about 6in (15cm) from front to back!

Then take a look at the inhabitants — marine invertebrates and coral fishes, including three Seahorses (one of

them heavily pregnant at the time of my visit), and the questions immediately start falling over each other in their urge to be answered.

How could such a system conceivably be viable? The answer, of course, lies in the way the environment is controlled. Lighting levels (by means of Triton tubes, plus an additional spot directed towards the lower levels), water purity... and, most importantly, oxygen levels, are all very evidently and very expertly being kept very much under control.

Bold, brightly-coloured, feeding, active fish, plus wide-open anemones and Mushroom Polyps, coupled with crystal-clear water, and all other manner of indisputable 'indicators', prove that such a system *can* indeed be maintained perfectly adequately, albeit only by aquarists who, like David, really know what they are doing.

David Macpherson has other 'special aquaria' on show, all with their full complements of fish and plants (*real* plants), ranging from Table Lamp aquaria (one housing an octopus), to a coldwater Treasure Chest system and an old-style Gramophone aquarium.

Away from these out-of-the-ordinary set-ups, one thing that really delighted me was the sight of the beautifully furnished aquaria from which David and his staff, consisting of his wife, Caroline, and Steve Gadsby and Carl Bees, sell their fish. No bare tanks here — far from it. Every tank in the shop could just as easily be in someone's front room. Nice one, David!

Add to this a comprehensive selection of dry goods, some rarely-seen fish (such as Lyretail Chocolate Mollies), plus a brand-new coldwater/pond/water garden department which should be up and running by the time this article goes to press, and you'll see why I would warmly recommend a visit to Windsor Aquarist.



At Windsor Aquarist, the tropical freshwater fish are sold from tastefully furnished aquaria that would not — individually — look out of place in one's own living room.



An aquarium with a very significant difference... or two... David Macpherson's 'Living Picture' system.



A treasure chest of coldwater 'Fancy Jewels'.



Windsor Aquarist's thriving 'Living Lamp' community of freshwater tropical fish and plants.



A genuine 'find' — a Lyretail Chocolate Molly. These fish will, no doubt, have been sold by the time we go to press... but there will be others.

Opening hours: 9.00 am to 6.00 pm seven days a week. Further details from: David Macpherson, Windsor Aquarist, Country Gardens, Dedworth Road, Windsor, Berks, SL4 4LH. Tel: 0753 832281.

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PRODUCT ROUND-UP

BY DICK MILLS

Independence (UK) Ltd

Getting your fish off to a good start is often the difference between persevering with the hobby and packing it in!

DOC WELLFISH'S AQUARIUM STARTER KIT helps you do just that by providing a two-pack kit first to condition the water, and then to protect your fish.

AMMO-LOCK detoxifies chlorine and chloramine and locks up ammonia and prevents it harming aquatic life. STRESS-LOCK contains the healing agent Aloe Vera (no, not a greeting to the Street's favourite busybody!) which protects and heals by acting as a liquid bandage to form a syn-



Latest Starter Kits from 'Dr Wellfish' — distributed by Independence.

thetic slime, replacing any natural slime lost during transportation or handling.

Just one teaspoonful of each product will treat 10 gallons (this may be American gallons

— so be sure to check). Starter kits are available in 1oz (c 28g) and 4oz (113.4g) sizes.

CHEMI-ZORB is a breakthrough in water filtration technology. A combination of two research-grade organic scavenger resins, two pharmaceutical-grade ion-exchange resins and high-porosity, phosphate-free carbon adsorbents, it removes synthetic and naturally-occurring pollutants and stress-causing metabolic byproducts in fresh and saltwater aquariums. Available as a 10oz (283.5g) pouch, it is easily used in any canister filter etc.

Details from: INDEPENDENCE (UK) LTD, Units 9 & 10, Lady Ann Mills, Lady Ann Road, Batley, W Yorkshire WF17 0PS (Tel: 0924 422644; Fax: 0924 422652).

Cyprio

If you think you've got it easy, spare a thought for pond pump designers.

To operate an external filter properly, all the dirt should be pumped out of the pond with the waterflow. Enter the pump's first line of defence against blockage by dirt — the pump strainer. Do away with the strainer and the pump's internal waterways must be large enough to cope with sizeable chunks of **** (I'm not having that sort of language in my magazine! Ed. I don't know what you

mean. I was going to say mud! DM), but this brings in larger electricity bills.

However, those clever people at CYPRIO have come up with a range of pumps which fit the requirements without breaking the bank (can you cost your time anyway for constant cleaning out of those strainers?). Depending on model, the DOC range of pumps can shift from 1,350 gph (c 6,150 litres) at 2m (c 6.6ft) head to 3,000 gph (c 13,600 litres) at 3.5m (c 11.5 ft). All are of non-clog design, manufactured in stainless steel, with

hardened stainless steel shaft, plus bottom-bearing protection for longer life.

Matched optional accessories include a Universal Discharge Adaptor to fit hoses of 20/25/32/40mm (c 0.8/1.0/1.26/1.6in) diameter, Vertical Base Plate Adaptor for vacuuming or connection to undergravel filters and Horizontal Venturi. DOC-VAC is also available with strainer pot to special order, excluding pump.

The company's move to stainless steel is completed by the introduction of the new VACMASTER PACKAGE.

Powered by the JES5 stainless steel pump coupled to the heavy duty CYPRIVAK Strainer Pot the unit shifts up to 7000gph (c 3,180 litres) and comes with cable, carrying handle, on/off switch, telescopic 4-8ft (1.2-2.4m) aluminium pole, heavy duty vac head and 10m (c 33ft) heavy duty 1.25in (3.2cm) hose.

Send £150 for full Product Portfolio, or write for details to: CYPRIO LTD, Eastgate Mews, 131-133 Eastgate, Deeping St James, Peterborough PE6 8RB (Tel: 0778 344502; Fax: 0778 348093).

Aqua-Soil

Are you definitely sure that your pond plants will be receiving adequate fertilisers for the next 6-8 months? If not, then AQUA-BOOST from AQUA-SOIL is what you should be looking out for.

Aqua-Boost is supplied in a thimble-shaped pod, the pod being made up of a slow-release fertiliser contained in small, seed-like, shells bonded with a dissolvable organic coating. A combination of a rise in temperature and moisture dissolves the coating over a period of 6-8 months, thus continually feeding the plant. It is not coinci-

dental that the rise in temperature affecting releases matches the extra needs of the plant for food.

The pods are simply pushed into the soil around the plant, and can be used at any time of the year — even overwintering with the plant ready for next spring if necessary. A box of 20 Aqua-Boost pods costs £3.95.

A leaflet on both Aqua-Soil and Aqua-Boost is available from: AQUA-SOIL PRODUCTS LTD, Blue Waters Estate, Bovey Tracy, Devon TQ13 9YF (Tel: 0626 835135).

Fertiliser in 'pods', courtesy of Aqua-Soil.



Remanoid

Encouraging wildlife into the garden stands a greater chance of success if there's a good source of water.

Naturally, a pond suits this requirement down to the

ground, and for nearly instant success try using **REMANOID'S HIGH-LASTIC** or **FLEXIPOND** liners. Both are UV stabilised and don't contain softening agents which might be harmful to water, aquatic life or even the atmosphere (during

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Both liners carry long (10-year) guarantees and can be bought pre-packed in popular sizes (or cut to length in the case of High-Lastic), or in handy pre-packs (Flexipond).

Full details of all Remanoid

pools and associated equipment, and **FREE COPY** of the Remanoid Pond Care Guide, from: **REMANOID LTD, Unit 44, Number One Industrial Estate, Medomsley Road, Consett, County Durham DH8 6SZ (Tel: 0207 591089).**

Interpet

Mention serendipity at **INTERPET** and they won't mind a bit. In fact, they're only too pleased to acknowledge that a chance encounter between two harmless chemicals led to the development and more than

successful marketing of **POND BALANCE**, the revolutionary remedy for blanketweed.

The easy-to-use granular format has no harmful effects upon any other plant life so pondkeepers' nightmares could be a thing of the past. Working by adjusting the water chemistry, Pond Balance is equally

effective in the ultra-clear water conditions of Koi ponds and in ponds with a silt-covered floor.

However, the biggest resistance encountered to the new product was that the would-be purchasers simply didn't believe it would work! Having proved that it does, Interpet have now produced a larger pack size.

As we are now entering 'green-water' time, don't overlook **GREENAWAY**, Interpet's other environment-friendly remedy for water-borne algae.

Details from: **INTERPET LTD, Vincent Lane, Dorking, Surrey RH4 3YX (Tel: 0306 881033; Fax: 0306 885009).**

PRODUCT LAUNCH

Here's one for marine lovers — what's the connection between a seawater mollusc, one's libido and **C J Skilton**? The snappy one-word answer is oysters! Putting them all together involved a new filtration plant, a bed of oysters and a trip to Whitstable for a practical demonstration.

As neither our editor nor yours truly could get away (or maybe our other halves wouldn't trust us to survive such a dangerous combination — fish are bad enough, but aphrodisiacs as well?) we sent along Peter Furze, the **FBAS's Fishworld** magazine editor, to winkle out the secrets. Here is his report:

"Wednesday, 6 February 1992, in the Kent coastal town of Whitstable, saw the launching of the **AQUASKIL MOLLUSC PURIFICATION UNIT** at the historic (established in 1896 no less!) Whitstable Oyster Fishery Company. The unit has been designed by **CHRIS SKILTON** to meet the new EC Directives which come into force in 1993; this will require bivalve molluscs to be held in a sterilised medium for a period of 42 hours before they are released for sale.

"The life story of the oyster is an undemanding one: once the young oyster is planted on the seabed, it stays there, happily filtering out its natural food from the surrounding seawater and requiring neither artificial feeding, fertilisers nor pesticides; all it needs is a high level

of water quality if it is to grow satisfactorily.

"When mature, oysters not only taste good, but are good for you as well — lots of vitamins, proteins, hardly any calories and, throughout history, they've been thought to work wonders on your fading sex life!

"Although once only eaten when the month had an 'R' in it, by providing a uniformly cool environment throughout the summer months (non 'R' months when the oyster would normally be spawning) has enabled oysters to appear on the menu all year round. The Purification Unit enables this kind of environment to be maintained at a running cost comparable with that of a 100 watt light bulb.



The 2,000-oyster capacity **Aquaskil Mollusc Purification Unit** installed at Whitstable Oyster Fishery.



Chris Skilton's new Titanium Cooler Unit could prove a boon to large-scale native marine units. Will a small-scale 'aquarium' system follow?

"The unit installed at Whitstable held 16 trays in 8 tiers, each tray holding 125 oysters, making a total capacity of 2,000 oysters. The 650-litre (143-gal) reservoir is made of extra-strong, food-grade High-Density Polyethylene. Seawater is pumped up to the top of the unit at a rate of between 2-22 litres/minute (0.4-4.8gal/min), passes through the UV unit where it is sterilised, and trickles down via a spraybar over the trays and back to the reservoir for recycling once more. The reservoir filter unscrews for easy cleaning and this also allows blanking off during pump maintenance.

"The UV steriliser is a high-performance miniaturised unit built specifically for the Aquaskil system. Because of the close

proximity design, the body is made from specially-formulated plastic with ultra-low toxicity levels so that there is zero metal leaching from the polymer. An electronic starter switch ensures maximum efficiency from the tube during its six months' life.

"Although the minimum temperature range of various molluscs (Native Oysters, Pacific Oysters, Hard Clams, Mussels, etc) can be decreased by around 2°C (c 3.6°F) — but the natural filter-feeding capacity may decrease) the recommended maximum temperatures must never be exceeded, otherwise spawning will occur and the food will deteriorate. Optimum purification temperatures lie between 10 and 15°C (50 and 59°F).

You may be wondering why the Cackle is missing from the list of species: this is because, although it is farmed in a similar fashion, it is cooked immediately after harvesting.

"Chris Skilton is also testing a new cooler made from titanium (resistant to saltwater corrosion) which should prove a boon during hot summer months to aquatic establishments keeping native marines.

"Finally, although everything is 'high-tech' these days, I was heartened to see that old technology habits still survive: the Purification Unit, for example, is housed in a cellar. To 'prepare' the water for use, the next-door cellar is allowed to fill with seawater at high tide and, after the water is allowed to stand to let the sand settle out from it, it is ready to use through a simple valve system."

Peter Furze

Dow Corning Hansil

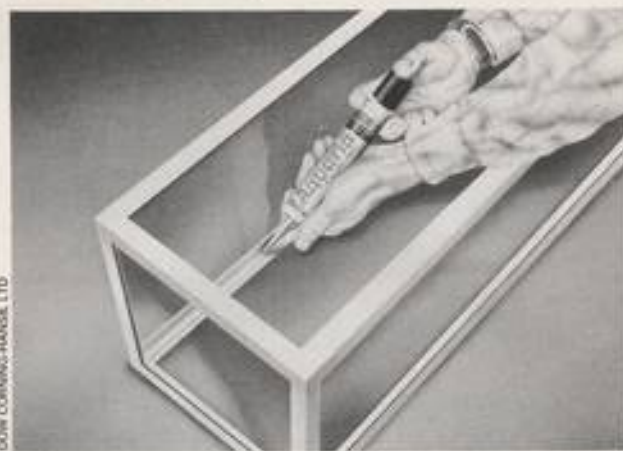
We tend to take things for granted these days, especially old favourites which have become household names yet which go on quietly providing excellent service.

With many look-alikes around (and some very dangerous — to fishes — non-suitable substitutes) one tends to forget originals like **DOW CORNING**, the pioneers of glass-bonding adhesives. Dow Corning **AQUARIA** clear silicone rubber sealant, not only serves as an adhesive when making all-glass tanks, but it can be used for all manner of aquarium-associated purposes too: sealing connectors, mounting ganged air-valves, attaching

hinged lids to show tanks, etc. Available in three sizes: 78g injector-cartridge, economy

310ml cartridge and in a 25g Repair Sealer tube. Stockists details are available from: **DOW**

CORNING HANSIL LTD, Wintersells Road, Byfleet, Surrey KT14 7LH (Tel: 0932 351911).



Dow Corning Aquaria is a clear silicone rubber sealant for the construction of glass aquaria, with or without metal frames. It is also suitable for applying fixtures inside or outside the tank, mounting valves and sealing connections.

Tahiti Aquariums

MARINA AQUARIUMS, the popular de luxe range of aquariums, hoods and stands from **TAHITI**, have a new look for 1992. The new range of hood

design replaces the more expensive fluorescent type previously available.

The new **MARINELANDER HOOD**, specifically designed to fit the Marina aquarium, is finished in dark brown textured plastic and can be fitted with one or two tubes and has storage

space for Hagen or Arcadia choke units; it also has a sealed condensation barrier and a removable aquarium access lid.

The lower price, plus the ability to hold two tubes, is looked upon as a distinct sales advantage for 1992 by the company. Marinelander Hoods are

available in 24, 30, 36 and 48in (60, 75, 90 and 120cm) sizes.

Details from: **TAHITI AQUARIUMS**, Aquarius Centre, Queen's Road, Hurst Cross, Ashton-under-Lyne, Lancs, OL6 8EW (Tel: 061 339 3131; Fax: 061 343 4439).

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CONTROL UNIT FOR FLUORESCENT TUBES



Adding fluorescent lighting to your aquarium has now been made easier with the introduction of Interpet's new Convertagear Fluorescent Tube Control Unit.

The compact Convertagear has its own on/off switch and comes with 2 metre tube leads to give you maximum flexibility in positioning. The Interpet Convertagear which is supplied complete with tube clips, will fit all fluorescent tubes and is designed for both 26mm (1") and 38mm (1.5") diameter tubes.

So with an Interpet Convertagear you have no excuse not to view your fish in a better light.



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SPONGES — THE TRUE SURVIVORS

Peter Bienias, of Aquatic Design, takes a look at these primitive, but adaptable and interesting invertebrates.

Illustrations by the author

Ask the 'person in the street', what the word "sponge" means to them and the answer would probably be, "It's something to wash the car with on Sundays", or "It's something soft and gentle that I use at bathtime." Funnily enough, to the marine hobbyist, the second statement means more than the first. It's not because all hobbyists own dirty cars, or that they prefer the natural texture on their well-kept skin. No, it's because the second statement refers to the animal and not a polyurethane or polyether substitute.

There is a great deal of 'history' surrounding the animals that occupy the reefs and seas of today, and few have a longer history than the sponge. Fossils have been found as far back as the Precambrian Period (650 million years ago). This means that sponges were among the very first multi-celled animals.

At this time, along with the solid skeletons of calcium carbonate, sponges formed the backbone of the ancient 'reefs'. Today, their role as 'reef builders' has been taken over by the corals, although they do still play a part in reef construction, helping to form what we hobbyists know as living rock.

This is done by some sponges burrowing into existing rockwork in their competition for territory. The dust created through their burrowing activity is dispersed into the water, and is then carried away by tidal movement and storms, along with the coral skeletons that have also been weakened by this burrowing 'action'. This debris is then deposited in lagoons, to make up reef islands, or it fills in holes to consolidate the existing reef. Although this is a continuous process, it takes a long time for its effect to be noticed.

ADAPTABILITY

Sponges are extremely adaptable animals, living in a depth range of from a few feet/metres down to nearly 3 miles (2-5,400 metres), and with a variety of shapes and forms that allow them to survive in many different environments.

This adaptability shows that the sponge will thrive almost anywhere, even on other animals. However, it does have its limitations. If a sponge has been taken from deep waters, it is normally a red or orange colour, but if it is put under normal lighting conditions in a reef aquarium, it will slowly begin to deteriorate. This deterioration is due to incorrect lighting, for, once a sponge has its lighting environment altered, its powers of adaptability very soon disappear.

There are three ways around this problem: the first is to protect the sponge from the direct light source; the second is to purchase a different and more appropriate species; and the third — which is probably the least impractical but will solve a lot of selection problems if considered at the start — is to buy a very deep aquarium in excess of 24 inches (60cm). It will also give greater environmental stability and the hobbyist will certainly benefit from the results.

FILTRATION AT ITS BEST

All the designers of commercial filtration equipment would appreciate sponges, since they are among the most efficient filters, relevant to size, in the world. A sponge the



Two branching Dictyoceratid sponges.



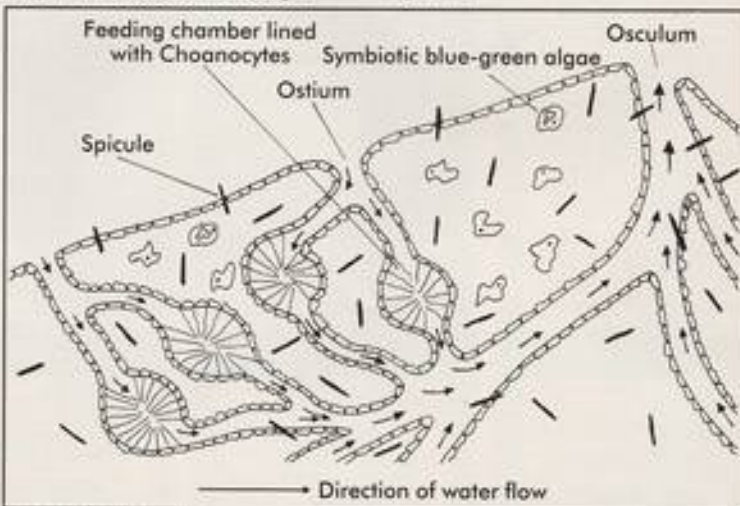
Attractive, and healthy. Cup Sponges (*Haliciona*) in one of my aquaria.

size of a tennis ball has the ability to filter 5,000 litres of water a day (1,100 gallons)! This process is achieved by the water being propelled through the feeding chambers by tiny whiplike cells called *choanocytes*.

Basically, a sponge consists of: *spicules* which act as a skeleton or structural support, and are made from glass-like silica or limestone; *ostia* (singular, *ostium*) — these are holes or pores through which the water passes into the animal; and *oscula* (singular, *osculum*) through which the water passes out.

Because of this need for water circulation through its structure, a sponge constructs and adapts its body according to the amount of water movement outside its body. Therefore, this must, clearly, be taken into consideration, along with all the other points discussed in this article, if we wish to keep sponges successfully in our aquaria.

As with all other living creatures, sponges need their requirements to be catered for to the letter, and, given proper surroundings, they will live for years. After all, something that has survived for millions of years on this planet shouldn't die within six months in an aquarium.



Cross sectional view of a sponge.

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Halifax Aquarist Society

The Spring Auction of the Halifax Aquarist Society will be held on **Sunday 5 April** at Forest Cottage Community Centre, Cousin Lane, Ovenden, Halifax. Booking in: from 12 noon. Auction: 1.15 pm. Further details from David Shields on 0422 360116.

Halton Aquarist Society

The H.A.S. is holding its 1992 Open Show and Auction on **5 April** at a new venue: Ditton Community Centre, Dundalk Road, Widnes. Benching: 11.30 am to 1 pm. Judging: 1.15 pm. For further details, contact Ted Derrick on 051 423 3896.

West Cornwall Fishkeepers

W.C.F. will be holding an Exhibition and Open Day on **5 April** at Camborne Community School.

This will take the form of a display of a large number of specially designed stands of fish species tanks in the main hall, along with trade stands, specialist clubs and association stands, and special interest and information displays, supported by specialists and experts to offer advice and information, along with continuous fishkeeping videos showing throughout the day.

A series of selected fishkeeping talks will take place in the adjacent lecture theatre, presented by both guests and resident speakers. The topics will range from a beginners' guide, through to in-depth species discussions.

For further information, contact the Secretary, Bob Williams, Parc Cottage, Park Lane, Camborne. Tel: 0209 717971.

Hull Aquarist Society

The 27th Open show of Hull A.S. will be held on **26 April** at the South Idunsly School, Mel-

ton. Full details from the Secretary, K F Taylor, 12 Southburn Avenue, Springbank West, Hull HU5 5BB.

Ilford and District Aquarist's & Pondkeepers' Society

Ilford & D.A. & P.S., in association with the Federation of British Aquatic Societies, are holding their annual Aquatic Convention — sponsored by Aquarian — on **Saturday 25 April**. Venue: Woodford High School for Girls, High Road, Woodford Green, Essex. Times: 11 am-5 pm. Tickets: at the door, or £1 (in advance).

There will be trade stands, sales stalls, an auction, fish, aquarium and pond, plants, raffles, bring-and-buy tables (all subject to confirmation), plus lectures from two eminent speakers.

For further details, phone 0708 748946, 081 550 1252 or 081 529 7173.

Merthyr Aquarists' Society

The 1992 M.A.S. Open Show will take place on **Sunday 26 April**. Full details are available from the Secretary, Maynard Jones, 5 Trevor Close, Pant, Dowlais, Merthyr Tydfil, Mid Glam CF48 2BG. Tel: 0685 89837.

The Merthyr committee would like to extend a vote of thanks to all the exhibitors and judges who made their last show such a success and look forward to seeing them again on 26 April.

Southend, Leigh & District Aquarist Society

This year's S.L.A.D.A.S. Open Show will be held on **2 May** at St Clements Hall, Leigh-on-Sea, Essex. Trophies and other prizes will be awarded for 1st to 4th places in each class.

Further details from the

Show Secretary, Chris Chestwright, 2 Cedar Avenue, Wickford, Essex SS12 9DT.

Swindon Aquarist Society

The 10th Open Show of Swindon A.S. will take place on **Sunday 3 May** at the new venue of Upper Shaw Community Centre. Booking in: 9 am-12 noon. Schedules from Kevin Curtis: 0793 728194, Chris Lawton: 0793 616394 or Jean Perrett: 0793 814616. For further details of S.A.S. and its activities, contact Jean Perrett, Advertising Manager, 38 Coronation Road, Wroughton, Swindon, Wilts SN4 9AS.

C.A.S.T. 88

The 3rd C.A.S.T. 88 Annual Show will take place on **Sunday 3 May** at the Boys' Brigade Hall, Castle Street, Caergwrle, Wrexham, Clwyd. Benching: 11 am to 12.45 pm. Judging: from 1 pm prompt. Full details from Peter Jones, 1 Hope Street, Caergwrle, Wrexham, Clwyd LL12 9AA. Tel: 0978 761829.

Stafford Aquatic Society

The Stafford Aquatic Society is to hold its 6th Open Show on **Sunday 3 May**. Venue: The Universal Grinding Wheel Company Ltd., Canteen and Social Club, Dosey Road, Stafford. Doors open: 10 am. Further details available from the Secretary, Larry Lainton, on 0785 44406 (evenings only).

The Merseyside Koi-Keepers' Society

The M.K.-K.S. will be holding a two-day show on **Saturday and Sunday, 9-10 May** on farmland at the junction of the A49 and the A533, with easy access just five minutes from the M56 motorway.

There will be many attractions, mostly with a Koi-related theme, the aim being to attract, both families with Koi-keeping experience, and potential newcomers. For full details, contact Keith Allen, Show Chairman, 45 Armscot Close, Hunts Cross, Liverpool L25 0NX. Tel: 051 486 6394 or 051 424 8879.

Canadian Association of Aquarium Clubs

The 33rd Annual C.A.O.A.C. Convention — dubbed the Great Wet North C.A.O.A.C. 1992 Convention — will be held between **15-18 May** at the Westwood Inn, 18035 Stony Plain Road, Edmonton, Alberta, Canada T5S 1B2.

Speakers, auctions, a banquet and an aquatic tour, have all been booked for this large and important gathering hosted by the Aquarium Club of Edmonton, the Northern Manitoba Tropical Fish Society and the Regina Aquarium Society.

For full details, contact Ken Ealey, 7731 38A Avenue, Edmonton, Alberta, Canada T6K 3E4. Tel: 403 461 9872.



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The firms listed are wholesalers or retailers of both in fishes, tanks, plants, appliances and accessories, reptiles and amphibians. Abbreviations: W Wholesale only. R Retail only. WR Wholesale and retail. C Coldwater. T Tropical. M Marine. P Plants. AA Appliances and accessories. B Books. R & A Reptiles and amphibians. ECD Early closing day.

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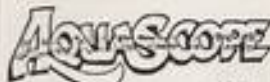
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NEXT MONTH

Koi come under our spotlight next month in our special Focus issue on these outstanding fish.

In addition to our regular contributions, such as *Koi Talk* and *Koi Calendar*, *John Cuvetier* and *David Twigg*, our Koi keeping expert, will each be providing us with a major feature.



- In *John's* case, he'll be concentrating on the water quality side of things, including the value of *vegetable filters* in Koi keeping.
 - As the number of queries we get from pond owners who want to convert their set-up to Koi keeping continues to increase, *David* will be looking at how you can achieve the *Changeover From Garden Pond to Koi Pool*.
 - *Peter Skinner* of Koi Kraft, will be asking the question: *Are You Well Connected?* No, it's got nothing to do with whom you know in high places, but with a much more important matter, like ensuring that you install the plumbing system for your Koi pool as it should be done.
 - Rounding off the major commissioned *Focus on Koi* features, *Nigel Caddock* of Nishikigoi International, will be chipping in with one of his colourful, expert, occasional contributions.
- And that's not all. *John Dawes* paid a visit to *Kedington Koi*, a newish, smallish Koi outlet with fish of tremendous quality. We have his report, as well as his review of the latest Koi book from Tetra's *Dr David Pool*.
- Turning to 'non-Koi' matters, our editorial package is as varied as ever.
- *Gordon Churchill* provides an interesting insight into fishkeeping in the land of glaciers and geysers, *Iceland*.
 - *Pat and Derek Lambert* go hunting for livebearers and killies in *Jamaica*.
 - *Linda Lewis* goes back to basics and advises on keeping and breeding *Platies*.
 - *Max Gibbs* rounds off his spectacular review of *Pygmy Angels*.



After a hugely successful run spanning 40 issues of *A & P*, we say goodbye to our series of **FREE** giant full-colour posters with another superb picture from *Max Gibbs*.

Then, there are our regulars, news, views, reports, show dates, letters, books, videos... you name it, we've almost certainly got it! See you in May.

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Letters

Eheim Filter Part Sought

I have an old Eheim 2006 internal cassette filter and am in desperate need of obtaining a replacement bottom section which has become damaged. It is the part that the cassette actually fits on to (see illustration).

Although both John Allan Aquariums (the UK distributor for Eheim) and Eheim (Germany) have both been extremely helpful in supplying other replacement parts, they cannot assist me with this bottom section.

I wonder, therefore, if any *A & P* readers still have one of these old, and very reliable, filters among their collection. If so, I would be perfectly happy to buy the part in question... should anyone be willing to part with it.

I'll keep my fingers crossed.

Keith Durrant,
59 Neville Road,
Luton,
Beds LU3 2JG.
Tel: 0582 504948.

[Having spoken to Keith at some length about the matter, and having explored other possible avenues of supply, we are very

pleased to try to assist him in his search, for this rather elusive, but vital, piece of equipment. — Ed.]

Tracking Down Societies

In several recent editions of *Aquarist & Pondkeeper*, a common recurring subject has been the location or existence of 'nearest societies'. Indeed, in December 1991 an appeal was made to all the major Federations to make their membership lists available.

It should not take too long to see the impracticability of this — with the 'deadline date' for copy often weeks or months ahead of publication, such published lists stand a very good chance of being out of date by the time they are read!

By far the best way to locate aquatic societies is to contact the Federation of British Aquatic Societies 'society-finding' service. A fully-updated record of all existing societies nationwide is kept by the Federation and, usually, a short list of societies within easy reach can be obtained (a selection of societies is given to provide a choice of meeting dates) for the benefit of any would-be members.

In addition, in the unlikely event that no conveniently-reachable society exists, the Federation publishes a booklet giving full guidance as to how to form a Society and keep it running. All enquiries should be addressed to:

Adrian Dempsey,
General Secretary
F.B.A.S.,
194 Greenhill Road,
Greenhill,
Herne Bay,
Kent.

Dick Mills,
P.R.O., F.B.A.S.

Conservation and the Fish Exhibitor

I am a fifteen-year-old *A & P* reader. As a part of my hobby, I show fish.

In principle, this, at first glance, appears to be against my beliefs of why animals of any sort are kept in captivity, because they are entered into competitive exhibitions (shows). At a push this could be compared to other animal participant contests, such as horse-racing, but this is not how I choose to look at it. I see it more as an advertisement for our hobby.

To give an example: if I were to enter a species such as, say, a Cherry Barb (*Barbus nana*), for a show, then, regardless of how many points it collects, it is a display for people to see.

An aquarist quite new to the hobby, who has never seen a Cherry Barb before, or perhaps not one so big, or colourful, may take quite a liking for it, seeing it at its peak, and go out and buy some him/herself.

This aquarist then has the pleasure of rearing the fish to full maturity, and may even manage to breed them. He/she then has the satisfaction of knowing that they have achieved something worthwhile, but also, more importantly, the Cherry Barb, which is under threat in its natural environment, may well now be — thanks to the show introducing this species to the aquarist — at least one brood further away from that point of no return.

[Cherry Barbs are also bred commercially, rather than being removed in large numbers from the wild. Ed.]

I do not show Cherry Barbs, but, with them being an easy-to-

keep and easy-to-breed species, I thought it would be a good example to use. I show catfish, mainly.

The point is that though this happy tale may seem a pretty naive and unlikely one, it is not, really, because it was taken from just *one* exhibit on the bench out of hundreds, sometimes thousands, of fish, surrounded by thousands of aquarists... and the story doesn't end there.

The aquarist has now bred his/her barbs, and has a good-sized brood. The brood is, in fact (as is usually the case), too large for the aquarist to keep, so some must be 'removed' from the system. The breeder therefore gives a few to another breeder in exchange for other unrelated barbs, or whatever.

The next enthusiast may have a couple of these fish already, taking some more to make up a shoal. He/she too, breeds them, and the brood is too large, etc. ...

The numbers increase and increase until pet and aquatic stores become involved, and start to see these fish as 'very popular' and 'easy to sell'. They are now so popular, in fact, that the price is reduced, and more people can afford to buy more fish, increasing the demand on the commercial or local breeders.

The result? More fish bred, more fish bought, and fewer fish taken from already-low natural stocks. When the natural environmental situation is judged to be a harm-free environment again, the natural population can be rebuilt to its original safe number by the introduction of captive-bred fish, brought about by skillful aquarists just 'doing their thing', and, at the same time, saving a species from extinction. And remember... it may have all started from a show!

Therefore, after dragging you, the reader and aquarist through that merry little tale, I express my view, that it is a bad idea to impose heavy import bans on fish that can be bred in aquaria, or to make it illegal to keep 'bread and butter' fish in this or any country, because, not only would it kill the hobby, but also an economically sound industry, and possibly the largest 'green' environmentally-friendly conservation group in the world!

Phil Hollings,
Chester.



THE MISSING PART

Eheim 2006 internal cassette filter. The part that Keith Durrant requires is indicated.



Spotlight

THE LOOKDOWN

In the latest of his challenges, our intrepid 'Seaviewer', Gordon Kay, takes on one of the most unusual-looking shoaling species you are ever likely to meet.

Main Photograph: David Allison

John Dawes, our editor, must spend hours just looking for slides of animals that hardly anyone has ever heard of, let alone knows anything about, in order to catch me out! The extraordinary animal in the photograph is his latest attempt — I trust that you will not see it as a victory for John!

THE FAMILY

The Lookdown (*Selene vomer*) is a member of the family Carangidae — the Jacks and Pompanos — which comprises more than 200 species and has representatives in both temperate and tropical seas all around the world. A few even live in brackish or freshwater.

Shape and colour vary enormously within the family. Some look like Mackerels, except for the fact that they lack that species' distinguishing row of finlets. Many have very small scales, but at the end of the lateral line, these are enlarged to form a keel. There are also (usually) two spines in front of the anal fin, and the tail is forked.

The young of the family travel in schools, but the adults of most species are solitary.

The Carangidae contains members like the Greater Amberjack (*Seriola lalandi*),

which can grow to six feet long (180cm) and weigh nearly 150lb (68kg) but also the Trevally (*Caranx* spp) — which many of you will have heard of — whose average weight is a mere 2lb (0.9kg).

LOOKDOWN FEATURES

Our subject is the strangest of the Atlantic Jacks, having an exceptionally thin flat body and an unusually high forehead. The first rays of the second dorsal fin are extended into filaments which reach past the tail fin. The first rays of the anal fin are also extended, but not as far as the dorsal fin.

Selene vomer can grow to as much as 12in (30cm) long, but 8in (20cm) seems to be the average maximum. This animal lives in the tropical Atlantic, being found on the west coast of Africa in the east and, in the west, from New England and Bermuda, south to Uruguay, including the Gulf of Mexico. The Lookdown is particularly common around the Florida Keys.

It is a shallow water species which likes to live over soft, sandy or muddy bottoms — which probably accounts for the fact that the eyes are high and the mouth set low to facilitate foraging in the mud for its food (see also Dr David Ford's photograph and com-

ments in last month's article, *Finnicky Feeders*). Dinner for the Lookdown is made up of prawns, shrimps and small fishes, and great shoals of them forage for these in the open water they love so much.

No one knows very much about the reproduction of this species but they are almost certainly pelagic spawners, with the fry taking their chances in the plankton. Juveniles have a very metallic appearance, but that is more as a result of the lighting used over aquariums than anything else. In any case, it seems to disappear as the animal matures.

Selene vomer is occasionally seen in the aquarium trade, although Richard Sankey — of the Tropical Marine Centre — tells me that they do not ship well and the supply seems to be seasonal. This is doubtless due to the fact that the species, in common with the rest of the family, is pelagic and the fry probably drift over wide areas.

AQUARIUM REQUIREMENTS

However, the Lookdown is a strong aquarium subject. It feeds well on most of the usual aquarium fare and is hardy enough to live to a ripe old age. Juveniles do best in aquaria, particularly when kept in small groups.

Their hardiness can prove a headache in this respect, though let's face it, how many people have a tank large enough to house a shoal of adult-size Lookdowns? However, if you do have the space (and the wherewithal) for a huge aquarium, then a group of three to five Lookdowns is a remarkable sight.

I would suggest that the aquarium in which they are housed has plenty of free swimming space and a minimum amount of aquarium decoration. *Selene vomer* has a tremendous appetite and its tankmates have to be chosen with this in mind. Any small fishes will be eaten, so a Lookdown's tankmates must be things like large Angels, Tangs, Puffers, Triggers and the like.

However, this is not a particularly aggressive species, although it is well able to look after itself in the hurly burly of a 'big fish' aquarium. Lookdowns would be unlikely to eat flake food, so your freezer should be stocked with foods like Lancefish, Mussel, Cockle, etc.

I can see that the Lookdown is not everyone's cup of tea, especially with the current trend towards invertebrate aquariums, but, you know, trends do change, and I can sense at the moment the merest inkling of a move away from invertebrate aquaria back to fish-only tanks. If I'm proven correct over the next 12 months or so, then who knows, *Selene vomer* might well become an established sight in European aquariums. What a pleasant addition to this hobby they will make!



The Lookdown is currently available in relatively small numbers but, if the 'mood' changes within the marine hobby... as it might just be beginning to happen... then this large and 'unusually' elegant fish may well become very popular indeed.

My favourite: *Fish*

No question which kind of (cat) fish I would state to be my all-time favourite! It's just a difficult decision choosing which *Corydoras* of all the known species should be on the top of my charts. For those of you who know how I feel about some of the giant Amazonian catfishes, my choice may come as a surprise.

There are 120-odd species/subspecies of *Corydoras* known, and I love them all. I must admit, though, that I enjoyed narrowing down the selection to a mere handful, and I must congratulate our editor on offering contributors such a wonderful task!

THE BEST OF THE BUNCH

In the 'final race' I had to field *Corydoras arcuatus*, known affectionately as the Skunk Catfish, because of its superb black stripe which traces the length of a cream body.

Any fishkeeper who owns a copy of the 1960's little Pet Library booklet, *Enjoy Your Catfish* by Albert Klee (an excellent introduction to an incredible subject...) will, no doubt, recall Aren van den Nieuwenhuizen's perfect picture of a 'pair' of Skunk Catfish. I used to stare at that picture and dream of keeping some in a special aquarium.

It seems hard to believe that 20 years later, *Corydoras arcuatus* is a 'bread-and-butter' wild import from Peru/Brazil. I would regularly telephone most of the London shops that advertised in *A & P* requesting the Skunk Catfish, only to be told they "had just been in" or "never get them". Funnily enough, I obtained my first specimens when I moved to Hertfordshire from the North of England, aided and abetted in my relentless search by Catfish Association stalwarts Derek and Pat Lambourne.

I could have chosen *Corydoras adolfoi* to lead my chart. With its orange head spot, this catfish is, arguably, the most stunning of all species available today.

My selection would not simply be based on this unique character of its exceptional colour pattern. This Upper Rio Negro catfish would be chosen not because of the incredibly fascinating mimicry that exists between *Corydoras adolfoi* and *Corydoras imitator*, but because I am currently undertaking special research into various aspects of their intertwined behaviour. In the last 18

David Sands presents his top fish: the Bearded Cat from Brazil

Photographs — unless otherwise indicated — by the author



Wet in Brazil in 1979 — on the trail of the Bearded Catfish.

months I have investigated these two *Corydoras* species more than any other fish I have kept in over 20 years of fishkeeping.

If my ego truly reigned supreme, then I would have chosen *Corydoras davidsoni* because I was so thrilled to have this Lower Rio Negro species named after me. The fact that it is almost always confused with the Colombian Rio Meta species *Corydoras melini* does not bother me... I never point out the mistake to shops when I am visiting!

When I was travelling in Canada four years ago, Paul McFarlane, a CAOC president, showed me a tank full of his spawnings of *Corydoras davidsoni* and he was pleased

to have the correct name given. "They'll be worth more...". Peter Moyle was the first to breed them in the UK, and I am pleased that this species will be around in the hobby for a few years to come.

THE FISH OF DREAMS

My choice for my favourite fish, though, had to be the Bearded Catfish, *Corydoras barbatus*. For years this exceptional-looking catfish remained, like the Skunk Catfish, a picture in American books. The real tease was Axelrod's 1970s collecting articles in TFH showing beautiful ornately patterned specimens fished out of a rambling Rio de Janeiro river.

Not only did I dream of keeping this catfish, I secretly dreamed of travelling to Brazil and collecting this fish in Nature. One point about dreams and reality: the two rarely match each other, and many a dream plummets to the ground when reality strikes.

In the year-long planning to travel to Brazil in 1978/1979 I had many real dreams about my impending journey to collect this *Corydoras*. In one vivid dream I sailed my way silently through a fern-filled forest — exotic greenery, huge fronds and giant plate-sized rubber plant leaves falling away to reveal sunken ruins of a jungle temple. Within its crumbling walls, giant cartoon *Corydoras* could be seen above me, sitting on rafters like swallows on the line waiting for autumn. They winked and smiled (like they do) and I was in awe and in 'heaven'.

Another dream led me into a storm drain where I stood, legs apart, as the water ran beneath me. In the white water, *Corydoras* started to leap just like salmon against the flow, and all I had to do was hold out my cupped hands to capture golden catfish. I was childlike, full of glee, whooping with delight, and I didn't want to wake up.

In September 1979, when I finally approached the actual place where I collected live specimens of *Corydoras barbatus* and *Corydoras macropterus*, there actually was a storm drain under the sand/dirt road... and fantastically, the flooded creek was surrounded by all kinds of exotic plants — dripping into the mirror of dark brown water — like a scene from the biblical Garden of Eden. I was very awake then!

That was one of the very few times in my life that the reality took off from the dream and even improved on it. The 'off-the-beaten-sand-track' blackwater habitat of my favourite catfish stunned my senses over a decade ago, as did the low pH (below 4.8) and zero hardness... not withstanding the low water temperatures.

CLASSIFICATION

The Bearded Catfish, *Corydoras barbatus* (Quoy & Gaimard, 1824), is a comparatively unique species among *Corydoras* — physically different enough to be placed in a



Rio de Janeiro *C. barbatus* — the 'long white-nosed form'.



Two Sao Paulo *C. barbatus* — the "golden flecked/yellow-and-black-blotched form".



On the edge of Bearded Catfish country.



The exotic 'inner jungle' home of the Bearded Catfish.

separate genus by early scientific authors (I suppose that is why it stands out). It is certainly much larger and longer than most *Corydoras* species at a standard length of

75-85mm (c 3-3.4in) although this size is often exaggerated as 100-150mm (4-6in), the lesser of which might be achieved if the tail is included as a total length.

Males, when sexually mature, possess a line of cheek bristles at either side of the head (a factor shared with only half a dozen other *Corydoras* species) and are usually more ornate in the gold/black markings.

There are at least two colour forms of *Corydoras barbatus* found in Southern Brazil. The long white-nosed form from Rio de Janeiro (collected by the editor of this magazine a few years ago) and a golden flecked/yellow-and-black blotched form that I collected between Sao Paulo and Santos.

I believe the two forms should be classed as separate species, as they differ in morphological and physiological characters and would appear distinct from each other, but this article is not the place to state such detail.

One important aquaristic detail in which the two quite substantially differ from each other is that the Sao Paulo form spawned readily for me and various other catfish enthusiasts after I returned from my Brazilian expedition with live specimens. In sharp contrast, the Rio de Janeiro form appears to require different conditions and is difficult to maintain in captivity, let alone get it to breed!

SOME OBSERVATIONS

Newly-imported specimens, especially the Rio forms, appear to be badly treated somewhere between capture, holding, export and import. I have seen thousands of specimens with a concave ventral groove where a rounded stomach should be. These starved specimens rarely live beyond the first month or two although, I hasten to add, this does tend to apply to large specimens. The stress of transportation leads to difficult-to-treat infections.

Once healthy specimens are established in a bright pH, well-oxygenated-water aquarium (not too organic or high in nitrates) they thrive on a combination of a good flaked food, frozen Gamma Shrimp and blood-worm *Tubifex*.

Males are territorial, and the sure sign of pre-spawning activity is to find a male pushed into a corner. In Nature they spawn into the flooded grasses and this behaviour is repeated in aquaria as females place eggs high onto the aquarium glass near the water surface in clumps of eights, to groups of eighty or more.

CLOSING THOUGHTS

For the uninitiated, or those late of another planet, they can rest assured that this catfish species would enhance any large community aquarium. It is not easy to choose one species from so many, but I must admit the Bearded Catfish almost 'chose itself'.

I remember selling a large pair of some of the first *Corydoras barbatus* to be imported into the north of England in the early eighties to a Killifish enthusiast! He thought they were superb and bought them, even though he didn't keep catfish.

I remember smiling as he left the shop and thinking, "There's hope for non-catfish-enthusiasts yet...!"



One large and one small stem tuber in *Potamogeton pectinatus* (Specimen No. AdG 942).

SOUTH AMERICAN AQUATIC PLANTS

Part 2 Stem and Root Tubers

Arie de Graaf looks at the growth of two different types of tuber formation in four plant species.

Photographs by the author



A rhizomous (root-like) tuber in *Echinodorus paniculatus* - the Broad-leaved Amazon Sword (Specimen No. AdG 785).



Tubers in *Burnatia enneandra* (Specimen No. AdG 190) - note the empty (hollow) old tuber.

Tubers (as in potatoes) are important food storage and reproductive organs in many plants, including some aquatic species. Among these are some plants belonging to the family Alismataceae, the family to which Amazon Swords (*Echinodorus*) belong, eg as described by Sculthorpe (1985). The importance of two different kinds of tubers in *Echinodorus paniculatus* Micheli, found in Ecuador, as outlined below, is described more fully in de Graaf (in preparation).

STEM AND ROOT TUBERS

Sculthorpe distinguished stem and root tubers. Stem tubers are described as "... rarely functioning directly as perennating organs" and runners may produce terminal swollen structures which remain dormant during adverse conditions and later grow into new plants. These structures vary in form, origin, and development and do not fit into any of the accepted categories of storage organs. However, they are essentially swollen portions of stems and those of successive years bear no constant relationship to their predecessors: They are, therefore, better regarded as stem tubers, rather than corms."

Examples given include *Nelumbo scirpus* grossus, *Cyperus eiculentus*, *C. rotundus*, *Potamogeton filiformis*, *P. pectinatus* and the *Sagittaria* species *sagittifolia*, *subulata*, *graminea*, *cuneata*, *latifolia* and *sanfordii*.

Examples of root tubers given included "the underwater banana-plant" and "the banana floating-heart," *Nymphoides aquatica* and *cordata* and *Nymphaea mexicana*.

TUBERS IN POTAMOGETONACEAE *Potamogeton pectinatus* L.

In a ditch one km beyond the Mohlylk paper factory at the left side of the road (Suameer, Friesland, The Netherlands) I collected stem tubers of *Potamogeton pectinatus* L. (Specimen No is AdG 942).

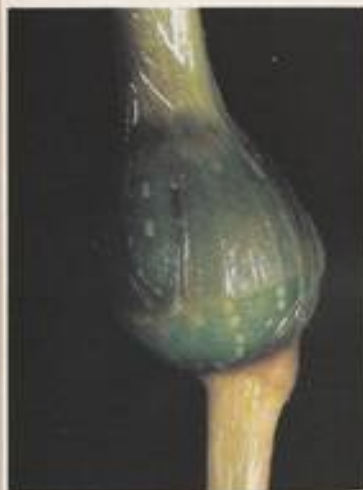
Sculthorpe describes the development of the stem tubers as follows: "... small tubers are formed from lateral buds of the rhizome which would normally develop into elongated leafy



A pinkish-red stem tuber in *Sagittaria sagittifolia* (Specimen No. AdG 793). Other colours develop with age.



As the stem tuber's food reserves are used up in the development of adventitious roots which grow from the nodes and the first ribbon-like leaves begin to grow, the tuber itself gradually shrinks (Specimen No. AdG 785).



A mature *S. sagittifolia* stem tuber - green with yellow spots.



Echinodorus paniculatus (Specimen No. AdG 785) in its natural habitat near La Julia in Ecuador.

shoots. The two basal internodes of the bud become swollen by starch accumulation, the other internodes remaining condensed and undeveloped and functioning as a terminal bud. The whole tuber is sheathed in a scale leaf and is usually buried, at least partly, in the soil. After its period of dormancy the tuber forms a new rhizome from which erect shoots subsequently arise."

TUBERS IN ALISMATACEAE *Burnatia enneandra* M. Michel

In the monotypic *Burnatia enneandra* M. Michel²⁷ (AdG 190), which is distributed in Africa, a new young plant develops every year. A new tuber for the following year is formed next to the plant, which dies. A hollow tuber is left.

Sagittaria sagittifolia L. (AdG 793)

I studied the forming of the tubers in this species and the development of a new young plant in my garden pool. These tubers are described by Sculthorpe as follows: "In late summer and early autumn the stolons²⁸ begin to show terminal tubers, each of which develops by an enlargement of the two short internodes posterior to the apical bud of the stolon (Arber, 1920). Each tuber, laden with starch and sheathed by enlarged scale leaves, is carried to some depth in the soil by the positive geotropic response²⁹ of the stolon. When mature, the tubers are from 3 to 5 cm long, ovoid, or subcylindrical in shape."

The tubers are often coloured in a specific way by epidermal anthocyanins. I saw that the tuber was first red, then blue with yellow spots and, finally, green with yellow spots. Sculthorpe supposes, that in spring, under



Root tubers of the Broad-leaved Amazon Sword (*E. paniculatus*).

the stimulus of a slight rise in temperature, the basal one or two internodes of the apical bud elongate, carrying the rest of the bud up to the surface of the substrate.

Echinodorus paniculatus Micheli

Locality: La Julia in El Salto; the road between Babahoyo and Purbloviejo.

The area was characteristic of an *Echinodorus* biotope. In the background of the photo it is easy to see the flowering *Eichhornia crassipes* (Martius) Solms-Laubach (Water Hyacinth). This is a typical floating plant. Thus the conclusion, that in the rainy season this area is flooded, is correct.

Taking *Echinodorus paniculatus* from the bottom was somewhat of a problem. The plant had a tuberous rhizome with strong wooden roots which were anchored securely in the ground and difficult to remove. The rhizome was the size of a large potato. In my opinion, this tuber has a function in the strategy of survival of the plant.

The tuberisation in other genera of the family Alismataceae consolidates this presumption. The question is to what extent can *Echinodorus* plants survive a dry season longer than one year.

* NOTES

1. A perennating organ is a food storage organ that allows plants to survive from one year to the next.
2. A monotypic genus is one containing a single species.
3. A stolon appears as a 'swollen' stem tip.
4. A positive geotropic response is one in which growth occurs downwards i.e. in the same direction as the pull of gravity.

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Collecting Location No 6 near Lebamba.

It has always surprised me that the bubble-nesting *Ctenopomas* (Bushfish) haven't established themselves in the hobby as well as their Asian cousins. They have the same interesting life style; so similar in fact, that you could consider them as African 'gouramis'. Scientifically, they are known as the *Ctenopoma conspicuum* species group, to separate them from the larger, free-spawning *Ctenopoma* species. Their main distinguishing features are their small size, bright colours and the fact that males and females are visually distinguishable. Although there may be as many as nine species in the group, the commonest species are *Ctenopoma ansorgei*, the Orange or Ornate Bushfish; *C. fasciolum*, the Banded; *C. damari*, the Pearl; and *C. nanum*, the Dwarf.

MISLEADING NAME

The common name for *C. nanum* is the Dwarf Bushfish. However, the name is more than a bit misleading. For one thing, this is not the smallest of the bubble-nesters, *C. damari* is. Secondly, the name, 'dwarf' might tend to lead you to believe that this is a peaceful species, until you remember that the dwarfs of legend were a fierce warrior race! In fact, this is by far and away the most aggressive of the bubble-nesting Bushfish.

A better name might be, Blue Bushfish, to describe the colour that infuses the fins and interspaces the 6-8 brown or black stripes on the body of the male.

The literature suggests that this species

can be found in the Cameroons and south, throughout the Zaire River basin, and in Angola. In southern Africa, there is a very similar, chocolate-brown fish, known formerly as *C. ctenos* and currently as *C. intermedium*. In fact, the wide distribution and regional variations suggest that there are, at least, five related species that may have been referred to under this name, making up what is known as a 'species complex', all having similar fin ray and scale counts. *C. lineatum*, *C. milleri*, *C. sp. cf. nanum* are the other members of the complex.



An old male *Ctenopoma nanum* from Collecting Location No 6.

Fish of this group are most commonly found in rainforest areas and these have a series of bars on their flanks, but the species

that come from the savanna areas: *C. milleri*, *C. intermedium* and *C. sp. cf. nanum*, all have broken bars or mottling.

COLLECTING NANUMS

The Dwarf Bushfish was first collected in Gabon by that remarkable Victorian explorer, Mary Kingsley, along with *C. kingsleyae*, the species that carries her name, thanks to Dr Gumbert at the BMNH. She also found *C. nigropannorum* in that country which, in addition, hosts *C. maculatum*.

In July and August 1991, I was given the opportunity to follow in Mary Kingsley's footsteps when Allan and Barbara Brown invited me to accompany them on their trip to study Killis and *Ctenopoma*. (Well, perhaps not exactly her FOOTsteps, because I don't believe she had the advantage of a 4WD!).

In a hectic 16 days, we covered about 3,500 Km and fished 30 sites, 17 of which yielded a total of 47 *Ctenopoma*, all but one being *C. nanum*. The one exception was a member of the *C. kingsleyae* group. We fished for them using rigid-frame triangular nets with 18-inch sides, either pushing them into the vegetation or trampling the vegetation towards the nets.

In these sites, the fish inhabited slowly flowing rainforest streams of less than 1m

deep, of pH between 4.8 and 6.6 and negligible hardness. They were usually found in the tangle of vegetation near the banks of the shaded streams, in company with a variety of killifish, barbs, characins, catfish, elephant fish and *Pelmatochromis* and *Hemichromis* cichlids. In ten of the sites, we only found one or two *C. nanum*, but in four, we found five or more adults.

The wild-caught Dwarf Bushfish were all bagged singly in medicated water from their own habitats and transported home with only one or two losses. The fish from each location had to be housed separately, in case there were local variations. Gartner (1983), for example, mentioned two varieties: blue *C. nanum* from west of the Chailu Massif and the higher-backed brown *C. nanum*, from the south-east. Further, on our expedition, we caught one very orange fish en route to Lambarene.

A PUGNACIOUS DWARF

David Armitage, editor of *Labyrinth*, the journal of the Anabantoid Association of Great Britain, recounts his experiences collecting, keeping and breeding the variable Dwarf Bushfish.

Photographs by the author

Although I had some tanks set by, these had to be subdivided with flexible perforated plastic partitions, to make enough territories for the fish. For a week some specimens suffered the indignity of being housed in 1lb honey jars floating in an aquarium.

RESILIENT CHARACTERS

These wild-caught fish, unfortunately, did not take flake, unlike some examples of the species that I have kept. Frozen bloodworm, however, proved most acceptable to them and they have been successfully maintained on this diet, almost exclusively.

They were also very bold and spent a lot of time at the front of the tank, waiting for food. Both sexes proved very aggressive towards their own kind, to the extent that the resulting scraps could prove fatal to weaker fish.

Fortunately, they seem quite resilient, so the losers, who had often lost all their tails, would recover if separated in time. It was mainly during these agonistic interactions, that the fish displayed the crisp, broad black bands on their body.

BREEDING

In November, some of the fish started to build bubble-nests and, eventually, the pairs I



A very attractive small male from near Lambarene (Location 9).

had from two of the locations spawned. One of these pairs was in a 12in (30cm) cube, the other in space about 12 x 12 x 6in (30 x 30 x 15cm). My tanks are all unfiltered and unoxygenated, with a bare base, no gravel; the only equipment is a heater-stat.

There was a floating *Utricularia* (Bladderwort) mat at the water surface, a potted plant or a piece of bogwood, and some plant pots on their sides. The rainwater, which I also used to make monthly 25% water changes, was at about 22° (c 71.5°F).

Large, domed bubble-nests, usually

anchored to floating vegetation, were built by the males who now had become very dark so that the bands weren't really visible. They also had magnificent fin extensions. At their maximum size of 2in (5cm) they were easily distinguishable from the stubby, lighter females who were perhaps half an inch shorter. Sexing is not always straightforward. Previously, males that I have kept together have not developed fin extensions.

The female has to pluck up the courage to initiate the spawning embrace by pecking the male's flank before the pair embrace under the nest, with the female still the right way up. At this time, she displays a broad pale band down her side.

Spawns of several hundred were produced at about six-week intervals. They hatched after about a day and swam free after a further two days. Using Infusyl and micro-worm, I was able to raise 50 or so with no trouble and in the presence of their parents.

This may seem to complete the story but, in fact, the true measure of my breeding success will be to see if I can continue this line of Dwarf Bushfish without replenishment from wild stock.



Above, we collected this striking male at Location 25 en route from Makokou to Okandja.

Below, the dark coloration exhibited by this male collected at Location 26, near Makebe, is reminiscent of the spawning colours of the species.

ACKNOWLEDGEMENTS

As always, thanks to Stephen Norris, Arizona State University, for the latest on *Ctenopoma* and to Allan and Barbara Brown, for inviting me on their Gabon trip.

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A.A.G.B.

Further information on labyrinth fishes is available from the secretary of The Pinefield Road, Barnby Dun, Doncaster DN3 1QT.

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