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OCTOBER 1994

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**FRIENDLY
BULLFROGS**

**GUATEMALA
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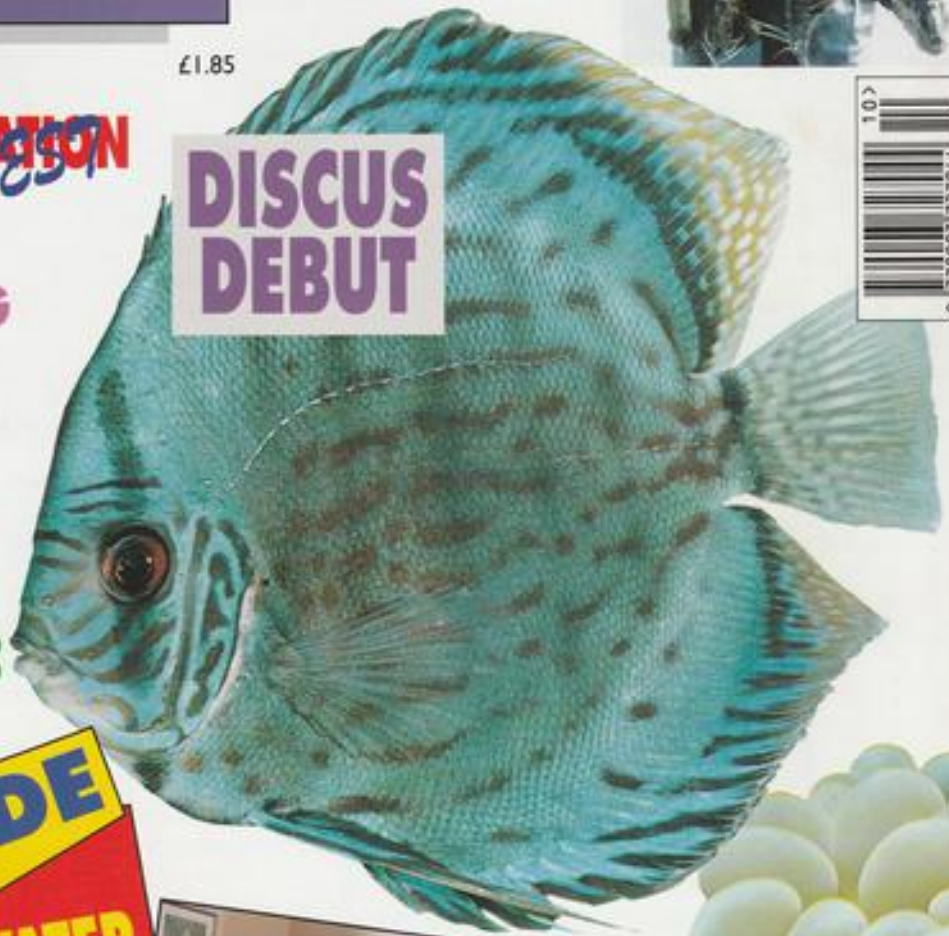
TANK AERATION
UNDER TEST

**BREEDING
MARINES**

**'CREATING'
IDEAL
FANCY
GOLDFISH**

**ALGAE:
FRIENDS
OR FOES?**

**DISCUS
DEBUT**

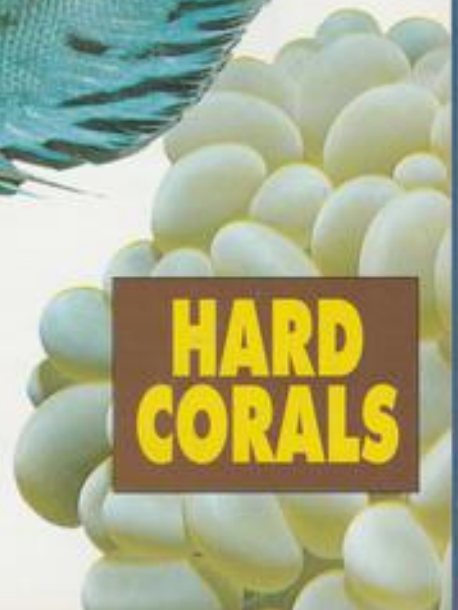


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EDITORIAL

Einstein, tricks and Goldfish

Recently, the Daily Telegraph ran a story entitled Respect the Einsteins in the underwater lab dealing, among other things, with "the much maligned goldfish".

Did you know that the Goldfish was "much maligned"? I didn't. Adored by many, certainly. Abused by some, certainly. But maligned? Who by?

Anyway, the article in question contained what some might interpret as the best and the worst of general newspaper reporting on ornamental fish.

The best came in the shape of some interesting, sensible and correct statements and opinions from our regular 'fish vet', Lance Japson.

Going by the nature of the quotes reported in the article, his views seem to have been, for the most part, pretty fairly represented and interpreted, thus informing without resorting to the 'freaky fringe antics' so much loved by the press. The one glaring exception was that Lance was quoted as having said that Goldfish don't usually achieve their full 12-inch potential "because they are so stressed".

I didn't think for one moment that he would have said this — simply because

limiting factors include all sorts of parameters, from diet to space — so I checked and, sure enough, he had been misquoted.

Then there's the Einstein bit. Why, oh why, do newspaper reports on pets have this inherent prerequisite to demean the very creatures they are trying to generate some interest in by going for unnecessarily inaccurate and misleading headlines?

And it doesn't stop there either. This particular article, which could — despite the above — still be classified as among the better ones on Goldfish, couldn't help avoiding the apparently statutory inclusion of a 'freaky element'. In this case, it was a reference to Goldfish having "a perfectly good memory", one that might actually allow them to "be trained to do simple tricks".

Trick-performing Goldfish? Who needs this? Certainly not the Goldfish... and certainly not those of us who love it for what it really is, one of the most beautiful and lovable pets in the world... and not a mere performer of simple human-devised tricks.

John Dawes

AIRY AQUARIUM KEEPING

Below, left, aeration is essential for the wellbeing of all fish.

Right, powerhead with venturi alongside a 'conventional' airfilter. The powerhead proved excellent at oxygenating the aquarium water.

Interpet brand manager **Adrian Exell** airs some facts, figures and thoughts on aquarium aeration.

Aquarists have traditionally regarded the air pump as an essential piece of equipment for maintaining fish to power all sorts of filtration, as well as aerating and decorating the aquarium. In recent years, however, the small motor pump has progressively taken over from the traditional air pump in the filtration department. Powerheads now grace more undergravel uplifts, and neat self-contained internal power filters are fast becoming the most popular form of filter, particularly among beginners. As a consequence of this trend, more and more aquariums are being run without any form of aeration at all, other than the occasional venturi device on the water motor head, which draws some air into the aquarium.

The question I would like to address with this article is: Does this trend matter? Is air in the aquarium essential? Is the air pump an outdated piece of aquarium hardware, or an essential part of every aquarist's armoury?

Using our company's research and development facilities, a group of scientists therefore set about investigating the



difference between aquariums powered by power filters (with venturi) and those powered by an air pump.

Background

In order to understand the way in which we went about comparing air and motor filtration, it is essential to understand the primary functions which these two methods perform in the aquarium.

Firstly, it is important that water passes through a filter medium frequently enough so that mechanical and biological filtration are efficiently carried out. Secondly, it is essential that circulation of aquarium water is achieved, preventing



stagnation and dead spots. Thirdly, air and motor filters should promote gaseous exchange. It is this third important aspect that I will concentrate on investigating in the paragraphs that follow.

What is gaseous exchange?

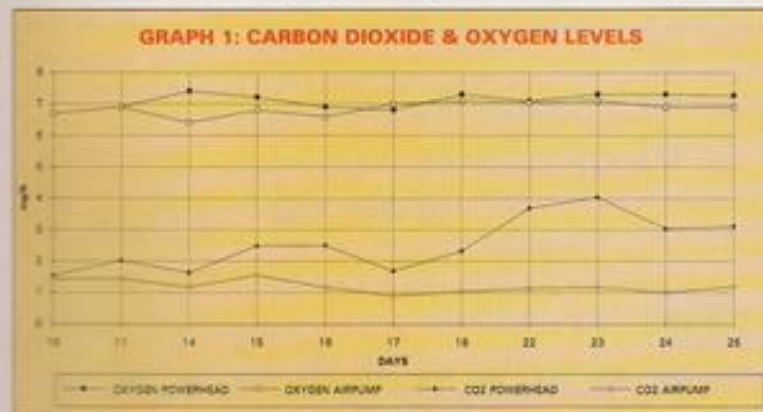
Desirable gaseous exchange involves water taking up oxygen and releasing carbon dioxide. Oxygen is an essential requirement for all aerobic creatures, which includes fish, plants and the bacteria in filters which consume fish waste.

Oxygen is taken in by living creatures and used in essential cellular activity to create energy. The by-product of this process is the creation of water, along with the toxic gas called carbon dioxide. Carbon dioxide (CO₂) is transported out of the living creature and dissolves into the water.

Efficient gaseous exchange ensures that there is an adequate supply of oxygen for all the living creatures in the aquarium, and that the carbon dioxide concentration does not rise to an undesirable level.

The water surface is where most gaseous exchange occurs; oxygen diffuses from the relatively high levels in air to the relatively low levels in the water, while carbon dioxide diffuses from the water into the air.

Gaseous exchange is thus prompted by agitation or anything else which increases the surface area of the water. Good water circulation ensures that all areas of the



of producing. You will then be able to decide if the new addition will complement and enhance your own.

Many hobbyists may be considering breeding Goldfish for the first time or, perhaps, they have already bred them but would like to create their own strain. Making the choice of breeding stock is made much easier if you know of someone who is producing the variety and quality which you would like to breed. For those not in this position, some considerable time must be spent searching the aquatic retailers for the type suitable for your needs. It has been my experience that some varieties like Fantails and Fantail-Moors will breed as near to true as I think it possible for Goldfish to breed. Even so, it is important to choose with care. An excellent idea is to visit one of the specialist

Goldfish shows, since there, you can see for yourself some of the best English-bred stock available on the show bench.

In the owner-bred classes, you can see the best fish that breeders are able to produce, and it is possible that they will have surplus stock to offer for sale. Forget their champion fish; it is unlikely that they will be willing to part with those. However, purchasing some of their second class stock will give you the chance of following in their footsteps with the best material for your future line.

The most important fish is your female, for she will be the foundation of your line. I would, nevertheless, suggest that the initial purchase should ideally consist of six young adults, since, large, good quality fish can be very expensive, which, of course, would be expected for pedigree animals. If possible, choose two females and four males.

Breeding programme

The ideal programme would commence with choosing the better of the two females, (the other should be looked upon

as a standby). When she is ready to breed, hand strip her of eggs with each male. Great care must be used when attempting to hand strip a fish, as catastrophic injuries can be inflicted by careless or rough handling. Never try to hand strip a fish until she has begun to release the eggs herself. In fact, I believe that only after the fishkeeper has gained some expertise in fish-keeping should he/she be tempted to use this method to spawn their fish.

Each batch of eggs should be raised separately in tanks labelled as to which male sired them. Grow all the fry on, culling out the mis-shapen and inferior, making notes on the development and progress of those remaining. It should soon become evident which of the males has fathered the better offspring.

From the best batch of youngsters, select the best male and female. In the second year, this young male will be crossed with his mother. Once again, the best male and female will be kept.

In the third year, mate the young male retained from the second year back to his grandmother, retaining the best male and female from that spawning.

The fourth year, we should pair the female which we kept in the first year with the young male from the third year. Again, retain the very best male and female.

In the fifth year, we breed the male from year four, pairing him with the female kept in the second year. Once again, we retain the best youngsters which display the characteristics we hope our strain will excel in. This programme will use mature females with the more immature, robust males.

Now, the fish we are producing should be continually improving, with a greater number of good fish in each spawning. Eventually, the majority will display the good qualities and characteristics which would be expected from line-bred pedigree fish.

It is obvious why records need to be kept, but it is surprising just how familiar devoted fishkeepers can become with their stock, recognising each individual and their relationship to each other. However, because line breeding is a continuous procedure, it is imperative that comprehensive records are maintained if proper control is to be kept on the breeding programme.

Selection of fish suitable for breeding is dependent on the characteristics your strain is to excel in. Choose fish for their body shape, finnage of the desired shape and length carried at the correct angle. If the variety demands paired caudal and anal fins, then the parent fish should have these attributes. The breeders should be the best that you can find, with the traits of their type, for example, well developed hoods, large eye bubbles, large fleshy nasal septa, raised domed scales etc.

SUGGESTED BREEDING PROGRAMME

	Female Line	Male Line
FIRST YEAR:	Year 1 (F) x Year 1	(M) = F1 (1st Filial Generation)
SECOND YEAR:	Year 1 (F) x F1	(M) = F2 (2nd Filial Generation)
THIRD YEAR:	Year 1 (F) x F2	(M) = F3
FOURTH YEAR:	F1 (F) x F3	(M) = F4
FIFTH YEAR:	F2 (F) x F4	(M) = F5
SIXTH YEAR:	F3 (F) x F5	(M) = F6

My suggested pattern for line breeding is, perhaps, rather less complex than might be followed by those breeders who have much greater space for rearing the young than someone like myself, a keen amateur enthusiast. However, from my own experience, I have discovered that by breeding my fish in such a line of descent, I have been able to produce large numbers of excellent quality fish each and every season from a single batch of eggs. At the start of my breeding programme, I was delighted to discover that I had a few very acceptable youngsters. As the seasons have passed, the overall quality has improved and the better individuals have appeared in larger numbers.

CAPTIVE CORAL CARE

While no-one would argue that hard corals do not represent a challenging prospect, sensitivity varies from species to species. Excellent examples are to be found by comparing the Brain Coral — *Tachyphyllia* sp. with the Tooth Coral — *Euphyllia plecteni* (See Part 1 — Sept '94 — for pictures of these two species).

Brain Corals are tremendously sensitive and require not only highly intensive lighting, but also a superbly clean and stable environment that the average hobbyist just cannot provide. On the other hand, Tooth Corals will tolerate slightly less demanding conditions and the mariner can expect much more in the way of success from this species.

Money to burn?

Hard corals are not cheap; one can expect to pay in the region of £25 for a modest little specimen. Therefore, it should be obvious that if you cannot supply the conditions under which these sensitive creatures have a good chance of thriving, then the money is best put to better use (like improving the system!).

Unfortunately, some aquarists persist in destroying coral after coral, knowing that their tank is incapable of supporting such invertebrates, but vainly hoping that some sort of miracle might happen and one might pull itself together enough to survive! I have a message for these people:

- 1) either stand outside your local dealer's and set fire to your money, or
- 2) send the money to me (a good choice that one!)

All joking aside, the real solution is to save the money and buy a really decent system, as will be described. Two air-operated uplifts and a fluorescent tube just doesn't cut it with hard corals, I'm afraid.

Feeding

Most hard corals will benefit from being fed small pieces of squid and lancefish once a week. Live foods such as brine shrimp and rotifers are also useful supplements to the corals' own symbiotic algae.

Of course, much of this food will be wasted should the fish be too numerous, as they will devour such tempting fare long before the corals have a chance to benefit. It also goes without saying that, should the corals reject the food, all traces need to be siphoned promptly from the tank.

Siting

Plenty of good-quality, intense lighting is essential. It makes great sense, therefore, to place the corals as close to the lighting source as possible, which, in most

Sophisticated water management is a must where hard corals are concerned. This is one half of such a system installed underneath a 7ft x 26 x 26in tank.

PART TWO

GOLDEN RULES

Nick Dakin rounds off his two-part review with expert tips and a few words of caution.

Photographs by the author

also proved useful in certain circumstances.

If, however, good-quality (ie Reverse Osmosis) water changes are performed as prescribed, or a constant water change facility is in operation, there should be little or no need for extra supplements. This is because supplements will always be replenished from a good-quality salt mix; consequently, the show tank will always have water in first-class condition.

Fighting corals

Hard corals need plenty of space and sense the proximity of competing species. The response is often for the more dominant species to attack the weaker one on two fronts.

Firstly, stinging cells can be released into the water which will damage the intruder at a distance, or secondly, long tentacles can be extended towards the opponent and these, being tipped with stinging cells, can damage very effectively.

The results of such conflicts can be



Second half of the same system, including trickle filtration unit and protein skimmers.

cases, means very high up the rockwork.

Another requirement is strong water circulation; not necessarily face-on blasting, but a decent flow-past.

Secure placement is vitally important, as corals injured in a fall are extremely difficult to restore back to full health; usually a small area of damage spreads, eventually to affect the whole animal.

Supplements

Various observations have encouraged a belief that a supplement of molybdenum and strontium helps to prevent some species from parting company with their skeletal bases. Iodine supplements have



A mixed fish/invert aquarium ideal for hard corals.

observed clearly. The weaker of the corals will appear 'burned' or consistently retracted away from the attacker. Should 'fighting' be suspected, move the corals as far apart as possible.

Hard coral tips

- 1 Keep fish stocks as low as possible, never exceeding 1in (2.5cm) per 6 gallons (c27 litres).
- 2 Provide as large an aquarium as possible, 40 gallons (c180 litres) nett must be seen as a minimum.
- 3 Always purchase healthy specimens that are fully expanded with no signs of detachment or damage. Specimens should be fully coloured and not anaemic in appearance.
- 4 Acclimatise specimens to a new environment very slowly to prevent pH or osmotic shock. 30 minutes is not too long.
- 5 Feed sparingly, if at all.
- 6 Provide high intensity lighting of the correct quality; 6-500k metals halides are best.

- 7 Monitor water quality continuously using accurate electronic meters where possible.
- 8 Use Reverse Osmosis water if at all possible.
- 9 Never introduce hard corals into a freshly matured aquarium.
- 10 Keep hard corals at a reasonable distance from each other within the aquarium making sure that they are securely positioned.
- 11 If you can't keep easier corals or anemones, then don't try hard corals!

Below, Plate Coral (*Fungia actiniformis*) — almost anemone-like... and not too difficult.

Below centre, Goniopora corals are on the difficult side. This is Goniopora stokesi.

Bottom, the beautiful — and aptly named — Bubble Coral (*Plerogira sinuosa*) is one of the easier species.



SPECIES TO CONSIDER

(E) = Slightly easier species
(H) = Much more difficult species

Tooth Coral (*Euphyllia plectel*) (E)

Frogspawn Coral (*Euphyllia* sp.) (E)

Bubble Coral (*Plerogira sinuosa*) (E)

Anchor Coral (*Euphyllia anchoral*) (E)

Organ Pipe Coral (*Tubipora musica*) (H)

Plate Coral (*Fungia actiniformis*) (E)

Goniopora (*Goniopora* sp.) (H)

Sun Coral (*Tubastrea aurea*) (E)

Brain Coral (*Leptoria* sp.) (H)

Brain Coral (*Trachyphyllia* sp.) (H)

Moon Coral (*Favites* sp.) (H)

- 12 Don't introduce hard corals into a tank with a bad nuisance algae problem — the water will not be up to scratch.
- 13 If you are sure your tank is up to it, try the slightly easier hard coral species first.
- 14 Don't persist if you fail with hard corals.
- 15 If you are not familiar with marine aquarium water chemistry, then hard corals are not for you... until you rectify this situation.

THE RIGHT ENVIRONMENT

Having decided that exceptional conditions are required to maintain hard corals, here is a list of the minimum parameters needed to expect success.

- 1 TANK 48 x 18 x 15in (120 x 45 x 38cm)
- 2 VOLUME 40 gallons (180 litres) nett, minimum
- 3 ESTABLISHED At least 4-6 months successfully.
- 4 NATURE Almost exclusively invertebrate; very few fish.
- 5 SUBSTRATE None, avoiding detritus build-up.
- 6 FILTRATION External trickle filtration with excellent water circulation. Heavy and efficient protein skimming with additional ozone. The highest quality activated carbon filtration.
- 7 WATER Reverse Osmosis water, or deionised water, is a must (toxins in raw tapwater usually prove fatal). Finest quality salt (not just the cheapest!).
- 8 WATER CHANGES Either 15-20% per fortnight without fail, or a constant water change system, which would prove much more successful.
- 9 WATER PARAMETERS Ammonia and nitrite — no trace at any time; Specific Gravity (S.G.) stable between 1.021-1.026; temperature 77-79°F (25-26°C); pH 8.2-8.3; nitrate — zero; phosphate — zero; Carbonate Hardness (KH) — 12-18 dKH (although a natural sea-water level of around 7 dKH would be acceptable); dissolved oxygen — 6-6 ppm; redox potential 250-400mv.
- 10 LIGHTING Metal halide lighting is almost obligatory, with one 150 watt lamp at 6 500k per 2 sq. ft (c0.2 sq. m). High-intensity fluorescent tubes in the right quantity would be acceptable — a five-foot (150cm) tank would need 5 or 6 tubes, plus reflectors. A photoperiod lights on) of 12 hours each day will be needed.
- 11 EXTRAS Ultraviolet steriliser, oxygen reactor, redox controller, dosing pumps for calcium supplements etc., platinum chiller to keep temperature stable, as lights will tend to send it soaring.

SEAVIEW

BY GORDON KAY



Vegetarian revelations

There was a very interesting article in the spring/summer issue of *The Vegetarian* magazine this summer, all based on Man's lack of respect for the marine environment. It quoted some pretty horrific stuff, like the fact that as much as 50% of fish caught in the North Sea is not even caught for the dinner table.

Industrial fishing catches small oily species like sand-eels for use in animal feeds, or as an ingredient in the manufacture of things like candles and shoe polish. The article also goes on to tell of how fishing isn't even economically viable. According to the author — **Stephen Connor** — the world's fishing nations spend 124 billion US dollars on catching just 70 billion dollars worth of fish! The shortfall is made up with government subsidies.

Stephen Connor then goes on to talk about aquaculture — fishfarming. The aquaculturalists



TREVOR McDONALD

cites a study conducted in Ireland, which purported to find that 94% of the lice larvae which destroyed their trout fisheries came from salmon farms.

Apparently, attempts to treat the problem with a pesticide called Dichlorvos angered local shellfish farmers, as Dichlorvos is known to kill crustacea and other marine life at concentrations as low as 0.1ppm. It is also claimed that it causes cataracts in the Salmon.

The article further cited the statistic that a single tonne of farmed trout produces sewage equal to that created by 200 or so people. That amount of waste causes problems like algae blooms, which, in turn are responsible for low oxygen levels, suffocating fishes and other organisms. Because concentrations of trout and salmon attract seals — as well as other animals like otters — salmon farmers shoot up to 3000 seals every year, because they are seen as vermin to be exterminated.

Now, I cannot say how much of the article is truth and how much is propaganda, since no sources are cited and I therefore have no way of checking. However, I do know that articles like this always have at least an element of truth and — if only 25% of it is fact — then that is 25% too much for me!

SNIPPETS

1

Chasing a meal consumes a lot of energy, so it is little wonder that some predators have evolved more subtle approaches to tempt prey into range. The Angler Fish which are found in all tropical seas, for example, are well camouflaged with trailing strands of skin which look for all the world like weeds. On their dorsal fin, one of the stiffening fin rays is

completely separated to form a long stalk tipped with a tattered coloured 'shred'. When the fish waves this flag-like fin, small fishes find it irresistible, but just as one is about to bite, the Angler withdraws its fishing rod and sucks the fish in. The suction is so powerful that there is no need for an Angler to advance on its prey.

2

A young mussel is called a spat.

LUCIA LEWIS



Deep-sea Angler, complete with 'fishing rod' photographed at the Natural History Museum in London.

Bicolour Blenny (*Ecsenius bicolor*) in its burrow in an excellent section of living rock.

say that fishes are excellent converters of protein when compared with, say, cows. Apparently, Compassion in World Farming dismiss this in a report called **The Welfare of Farmed Fish**, issued in 1992, this report says that, while the food conversion ratio (FCR) of fish is usually quoted at being 2:1 a large part of a fish's body weight will be water or inedible parts, and so a more realistic FCR would be something like 10:1 showing a huge 90% of the feed being wasted.

The author then also states that, to sustain our levels of fish consumption through aquaculture, would mean that we would have to find **FOUR MILLION TONNES** of extra grain every year! We simply do not have that much grain.

Another issue which the article raises is that of overcrowded aquaculture pens. It

Living rock rules

Living Rock is the common name given to calcareous rock which is taken from the shoreline or thereabouts, in the tropics. The rock is coated with all manner of invertebrate life when it first comes out of the sea, but although a lot of this life is able to withstand being shipped 'dry' i.e. with no water in the bag, the more delicate species die off.

In the old days, much of the living rock came from Saudi Arabia, meaning a short flight and lots of life left on it when it came in. This particular source of supply has dried up due to political constraints and now, the stuff we see comes from either the Caribbean or other regions. The living rock from the

Caribbean is generally good stuff, but it is hard to find and expensive. For this reason, the majority of living rock seen in the trade comes from other places. This is much cheaper, but as you can guess, because of the long distance sometimes involved, it is often vastly inferior with regard to the amount of life it holds.

The worst thing you can do — no matter what anyone says — is to try to mature an aquarium with living rock. As I said earlier, much of the life on the rock is either dead or dying. As it decomposes, it will produce large quantities of ammonia and nitrite, which will kill most of the other organisms that may have survived.

Of course, when it comes to tank maturation, this will merely exacerbate the problem. At best, it will delay the maturation process and, at worst, it will result in a bacterial soup which will smell foul and will necessitate starting all over again. When introduced to an already matured aquarium, however, good-quality living rock will produce a splendid population of micro organisms which will become an important part of the aquarium.

Before you do introduce it, though, remember to expel any air that could be trapped in the rock. Many of the animals which have burrowed into it will die if

SNIPPETS

3

The Braer oil spill off the Shetland Isles in '93 and the Exxon Valdez disaster in Alaska, together released more than 170,000 tons of crude oil into the sea!

4

A chemical extracted from brown seaweed — calcium alginate — is used in a fibrous dressing that is twice as absorbant as cotton gauze.

5

We all know that Stonefishes use their hollow spines to inject poison into any predator. However, the Stonefish also uses camouflage to make itself look like a rock. Partly buried under sand or mud, its disguise is further enhanced by a covering of warty lumps which secrete a sticky substance to which small organisms become attached.

6

Engineers in Iceland have just designed a trawling net which is so huge that it could envelope TWELVE Boeing 747 jet aeroplanes!

Stonefishes are deadly masters of disguise.



CORAL WORLD, ELAT

trapped in air bubbles, producing (again) ammonia and nitrite.

Also remember that living rock has a definite top and bottom. One side will have been in the light — the green algae-covered side, while the other will have been in the shade. If you put the rock in upside-down, the algae will die, as too, will the shade-loving animals.

There can be no doubt that good-quality living rock is the basis of a potentially wonderful home 'reef'. However, it is not, in my view, without cost to the environment, so, please, try to buy 'cultured' living rock if you can.

And finally...

A WELL DONE AWARD goes to Lee Mansfield of Portsmouth Sealife Centre, who used embryonic fluid from an infertile egg to keep a developing Bull Huss Shark alive after a dog had picked up the egg-case and damaged it. See News, Sept '94. Meanwhile, I'll be with you next month...

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GUATEMALA

Quest for

- 1 Rio Dulce — site of failures... and triumphs.
- 2 Iguanas are sold for food in the region... at about 8 Quetzels (less than £1). Note the legs tied behind the back to prevent escape.
- 3 An uncommon photograph of a common fruit — the cashew nut.
- 4 Live (just!) adult Golden Mojarra among a commercial fisherman's day's catch.

We (Ross Socolof, Harry Specht, Rusty Wessel) arrived in Guatemala City on Monday 11 April, 1994. It was 8 pm and pitch black outside when we cleared Customs. I had a Toyota Land Cruiser reserved for pick-up the next day. We discovered that it was immediately available, and as rental time starts from the hour you take the vehicle, we signed in. This was against all of my better instincts, as I knew from previous experience that we were looking for trouble.

We then set out on this very dark night to find the Pan-American hotel near the airport. We had a map and instructions and, brimming with confidence, we were off.

Drive through hell

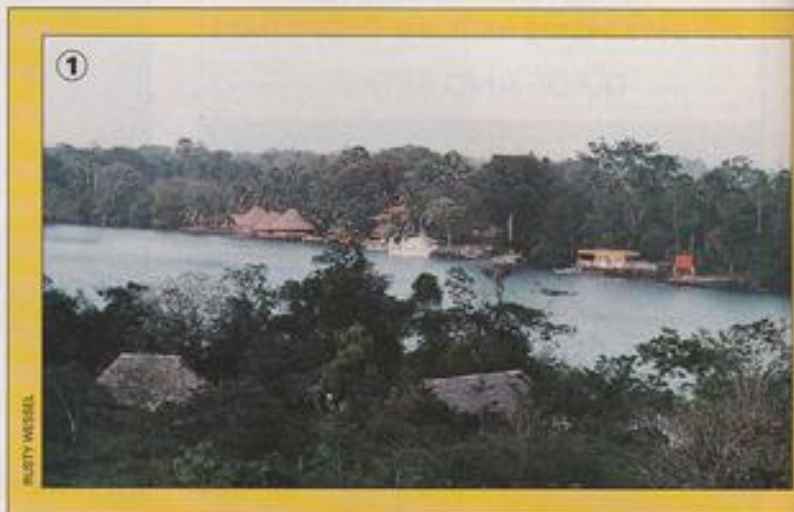
Guatemala City is the ultimate maze during the day. At night, it is the city from hell! It is also terribly dangerous. Street signs are mostly non-existent. Where signs do exist, they are cleverly camouflaged to match the exact colour of the buildings, so that the sign can magically blend into the shadows. Perhaps one corner in 20 (even on main avenues) can be identified.

I am mostly night blind, so I do not drive in unfamiliar areas (all of the world). My job was therefore to sit in the rear and scream in terror. Harry had the job of sitting next to the driver and muttering, "I can't see any signs".

After two hours of hopeless confusion, Rusty Wessel, the driver, was coming unglued. Harry was now mostly speechless, his eyes glazed over. I do not think any of us ever knew where we were, other than hopelessly lost.

We gave up and checked into the first hotel type thing we saw. It was getting close to midnight. We had been lost for over two hours and we had not eaten. We managed some sandwiches, checked the fish we had accumulated in Spanish Honduras, and passed out.

The next morning we were properly fed and armed with expert instructions. A well marked map made us confident as we



left... and promptly got lost again. This time, as we were near the outskirts of the city, fortune smiled on us and we were shortly on our way east toward Agua Dulce and the Lake Isabel area.

Twenty kilometres from the city on the Atlantic Highway (which is the best and busiest road Guatemala offers), we stopped dead in our tracks. A few weeks earlier guerilla forces had blown up the bridge. A barely adequate pontoon substitute allowed traffic to cross in single file. We were on our way again after an unwelcome hour plus delay.

Earlier searches

This was my third trip to Agua Dulce and my fourth attempt to capture living specimens of the elusive Golden Mojarra.

The first time I collected at Agua Dulce was with the late Russ Norris in 1986. We stayed at a very clean and almost closed place called Marimonte. There were no other guests. The room Russ and I had was close to some small docks on the river. The collecting area there was excellent. We could seine and use the cast nets to collect.

Two of our three major target fish, *Cichlasoma spinulosissimum*, and Convict Livebearers (*Carinhubbia stuarti*) were brought back from that trip and introduced to the hobby. The third, and most wanted, fish, the Golden Mojarra (*Cichlasoma bocourti*) was not found. I really wanted that fish and that was why we were there. We gave it a good try.

The Golden Mojarra is a very attractive fish that has never been brought out of Central America alive. A very few speci-

mens had been collected, described and preserved many years ago, however. I had photographed (in colour) one specimen Russ speared two years earlier (1983) in the Moho River in southern Belize (where it was not supposed to be). This colour photograph ran in *FAMA* magazine in April 1984.

My second visit to Agua Dulce was with Jaap-Jan de Greef and was even less productive. Jaap and I found the Marimonte closed and boarded up. We had to stay in a terrible place. We gave *C. bocourti* two hard days of collecting and gave up with zero results. Rusty, at my urging, had been in the area with Thom Grimshaw, his friend, who operates a fish farm in Belize. His attempt to find the Golden Mojarra also failed.

Return to Marimonte

Now, eleven years after the initial effort, I was closing in again for another try to collect this rare and elusive beauty. Dr. Harry Specht had been with me on the Moho river trip in 1984 and was as excited as I was. Rusty Wessel had seen the colour pictures and was totally committed to the effort. He was now driving at 120 km an hour on a bad road heading for the area. He is not your everyday obsessed cichlid collector. He is a notch above obsessed — a tireless collector with a zeal exhausting to normal cichlidists! I could never have found better companions.

We were on our way. We were confident of success, but I had no idea where we would stay. Secretly, I hoped some guardian angel had purchased the remains of the Marimonte Motel so I could avoid

the Golden Morjarra

It took him several visits and eight years, but, in the end, persistence paid off and **Ross Socolof** finally closed in on his elusive and challenging 'prey'.



LUCAS ABRAHAM

the smelly, vermin-infested, mosquito-infested dump that was all that was available to Jaap and me five years earlier.

As we approached Agua Dulce, I saw a guard at a barrier by the dirt road where the old Marimonte Motel had been. It was evidently a private road and not a commercial business, so we kept going over the bridge.

I was amazed at how much the town had grown. Most of the thatched huts had been replaced with 'real' buildings. There were a couple of terrible looking places where we could stay.

Before trying one, on a hunch, we retraced our steps to recheck the possibility that we had missed something better. On this pass, I spotted the word 'Marimonte' near the guard house. It was an auspicious omen and, after we got the guard to let us enter, things got better and better.

The Marimonte (of my dreams) had been reborn. It is now a wonderful semi-private marina and club catering for affluent people in Guatemala. Most of the customers leave boats and then come to cruise and fish on weekends. The area is alive with Tarpon and Snook, so, eventually, sportsmen from other countries will discover the area.

There is a *Cichlasoma maculicauda* (the Black Belt Cichlid) fishery there that produces Black Belts in the three-pound plus range. That was the only food available on my initial visit, and it is a wonderful eating fish.

The room was supplied with an almost adequate air conditioner. It was late in the day and it was getting dark. We therefore had to try to collect.

Nothing spectacular was caught, but H.O. did manage to get one Convict Livebearer. This is a large zebra-striped livebearer that is seldom seen. This specimen was a gravid female and he was happy. I was sure then we would get more in the next days.

Eventful dinners

In the morning, when the only dead fish from the initial collection was the Convict Livebearer, I had a bad feeling. This was only momentarily unnerving and, as the sun was just rising, we prepared to collect.

Carrying our gear to the water, we got a good look at the new Marimonte. It had been transformed into a wonderland. The grounds contain many exotic trees and

flowers. Cashew trees were full of fruit. The Sapodilla (the tree that supplies 'chicle' for chewing gum) was spectacular and in flower. Red Headed Parrots, Coati Mundi, Macaws, Toucans, and even a baby Spider Monkey were semi-caged and kept on display in the gardens.

The best part of the display was that all the animals are kept properly. The cutest was a captivating baby Ocelot, but the real stars of this private zoo made their presence known as soon as we entered the dining area.

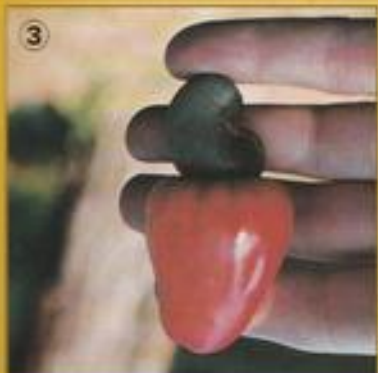
We quickly learned why the two girls who did the serving kept brooms handy. The performers were two almost-grown, tame, and delightful Raccoons. They lived in (among and on) the dining area, which was a large thatched building on the water. It made dining exciting when one would suddenly leap to the top of the table and make off with your bread. A swat or two with a broom kept them almost under control. They provided great entertainment, especially when they were attacking someone else's table.

The speciality was Mojarrá Marimonte, a huge whole Black Belt Cichlid that was at least a kilo in weight and was served with a wonderful sauce. We ordered it every meal.

Initial failures

We worked the area with push nets, seines, hand nets and a cast net. We spent a lot of time checking the fish with snorkel and mask to see what was there. No Bocourti, no *C. spinulosissimum* and no more Convict Livebearers. *Gambusia holbrooki* was described from this area and we found lots of them. Mexican Mollies (*Poecilia mexicana*) with a large percentage of reddish finned males were common. Cichlids were well represented by Super Meeki (*C. aureum*), *C. robertsoni*, *C. salvini*, Black Belts, Jaguars (*C. managuense*) and Blue-eyed Cichlids (*C. spilargenteus*). *Rhamdia* catfish, Atherinids, *Hyphessobrycon milleri*, Mexican Tetras (*Astyanax fasciatus*) and Pike Livebearers (*Balonox belizanus*) were there. Lots of fish, but not *bocourti*, *spinulosissimum*, or another Convict Livebearer. Repeatedly we struck out. We kept trying... but with no results. We took a break the second day after collecting hard in the area.

We travelled an hour or so to the Mayan ruins at Quirigua. There we found the unique and huge carved Stelae that



ROSS Socolof



ROSS Socolof



- 1 A juvenile Golden Mojarra is striped and lacks the golden coloration of the adults.
- 2 A not-often-encountered species: the freshwater Needlefish.
- 3 Our seven rescued Golden Mojarra.

has made this site famous, a small but well kept ruin that was more than worth the visit.

We collected promising areas on the way back to Marimonte, again with no success, although a huge Psychedelic Eel (*S. marmoratus*) was seined up. This one was as big as they get and was the first one that Harry or Rusty had ever seen. They really get your attention. This one was a monster. It was a good four feet long and came up snapping viciously. I told Rusty to grab it by the ears and I would take his picture. I hate it when someone looks at me the way he did!

Collecting was really discouraging. Next day was our last and we were all depressed. We had no sight of the Golden Mojarra. I knew they were there, as years before, they had been captured on a wonderful survey that had been done in Guatemala by such stellar American ichthyologists as Robert R. Miller, Reeve Bailey and Donn Rosen. I had copies of their collection site results with me. Miller had told me they had taken some *C. bocourti* in the area and had used a six hundred foot seine. Our biggest was 25 feet.

Last-ditch attempt

We had been chased by one local fisherman for the past two days to rent his boat and, as many areas were not easily reached, we relented and rented the boat. We spent the first hour heading towards the sea, which is some thirty or forty miles east. We found no places to collect and headed back toward Agua Dulce to try collecting in Lake Isabel.

Rusty spotted what looked like commercial fishermen, and we approached to

see what they had caught and to show them our Bocourti picture (that we carried everywhere). They had in their boat eight large Snook and a five-to-six-foot Tarpon.

The fishermen knew the fish in the picture and they directed our boatman to take us to an area where the native Black Belt fishermen unload their dugouts.

Things started happening fast. The fishermen all knew the fish, but no-one had caught any.

About then, the impossible happened. A late fisherman pulled in with a large catch (about sixty fish). They were all in the bottom of the boat, mostly dead. The few survivors were getting ready to die.

Bedlam and screaming was followed by really rude grasping of barely breathing large *Cichlasoma bocourti*. We were actually handling almost-living Golden Mojarra! No-one stopped us as we obviously were stricken by the rare disease 'Unhingedbibacourtiitis'. We had live, upright, pectoral-fins-flapping, living Golden Mojarra!

Four died that day and were preserved. The five survivors looked good. We were shaking with excitement. We learned from the natives that this was a very unusual happening, as they seldom see the fish and, in fact, they had not, in months, caught more than an occasional fish. We paid them a total of 18 Quetzals (two pounds sterling) for the fish.

We hired a young fisherman there who would take us to the area where the fish had been collected. This was the shoreline opposite the ancient Castillo (old fort) at the entrance to Lake Isabel. I suspect it was by then too late in the day, as we did not take any more specimens, although we spent hours trying. We then raced back to the Marimonte, where we spread our

prizes out into more adequate holding containers and treated them; this, so they could try to recover from their brush with imminent death.

Often we had speculated about what juvenile Golden Mojarra would look like as no-one had ever seen one. As the day ended, and we were getting ready to start packing for the next day's trip to Coban, Guatemala, Harry asked me to come with him for one last attempt to seine for specimens of Convict Livebearers.

Final bonus

I had developed an earache and had been trying to keep the ear dry, but agreed to give it a try. Rusty was sunbathing somewhere as he told us he deserved some time off. I was delighted when he showed up and agreed to seine one last time with Harry. They hit the big bonanza.

First they got a seine load of wonderful, mature Zebra Convict Livebearers. Next came (I still cannot believe this) part of a spawn of baby Golden Mojarra (*C. bocourti*). They look very different from the adults and are very attractive fish. Both are illustrated in this article.

The final news as I end this report is that *C. bocourti* (finally) made it back alive. Rusty Wessel has them and he will try to get them to spawn. Then we will be able to distribute this rare and beautiful fish into our hobby.

My quest started up sixteen years ago when the late Russ Norris of Belize sent me a picture of an unknown fish he had photographed after spotting it in a boy's string of just-caught fish. Five trips and a lot of sweat later, it is done. I never enjoyed anything as much.

Tomorrow's Aquarist

BY GINA
SANDFORD



Dash-Dots and Jelly Beans

For the last couple of months I've been wandering into one of my local aquatic stores at Morden (Morden Water World, to be precise) and each time, a tank of tetras has caught my eye. You know what it's like: the "Where on earth could I put those if I got some" syndrome sets in.

Up until a week ago, I resisted the temptation — for the tetras at least. I'd bought various other bits and pieces, but I knew that if I got the tetras it would need to be a shoal of at least six.

As it turned out, we were rearranging things in the fish house and Mike just happened to say that we needed something for the top tank. Two days later we were at Morden and nine Ulrey's or Dash-Dot Tetras (*Hemigrammus ulreyi*) were purchased.



Dash-Dots are beautiful, active... and great shoalers.

Although Ulrey's Tetra has been known to the hobby since 1905, it is not often imported and I certainly can't remember when I last saw some. They are a South American characin, coming from the Upper Rio Paraguay. Currently housed in a 36 x 18 x 18 inch (90 x 45 x 45cm) aquarium with soft acid water (pH 6.2 and a general hardness of about 8) and a good flow of water from a power filter, they have settled in well.

The gold line down the body and the gold flash in the base of the dorsal fin glint in the sunlight,



It looks like rhubarb... but it isn't. This is Gunnera — a giant among pondside plants.

while the whole body has a metallic sheen to it. Males are slimmer than females but there has been no sign of them attempting to spawn — unless they've been at it early in the morning while I'm still in the land of dreams. They've had a wealth of live foods, which they relish, as well as frozen and flake, so they should be fit to perform — time will tell.

If you get the opportunity to try this little fish, do so. They are peaceful and ideal for a quiet community aquarium. If you happen to be passing Morden Water World, you might like to drop in; there always seems to be something unusual available. On my last visit it was Jelly Bean Tetras, but these had reddish fins and we couldn't find them in the books. Now, I wonder where I can put some of these?

Big is beautiful

I know it's coming up to winter, and I know you won't be contemplating buying goodies for your pond, but you might like to daydream about a marginal plant for next season. With the size it can attain, you might also like to contemplate redesigning part of your garden to accommodate it!

feet, and with leaves some 6 feet in diameter, it makes an impressive sight. You can see large clumps of these in public gardens, where they are planted beside equally large lakes.

They should be planted in good soil, preferably in a sheltered, sunny, but moist position in March or April. Do not allow them to dry out. If the weather is hot and dry, water your Gunnera copiously. In winter, protect the crown of the plant from frost damage by covering with straw, bracken or similar material.

At one time, it was rare to see these plants offered for sale but, several times this past summer, I've seen small container-grown specimens in garden centres and specialised aquatic outlets.

There are two other Chilean species in cultivation: *G. chilensis*, which is an equally magnificent plant, and a much smaller, one could say minute in comparison to the other two species, *G. magellanica*. However, I have yet to see specimens of these two for sale. Maybe I've just been looking in the wrong places.

The genus *Gunnera* was named in honour of the Norwegian botanist Johan Ernst Gunnerus who lived between 1718 and 1773. He was a bishop at Trondheim and during the later part of his life, wrote *Flora Norvegia* (1766-1772).

Tetra TA COMPETITION

Win a Tetra Holdall by reading the following feature and answering the questions at the end.

The Tetra Information Centre receives over 10,000 letters each year from fishkeepers all over the world. Many of these letters contain requests for advice to solve certain fishy problems which seem to occur regularly. This month we hope to provide some basic fishkeeping hints to ensure your fish stay fit and healthy.

1 Safe tapwater

Tapwater is specially treated to ensure that it is safe for human consumption. Among other things, this involves the addition of a sterilising agent, usually chlorine, to kill any bacteria and other human health hazards.

Unfortunately, the chlorine is also toxic to helpful filter bacteria and fish.

To make tapwater safe for use in the aquarium, it is important that it should be treated with a good-quality tapwater conditioner before it is added to the tank. For the best results you should treat the tapwater and then allow it to stand for 2-3 minutes for the conditioner to work, before adding to the aquarium.

The tapwater conditioner will remove any harmful metals present in the water, but remember to avoid using water from the hot tap, which may contain high copper levels. Instead, use water from the cold tap, heated in a kettle.

2 Split/eaten fins

The disease responsible is called Fin Rot. This disease is caused by bacteria present in the aquarium or pond at all times. Fin Rot is called a secondary



disease, which means that it will only attack fish that have been damaged or stressed in some way. When the fins are damaged through poor water quality, fighting or bad handling, for example, the bacteria multiply.

Treating this condition involves two stages of action. Firstly, the bacteria should be controlled using a reliable Fin Rot treatment. Secondly, it is important to find and overcome the initial cause of damage. Very often, it has been caused by poor water quality, so check ammonia and nitrite levels. The fins will regenerate rapidly as soon as the bacterial infection has been controlled.

3 Unbalanced Goldfish

A fish which is unable to maintain its position in the water and either floats to the water surface, or sinks to the bottom, may well be suffering from a swimbladder disorder. Such disorders are common in Fancy Goldfish and are usually due to sudden changes in the water temperature which often occur in winter.

The best way to overcome such problems is to maintain a more constant water temperature, using an aquarium heater at a low setting if necessary. Move the aquarium away from any sources of heat, such as fires, or cold, including doors and windows.

An alternative cause of swimbladder disorder is excess feeding. The food within the intestine exerts a pressure on the swimbladder, causing the loss of balance to be more pronounced. This effect can be reduced by feeding more regularly, but on smaller quantities of food.

Further advice

For more detailed advice on fish or pondkeeping contact the Tetra Information Centre, Lambert Court, Chestnut Avenue, Eastleigh, Hants SO5 3ZQ or contact the 24 hour helpline on 0703 643339.

Write to them for their free information sheets which are packed with advice, from starting up an aquarium, to particular fish ailments and treatments.

WIN A TETRA HOLDALL

If you would like to win a free Tetra holdall, simply unscramble the following words which are incorporated in the above feature.

DBREMWSADIL
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TNOFEINC

Send the answers with your name and address on a postcard (or the back of an envelope) to Dept. AQ&P, Tetra Competition, PO Box 2162, Bournemouth BH2 5ZA, to arrive no later than 31 October 1994.

The first 10 correct entries to be drawn will each receive a colourful Tetra bag.



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Top, this golden male has a particularly strong orange colour.
Above, the wild-type.



Spawning under way inside a half flowerpot introduced for this purpose.

CICHLID

in Minnow's clothing

Photographs — unless otherwise indicated —
by the author

Dr Peter Burgess introduces a beautiful, hardy, easy-to-spawn minnow with an identity problem.

Is it a cichlid? Is it a small Golden Orfe? No, it's a Fathead Minnow! The amazing diversity of fishes ensures that there are exceptions to every rule and the Fathead is, indeed, an exceptional minnow. It is one of a small number of minnow species (family Cyprinidae) which guard and defend their eggs, in contrast to the vast majority of cyprinids which abandon their eggs immediately after spawning. The Fathead ensures that its progeny are given a helping start to life, thereby improving their chances of survival, a characteristic which is usually associated with the cichlids and anabantoids.

"Fathead" seems a rather uncomplimentary name for this unusual fish, but it accurately describes the thick, semi-translucent pad which extends from the nape to the dorsal fin of mature males. Seen from above, this pad resembles an elongated blister, and when viewed head-on, the fish assumes a very odd appearance!

Distribution

In the wild, the Fathead (*Pimephales promelas*) occurs throughout much of North America, being recorded as far south as Louisiana and



Male Fathead in prime condition, looking after its clutch of eggs.

across the Mexican border into Chihuahua, its northerly range extending up into the cold wilderness of Canada's Great Slave Lake region of the North West Territories.

Fatheads occupy a range of habitats, including lakes, ditches, brooks and even beaver ponds, but generally they do not inhabit fast-flowing streams or rivers.

Enter the morph

The wild-type Fathead Minnow was never a serious contender as an ornamental coldwater fish, for it has a rather drab coloration, ranging from olive green to brown above and silvery white below — hardly a match against the Goldfish, Bitterling or Golden Orfe.

Fortunately, however, an attractive yellow-orange colour form emerged in captive-bred stocks some years ago. This yellow or 'xanthic' morph (it has pigmented eyes and is not an albino) is nowadays occasionally seen for sale in the UK under the name of Golden Minnow or Rosy Minnow.

Unfortunately, most of the Fatheads offered for sale in this country tend to be juvenile specimens, often in an emaciated condition. Very occasionally, the original dark colour form finds its way into the aquarium shops. Some xanthic specimens show dark patches on the body, probably representing a genetic throwback to the wild type.

Aquarium care

Reaching only 3 inches (c 7.5 cm) in length, the Fathead Minnow is ideally suited to relatively small aquaria, where it will peacefully coexist with similar sized fishes. Fatheads can be kept together in groups, or in mixed-species communities, or simply as a pair maintained alone in a ten-gallon (45-litre) aquarium.

The fish are quite hardy in terms of aquarium requirements, tolerating tropical conditions to around 28°C (82°F), although unheated aquaria held at room temperatures, between 16-24°C (61-75°F) suit them well.

Rockwork is an important feature of the Fathead aquarium and, in this respect, the fish should be housed as if it



Left, Fathead eggs during their first day of development.

Right, three to four days into development, the shapes of the embryos are clearly visible.

were a cichlid, rather than a cyprinid. The decor should include half flowerpots positioned to form arches, plastic pipes (1.5 to 2.5 inch internal diameter) and slate caves, these structures being preferred as spawning sites. Aquatic plants are not necessary but can be included to provide extra cover; unlike cichlids, Fatheads do not dig in the gravel and do not uproot plants.

Fatheads tolerate a wide range of water conditions, such that I have bred and raised them in soft, acid (pH 6.4) and hard, alkaline (pH 7.5) waters. The fish seem to prefer soft lighting. No special requirements are necessary with regard to filtration. I use a small internal power filter, plus mild aeration.

Food requirements

The long intestine of the species, being over twice its body length, is a typical feature of cyprinids and suggests a dietary requirement for significant quantities of vegetable matter. This is borne out by studies on wild specimens in which the stomachs were generally found to contain large amounts of algae, together with zooplankton, insect larvae and organic material.

Under aquarium conditions, Fatheads readily take flake or small pellet foods, but given its natural food preferences, a regular supplement of algae would seem appropriate (*Spirulina* algae is now commercially available in flake form). The fish also enjoy live or frozen *Artemia* (brine

Spawning under way inside a half flowerpot introduced for this purpose.

shrimp), bloodworm and *Daphnia*.

Fatheads are enthusiastic feeders but are not aggressive at meal times, taking food directly from the surface or mid-water, as well as foraging head-down over the substrate.

Sexing

In mature fish, the sexual differences are obvious. Males are the larger, their bulk being exaggerated by the thick dorsal pad which extends from the nape to the beginning of the dorsal fin. The female possesses the typical 'minnow' shape, similar to our native Common Minnow (*Phoxinus phoxinus*).

In sexually mature males, the first dorsal ray is separate and is thick and blunt, and the fish develops smallish white 'nuptial' tubercles which are distributed mostly over the snout. The ripe female will be swollen slightly with eggs. However, in contrast to the wild form, the yellow



AQUARIUM CARE TIPS

- Aquarium size: 10 gallons (45 litres) for one adult pair.
- Temperature: wide tolerance range. However, an unheated aquarium, around 16-21°C (61-70°F) is ideal. If kept in ponds, it may be wise to overwinter the fish outdoors.
- pH, water hardness: not fussy.
- Lighting: low level. Fatheads do not enjoy bright lights.
- Aquatic plants: optional.
- Filtration: internal power filter, plus low/moderate aeration. Avoid excessive water turbulence.
- Substrate: fine to medium gravel.
- Decor: half flower pots, slate caves, plastic piping — these being ideal spawning sites.
- Feeding: not a fussy eater; will readily take flake, pellet, live, frozen foods. Ensure green foods are included in the diet.

morph female never bulges dramatically, at least not in my specimens.

She also develops a short, thick tube near her vent, known as the ovipositor, through which the eggs are passed; this is another feature shared with the cichlids. The male possesses a smaller, thinner tube during breeding time, through which the sperm are released.

Breeding

The following conditions have proven successful for aquarium spawning, but they should not be regarded as hard-and-fast rules, as these fish readily breed in captivity.

Dietary conditioning is important, and I generally increase the proportion of live/frozen foods, while maintaining green matter in the form of *Spirulina* flakes.

As with many temperate freshwater fishes, an increasing water temperature is one of the key triggers to breeding activity. Spawning occurs when water temperatures rise above 18°C (c 64°F), although spawnings at lower temperatures (down to 15.5°C -60°F) have been cited in the scientific literature.

As far as age of fish is concerned, I wait until they are one year old before allowing them to breed. However, there are recorded cases of Fatheads spawning at three months of age. The fish will breed in community aquaria.

At room temperatures, around 22-24°C (c 72-75°F), Fatheads may spawn as often as every five days, but this frequency may ultimately affect the health of the females. For this reason, it is wise to separate the sexes occasionally, for 4-6 week periods, in order to rest the females.

Pre-spawning behaviour usually occurs close to the site where the eggs will be laid, such as within a flowerpot. The pair go through pre-spawning embraces, swimming side-by-side and twisting upside down. Eventually, the female



The underside of lily pads are favourite spawning sites for Fatheads kept in ponds.



Miniature Fatheads at two months old.

deposits a few eggs which are simultaneously fertilised by the male. The eggs are adhesive, as are those of many cichlids, and are generally deposited on the underside of structures. Clutch size varies between 30 to several hundred eggs.

After spawning is completed, the male remains beneath the clutch and guards it against intruders. While pursuing these parental duties, he is mildly aggressive to other fishes, including the female, driving them away from the nest, but never appearing to cause serious damage to the tankmates.

The male exhibits a fascinating behavioural response towards the eggs in that he regularly strokes them with the fatty pad on his head, which possibly serves to clean them. Occasionally, the egg clutch disappears and cannibalism by the male and/or female must be suspected.

I generally remove the male a few days after spawning. Alternatively, the structure containing the eggs can be moved to a smaller tank, around two gallons (9 litres) — a brief exposure to air will not harm the developing embryos. An aerator stone is positioned near the clutch to ensure good water circulation.

Hatching occurs 5-12 days later, depending on water temperature. The fry will take their first feed by day 2 post-hatching, and will accept finely powdered flake food which can soon be supplemented with newly hatched brine shrimp. Within a month or so, the fry can be netted and moved to a larger tank for growing on. Fatheads live for around two to four years.

Fatheads in the pond

Its small size, conspicuous orange colour and active mid-water swimming behaviour makes the Fathead Minnow an ideal fish for the small garden pond, where it will happily co-exist with Goldfish. Viewed from above, it resembles a small Golden Orfe.

In Britain, Fatheads will spawn in the pond during the summer months, often depositing their eggs on the undersides of lily leaves. I have maintained specimens outdoors throughout the year, although some losses occurred during a severe winter. This apparently poor adaptation to very cold conditions is unexpected, given the fish's extreme northern distribution. It is therefore possible that the yellow morph is less hardy than the wild fish.

In conclusion

The yellow variety of the Fathead Minnow deserves to be a favourite for the coldwater enthusiast, especially in view of its fascinating spawning behaviour and general hardiness. As mentioned earlier, the paucity of quality adult fish for sale in this country may well explain its current low popularity, a situation which I hope will change. So, next time you consider acquiring something unusual for the cold-water tank or pond, think about some Fatheads!

PIMEPHALES FACT FILE

Fathead Minnow
Pimephales promelas (Rafinesque). Etymology: Pimephales=fat head; promelas=before, black.

Three subspecies have been described, namely: *Pimephales promelas promelas*, *P.m. confertus*, and *P.m. harveyensis*, although there is some disagreement as to the validity of this systematic arrangement.

Bluntnose Minnow

Pimephales notatus (Rafinesque). Etymology: notatus=noted, spotted. Size: about 2.5 inches (c 6.4 cm). Distribution: found mostly in the Eastern United States. Spawning habits are similar to those of the Fathead. Colour: described by Scott and Crossman (1979) as olive green to brown dorsal surface with silvery sides and silver white below. A conspicuous dark spot occurs at the base of the caudal fin from which a dark lateral bar extends to the eye. (I would be pleased to hear from anyone who is in possession of this species!)

FATHEADS GALORE

In the United States, the Fathead is used as a bait fish, being raised in vast quantities to supply the angling trade. A survey in the 1970s showed that there were approximately 3,000 bait dealers and 350 fish farmers in America which dealt with this species (cited from Quinn, 1990).

Further Reading

Quinn, J. R. (1990). *Our Native Fishes*. The Countryman Press Inc., USA.
Scott, W.B and Crossman, E.J. (1973). *Freshwater Fishes of Canada*. Bulletin 184 of the Fisheries Research Board of Canada, Ottawa 1973.

SPAWNING AND REARING

Colin Grist advises on how to choose broodstock and on how to feed the fry if the choice proves to be successful.

Throughout all that has been discussed so far in this series of articles, the greatest challenge is undoubtedly to achieve a successful spawning and rearing of your chosen species. But, how do you get started? Obviously, you require some parent fishes, although obtaining true pairs can, in many cases, be more difficult than inducing a successful spawning.

One of the reasons why Clownfishes, *Amphiprion ocellaris*, are so popular for captive breeding projects is the fact you only require two individuals to ensure having a viable pair. This is because the larger, more dominant, of the individuals will either be, or will change into, a female; the smaller one will remain a male and become sexually active, while any others in a group will be sexually non-active.

High costs

Sometimes it is possible to obtain pairs which have already been mated, but normally you will have to pay a high premium for these. Any species for sale as proven pairs will almost certainly carry a high price tag. I know this is often the way in commerce, but, as far as the aquatic trade is concerned, I believe this to be wrong in this case. It is not unusual to come across pairs of Clownfishes being sold for between £50 and £80, despite them normally costing less than £10 each from retailers, and I have seen a proven pair of Maroon Clownfishes, *Premnas biaculeatus*, being sold for £110! These prices seem excessive to me and offer no incentive whatsoever to prospective marine fish breeders.

Those who collect fishes for the aquarium trade find it easier to catch a mated pair than two separate individuals, so, obviously no extra cost is incurred



TREVOR McDONALD

Healthy juvenile Black Clowns (*Amphiprion melanopus*) photographed at Aqualife Research Corporation in Fort Lauderdale, Florida. At four weeks the colours and patterns typical of the species are already present.

there. Occasionally, it might be necessary to package mated pairs of certain species in such a way that more space is required in the freight boxes, but the extra cost will be minimal and could be offset (in the ideal world!) by the fact that the paired fishes were caught more economically than usual.

Wholesalers and retailers may have to provide space for the pairs without other fishes disturbing them, which could be argued to incur an extra cost, although with careful management of stocking, this can easily be avoided.

I also believe some wholesalers and retailers should do a bit more to find out who is active in breeding and rearing so that these people, or establishments, can be offered first option on any proven pairs that become available.

Buying and acclimatising

Whether you can obtain proven pairs or have to take pot-luck, it is important to check the health of the fishes. Always look out for parasites and unusual spots and lumps before purchasing. Never buy fishes with pinched bellies and/or cloudy eyes — only consider those with a bit of 'meat' on



ROGER FOGGOTT

A mated pair of Banded Clowns (*Amphiprion clarkii*), here photographed in the wild in the Maldives (the smaller fish is the male). Such pairs are often easier to collect than two separate non-mated individuals.

them and bright clear eyes, and watch for alertness and normal swimming behaviour. If possible, it is also worth asking if you can see the fishes feeding.

Once you are happy the fishes you require are suitable for your purposes, transfer them carefully and as swiftly as possible to their destination. Introduce the fishes to their new home by gradually mixing tank water into the water the fishes have been transported in to equalise any differences in temperature and specific gravity etc.

Most important of all is checking pH. Sudden changes in pH, especially downward, can cause a great deal of harm to fish. This is not usually a problem which is often encountered, unless the transfer journey has taken a very long time, but it is always prudent to monitor pH, just in case. Newly arrived fishes in shipments from abroad will be found in water where the pH has dropped to as low as 5 (8.3 being normal for marines); therefore, a great deal of care is required to make the adjustment slowly.

One method to acclimatise water conditions which I have successfully used for many years is to support the fish transfer bag in a suitable container and drip-feed into it water from the

destination tank by means of a length of standard 1/8 inch aquarium air line and a valve (see diagram). The whole operation should be carried out under dim lighting conditions, but not total darkness. Normal light can be resumed after a couple of hours when the newly introduced fishes have quietly become accustomed to their surroundings.

At this juncture, I must mention that I am assuming the aquarist has researched the natural history and requirements of the species he or she is going to attempt to breed before obtaining them. It is important to try and simulate the correct water conditions and habitat (see the previous article in this series — August '94). More specific details on various groups of fishes and invertebrates will be given in forthcoming articles.

Feeding for success

Once your subjects have settled into the breeding tank, it is important to start a strict feeding regime which is as close to their natural requirements as possible. In most cases, you will find suitable foods within well known proprietary ranges.

Although it is not always essential, it may help if the fishes were fed in a manner relative to their natural feeding behaviour. For example, your chosen species may simply rise to take planktonic organisms from open water areas, or graze on algae (try culturing the correct species), or sift through the substrate for small invertebrates. In addition, try offering fish roe, as this contains certain hormones which are believed to help trigger breeding responses.

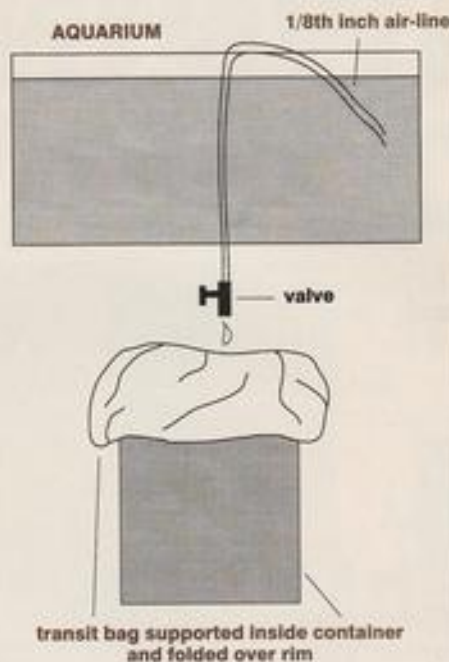
If after a prolonged 'conditioning' period you have still not had any results, it will be worth considering these following points. Perhaps water conditions or food etc. are still incorrect, in which case further research will be necessary. Or, you have ended up with specimens all of the same sex — in a very large number of coral reef species, it is extremely difficult to distinguish between the sexes, at least by eyesight — so you will probably need facilities to separate the individuals, especially if aggressive behaviour ensues. Perhaps pairs need to be separated by a transparent partition until full breeding condition has been achieved, which is a technique frequently employed when breeding certain species of freshwater tropicals.

Whatever happens, it is vitally important for you to document your observations in a note book and pass on your information to relevant people and organisations.

Fry rearing

If your fishes are successful in spawning, then you will have to transfer the free-swimming larvae or floating eggs into a rearing tank. The techniques for

Technique for acclimatising fishes by drip-feeding water from aquarium into transit bag



NEXT TIME

The start of a few articles on the techniques and requirements for breeding and rearing different groups of fishes and individual species.

INFO BOX

1 To establish broodstock, other than by obtaining proven pairs, combine groups of juvenile specimens of the same species, preferably from different sources, as this will help ensure any offspring will be genetically strong.

2 Always research the natural history of your chosen species before obtaining broodstock. This will allow you to prepare the correct physical (temperature, light, habitat etc.) and chemical (water quality) environments.

3 If you have witnessed a successful hatching, the larvae rearing tank should have a food (rotifer) concentration of about 30 organisms to a teaspoon sample of water.

4 Where large numbers of young fishes are being reared together, watch out for them huddling and shimmying in groups. This will be caused by the phenomenon known as Toxic Tank Syndrome. Move the fishes into a totally isolated system and the symptoms should go away, otherwise you will probably lose all the brood in a very short period of time.

doing this were described in my August article, which deals with creating a hatchery.

Once the larvae are free-swimming, they will continue to take nourishment from their yolk sacs for a short period. After that they will require a constant supply of suitable live foods, so you must have your rotifer and algae cultures already established (see my article on this subject).

The concentration of rotifers (or whatever organism is used as a first food) to be maintained in the rearing tanks will often have to be determined by trial and error. However, the following will serve as a good guide. If you are not in a position to use a microscope, then a plastic teaspoon and a magnifying glass will have to suffice when monitoring rotifer concentrations. Ideally, you will want about 30 rotifers to a teaspoon.

Take around half-a-dozen teaspoon samples from the rearing tank during each test and when the average concentration equals 30 organisms, there will be enough to rear the larval fishes. This concentration must be maintained, and in time, you will be able to judge the levels just by looking at the water in the rearing tank.

When the larvae reach metamorphosis and become juveniles, usually between 1 and 4 weeks, depending on the species, you will notice colour and pattern appearing, and they will start to look more like fishes.

Now is the time to start offering food such as newly hatched brine shrimp nauplii and other fine particles of food. As the fishes grow, you will need to separate them out into larger growing-on tanks.

Keep frequent checks on water quality in the rearing tanks, and do not worry if an algal bloom occurs, as it will generally do no harm.

One serious problem you are likely to encounter is what is commonly known as **Toxic Tank Syndrome**. Where relatively large numbers of larvae are being reared, it is possible to lose the lot through invasion of certain bacteria originating from filter media and other surfaces. Some of these bacteria could be overpowering strains of *Vibrio anguillarum*. Symptoms to watch out for are the young fishes grouping together and moving in a shimmying fashion. It seems the best cure is to move the fishes into another totally separate rearing tank which has had no contact with the rest of the system.

(TO BE CONTINUED)

STEPHEN SMITH



Gizmo and Nobby move home

Nobby, the UK's largest Nurse Shark in captivity, and Gizmo, a giant Queensland Grouper, have moved from their home for the last ten years at Shirley Aquatics, to Great Yarmouth Sea Life Centre.

A third tankmate, a smaller Yellow-tailed Grouper, has also made the trip from Shirley Aquatics' 16 feet-square aquarium to the comparative luxury of a 100,000-gallon tropical shark display at the East Coast resort.

"The shark and two groupers had finally outgrown their display tank at Shirley, Solihull, West Midlands, and there was simply not enough room to enlarge their tank any further," explained Shirley Aquatics' managing director John Cooke.

The Great Yarmouth display also houses a host of tropical fish, including more than 20 tropical sharks, among which are two other Nurse Sharks and a further Queensland Grouper — which may provide Gizmo with a mate!

"No-one knows what sex Gizmo is, but groupers can actually change their sex if they fail to find a partner of the opposite gender," explained Mark Oakley on behalf of the Sea Life Centres.

Pond popularity increasing

An increase in the popularity of ponds has been revealed in a survey of pondkeeping conducted by Interpet. According to the survey, in which just under 300 people in the UK were questioned, almost 60% had installed their pond within the past four years, while 73% of ponds in the UK are between 150

The Yellow-tailed Grouper begins its journey from Shirley Aquatics to Great Yarmouth Sea Life Centre, prior to the removal of Gizmo and Nobby.

and 1,000 gallons, with 88% being at a depth of two to three feet.

"Overall, very few people seemed to know how to make the best of their pond," remarked Adrian Exell, brand manager for Interpet. "Only 20% of people questioned purchased a filter at the same time as the pond, supporting the opinion that people tend to install a pond, have problems, and then try to solve them."



MAKE YOUR POND SAFE!

The survey was undertaken as part of the company's research into Interpet's new **Pond Workers In-pond Filter** which, Adrian Exell explained, "tackles all the key problems, including algae, as well as reducing pond maintenance and helping to prevent cloudy water and disease."

According to the survey, the vast majority (71%) of people questioned installed the pond themselves, and 25% like their ponds for their appearance, with 23% finding them attractive for wildlife. Only 21% said that fish are the highlight of their pond, although 94% of people questioned said that they have fish.

The most unpopular aspects of the pond are algae and blanketweed which accounted for 40% of complaints. People also disliked cleaning the ponds, problems caused by cats, herons, cloudy water and fish diseases.

Only 4% of those questioned had no plants in their ponds and over 50% had a filter, whether a piece of foam on the pump, or a multi-chamber Koi pool filter.

Interpet Limited, Interpet House, Vincent Lane, Dorking, Surrey RH4 3YX. Tel: 0306 881033. Fax: 0306 885009.

Instant success

A new range of high-digestibility foods for Discus and cichlids, tropical fish, and Goldfish, launched in September by the manufacturers of Phoenix 2000, has already achieved almost a third of its first-year targets.



The new range of Phoenix 2000 high-digestibility foods has met with enormous success.

The claim was made by **Goldline Feeds'** director **Steve Kuzio**, who now plans to appoint two further executives to the company's existing sales team. Speaking to *News* about the success of the newly-launched range, Steve explained: "The launch of the range of pellet foods is the culmination of intensive research and development. The Discus and cichlid food is the first in the world to contain beef heart, spinach, and Spirulina, as well as a blend of essential minerals and vitamins, and the proven high digestibility of the range helps aquarists to retain high levels of water quality and thus reduce strain upon filter systems."

Steve added that Phoenix 2000 Koi food has a digestibility of organic matter to a level in excess of 96%, verified by MAFF; while the recent additions to the range, for aquarium fish, have a ratio of 94% digestibility of organic matter.

The Discus and cichlid slow-sinking pellets have been on test for the past year at Discus breeding specialists **Euro Discus UK**, whose proprietor **Steve Dudley** remarked: "Within two days the workload had been cut almost by half, such was the effect of not needing to prepare special menus and having virtually no waste from uneaten or undigested food. Throughout the test period, the growth and

vitality of the stock has been tremendous, and there has been an improvement in the quantity of eggs produced."

Goldline Feeds, Pinfold Farm, Welham, Retford, Notts DN22 0SQ. Tel: 01777 702131. Fax: 01777 706800. Contact: Steve Kuzio, Director.

Show, learn, and enjoy at Weston

Over 500 top-quality fish are expected to be exhibited at the **Supreme Festival of Fish-keeping** and the **Interpet European Open Show** at this year's Weston Show (Pontins Sand Bay Holiday Village, near Weston-Super-Mare, 4-6 November).

In addition, joint exhibition organisers **Interpet** and **FBAS** hope to install a 'Fish Phone' advice line (0934 643464), between 10 am and 5 pm — broadcast on Orchard Local Radio, as well as organise aquarium furnishing competitions (such as a 'race' to complete the task in 20 minutes) and run a series of seminars.

Guest speakers at the event are **Dieter Vogt**, who will be making two presentations during the weekend, and **Charles Harriss** of Purity on Tap; additional presentations will be made by the **International Water Lily Association** and the **International Marine Aquarists' Association**.

The festival will also incorporate competitions for the best stand and the best furnished aquaria, while the visiting public will be given the opportunity to judge the fish and stands. In addition, **Waterways**, the Hampton Silver Award winning water garden from **Anglo Aquarium Plant Co** will be re-mounted for the benefit of visitors for the duration of the show.

Day entry fee is £1.50 for adults and 50 pence for children, and FBAS has negotiated a special rate of £59 for a weekend booking at the holiday village. (Deposit of £15 per person is required at the time of booking — cheques made payable to FBAS).

Details: 1. **Information brochure and booking form** — Colin Richards, c/o 8 Acacia Avenue, Brentford, Middx TW8 8NR (Tel: 081 847 3586).

2. **Supreme Championship and Open Show Entries** — Alan Henderson, 5 The Nook, Corby Village, Corby, Northants NN17 1XA (Tel: 0536 258 269).

3. **Tableaux Entries** — Peter Furze, 9 Upton Road, Hounslow, Middx TW3 3HP (Tel/Fax: 071 570 0934).

A & P
AQUARIST & PONDKEEPER
Supplement

Step-by-Step Community tank guide

Successful catfish catering formula



Top tips for Cichlid tanks

Beginning with Discus

Create a spectacular Dutch aquarium





FRESHWATER TROPICAL AQUARIA

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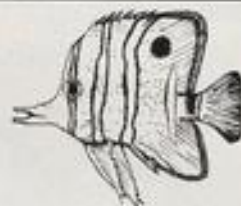
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Besides sharing a passion for aquatic creatures, we all — as aquarists — have, or have had, at least one other thing in common, irrespective of whether we've ended up specialising in livebearers or cichlids, or whatever: a community aquarium. In our early attempts at fishkeeping, many of us will have also experienced the odd disaster with our community set-up.

In my case, my first community aquarium (set up way back in 1953) suffered from youthful over-exuberance on my part. Thinking back, I think I had so many fish in it from the start, that they probably didn't even have room to turn! No wonder I was soon scooping out smelly corpses from the rotting soup with such disturbing regularity. If I had known then what I know now (as they say)... but I didn't, and my fish suffered as a result.

If the above is your idea of what beginners have to go through, then let me assure you that you *don't* have to experience these disasters. Setting up a community aquarium is easy, as long as you adopt a sensible, informed approach. And disasters *don't* have to happen... and *will not* happen... if you obey a few basic commonsense golden rules.

The great thing is that these rules are not as totally inflexible as many other rules. They have limits, of course, but the 'edges' of these limits are not particularly sharply demarcated.

Setting up

Take setting up the tank itself, for example. There are numerous ways in which this can be done, and opinions vary on the more minor procedural details, but they all cover the essentials.

One such procedure which can be applied to the majority of set-ups is outlined below. However, if you are planning specific layouts for, say, Discus, Rift Lake Cichlids, or Catfish, these have their own special requirements (see the articles by Anton Cass, Mary Bailey and Gina Sandford elsewhere in this Supplement for expert guidance on specialised systems).

1 Check that all the necessary equipment has been bought: aquarium, stand (if necessary), hood (unnecessary if spotlights or mercury bulbs have been chosen), condensation tray, lights, starter unit (if lights are fluorescent), heater-stat, thermometer, aerator, airline, non-return valve, diffuser stone, filter, filter media (if model is not of the undergravel type), gravel, gravel tidy (if desired), terracing/rocks/wood, plants (to be kept moist), plugs (one for each piece of electrical equipment, though if a cable tidy is used, only one plug may be necessary) and water testing kits.

Certain items of accessory equipment such as algae scrapers and nets, will need to be bought soon, but are not absolutely essential on the first day.

Successful Communities

A&P editor John Dawes offers a step-by-step guide to setting up a community tank.

Photographs — unless otherwise indicated — by Harry Grier/Florida Tropical Fish Farms

As their 'label' suggests, community aquaria contain a selection of fish and plant species that can co-exist in harmony.



A community aquarium often forms a focal point of interest for the whole family.

2 Select a site away from direct sunlight, draughts and extremes of temperature. Check that the piece of furniture (if one is being used) on which the tank will rest is strong enough. This does not, of course, apply if you are using a proper aquarium stand or cabinet.

Remember: water weighs a lot — 10lb (4.5kg) per gallon (4.5 litres). Gravel weighs about 100lb (45kg per cubic foot, c6.25 gal-28.4 litres) and rocks even more.

3 Test the tank for leaks and repair them, or exchange the tank if necessary.

4 Rest the empty tank on polystyrene strips or sheet.

5 Add the gravel, sand or other substrates in the following sequence:

- (i) Place undergravel filter into position if one is being used;
- (ii) Lay gravel tidy on top of the filter plates if one is being used;
- (iii) Rinse gravel/sand thoroughly in a plastic bucket until water runs clear;
- (iv) Spread a layer of gravel/sand on the filter plate or gravel tidy;
- (v) Add layer or pockets of organic planting medium if required;
- (vi) Add remainder of gravel/sand and arrange aquascape with chosen rocks, bogwood, etc. Personal taste plays an important part here but, if possible, symmetrical arrangements

It is almost unthinkable to have a community set-up without Guppies.



Gouramis, like the Three-spot, are popular community fish, but tend to become aggressive as they grow.

Platies are a good choice... but not long-finned varieties such as this one, if there are any fin-nippers around.



The Angelfish has always been one of the Top Ten fish for first aquaria



should be avoided.

6 Place heater-stat, airline and internal filters in position, making sure that the base of the heating unit does not touch the gravel.

WARNING: Don't switch anything on!

7 Add the water. This is best done in a 15-point sequence:

- (i) Start filling the aquarium with water. Avoid disturbing the bedding medium by pouring the water onto a sheet of newspaper, grease-proof paper or plastic laid over the aquascape. Alternatively, pour the water into a jar or jug placed on a saucer. The important thing is to avoid direct contact between the stream of water and the bedding medium.
- (ii) Fill the aquarium up to the halfway mark only.
- (iii) Add a small quantity of warm water to raise the temperature into the tropical range (even plants can feel the cold!)
- (iv) Remove newspaper, jars, etc.
- (v) Introduce the plants, ensuring that small species are placed near the front. Make sure that plants whose leaves emerge from a crown, e.g. *Valisneria* and Amazon Swords, have this part exposed. If covered, crowns can rot.
- (vi) Add water conditioners and dechlorinator.
- (vii) Complete the filling process, leaving, at least 2.5cm (1in) between the surface of the water and the edge of the glass.
- (viii) Arrange power filter inflow/outflow tubes, or push powerhead into position on top of the undergravel filter airlift.
- (ix) Lower condensation tray into position.
- (x) Install lights in hood.
- (xi) Place hood in its permanent position.
- (xii) Arrange cables, airline, starter unit, etc., in hood compartment if this is available. If not, arrange leads and airline neatly out of view behind the aquarium, e.g. using a cable tidy.
- (xiii) Insert non-return valve in the airline.
- (xiv) Locate aerator above tank level, e.g. suspended from a hook on the wall.
- (xv) Set up power filter connections.

8 Start the aquarium running. Follow this sequence of steps:

- (i) Switch on all electrical equipment. This should be done, preferably, in the morning to allow for monitoring and adjustments.
- (ii) Adjust air and filter flow rates — neither should be too turbulent.
- (iii) Check temperature hourly and adjust thermostat if necessary.
WARNING: switch off all electrical appliances before any adjustments are made. Allow heater to cool down for about ten minutes before removing it from the water.
- (iv) Test pH and hardness and adjust if necessary.
- (v) Run the system on a 12-15 hour light period for a week if possible. This week-long period is not an absolute necessity with the water treatments and conditioners available today. However, it is advisable, since it allows the aquarium to settle down and the aquarist to carry out adjustments and generally become familiar with the art of aquarium management.

During the first week, the water may become cloudy. This is quite normal and is caused by a 'bloom' of micro-organisms. It should clear within a few days, marking the end of the first major observable stage in the maturing process.

Stocking levels

1 Fish

There are so many different kinds of aquarium fish, and their requirements differ so much, that it is quite impossible to give universally applicable, infallible figures concerning the numbers of fish that an aquarium will hold.

Even the same aquarium will vary in the number of fish of a single species that it can accommodate if the temperature, diet, filtration, aeration, or any other factor is altered.

It is therefore essential not to be too ambitious, particularly at the outset. A safe way of going about stocking an aquarium is to start off at the 50% level and add fish gradually over a period of weeks. This approach has the added advantage that it avoids stretching the biological capacity of a filter beyond its limits, thus giving it time to mature and enhance its efficiency in tune with the slowly increasing fish population.

The figures given in the accompanying table represent approximate stocking levels (at full capacity) for fish which are neither over-aggressive nor possess other 'undesirable' qualities which dictate that they may be kept either individually or in pairs. Note that the sizes of the fish are measured in body length, omitting the length of the tail.

Everybody's favourite catfish for a community aquarium: the Bronze Cat (this is the albino form of the species).



2 Plants

Genuinely small plants, i.e. those which grow only to a maximum length of 10cm (4in) or so, should be stocked at the rate of 50 plants per square foot of planting area (c. 900 sq.cm). This would include species such as *Sagittaria subulata* forma *parvifolia*. Medium-sized plants, such as *Valisneria* and *Hygrophila*, should be planted at a lower concentration — say, around 20-25 plants per square foot (c. 900 sq. cm). For specimen plants, such as the larger Amazon Swords (*Echinodorus* spp.), single specimens, or just a few, will be enough.

For a selection of plants and a possible layout, see Barry James' article on Dutch Aquaria elsewhere in this Supplement.

I referred in my opening to the fact that disasters can be avoided. Following the guidelines outlined in this article should help you achieve initial success. **MAP**



This page, from top to bottom.

Cardinals are gorgeous fish that should be near the top of everybody's list. However, avoid putting in small specimens with medium-sized or large predators such as Angels. Mollies are always recommended for community aquaria, yet many varieties (if they've been bred and reared in slightly salty/brackish conditions) will tend to suffer after a while in complete freshwater set-ups.

Barbs (this is a long-finned Rosy Barb) are attractive shoalers. They can be fin-nippers, though, if kept singly or just in pairs.

Swordtails are hardy, active and beautiful, and should feature in every fish selection.

APPROXIMATE RECOMMENDED STOCKING LEVELS

Aquarium Surface Dimensions		Number of Fish		
Inches	Centimetres (Approx)	Up to 5 cm (2 in)	5-7.5 cm (2-3in)	7.5-10cm (3-4 in)
18 x 10	45 x 25	14	10	Not Recommended
24 x 12	60 x 30	22	16	14
36 x 12	90 x 30	33	24	21
48 x 12	120 x 30	44	32	29
60 x 18	150 x 45	83	60	54

COMMUNITY FISH SELECTION

Common Name	Scientific Name	Comments
Guppy	<i>Poecilia reticulata</i>	Numerous fancy varieties are available
Swordtail Platy	<i>Xiphophorus helleri</i> <i>Xiphophorus maculatus</i> <i>Xiphophorus variatus</i>	These species are very closely related and inter-breed. Male Swordtails can be aggressive towards each other
Molly	<i>Poecilia sphenops</i> <i>Poecilia latipinna</i> <i>Poecilia velifera</i>	All Mollies should be kept in water containing about one teaspoonful of salt per gallon
Zebra Danio	<i>Brachydanio rerio</i>	This is a very fast-swimming shoaler
Spotted Danio	<i>Brachydanio nigrofasciatus</i>	This species is similar to its close relative, the Zebra
Neon	<i>Paracheirodon innesi</i>	These two species are very similar to each other.
Cardinal	<i>Paracheirodon axelrodi</i>	Cardinals have more colour. Both are shoalers
Harlequin	<i>Rasbora heteromorphia</i>	A beautiful shoaling species with a cone-shaped dark patch in the posterior half of the body
Tiger Barb	<i>Barbus tetrazona</i>	Lively shoaling species. May nip fins if kept singly or in pairs, therefore keep in shoal. Several varieties are available
Angel	<i>Pterophyllum scalare</i>	Only small specimens should be kept in a community tank. Several varieties are available
Bronze Catfish	<i>Corydoras aeneus</i>	This species is also available in an albino form. Good, sturdy bottom-level feeder
Kuhli Loach	<i>Acanthopthalmus semicinctus</i>	This is a peaceful eel-like species
Sucking Loach/ Chinese Algae Eater	<i>Gyrinocheilus aymonieri</i>	Sucker-mouthed very fast-swimming herbivore. Some specimens can be aggressive
Plecostomus	<i>Hypostomus</i> spp	Sucker-mouthed herbivore. More peaceful than the Sucking Loach and a slower mover
Dwarf Gourami Three-spot/Blue/ Gold/Platinum/ Cosby/Opaline Gourami	<i>Colisa lalia</i> <i>Trichogaster trichopterus</i>	These species have special air-breathing organs. <i>T. trichopterus</i> males can be aggressive
Siamese Fighter	<i>Betta splendens</i>	Only single males may be kept safely in a community aquarium

Beginning with

Anton Cass of Aquafight presents the perfect introduction to Discus keeping.

In every walk of life, whether it is with work or pastime, there exists an ultimate goal, a holy grail, an Everest waiting to be climbed. Fishkeeping is no different in this respect, with many aquarists pursuing their own impossible dream. To the Koi keeper, it is probably the Tancho Sanke, the fish with which Koi keeping begins and ends (every beginner wants it and, once obtained, it is argued that the ultimate has been achieved). For the tropical freshwater aquarist, the Discus is that dream.

Discus have, for many years, been associated with words and phrases, such as "require soft acid water, extremely shy and nervous, difficult to feed, susceptible to mystery diseases and require a darkened aquarium with little or no water movement", which have in turn all contributed to the mystique of this fish. In fact, some of the statements have been responsible for the loss of numerous specimens because, as we shall see, they are based on descriptions of the natural habitat of the Discus, the Amazon River system, which, because of its sheer size, cannot be duplicated in any home, let alone that of the average aquarist.

Getting started

Having questioned the old establishment of thought concerning the 'King of the Aquarium', how does one proceed to consider the task of keeping and successfully maintaining this magnificent fish?

The primary area to consider is the actual aquarium that is going to be utilised. Size is of obvious importance, but not just the dimension of length. Because Discus are reasonable-sized fishes, akin to a six-inch (15cm) saucer, and are not as boisterous as other cichlids, i.e. their brethren of Lake Malawi, they do not require an extremely long aquarium. They tend to be more sedate, preferring to retire to the rear of their home; they also like to have a reasonable amount of water to move up and down in. It is for these reasons that depth and width take on a very significant role.

Discus may be maintained very easily in a two-foot (60-cm) cubed aquarium, whereas other cichlids would experience problems due to lack of surface area. As a guideline, my own recommendation would be for a minimum size of 36 x 18 x 15in (90 x 45 x 38cm) — approximately

35 imperial gallons (c160 litres).

In addition, the siting of the aquarium needs to be considered. Discus, especially the larger specimens, do not like to be low down. They rarely become confident and do not exhibit their true colours, which is somewhat of a waste. The same also applies to fishes kept in aquaria that are subject to a lot of commotion, i.e. people constantly running in front, banging doors or even other pets jumping around the vicinity.

Surprisingly, lighting does not have to be extremely dim, despite what ideas of the natural biotope of the Discus may exist. In the natural surroundings, Discus tend to inhabit areas in the vicinity of large expanses of tree root systems, hence their high and laterally compressed shape.

They do not inhabit black water systems, preferring white or the clearer type of water found in the tributaries. This is reflected in their reaction to domestic lights. As with everything, avoid extremes, that is to say, 200w systems over a small aquarium — but most of the standard aquatic tubes, especially those of the brighter nature, are accepted quite easily, even if the fish take a short time to get used to them.

Good filters

Filtration is the one area where lack of it can be costly. Discus react very badly to poor water quality, eventually falling victim to various ailments. Nitrite (NO_2) is hardly tolerated at all, with most fishes becoming very ill in a very short time and dying unless something is done immediately. Therefore, invest in a decent filtration system and do not worry about water turbulence.

Possibly the reason that many people believe that Discus do not like fast-flowing water, originates from the idea that the natural locations of these fishes appear to be very still, with no water movement. They may appear very still — and may even be so to a point — but they also contain more gallons than the larger-than-average aquarium... and the water is 'aquatically' pure; that is to say, there is no adverse reading of toxins at all. Moreover, there is usually quite a significant current somewhere, causing an extremely effective water change.

There are numerous more-than-adequate filter systems available, from the large canister type, to the more recent large internal systems. Some aquarists actually opt for two smaller units so that they can have a backup system. This also allows one filter to be cleaned while the other then serves to reactivate the renovated one. In this way, nitrite surges can



BILL TOMNEY



BILL TOMNEY

Buying a number of youngish fish at the outset is probably better than going for adult breeding pairs.

Planted aquaria look more 'natural' than bare tanks and are preferred by most newcomers to Discus keeping.

Discus

Every Discus keepers' ultimate aim — successful spawning.

While very attractive in coloration, this young Discus is stunted (one clue is its relatively short body length in relation to its height). Such fish are not likely to produce good broodstock later on.

ARNDT THIN

be avoided easily, causing little or no stress to the fishes.

Undergravel systems do work, but as far as Discus are concerned, their lack of accessibility in cleaning, plus the fact that aquarium gravel is not always inert, i.e. it can cause adverse water chemistry readings, do not make them ideal for the discus aquarium. As Discus can be messy feeders, small particles of food can also become lodged in the crevices, where they can rot, possibly causing further problems.

Decor

One of the more widely used substrates for many Discus set-ups is lime-free silica sand. This has the benefits of being completely inert (does not affect water chemistry) and, because it tends to pack down due to the grains being fine, food does not tend to become overlooked, as it cannot disappear into any crevices.

Any other additions to the aquarium should also be completely inert. Check any rocks, as they may contain limestone or some other compound which may cause problems. The best ones to use are of the igneous variety, i.e. granite or basalt, or sedimentary types such as sandstone, as these do not decompose in water.

An alternative is some form of aquatic wood, i.e. curio wood, as this tends to make the water of an acid nature, due to its release of tannins. Any wood should be soaked to allow for excess tannic acid to be released before being placed in the aquarium. Certain of the cheaper woods for sale also float, so ensure that these are firmly weighted down before adding water.

Warmth & plants

Discus do not like cool water; they are, in fact, the complete opposite, requiring a water temperature of around 29°C (84°F) to be comfortable. A degree or two either way will not bother them, especially larger specimens, but it is not recommended that the temperature is kept lower than 27°C (80°F) for any appreciable length of time (recommended maximum below this limit would be around 24 hours for most Discus, possibly Brown Discus being an exception).

A good idea is to purchase a good-quality thermometer, or even two, to ensure accurate readings. The photographic or the aquatic mercury-based ones are the most accurate.

Also required is a good heating system, with enough in reserve comfortably to maintain the required temperature and above, as there will be times when an increase in heat is necessary, especially when treating for certain ailments.

Many people wish to plant the aquarium, especially if it is in the home, not

wishing to sit looking at what can be best described as the sterile set-up favoured by many Discus addicts.

This can be somewhat of a problem in two ways. First of all, the difficulty lies in establishing plants which can stand the conditions found in the Discus aquarium. High temperature, low pH and less-than-ideal lighting, can all contribute to poor plant growth which, in turn — due to rotting leaves — does not exactly help in keeping water quality up to an acceptable standard. Secondly, if the aquarium is planted too densely, the fish never make much of an appearance; in fact, they become very shy and nervous, so that keeping them at all, is hardly worth the effort.

As with all decor, use the plants to break up the open swimming space; that is to say, use either a tall plant or piece of wood approximately one third along the aquarium length, and position it either a third of the width from the back, or front, and then place another item one third from the other end, but on the opposite third to the first.

Water quality

Without any doubt, the most important factor concerning any aquarium, not just Discus ones, is the water. Moreover, where Discus are concerned, it is probably the one area that is the most important single cause of many people's downfall.

Discus like regular water changes and fishes that are not kept in such a way, eventually succumb to illness, while those that manage to survive, never manage to show their full colour.

As for its composition, water which is extremely hard and alkaline is not suitable, so if this applies in your case, then steps must be taken to rectify the situation. Generally speaking, a pH between 6.5 and 7.2 is fine for Discus. Obviously, the nearer to 6.5 the better, but many of the main German breeders actually raise their young in slightly alkaline water.

Hardness should ideally be below 10, but I have known of fishes thriving in the moderate range, around 15 degrees total hardness. Nitrite (NO₂) should be zero, and Nitrate (NO₃) should be kept as low as possible, preferably below 25ppm.

At this point, it is a good idea to stress that if you intend to keep Discus, you must be prepared to check the water on a regular basis, i.e. weekly, and have the necessary test kits to hand.

Adjusting conditions

Once purchased, take your test kits home and check the composition of your tapwater; after all, this is what you are going to fill the tank with. Your water may be totally unsuitable for Discus, in which case, you have to decide what steps you will have to take. If it is too alkaline, then lowering the pH by means of an aquarium



BILLY WITSEDE

buffer is all that may be needed. Believe it or not, soft alkaline water can exist — that coming from my own tap at this time last year actually measured pH 8.2 with a total hardness of only 3 degrees!

Altering the pH was a relatively simple task. However, there is more likely to be a relatively high hardness which cannot be removed easily. In fact, the pH may be quite acceptable, yet the hardness not so. The solution is to soften the water by removing the ions causing the hardness by either purchasing a de-ionisation unit or a Reverse Osmosis system or, perhaps, some other softener unit (use only those for aquatic purposes, not household ones, as the latter contain resins which are unsuitable for aquatic use), or attempt to remove the hardness by utilising peat.

Each method has its drawbacks (don't they all?). Peat is, by far, the cheapest option, but it has to be of the right type. Much of the peat sold in garden centres appears to have little or no effect whatsoever; the only type that does have an effect, is Sphagnum Moss peat which does soften the water. Peat is messy to use; it requires, for instance, to be washed through and then placed in some type of filter unit to get the maximum effect. The best way to use peat is to place it in a nylon type of bag which can be disposed of once the softening properties have been exhausted.

De-ionisers & RO's

With regard to de-ioniser units, these are probably the most effective method of water softening in the sense that they are fully rechargeable and, dependent upon size and actual water hardness, can produce a reasonable gallonage. The main and big drawback is that they are quite expensive.

Reverse Osmosis is a system which extracts impurities from water by passing it through a membrane. Again, this is a good system, but not only is it expensive to purchase (the replacement membranes are not cheap and will run out quicker if there is a high impurity content), but there is also a high percentage of waste water, which is something to be wary of if you are on a water meter.

Recently products have appeared on the market which do make the task of obtaining softer water a little easier. Disposable resins can be obtained, but like their name suggests, they have to be disposed of when exhausted. However, several companies have now produced various sizes of rechargeable softener units, from small bags to quite large and moderately priced systems, that are well worth looking at.

Buying the fish

Assuming you have come this far, now is the time to purchase your Discus. Firstly, do not be confused by the myriad names that seem to leap at you from each

advertisement; many are merely variations on an existing theme. Secondly, make a few enquiries and then follow these up with visits if possible.

Talk to each dealer, listening to what they are saying. Look closely at the fishes they have for sale. Are they in good colour? Do they readily come to the front of the tank awaiting food? Are they a good shape (round not elongated)? How big are their eyes (if they look too big for the body, then the fishes may be stunted)? Clean tanks with good filtration is an indication of a caring dealer, as is someone who is prepared to spend time talking to you.

When comparing prices, make sure that you are comparing similar-sized fish of the



A well matched healthy pair will spawn almost anywhere. In this case the eggs have been laid on the undergravel filter airlift tube.

same type and similar origins. Most German-bred Discus are more highly priced than some of their Far Eastern farm-bred cousins, but there are also very expensive Oriental-raised fishes from noted breeders. Sadly, there are also a few unscrupulous outlets who try to sell fishes at inflated prices claiming they are not what they really are. Trust your instincts. Do not buy if you are unsure, and do not be afraid to ask questions.

First-time buyers should also resist the temptation of purchasing a breeding pair, for numerous reasons. One is that big fish do not travel as well as small ones and the inexperienced aquarist may find life rather traumatic in settling them down. Also,

large fish are expensive, and if anything goes wrong, you have spent a lot of money for nothing.

Oddly enough, the two reasons are valid enough for not purchasing a pair of large fish to start off with, but are not the main ones. Discus are, by nature, shoaling fishes, and the purchase of a small number, dependent on tank size, is a good idea. Safety in numbers is the rule, especially when the fishes have settled down, because there is always one that will be subjected to bullying. The larger the number, the more chance the weaker one has of hiding in the crowd from the most dominant fish.

Remember, Discus are cichlids, and while not being outright aggressors like some of the others in the group, they can still be quite vindictive. Another reason for purchasing small is that, as the fishes grow, the aquarist will learn a lot about them and their habits, which will provide valuable experience.

Avoiding problems

Once you have taken your fishes home, there is the main concern that adding 4-6 Discus to a new aquarium will cause nitrite poisoning. Obviously, this is going to happen, so it is better to avoid the problem, rather than tackle it when it has happened, which will cause unnecessary stress to the fishes.

Some people advocate seeding the filter system with one of the bacteria culture products on the market. If this is done, ensure you are ready to add Discus very soon after the nitrite reading has fallen, otherwise, unless you continually feed the *Nitrobacter* (aerobic bacteria) they will very quickly die off. In effect, they need a continuous supply of fish waste to ensure their survival.

Another method of introducing fish to a new set-up is to add other types of fishes to the tank. These will either be removed later, if the aquarium is to be an all-Discus one, or will form part of the aquarium in a Discus-style community. These fishes should be on the tougher side, and so long as the nitrite build-up is gradual and is controlled with regular water changing — thus not allowing a bad build-up and ensuring that constant fresh water is added to avoid asphyxiation of the blood — they do not seem to suffer unduly. Feeding at this time should be minimal.

The final method — and one that was used in the old days — is to add a small number of Discus, perhaps half of the ultimate stocking level and undertake very regular (daily) water changes of around 10% for around two to three weeks to ensure no nitrite can build up. Surprisingly, this approach works and is favoured by many people who have some impressive Discus to prove it. If you do undertake this method, again, feed sparingly.

Foods, like an ox heart mix with vegetables, etc are eagerly accepted... or should be. Most frozen foods like bloodworm and



Cardinals can be safely kept with Discus... as long as they are not too small... or the Discus too large.

brine shrimp are also accepted eagerly, as are some granular foods.

One vital point to mention is that Discus have a very small, soft mouth in relation to their size, so ensure that the food given can be swallowed. In general, if you feed little and often, two to three times per day, with a day when nothing is given (it will do no harm for any fish), this is ideal.

Assuming that all (or most) of what has been said has been undertaken, then there should be few or no problems with your Discus, but invariably things can go slightly wrong. In addition to some of the more well known complaints, Discus react poorly when subjected to stress which can be caused by a variety of factors, especially poor water conditions.

If your fishes show any of the above signs, seek help; a good source should be the point of purchase. Before reaching for the telephone, though, do a thorough check on all equipment and temperature,

as well as a complete water test. You never know what may come to light, and the information will be required by your dealer.

Tankmates

Oddly enough — and despite what some people say — there are some fishes that can be kept in the same aquarium as Discus and that do, in fact, enjoy the same or similar conditions. There are, however, a lot more that do not. Obvious candidates that are reasonable are small tetras, such as Cardinals (*Parachanna axelrodi*) and the various Rummy-nose Tets (*Petitella georgiae*, *Hemigrammus rhodostomus*, *H. bleheri*).

One problem that has arisen is that when people have added Cardinals to the same tank as large Discus, the Discus have consumed the Cardinals with relish. It may therefore be wise to add such small

fishes to aquaria with small Discus and allow them to grow up together.

One fish which comes up for regular consideration is the Clown Loach (*Betta macracantha*): in fact, many people find this an ideal addition to the aquarium. It enjoys similar conditions and is a good scavenger. I, however, have found that Discus tend to panic when the loaches came hurtling out for food. Having said that, I have never actually tried the fishes together in a furnished set-up; the one I used was a more sterile environment.

Catfish always arouse controversy when it is suggested that they be kept with Discus. Many people keep *Corydoras* with Discus, but this is not always a good idea, because many of these small, peaceful armoured cats are found in cooler streams higher in the Andes and keeping them in the same high temperature as Discus shortens their life considerably.

Advice on this subject is difficult, as habits do vary with individuals, but one catfish which does come to mind as being reasonable is the Sailfin Plec or *P. gibbiceps*. Of all the individuals I have kept, I have never found one causing any concern to my Discus, even then they reached a healthy eighteen inches in length. This latter statement illustrates the main drawback in that the fish does reach large proportions and will wreck a nicely planted aquarium.

Its size, however, does not bother the Discus. A pair of wild Blue Discus I had destroyed all the myths about these fishes. Not only did they spawn in a tank with fast, turbulent water, but they actually spawned on the uplift pipe of an Eheim pond filter! They even attacked a large Sailfin Suckermouth, repeatedly head-butting him until he got fed up and swam off, presumably looking for a couple of paracetamol tablets to cure what must have been quite a headache!

Certain Dwarf Cichlids of the *Apistogramma* genus can also be added to the Discus aquarium, if so desired. *A. agassizi*, *A. nijsseni* etc, all make reasonable choices for something a little different. The main drawback is that they do sometimes wish to breed and might upset the balance if the aquarium is on the smaller side.

Whether or not the aquarist feels the need to add other fish to a Discus set-up is entirely a matter for the individual concerned. Perhaps Discus should be given the royal treatment and be kept just with their own kind.

Certainly, when one sees a shoal of large, well conditioned Discus, whatever the type, strain or species, one cannot help but be left a little in awe at these handsome saucer-shaped fishes moving serenely around their watery home with an almost arrogant, yet regal, attitude which sometimes seems to mask their highly developed intelligence and natural curiosity. Indeed, we are left in no doubt what when looking at such a spectacle, the Discus is definitely the 'King of the Aquarium'.



Apistogramma agassizi: a good companion Dwarf Cichlid for Discus.

DISCUS BASICS

Tank Size: 36 x 18 x 18in (min) — 90 x 45 x 38in

Lighting: Most aquatic tubes (eg Triton, Powerglo)

Filtration: The best affordable. Minimum recommended: external canister or two smaller internal systems

pH: 6.5-7.00

GH: 10 degrees or below (ideally)

Nitrite: Zero

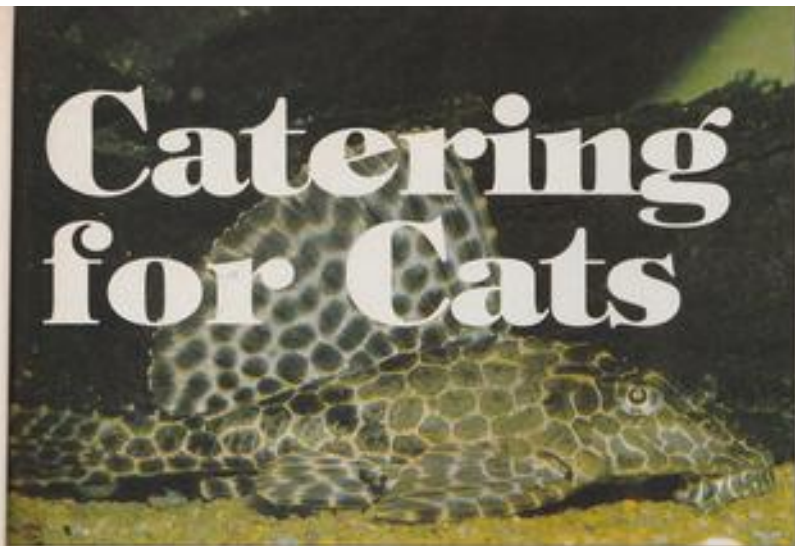
Nitrate: 25ppm or lower

Temperature: 29°C (84°F)

Decor: Inert. Ideal substrate: lime-free silica sand. Other decor: corno wood and inert rocks e.g granite, sandstone or basalt

Food: A varied diet, as Discus will take ox heart mixes, blood-worm, brine shrimp and any other food, such as granular or flake.

Catering for Cats



With so many species to choose from, there's no simple type of aquarium that will meet the needs of all catfish species, as **Gina Sandford** explains.

Photographs — unless otherwise indicated — by Mike Sandford

Pics, from top to bottom:

Glyptoperichthys (Pterigoplichthys) gibbleps (What a mouthful!) — the elegant Sailfin Plec.

Chaca chaca — the appropriately named Frogmouth.

Synodontis angelicus: just one of a wide selection of Synos available.

*Corydoras species (this is *C. acutus*) are the most popular catfish of all.*

Pelteobagrus ornatus (no common name) is a good choice for a mixed community containing non-catfish species.

When our editor asked me to write about a catfish aquarium, I was a little concerned about exactly where to start. The problem lies, not in the size or decor for the aquarium, but with the fish themselves. They form such a diverse group that the possibilities for a catfish aquarium are almost limitless. Catfish are also the second largest group of primary freshwater fishes (after the Cyprinids), with something in the region of 3,000 species, so the choice is not just in size, form and colour, but could also be by speciality, for example, Electric Catfish or Parasitic Catfish.

Size factors

Perhaps the best place to start is to look at the size of catfish, as this, in turn, will influence the size of the aquarium. A great

many catfish families have large and small species within them, so it is worth investigating a little further before you paint all the genera with the same brush. Take, as an example, the South American Doradidae, (Talking Catfishes); one of the smaller species that is occasionally imported is the Star-gazing Dorad (*Astrodoras asterifrons*), an innocuous little creature that wouldn't harm a Neon, while at the other end of the scale, there is the Dolphin Catfish (*Pseudodoras niger*) which can grow a metre or more, but is, none the less, a gentle giant.

For the purposes of this article I have omitted the very large and/or specialised catfish which are normally kept on their own or with just one or two other fish, as these demand an article in their own right, and have only considered the small and medium sized creatures.

Size, however, should not be equated with aggression. There are predators which will take fish and yet be compatible with other larger fish; this is not aggression, just a feeding pattern. The problem arises when you try and keep single specimens of fish which, in the wild would be territorial.

Some of the African *Synodontis* species are classic examples. *Synodontis acanthomias* (no common name) has one of the worst reputations for being a bully. It will cheerfully rip the fins of other fish and harass them to such an extent that they hide away all the time.

Some of the smaller Bagrids, such as the Two-spot Catfish (*Mystus macracanthus*), are best kept in shoals so that they are too busy chasing each other to bother about the rest of the fish in the aquarium. And, of course, the reverse is also true. Catfish can be the subject of bullying by other aggressive fish. I have, for example, seen a half-grown specimen of the Giraffe-nosed Catfish (*Auchenoglanis occidentalis*) harassed by the cichlids whose tank it shared; the catfish's fins were permanently picked at and it showed damaged fin rays and sores on its barbels. It was still feeding and growing but, with a little consideration on the part of the owner, it could have had a far better deal.

Body types

Body shape is another consideration, and here we have to make some generalisations. Some catfish are *depressed*, that is to say, the body is flattened — they look as though they have been trodden on; others are *compressed*, ie the body is flattened from side to side.

What does this tell us? The depressed fish is a bottom dweller. It lives in or on the substrate and, the eyes are situated on the top of the head so it can see what is coming at it from above, whereas the compressed fish is a pelagic (free-swimming) fish and the eyes are on the side of the head so that it has all-round vision. After all, predators can attack from all directions while it is swimming along minding

its own business. These pelagic catfish are often shoaling fish, there being safety in numbers, so, if we are considering keeping them in our aquarium, we should provide swimming space and buy a shoal.

These are two extremes; catfish in general are usually sedentary and the body shape is triangular, with the pectoral fins expanded. This helps the fish hold station in fast-flowing waters, with the fins spread, while as the water passes over the fish, the body shape results in the fish being pressed to the substrate. The pectoral fins are also used by some species to lock themselves into crevices to escape predation during the day.

Barbel clues

Barbels can also be an indicator as to the general demeanour of the fish. Again, talking in generalisations (because nature always breaks any rules that we care to impose), if a catfish has very long barbels, it is a hunter. The barbels are covered with taste receptors so, with long barbels, the fish can 'taste' its prey, triangulate on it and lunge to capture it.

Other cats have short barbels for sensing things in the substrate.

One of the classic exceptions to this is *Chaca chaca*, the Frogmouth Catfish. It has very short barbels that fringe the mouth, but it is an out-and-out predator. One look at the wide gape is enough to give the game away. This is definitely not a fish for the community aquarium!

Habitat considerations

Finally, there should be some thought as to the habitat of the fish. Is it lacustrine (from a lake) or riverine? Is the water soft and acid, or hard and alkaline?

By determining what the fish need we can then decide on the decor for the aquarium. For those who want something completely different, there are even brackish water and marine catfish, but these are not dealt with here.

This consideration of habitat will also influence the type of filtration system you may install. A large power filter would create a through current in the aquarium, while power heads on undergravel plates would give turbulence and high oxygen levels. A separate biological system would give a much calmer aquarium, but would still provide the high-quality water required for some of the more delicate species.

Lighting is also of importance. Although many catfish are crepuscular, (active at dusk) there are still many that are out and about during the day. If you wish to grow plants, then high intensity lighting is required, either with several strip lights (in which case, the more shade-loving catfish can find seclusion in among the plants or hide among wood and rocks), or you may prefer to use spotlights.



The Whiptails — like the various *Fariowella* species — should be provided with appropriate resting places (eg) bogwood.

An advantage of spotlights is that they only illuminate a limited area. You can use this to your advantage in the partially planted aquarium by making a feature of clumps of plants, while leaving the remainder of the tank in the dark so that the fish feel safe.

'Regional' aquaria

Purists may like to create a 'regional' aquarium, something like an Amazonian river bank. To create a good impression, such a set-up would need to be quite large, at least a 4-foot tank, 18 inches wide and the same deep (120 x 45 x 45cm). This would involve selecting wood that takes the form of roots projecting into the water, maybe a couple of rounded boulders, a sandy or fine gravel and some thickets of plants such as Sword Plant (*Echinodorus*) species and *Cabomba* or Water Stargrass (*Heteranthera zosterifolia*). Lighting could be accomplished with spotlights to give a dappled effect. The water would be soft, less than 15°dH, and slightly acidic.

It is necessary to create some sort of flow through such a tank, and this can be achieved with a good external power filter. Although these may be expensive, power filters are the life support system for your fish and worth the investment.

Such an aquarium would be ideal for some of the medium sized Doradids, such as *Rhinodoras d'orbigny*, with the Spade Cat (*Pseudohemiodon laticeps*) for a bottom-dwelling species and some other Loricariids (Whip-tailed Cats), such as *Hypotomus* sp (Plecos), *Glyptoperichthys* sp (Sailfin Plec) or Gold Nugget Plec which would be happy grazing over the wood. As a focal point, a couple of medium sized Pimelodids, such as *Pimelodus albifasciatus* would be acceptable. One of the advantages of this type of open-topped aquarium is that the plants can grow out of the water and give a real jungle effect.

Similarly, an African catfish aquarium

could be created. Apply the same principles, pick the habitat, a stream maybe, and research the types of plant that grow there — for example, Red Ammania (*Ammania senegalensis*), *Anubias* sp. or Vallis or Tape Grass (*Vallisneria spiralis*). Then, choose your fish to match the size of the aquarium. Small *Synodontis* are the obvious choice, but there are also *Ampelisca* (Hillstream Cat), *Phractura* (African Whip-tail) and the 'other' African Whip-tail (*Belomogonius*), to name but three.

Everyday choices

Life doesn't have to be that complex though; it is perfectly possible to choose catfish for the everyday home aquarium. Sometimes it is only possible to have one aquarium and this has to satisfy everyone in the home. To some, the thought of lots of ugly brown, dull catfish that spend all day hiding and all night devouring the other inmates of the aquarium is just too much to contemplate. But it need not be so. Catfish can predominate in the community aquarium, provided you pick the right ones.

Corydoras are on everyone's list because they are always out and about but, if you have four or five of the same species, they may spawn for you. Try to add some variety by getting away from the everyday Peppercorn Catfish (*C. paleatus*) or the Albino Cory (*C. aeneus*) and pick something a little more attractive, such as the Black-top Catfish (*Corydoras acuma*), Sterbas Catfish (*C. sterbai*) or Bearded Catfish (*C. barbatus*).

For a complete change of body shape, the Loricariid Twig Catfish, *Fariowella*, couldn't be more of a contrast. These are long, thin, pencil-like fishes, but be warned, they can be difficult to acclimatise; the aquarium needs to be well established and the water kept in tip top condition for these creatures to do well.

Feed them plenty of green foods, such as lettuce leaves, and they will not eat your plants. The average aquarium cannot supply sufficient algae, so it is necessary to supplement their diet, otherwise they will graze on your plants, leaving, at best, holes in the leaves and, at worst, something that looks like a net curtain.

Just take a look in your dealer's tanks and see what takes your fancy. Look up the fish in a book or ask advice before you buy and, if you are at all unsure about it, leave it where it is.

Tankmates & diets

Some of the most effective catfish aquaria are not devoted solely to catfish. Catfish may predominate but, for movement and colour, a shoal of characins or barbs may be added. In some respects, it is important to remember that our favourite choices do not live in isolation but react with others, so we need to pro-

The giant Dolphin Catfish (*Pseudorasbora niger*) — certainly not the ideal candidate for the average aquarium.



vide the possibility of some of this interaction in the aquarium to get the best from our fish. By doing this, we find that they may take different foods.

Most aquarists consider catfish to be meat eaters, with the exception of the Loricariids which are vegetarians (we've drifted into that realm of generalisation again). When feeding live *Daphnia* to tetras, some of the Loricariids will, in fact, also eat the water fleas, while at the other end of the scale, when feeding peas to a *Semaprocheilodus taeniurus* (no common name), Giraffe-nosed Catfish (*Auchenoglanis*) will come out to pick up all the ones that fall to the bottom. Perhaps the most surprising pea-eater I've come across was a Siamese Tiger (*Daniolepis microlepis*) — not a catfish — an out-and-out predator if ever there was one. It just goes to show: it doesn't matter how long you've been keeping fish, there's always something new to learn.

ADP

CATFISH AQUARIUM SELECTIONS

Small species

(For a 3ft planted aquarium)

18 *Corydoras*, say 6
Corydoras septentrionalis,
 6 *C. axelrodi* (Axelrod's
 Catfish) and 6 *C. arcuatus*
 (Skunk Catfish), 6
Otocinclus vittatus (Oto),
 or 6 *Otocinclus paraguayensis*
 (no common name)
 A shoal of 10 *Epiplatys
 debauwi* (Debaui's Cats),
 or *Kribia platyodon*
 (Glass Cats), 3 *Synodontis
 nigricornis* (Upside-down
 Cats) or 3 *Mochokiella
 paynei* (Payne's Catfish).

Medium-sized species

(for the same 3 foot plant-

ed aquarium, but with
 more robust plants)
 Pair of *Hoplosternum pec-*
torale (Spotted Hoplo)
Synodontis brichardi
 (Brichard's Cat)
Synodontis alberti (Albert's
 Cat)
 2 *Lilicossia siamensis*
 (Bumblebee Catfish)
 4 *Myxus ornatus* (One-
 spot/Peel Catfish)
 Pair *Ancistrus
 dolichopterus* (Bristle-
 nosed Catfish)

Mixed community

(For a 3 foot planted

aquarium)
 4 *Whitelineatus laevis*
 (Whitetail)
 4 *Burjuria splendens*
 (Emerald Cat)
 6 *Pterapogon kauderni*
 (no common name)
 10 *Moenkhausia pittieri*
 (Diamond Tetra)
 4 *Epiplatys spilargenteus*
 (Flying Foxes)
 6 *Coinia zebra* (Honey
 Gourami) (3 pairs)



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MARY BAILEY



MARY BAILEY



MARY BAILEY



MARY BAILEY

Top left, Cichlids vary so much in size, behaviour, habitat and so many other factors that it is impossible to offer guidelines that apply to them all. For many small South Americans, the Apistogrammids, for instance low caves are desirable/essential. Top right, suitable spawning sites for species such as *Julidochromis transcriptus* can be provided by rocks such as mica schist. Above left, a typical Mbuna/mouthbrooder set-up has ample cover provided by numerous lumps of tufa rock. Cover must not, however, be interpreted as providing suitable spawning sites for substrate-spawning species such as the Tanganyikans. Above right, large robust species like the Jaguar Cichlid — *Parapetenia* ("Cichlasoma") *managuense* — will destroy most plant arrangements.

The Cichlid Aquarium

Mary Bailey bravely tackles this almost impossible challenge and comes up with an excellent review that all existing and potential cichlid keepers will find invaluable.

Photographs — unless otherwise indicated — by the author

Cichlids come in all sorts of shapes and sizes, from $\frac{1}{2}$ in (1.9cm) dwarfs, up to the 36in (90cm) Giant Cichlid, *Boulengerochromis microlepis* — or even larger, if anglers' tales of monster Peacock Bass, *Cichla ocellaris*, are to be believed. Like other fishes, they also come from a variety of biotopes — huge alkaline lakes,

tiny acid forest pools and streams, desert oases and brackish estuaries, among others.

I am sure most hobbyists must be aware of this, or at least, given the diversity of size and habitat of other creatures, have an inkling of the probability. So it remains a perpetual mystery to me why so many aquarists assume the label 'cichlid' is a

kind of *carte blanche* to mix members of this large family with little or no reference to their actual needs.

I cannot hope to cover all the intricacies of cichlid diversity in a single article, nor am I optimistic enough to try to change human nature overnight. However, some basic guidelines will not come amiss, so I propose to break down the group as a

whole into a number of main habitat types, and also provide some guidance as to what cichlids can reasonably be mixed, both with each other and with non-cichlids.

Behavioural considerations

First, though, I must mention the other great constraint on cichlid mix-and-match. Most aquarists, if asked why they like cichlids (assuming they do!), will admit to being attracted by their 'character' and breeding behaviour — even intraspecific fish-hating spouses have been known to turn positively broody at the sight of a pair of cichlids with fry. Yet, it is this very behaviour which is the cause of almost all cichlid behavioural problems, and which can be summed up in the single word: "territoriality".

In order to care for their eggs and fry, cichlids, or at least the substrate spawning species, MUST hold territory, and this means driving away any other fishes foolishly enough to try to intrude. Again, most aquarists are aware of this basic principle. Where the problems really start is with ignorance of the ACTUAL territorial requirement of the average cichlid. This is often, at least, partly in proportion to body size, but the zeal with which it is defended is more likely to depend on the competitiveness of the species concerned, which, in turn, depends on population density in the wild.

Thus, Convicts (*Archocentrus nigrofasciatus*), which derive from a crowded and competitive environment, even after decades of captive breeding, retain their instinctive need to fight tooth and claw for a home of their own. On the other hand, most species from the Amazon floodplain lack this belligerence, as their breeding season coincides with the inundation of the forest floor, which provides more than enough territory for everyone.

What we must always remember, however, is that while cichlids with a natural territorial requirement approximating to the average human living-room will allow themselves to be restricted to a 48in (120cm) tank (for example), we must not automatically expect them to share this minimal living space with other fishes!

Mouthbrooders are totally different again — territory is essentially only for the actual spawning, and the fry are then kept safe in the mother's mouth. So, while most mouthbrooder males would undoubtedly like a large territory, and can be highly competitive, we do not have to provide such in order to breed them successfully. In fact, we can turn territoriality against itself by crowding, so although the 'Attila the Hun' urge remains, males have to work hard to hang onto a tiny patch.

So, forget about the normal factors governing stocking density (inches of fish relative to surface area of tank) when dealing with cichlids; there are quite different sets of rules involved. I hope it is now obvious from what I have already said, that it is



On the South American side, species like *Aequidens* (*Laetacara curviceps*) are kind on plants and even spawn on them.

not a good idea to mix cichlids with different territorial rulebooks!

Variety of biotopes

For the purposes of this article, I am going to divide cichlids into a number of rough geographical/biotope groupings — but stressing once again the absolute necessity of checking up on the requirements of individual species. (Magazines, like aquaria, suffer from restricted space, so smaller groups such as the Chromides will have to be omitted this time).



Jewel Cichlids (*Hemichromis* sp) make great parents... but are soft-water thugs!



An example of mismatching. This Peacock female ("*Aulonocara nyassae*") needs open substratum, but not — as here — consisting of coral sand which may cause 'itching' and gill damage.

1 East African Lakes

Lake Malawi is moderately hard and alkaline (7-10 dGH, pH 7.5-8.0), Lake Tanganyika more so (dGH 17-20, pH 8.5+), and both are noted for extremely pure and well oxygenated water; these conditions are essential for the well-being of their fishes. A temperature of about 80°F (c26.5°C) is suitable for maintenance and breeding. Lake Victoria is also moderately hard, but more neutral in pH, its waters are nothing like as pure, and oxygen content is seasonally variable.

In practice, however, hard, alkaline, clean, oxygen-rich water suits fishes from all three lakes, which are large (more like inland seas), and contain a number of biotopes. For our purposes, these can be divided into two main types — rocky, and open bottom with scattered rocks and *Valisneria* (Tape Grass) beds.

The type of substrate material used will depend on the type of fishes to be kept, but should NOT be 100% coral sand, which tends to fly up and is, I believe, responsible for most cases of severe 'itching' and gill irritation (and damage!) in Rifts. Ordinary aquarium gravel is suitable for all but the bottom sifters (Peacocks — *Aulonocara*s, Sand Eaters — *Lethrinops*, and some "Haps"), for whom fine sand is necessary. About 10% coral sand can be mixed with gravel (which traps the particles) as a pH buffer. Coral gravel, which is sharp and angular, should NEVER be used, as it can lodge in gullets and cut delicate lips.

Filtration should be of high efficiency, especially in crowded mouthbrooder setups, with additional aeration if necessary.

When setting up a rocky biotope, the golden rule is "Think Big" — use lots of rock, the larger the pieces the better — their weight will give them stability. Create as many nooks and crannies as possible. Any type of rock can be used, as long as it does not contain toxic impurities (beware of pretty crystals or metallic streaks).

Tufa is a popular, but expensive, choice whose lightness means that lofty structures can be erected easily, and which provides an additional pH buffer. Having said this, it is totally unsuitable for Tanganyikan substrate spawners, as it is too rough to provide a suitable spawning substrate. Slate and granite are far better, and let me reassure those who fear for the effect of the weight on the tank bottom — I have used more than 1/2 tank capacity of granite and not (yet!) cracked a tank, even all-glass tanks with plain, rather than wired, bottoms.

This type of set-up can be used, with modifications, for rock-dwellers from any of the lakes. For mouthbrooders (eg Mbuna, *Tropheus*) the rockwork should be continuous, reaching well up towards the surface in places to break up the line of sight along the tank. For these fishes a 48in (120cm) tank is the sensible minimum, though 36in (90cm) may do for the smaller and quieter species.

Population density should be high to reduce territoriality. For substrate spawners (eg Julies — *Julidochromis* and many *Neolamprologus*), on the other hand, territorial space is essential, though many small Tanganyikans will make do with very small territories. The only problem is that while they will live and breed in a small cave, you won't see them if they are 'trapped' there by the territorial requirements of their neighbours! Ideally, modify the rockwork so that it provides a separate rockpile for each pair, with a small open space between. Or use single species tanks (24in — 60cm — minimum).

The other generalised Rift Lake habitat is rather easier to set up, and the emphasis should be on plenty of open swimming space and bottom, with some cover provided by isolated rockpiles, large single rocks, and patches of *Vallisneria*, which should, again, also break up the line of sight along the tank. The plants will be vulnerable to digging activity, and a sensible precaution is to border the clumps with pebbles or large-grained gravel.

Mixed habitats are possible, depending on tank size and occupants — a pair of dwarf rock-dwelling Tanganyikans will happily occupy a small rockpile in a 24in (60cm) tank, while a colony of shell-dwellers (eg *Lamprologus ocellatus*) occupy the open substrate nearby. But to create the same effect, at least on a sensible scale, with mouthbrooders, is going to mean a 72in (210cm) tank or larger.

Always take size, habits and tempera-

The Blockhead (*Steatocranus casuarinus*) will live quite happily in a community as long as its water chemistry requirements are met.

ment into consideration when choosing your species mix; do not mix cichlids from the different lakes, or mouthbrooders and substrate spawners, unless you know exactly what you are doing! And NEVER try to mix Rifts with other cichlids, or with non-cichlids (other than Rift Lake endemics such as the 'Cuckoo' Catfish, *Synodontis multipunctatus*).

2 Rapids Cichlids

The rocky, unplanted, biotope described above can be readily adapted for rapids cichlids, both from West Africa (eg Lumpheads, *Steatocranus*) and the less well known types from South America (*Teleocichla*, some Pike Cichlids, *Crenicichla*).

These, however, are generally fishes of softer, acid or neutral, waters (hardness <8 dGH, pH 6.0-7.0, but check actual requirements of individual species), so not only will the water chemistry differ, but, ideally, no calciferous material (rocks/substrate) should be included. Tufa rock is, thus, definitely out, the more so because rapids cichlids have atrophied swimbladders and spend much of their time perched on water-worn rocks, whose smooth surfaces do not abrade their soft undersides.

Good water quality and high oxygen content are, again, prerequisites of a successful tank, but do not (as I did) confuse the latter with a liking for turbulence. Rapids cichlids are actually designed to

live in rapids. The Blockhead, *Steatocranus casuarinus*, will live quite happily with other small cichlids with similar water chemistry requirements, and thrive in general community tanks without wreaking havoc on other fishes or plants. I suspect the same will prove true of other West African species (but remember the oxygen requirement), but NOT the South American Pike Cichlids, *Crenicichla*, which are at least partially piscivorous (fish-eating) and likely to polish off the Neon Tetras!

3 Acidic Rainforest Cichlids

Although there are major differences in the South American and West African acid water biotopes (the most important being that, while the low-lying forest floor of the Amazon basin is regularly inundated, providing extra living/breeding space, this does not happen in Africa), the same general set-up is suitable for fishes from both regions with, of course, some adjustments depending on the size and habits of the fishes.

The first prerequisite is for soft acid water, which will be necessary for breeding most species, and although well-established types can be maintained in less suitable conditions, this should not be tried with recent imports. The hardness should be as low as possible, and the pH always less than 7.0, though the degree of acidity required will depend on the species concerned. Metabolic byproducts should be absolutely minimal.

Although temperatures in the natural habitat may fluctuate dramatically with the seasons, especially in the Amazonas, 78-80°F (25.5-26.5°C) will suit most species for general maintenance, with an increase of a degree or two for breeding. Rainforest habitats are generally slow-moving or still waters, so the filtration must combine a suitable level of efficiency with absence of turbulence.

Rocks have little part to play in the decor, and bogwood is far more appropriate, simulating the fallen trees and exposed root systems found in nature, where submerge plants are relatively rare and vegetable cover is more normally provided by trailing grasses and branches; in captivity aquatic plants are a more than acceptable substitute, providing both shelter and shade. The substrate should be fine, inert sand or gravel for dwarfs and bottom sifters, with coarser grades equally suitable for the larger non-sifters.

Obviously, there will be a difference in scale, depending on the size of the occupants. Large species (*Severums* — *Heros severus*, *Festives* — *Meionaneta festiva*) will require ample swimming space combined with large pieces of bogwood behind/under which to hide, although, being open breeders, they do not require caves for spawning.

Plants should be robust and well-rooted to avoid accidental up-rooting by the more



M.P. & C. REDDOR

enable them to live in rapids, where they are virtually immune from predation, without being swept away; there is little turbulence on the bottom itself, and they take advantage of the calmer areas in back-eddies and behind rocks.

They are often highly territorial, but this is aimed largely at conspecifics, so it is possible to keep 3, even 4, pairs in a 48in

process of swimming about. Some large species are totally inimical to plants — *Uaru* eat them, and Oscars (*Astronotus ocellatus*) pull them up. Geophagines (Earth Eaters) are bottom sifters which require open areas of fine substrate as feeding/breeding grounds; they will not, however, harm plants which are surrounded with a precautionary collar of pebbles.

Dwarf species (eg *Apistogramma*, Kribbs and their allies — *Pelvicachromis*, *Nannacara*) and slightly larger, but rather peaceful, species (eg *Chromidotilapia*, *Cleithracara maronii* — the Keyhole Cichlid) are highly bottom orientated, and most are hole-brooders which require 'caves' (in nature, holes in the bank or fallen trees) for their eggs and fry.

There is no point in trying to create aesthetically pleasing miniature grottos, as the fishes, in my experience, without exception, prefer flowerpots! For *Apistogramma*, these should be arranged with a low ceiling and small entrance; other species are less specific in their requirements. Remember to space caves at regular intervals — several close together will be taken over by one individual/pair. Dense planting, in clumps with the 'caves' at their edges, will boost confidence and provide shelter for newly emerged fry, as well as adults.

Surprisingly, to the uninitiated, these dwarfs are often far more territorial than the larger cichlids with which they often share a natural biotope. So a 48in tank will hold similar numbers of *Apistogramma* or half-grown Severums — about half a dozen of each. They are, however, generally only scrappy among themselves, and make ideal cichlid occupants for the general community — provided the water conditions are suitable. In fact, they should always be kept with a shoal of small characins ('Dither Fish') to give them confidence; in nature, they hide when the scattering of the tetras indicates a predator approaching; in captivity, no tetras is interpreted as a permanent predator presence!

Some of the larger Amazonians are equally suitable for community life, provided the non-cichlids (and the tank!) are to scale. Obvious exceptions are Oscars (destructive piscivores). Pike Cichlids (*Crenicichla*), by contrast, are unlikely to destroy their tank or bully tankmates, though they will, of course, make a snack of anything of suitable size (up to 60% of their own bulk ...!)

Tank Health Warning: West African Jewel Cichlids, *Hemichromis*, may share the habitat of Kribbs — *Pelvicachromis* and the like — but are, to my mind, a soft water analogue of Central American diags!

4 Central American Cichlids

And so the final, and to my mind, most problematical group — the Central Americans, in which I include a number of

species from the NW corner of the South American continent, where water conditions, and cichlid temperaments, match those of their more northern cousins. Although the region includes both slow-moving and more rapid rivers, spring systems, and large lakes, the water is mainly moderately hard and alkaline (7-10 dGH, pH 7.3-8.0), and of variable quality — in general probably less pure than the biotopes described previously, though that should not be regarded as an excuse for inadequate maintenance.

With a few exceptions, these cichlids are highly competitive, with rather large territorial requirements which they will endeavour to enforce. They are also inimical towards each other and other species, and towards plants, which are eaten by some species (in particular, *Thoraps*) and uprooted by others (most others!). The exceptions include the Red-hump Geophagus *Geophagus steindachneri*, and its close allies, the Blue Acara, *Aequidens* sp. (now possibly *Ae. latifrons* again, but the entire group is in dire need of examination, so it might be easier, for the purposes of this article, if we stuck to *Ae. pulcher*!).

Some species like the Convict Cichlid (*Archocentrus nigrofasciatus*) are highly competitive, something that needs to be borne in mind when planning the aquarium layout.



Hardly any of the species concerned can be regarded as truly suitable for a cichlid community, and they are certainly wholly unsuited to a general community, although a single pair can be included in a large tank of other large, robust, fishes. Some of the smaller species can be mixed reasonably successfully (eg Firemouths — *Thorichthys meeki*, Nicas — "*Cichlasoma*" *nicaraguense*, Jack Dempseys — *Nandopsis octofasciatus*, Convicts — *Archocentrus nigrofasciatus*) in a large (48in minimum) tank, but trouble is possible (probable) when breeding occurs, and it is wise to have, at least, a divider, preferably extra accommodation, available.

Attempts at creating communities of the larger species, even in huge tanks, are usually even more shortlived, though all may be well, as long as the fishes are sexually immature. The practice of mixing 'singles' in order to avoid breeding territoriality is ineffective, as males become terri-

torial anyway, and cross-breeding commonly occurs.

All things considered, in the long term, it is undoubtedly better to use single species tanks, size depending on ultimate fish size, but NEVER less than 30in (75cm) even for the smallest species. A viable alternative, and one which does away with the need for separate 'Target Fish' to distract territorial males from 'wife-bashing', is to divide large tanks and have a pair either side of the divider.

Most species are open brooders but all appreciate some sort of cover, and this is best provided by suitably sized flowerpots or rock-built caves. Flat stones in the open will provide spawning sites and 'ordinary' aquarium gravel is a perfectly adequate substrate. Reasonably strong filtration is needed to deal with eager appetites, and even those species from slow-moving waters do not seem bothered by a moderate amount of water movement. 75-78°F (24-25.5°C) is a suitable maintenance temperature, increased by a degree or two if breeding is slow to occur.

In conclusion

I have not, so far, said anything about lighting. This is largely a matter of experimentation and personal taste, but I must point out that most aquarists over-illumi-

nate their tanks, probably stressing the occupants in the process. Almost all cichlids, including Rifts, show their best colours and are most relaxed if given a dark — or, at least, non-reflective — substrate and dim to moderate lighting, or the shade of long-leaved/floating plants.

If the tank can be sited to receive natural light during the day, then the aquarist will benefit from the true colours of the fishes, and if this means cleaning algae from the front glass a little more often, that is, I feel, a small price to pay.

Obviously, it has not been possible to cover every small detail within the scope of a single article, but I hope I have succeeded in providing a template upon which the individual aquarist can build his or her own cichlid aquarium. It, nevertheless, remains essential to research the individual needs and behaviour patterns of particular species when planning the aquarium population. **MP**



MIKE SANDFORD

The Dutch Approach

Barry James of Everglades Aquatic Nurseries provides an easy-to-follow introduction to setting up a magnificently planted continental-type aquarium.

Have you ever wondered when perusing aquatic literature how the Dutch manage to achieve those fantastic mass planting effects in their aquaria? Well, the secret lies in meticulous planning and dedication, coupled with hard work... and a fairly deep wallet!

One thing is for sure, you cannot realise this sort of effect in small aquaria. While the length isn't so important, the tank must be at least 18-24 in (45-60 cm) in width, with a minimum depth of 24 in (60 cm). For the purposes of this article, I will work with a 60x24x24in (150x60x60 cm) aquarium.

The first consideration is, of course, the position the tank will occupy in the room, coupled with the style and size of the aquarium itself. Such details as to whether

the tank will be free-standing or panelled into a recess, the position of power points, windows and radiators must all be taken into consideration.

Try to choose a position away from direct sunlight, preferably in the darkest place in the room. This will ensure maximum contrast and avoid difficult-to-solve algal problems developing.

Equipment

The Dutch often combine the aquarium with house plant displays, so provision may be needed for troughs to accommodate the latter.

When dealing with deep tanks, it is very difficult to illuminate them successfully with anything other than suspended HQI.



MIKE SANDFORD

Top, a tastefully arranged aquascape incorporating a selection of fish as well as plants.

Above, a stunning Dutch aquarium in its 'natural' setting — somebody's living room!

Right, mass planting is a feature of all Dutch aquaria.

Top right, Pennywort (*Hydrocotyle vulgaris*) — about ten plants gathered together in a bunch — will look very impressive.

MIKE SANDFORD



SHAW-WORTH

(Halogen/Quartz) lighting. For our five feet long tank, I shall need three HQL lamps with reflectors. Continental models are switchable between 80-125 watts, and this facility is of great benefit, as we shall see later.

With open-top aquaria, I do not like outside filtration systems because of all

the pipes and wires that need to be disguised. I therefore tend to favour the Dennerle COC 400 internal power filter. This magnificent beast is built for continuous long-term running with minimum maintenance. It also has a built-in carbon dioxide (CO₂) reactor, nitrate remover, and heater-thermostat, although in our tank, this being only 150 watts, the heater has to be supplemented by an additional 200-watt model.

To achieve optimum plant growth, we will also need CO₂ enrichment. For this we will need a CO₂ pressure bottle, valve system, non-return valve, CO₂-proof tubing, bubble counter, night shut-off valve and a timer. The reactor, as mentioned earlier, is built into the filter. A long-term CO₂ device is also needed to ensure constant easy monitoring of levels.

Back and bottom

The next aspect to be tackled is the background. The rear glass may be fitted with a plastic photograph of an underwa-

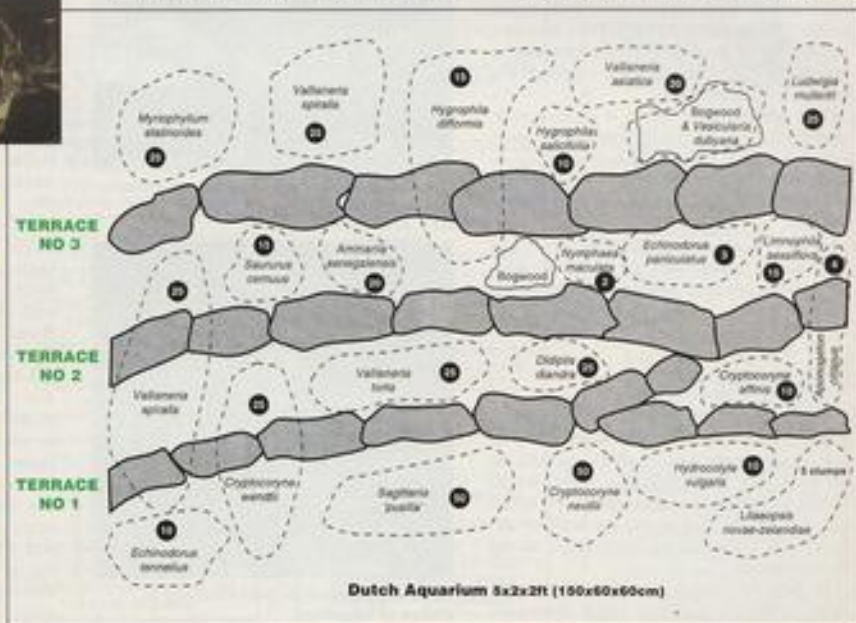
ter scene stuck to the outside of the glass with cellotape. Alternatively, the inside may have an artificial rockwork scene moulded onto it by means of an expanded polystyrene spray gun.

The bottom of the aquarium is the next task to tackle. The first job is to install a suitable cable-heater of the correct wattage; a 100-watt model should be sufficient. This is fixed in position with special suckers/clips to cover as much of the base as possible.

An ample supply of lime-free gravel must be available: 14-21 lbs (c 6.4-9.5 kg) per square foot (900 sq cm) will be needed. The particle size is important; I prefer 3/8" (3-6mm). This must be well washed before use. My own choice of substrate would include a mixture of trace elements and humus supplement, mixed together with the recommended amount of gravel according to the instructions.

This is then applied in an even layer over the heater cable. A suitable gravel tidy is cut to size and laid on top, followed by the rest of the gravel.

Rockwork and bogwood must be care-



fully chosen, and it is recommended that several trial runs be carried out before installation to get the most satisfactory design.

Rockwork must be lime-free and of a suitable shape and size for terracing. Bogwood must be carefully chosen for the position it is intended to occupy and the function it is to perform, such as acting as a perch for epiphytic plants like Java Moss (*Vesicularia dubyana*) or aquatic ferns. Many synthetic models are designed for hiding filters, heaters and cables and should also be considered.

In a 24 in (60 cm) wide aquarium, three terraces should be constructed. For these, rocks should be firmly embedded with 2/3 of the base buried in the gravel for stability. If necessary, glue them together with plastic padding or silicone rubber, inserting small stones and pebbles in the gaps between them to ensure that the gravel cannot dribble through.

I like to work with the aquarium nearly full of water; this also gives me a chance to switch on all the equipment and see that it is working correctly.

The plants

By this time, I will have worked out my planting plan, and selected the various species which will occupy the various niches in the scheme.

It goes without saying that the various plants have been selected for ultimate height and shape. Certain species will be part of the base planting. These will grow submerged indefinitely and will constitute permanent members of the plant community.

Others will occupy their positions for short periods of between six and nine months, after which they will deteriorate and have to be replaced with fresh specimens of the same or different species, depending on how they have performed or whether something different might give a better or fresh effect.

The ground plan which is illustrated in this article has all the elements of a good scheme, with attention being given to foreground, middleground and background planting. The plants have been selected for shape, size, colour and contrast to give an overall pleasing effect, but you can, of course, vary the choice according to availability, personal preferences, etc.

Day-to-day jobs

When the aquarium is first installed and planted, the lights should be switched to maximum power of 125 watts and left on for 48 hours. After this, the timer should be set to switch the lights on for 10 hours per day. When the plants are well established, the bulbs should be switched to the 80 watt mode.

Regular feeding is essential. Daily supplies of iron and other trace elements



This is the Chain Sword (*Echinodorus tenellus*) — a super plant for the foreground.



Didiplis diandra looks fantastic in clumps.



Cryptocorynes — well established — can last for years.



Ferns and mosses do well attached to pieces of bogwood.

should therefore be administered. N.P.K. (nitrogen, phosphorus and potassium) are particularly important to give the plants an initial boost. Afterwards, the tank will normally generate enough of these elements via the fish food cycle to satisfy the plants' requirements.

The carbon dioxide equipment will introduce sufficient extra carbon to ensure that the plants do not lack this most essential element.

The secret of successful Dutch aquaria lies in the mass arrangements of groups of plants of the same species. If cuttings, these should be bunched together in 'fives' and weighted down with lead strip to ensure that they do not become dislodged before rooting occurs. This normally takes about two weeks.

Subsequently, regular pruning and 'housework' must be carried out on the plants if the effect is to be maintained and to ensure that they conform with the original planting plan. They may be pruned several times before they weaken and start to produce spindly weak growth. It is at this time that they need to be replaced with fresh vigorous stock. Such plants as *Cryptocorynes* may, however, be left undisturbed for a number of years before being thinned out.

The fish

Fish must be selected carefully and their natural diets checked before purchase. Any vegetarians, such as Silver Dollars (*Metymnis*), Tinfoil Barbs, Headstanders, Scats, Monos etc should never be added under any circumstances. However, algae-eating species, such as Sucking Loach, and the smaller algae-eating catfish, should be added, but their activities carefully monitored.

Large fish should also be avoided, and any with digging habits, such as certain cichlids, excluded. In the main, it is best to play safe and go for shoals of small tetras, rasboras and danios etc.

Dutch aquaria must be the pinnacle of any freshwater aquarist's ambition, and a successful set-up will be an object of envy and admiration for all visitors, to say nothing of the great sense of accomplishment that such an aquarium generates in its creator.



The served dish, with a complete Koi smothered in Bean-curd sauce.



EAT UP YOUR KOI

The Japanese are famous for their Koi, or Nishikigoi as they call them. The fish is actually *Cyprinus carpio* Linné (1758), the species being named after Carpio, the island where Venus, the goddess of love, was born. The reason is that the fish was seen to produce hundreds of thousands of babies and is considered the animal of fecundity in Japan (much as the rabbit is so considered in the UK). The fish was farmed as a food, particularly in the east coast of Honshu called Niigata Prefecture, a centuries-old tradition that continues to this day.

The black form of the Carp (called Magoi in Japanese), which is omnivorous, can grow well on a vegetable diet, so farmers fed the fish rice and grasses and harvested the fish as a source of animal protein. Records go back to the 1800's showing that an albino form of the Carp occurred; then the coloured varieties were developed as a hobby fish by the farmers.

With typical Japanese attention to detail, the colour patterns of the coloured Carp were bred into named varieties, which now number 13 main categories. All are pedigree forms with national standards, and prize-winning fish

Aquarian's Dr David Ford has found himself in some pretty strange places and situations over the years ... but a Koi restaurant must be very near-impossible to beat for weirdness.

Photographs — despite the fact that he's in two of them(!) — by the author



Eating raw Koi. At this point, I am desperately hoping that the Saki supplied helps wash the flesh down!

can command thousands of pounds or dollars each, the costs being covered by stud fees. The world is climbing on this bandwagon, of course, and now there are Californian Koi, Israeli Koi, even English Koi.

When I visited Japan for the first time (a lecture tour — with interpreter — for the launch of **Aquarian** in that country), I asked to see a Koi farm because I have long admired the beautiful fish and keep varieties such as Kohaku and Showa as personally loved pets in my garden pond.

"Yes", my Japanese hosts said. "We will also take you to a Koi Restaurant". I assumed this was a normal restaurant with Koi as a decoration, but was surprised (horrified, actually) to find it was actually one of many restaurants that offer only Koi as a food item! I had to go to the pond where the Magoi swam and picked the fish I wanted, then go to another pond where coloured Magoi (actually, Koi far better than my pond ones) swam, to contemplate their beauty while the chosen fish was prepared for me to eat.

When I sat (on the floor) inside the restaurant and the dish was served, I discovered the only preparation was cooking the sauce they poured over the complete and newly dead but raw Koi. It is considered bad manners in Japan not to eat food given to you, therefore I did eat the fish. The sauce was delicious. I hope my Kohaku and Showas never find out ...



Standing by the Tokyo restaurant's pond of black and coloured Koi.

To quote a current expression — are your frogs and toads 'User-Friendly'? Some species, such as Clawed Toads, Fire-bellied Toads and the deservedly popular Whites Tree-frog, are so placid, accommodating and easy-going, that it is almost embarrassing how well they thrive without seemingly giving their owners any trouble. They must be user-friendly!

There are other frogs so temperamental that you need to spend hours dangling greenfly from a straw in front of their faces, and then the ungrateful things decide their sole diet is blackfly, to be eaten only when there is an 'R' in the month. Definitely user-UNfriendly!

Unhesitating choice

A species I would include in the first group, without any hesitation, is the Asian Bullfrog (*Kaloula pulchra*), variously known as the Malaysian Narrow-mouthed Toad, Painted Bullfrog, Indian Ox-frog or Asiatic Painted Frog. Irreverent dealers often refer to them as 'Chubbies', a name which suits these plump frogs only too well. They are found in many parts of Southern Asia, including India, Malaysia and China, and belong to the family Microhylidae, which has many interesting members. However, *Kaloula pulchra* seems to be the only species regularly imported.

The basic colour of the Asian Bullfrog is dark brown with an irregular broad cream band running along each side, from the eye to the hind leg. Often, this band has a pink or reddish tinge. The colours of these frogs seem to change according to humidity/lighting/mood/what-they-ate-for-dinner! No two have quite the same markings, which is useful for identifying individuals if you keep several.

The skin over the back is smooth, but at the sides, it is slightly grainy. The body is flattened, almost as though it has been trodden on, and the head is slightly pointed.

Asian Bullfrogs are definitely toad-like in appearance. These peculiar frogs are quite large, about 3-4in (8-10cm) in diameter — I use that word advisedly, as they are almost circular.

Their abdomens hold a lot of water, and sometimes they will expel this indignantly if picked up. I have read that this liquid is foul-smelling, but have never noticed any odour with my specimens. Perhaps they are extra user-friendly!

The hind feet of the Asian Bullfrog are adapted for burrowing, with small horny spurs on the heels, and their limbs are short and powerful. They have an amazing way of sitting on a pile of moist earth, pressing down with their feet, and sinking below the surface without any visible effort.

Although these frogs are nocturnal, they often waddle around during the day, especially if they know there is food in the offing.

They are exceptionally placid creatures,

User-Friendly Bullfrogs

They may be fat and floppy but, as Susan Brewer explains, Asian Bullfrogs make great pets.

Photographs by the author

not seeming to pay the slightest attention when a hand is inserted into the tank, and it is good to know that they are not going to leap out and disappear when the lid is removed. Apparently, in the wild they tend to frequent places near human habitation, and clusters of them can be found at dusk catching insects attracted by the lights of houses and street lamps.

Accommodation

Asian Bullfrogs should be kept in a large vivarium, minimum 36 x 12 x 12in (90 x 30 x 30cm), floored with peat, sand, gravel, or a mixture of all three, covered with a thick layer of Sphagnum Moss. My frogs seem to appreciate a freshly dug turf or grass (make sure it is from an uncontaminated source), and they ponderously clamber over it, burrow under it, and generally have a wonderful time.

Robust plants can be installed, such as Yuccas, Kalanchoes or Ficus, but Asian Bullfrogs do not care about gardening and will determinedly stomp over or knock down any obstacles, so be warned!

A flower-pot on its side makes a good shelter, as do some curved pieces of bark. In my tank I have a couple of tree-branches, about 1in (2.5cm) diameter, wedged a few inches from the ground. One of my specimens seems to take great delight in precariously balancing along these branches, looking for all the world like a great over-weight tightrope walker.

A deep dish of water should be sunk into the peat, as these frogs are very fond of bathing. Even better is to glue a 3in (7.5cm) strip of perspex using aquarium sealant, across the tank to form a pond. A ramp should be made from the same material to make access easier. I have found that my frogs are at their happiest squatting motionless in a couple of inches of warm water and will stay there for hours. They are quite capable of taking food in the water, if the odd cricket or mealworm should happen by.

If the tank is kept in a normally heated living room, and is lit by a fluorescent light for 10-12 hours a day, no additional heating should be necessary. It is benefi-

cial to spray the moss lightly regularly, though, as the frogs seem to appreciate a humid atmosphere.

Feeding is simple and quite straightforward. Asian Bullfrogs have huge appetites and make short work of a bowl of mealworms, scooping them up one by one with their sticky tongues. They will also take crickets and locusts, which should be dusted with a proprietary vitamin supplement. Earthworms are popular, too.



Adult pair. The male is the smaller specimen.



Male from the side.

ably

Often, Asian Bullfrogs will feed from your hand, which means you can vary the diet with scraps of raw meat or liver.

Difficult breeders

Sexing adults is reasonably easy, because the female is larger and fatter, and the skin of the male's throat is more granular. He also has a vocal sac. The call of the male is said to resemble the moo of a cow, although most of the time they are quite silent, apart from the odd chirrup or hiss.

Unfortunately, these frogs are almost impossi-

ble to breed unless you have a large set-up. The most likely way to achieve success would be to give them their freedom in a heated greenhouse or conservatory with a fairly deep pond, although, having said that, in the wild they often spawn in shallow ditches and puddles.

It seems to be heavy rain after drought that triggers breeding, so a pump-operated fountain, or even a sprinkler hose, might well provide the needed stimulus, especially if the frogs were kept in drier

conditions for a few weeks beforehand.

If you are lucky enough to get them to breed, the eggs, which are very sticky, need to be transferred to a tank heated to 20°C (68°F). The larvae will hatch within twenty-four hours and must be fed with powdered fish food, *Daphnia* and the like.

When the froglets develop, which should be within three weeks at the above temperature, transfer them to a moist vivarium with plenty of moss that is sprayed daily. The young frogs will feed on whiteworms, *Tubifex*, hatching crickets and various small insects.

White's/Bullfrog mix

Earlier, I mentioned White's Tree-frogs, which are sturdy, muscular creatures. Asian Bullfrogs are the opposite; they are flabby, soft and floppy. It would be mind-boggling to imagine them attempting to perform the great aerobic leaps of the Tree-frogs. Instead, they are slow-moving and ponderous, tending to plod determinedly along, rather like a tortoise.

However, these Bullfrogs are ideal companions for White's Tree-frogs. They will ignore each other, of course, as is the norm with these creatures, but as they are of similar size, build and temperament, there will be no problems, and both species are more than capable of holding their own when it comes to feeding time.

I have discovered that the White's Tree-frogs tend to regard the Asian Bullfrogs as rocks, and often absent-mindedly sit on them! This doesn't seem to worry the Bullfrogs at all, and when they want to move, they just start to trudge along like small Sherman tanks, usually giving a slight shake to dislodge any squatters as they do so.

At the beginning of this article, I light-heartedly used the term 'user-friendly', but in case anyone is worried, I would like to make it clear that I am not advocating that Asian Bullfrogs can thrive on neglect, poor treatment or insufficient food. However, with proper care, these wonderful frogs, full of determination and character, make worthwhile inhabitants for any vivarium.



Feeding presents no problems.

ASIAN BULLFROG FACT FILE

Common Name:	Asian Bullfrog (but see text!)
Scientific Name:	<i>Rhombophryne</i>
Family:	Microhylidae
Distribution:	Southern Asia, including Malaysia, India and China
Size:	Male 3in (7.5cm) Female 4in (10cm)
Colour:	Dark brown with cream bands
Disposition:	Pleasant



White's Tree-frogs and Asian Bullfrogs don't fight — they just ignore each other!

CAPTIVE CARE

Vivarium:	Large, min. 36 x 12 x 12in (90 x 30 x 30cm)
Conditions:	Moist, with deep peat moss layer for burrowing
Temperature:	66°-81°F (19°-27°C)
Diet:	Crickets, mealworms, earthworms, liver
Breeding:	Unlikely, but possible in an extremely large set-up



COLDWATER

JOTTINGS

BY
STEPHEN J. SMITH



Talking point: Chinese whispers

I have felt some concern about the fact that rumours have been flying around over the past summer, apparently about certain suppliers and their supposed circumstances with regard to outbreaks of SVC. Some of these rumours have been 'behind the hand' comments naming individual suppliers.

One supplier in particular (whom I shall keep nameless) was said to have been 'closed down' following an outbreak. Naturally, I checked out the circumstances, both by telephone and by visiting the supplier in person, and found that the rumour could not have been further from the truth.

What has happened is that, with the threat of an outbreak of SVC in the UK this season, the Ministry of Agriculture, Fisheries and Food (MAFF) have been undertaking routine investigations of all suppliers of ornamental coldwater fish. I understand that the initial phase of the investigation was concerned with importers, and that retailers would also be inspected as time goes by. So perhaps your retail establishment could be next ...

Another set of rumours I have heard concerns a retailer which had closed down, and the alleged 'reasons' behind their decision to close. Again, the 'Chinese whispers' proved to be quite untrue, unfounded, and misguided.

So what do these rumour-mongers hope to achieve? Why the rumours at all? Is it because the rumour-mongers care for their industry and are concerned about the circumstances of their fellows in the trade? Or could it be a case of 'phew, lucky it wasn't me'?

I would never put down to malice that which may really be due to ignorance but, please, all those who care about the aquatic industry, do check before speaking about those who, after all, are colleagues. At the end of the day, the well-being of the industry depends upon the perceptions of customers — your customers. And if they get the idea that one or two individuals are not up to scratch, it can

reflect, not only upon the perpetrators of such rumours, but upon the industry as a whole as well.

Inside-outside pool

It was a pleasure to be invited to visit a regular reader of **Coldwater Jottings**, Keith Johnson, who lives in a neighbouring village of Countesthorpe, near Leicester. Keith is a keen Koi keeper and a member of both Midland Aquarists and Pond-keepers Society (MAPS) and Leicester Koi Association, and told me that he was constructing a Koi pool with a difference, which I really had to see for myself.

I'm glad I did! The striking difference with Keith's pool is that it has been designed so that half of the surface is inside the house.

The main body of the pool is situated where his patio used to be, while the remainder is planned to be indoors, under a specially-constructed conservatory.

Leicester Koi-keeper Keith Johnson with the excavations for his inside-outside Koi pool.

The pool and conservatory project is expected to be fully completed by the spring, so I, for one, am looking forward to seeing it completed and hope to keep you in touch with updates and illustrations.

The ups ...

What a season 1994 has turned out to be. This is the first season that I have spawned and reared a Goldfish in a 'natural' manner, outdoors. Until this year, all my spawnings have been undertaken indoors or in the greenhouse, using aquariums and heating. However, I have modified my rearing set-up so that the whole process begins with 'natural' spawning within the outdoor pools, leaving the fry to 'grow on' in the same pools.

The reason for this was to save some of the time involved, as the expansion of both my business and my family has eroded some of my erstwhile 'leisure time' (ie, fishkeeping time). However, the results have been tremendous, with several spawnings of selected broodstock and some pretty decent fast-growing fry. The hot summer helped, of

course. And now, it's a question of sorting and grading before overwintering with the pools covered. Am I looking forward to next season ...!

... and the downs

One of the 'lowlights' of the season, for me, was my first attempt at keeping Red Shiners, *Cyprinella (Notropis) lutrensis* in an outdoor ornamental pool. Somehow, they just didn't seem to take to the pool, in spite of the reasonable summer weather.

I understand that I would have done better with Rosy Barbels, which are often kept indoors at temperatures far higher than they need to be. So, it's time to heave a huge despondent sigh and try again, only this time, the Shiners are destined to be kept in indoor aquaria.

Perhaps I might also give the Rosy Barbels a try!

Join the club!

An ideal means of gaining more enjoyment from this most pleasurable pursuit of fish-



STEPHEN SMITH

keeping is to join a coldwater society, or even the coldwater section of an aquatic society.

Just about every region of the UK has a 'fish club' of some shape or form, and subscriptions are usually pitched so that they make hardly a dent in the pocket. The advantages are that you are able to meet people of all depths of interest in fishkeeping — from those who have just one fish in a bowl, or a few fish in a pond, to the real enthusiasts who live and breathe water — or, at least, the animal and plant life which inhabits this essential element!

Specialist coldwater societies are situated throughout the length of the UK, and you don't necessarily have to attend every meeting (or any at all) to become a member. The latest details I have on some of the main Goldfish societies in the UK are listed below. Secretaries, if the details of your society are out of date, or aren't even here, then it's up to you to update me; I'll be delighted to publish your details in a future Jottings.

Association of Midland Goldfish Keepers — Membership Secretary: Mrs Anne Bloor, 10 Bamett Crescent, Woodford Halse, Daventry, Northants, NN11 3SP. Tel: 01327 61198.

Bristol Aquarists Society — Secretary: Tom McDermott, 10 Copley Court, Hanham, Bristol, BS15 3SH. Tel: 0117 960 8512.

Goldfish Society of Great Britain — PR Officer: John Stace, 23 Green Lane, Northgate, Crawley, West Sussex. Tel: 01293 533945.

Midland Aquarists and Pondkeepers Society (MAPS) — Secretary: Keith Watson, 39 St. Marks Court, Pool Close, Bilton, Rugby, Warks CV22 7RW. Tel: 01788 811587.

Northern Goldfish and Pondkeepers Society — Secretary: John Rees, 19 Cavendish Road, Urmston, Manchester M31 1YA. Tel: 0161-748 4835.

South Park Aquatic (Study) Society (SPASS) — Secretary: Norma Brown, 4 Coombe Lane, Whiteley Village, Walton-on-Thames, Surrey, KT12 4EL. Tel: 01932 842011.

West of Scotland Goldfish Society — Secretary: Sandra Lang, 50 Luganswell Road, Glasgow G46 8AX. Tel: 0141-638 8980.

Scottish Goldfish Group — Alan Gardener, 4 Carron Grove Road, Carron, Falkirk, Stirlingshire FK2 8NX. Tel: 01324 551338.

SOAPBOX

Advice for free ...? Of course!

At 77 years of age, keen aquarist and gardener Jack Frisby, who lives in the next village to me, is not a man to trifle with. Indeed, he is a man whose advice you can pretty well rely on. And people do, which is why Jack contacted me recently.

It seems that people are buying fish from specialist aquatic retailers in neighbouring towns and, when they find they have problems, are spending upwards of an hour with him at his own one-man aquatic and plant establishment to gain the benefit of his 'little grey cells'. That, in itself, is not the problem.

According to Jack, having imported the benefit of his knowledge, they then walk away with neither a purchase nor, in some cases, even a "Thank you". Jack has expressed his concern that people are going to him with

problems which, in the main, are caused by advice given by inexperienced but well-meaning "Saturday helpers".

I, too, share his concern that fish themselves are suffering stress and, in extreme cases, even death as a result of such, often ill-founded, advice. So there are two lessons to learn from this:

1 By all means ask the advice of your aquatic retailer whenever you make your purchases, if not before. But, when you do, please avoid the peak times of trade, which are usually at the weekend. It will be far better for you, your fish, and the retailer himself or herself, if you can pop in during a quiet moment at, say, the beginning of the week, when retailers may have more time to impart the benefit of their experience.

2 You can be assured of good advice, not to mention first class aquatic facilities, if you purchase your fish from a retailer which is approved by OFI (UK). This is the governing body of the ornamental fish industry in the UK and members only are entitled to bear the OFI (UK) logo on their premises and stationery.

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Reading up

Buying your first Discus is an exciting event these days, as there are so many colour varieties available. Although challenging fish, Discus have now become fairly easy to look after. This is probably due to the information available in books and monthly magazines, making the Discus a very popular choice.

Before purchasing any fish, it would be wise to have a good book to consult. There are numerous ones to choose from which are based on the authors' own experiences. You may also, find, if you buy different books by different authors, contradictory



A great book for the more experienced hobbyist

DISCUS

views on how to keep and breed Discus.

This does not, however mean that one is wrong and the other is right. In fact, there may well be several different ways of achieving the same goal, so don't be put off by controversy. You will, after a while, be guided by your own experience.

Books are excellent guides to a good start in the hobby and much valuable information can be gained from looking at the following titles:

- The King of the Aquarium* (Eberhard Schulze)
- Discus for the Perfectionist* (Jack Wattlely)
- Brand New Discus* (Japanese Discus)
- The Proper Care of Discus* (Bernd Degen)
- Discus Health* (Dieter Untergasser)

Buying your first Discus

After collecting some background knowledge and setting up your aquarium, now you are ready to view some Discus.

Try not to buy the first fish you see. Have a good look around for quality fish, because if successful, you will be keeping a fish that may live as long as eight years.

Beginners are inclined to purchase 2in Discus as they are much cheaper. If you go for this option, six individuals is a good number to start with. By buying half a dozen, future problems will have already been minimised, as a smaller group may not do as well, due to bullying by a dominant fish, so, the more the merrier!

Young Discus should be round-bodied, very alert and always hungry. Being greeted at the



BILLY WHITEHEAD

Buying a shoal of young fish will give you the best chance of ending up with, at least some, very good adults.

front of the aquarium by a hungry shoal of Discus is a sure sign of healthy fish.

If they cower in corners, have large eyes and sunken abdomens, there can be no doubt that these will be poorly kept fish. Fish of this standard will very likely, have had a past history of illness and should be avoided ... always. What you see is how they will be when they end up in your aquarium.

Compatibility

Most Discus of different varieties do get on with each

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DISCUSIONS

BY
STEVE
DUDLEY

other without any problem. However, some may require slightly different conditions.

Wild Discus, for example, will not be used to many things i.e. aged water, nitrates, limited space, water changes, bright lights, food and intervention by the hobbyist. Most of these will therefore take time to become acclimatised and, during this period, stress may induce certain ailments which can have consequences on other inmates. So, remember to keep new fish in separate aquaria for a month or so, cleansing them of any parasites which may have travelled with them.

Of all the Discus, Heckels are probably the most difficult and tend to be a little more choosy who they hang around with. I think they prefer their own company. Breeding of this species is also quite a challenge, which is why we seldom see juveniles offered for sale, although various crossings have been achieved with sub-species.

Stocking levels

Stocking densities of Discus may vary according to certain factors. For 'normal' keeping of adult fish 6-8in (15-20cm) with

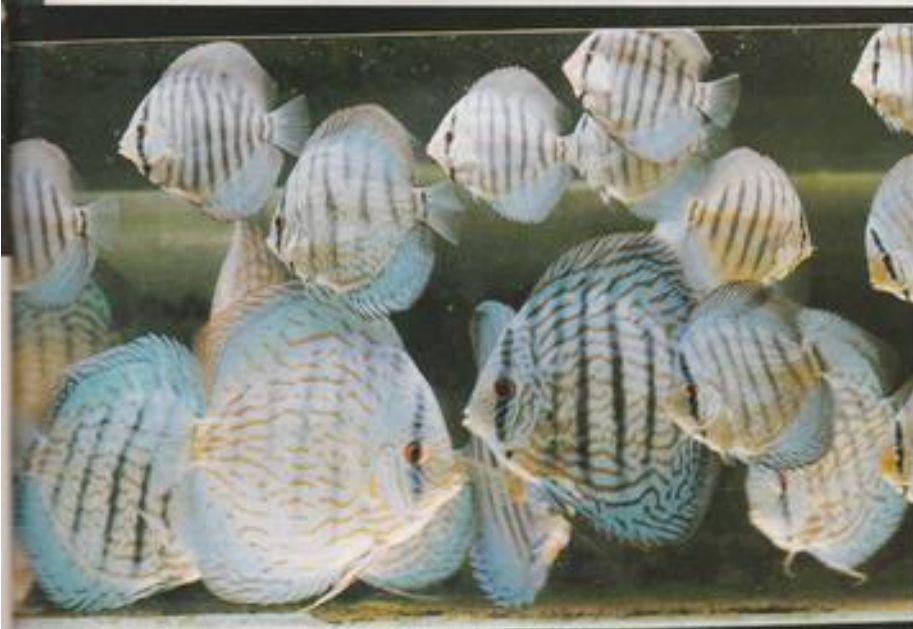
minimum biological filtration and water change of 20% twice in one month, allow an average of 7-8 Imperial gallons (32-36 litres) of aquarium water per fish.

If your filtration were to be upgraded and water changes increased to once per week, then only 5 Imperial gallons (c23 litres) would be needed to

sustain a healthy Discus. So stocking levels are dependent on how you intend to conduct your hobby.

I can house up to 30 adult fish in a 60-gallon (c270-litre) tank without hindering their health. However, the aquarium is one of eight and they share a filter system which has a capacity of 50 gals (c230 litres), which ensures the health and well being of the fish.

The density of fish per gallon of water is difficult to calculate. So when somebody does calculate something, it is usually given as 'Rule-of-Thumb' ... and everyone's rules are different!



STEVE DUDLEY

Rule-of-thumb guidance on stocking levels usually works ... but the levels vary!

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out and about



KOI '94 Best Nation

By David Twigg

Photographs by the author

Once again, Lyn and I made the annual pilgrimage to the European home of the Koi Show, Billing Aquadrome, located just south of Northampton, where — unless you came to Warwick — you could not get much nearer to the centre of England!

Billing lies literally half a mile from a major dual carriageway road that is directly linked to the M1 motorway. Even for those travelling from the previously poorly served East of England, the journey must have been made simpler by the opening of the A1-M1 link.

But back to the 19th National Show (the largest show outside Japan), again sponsored by Hikari and this year on a new, larger site within the Aquadrome grounds. This show was the biggest yet to be put on by the British Koi Keepers' Society, and Show Chairman Paul Jarrett and his committee had worked very hard for over twelve months to get the logistics of the show sorted out. Everything from vans for the Koi, through marquees for the dealers, to clowns for the kids, had to be arranged and were such that everyone was catered for to their satisfaction.

I was given help and assistance with photographing the top Koi in the show and my thanks go to the man with the bowl, Doug Raby, and his netman Wayne, for their patience. Koi never manage to line themselves up when required for photographing but, nevertheless, I hope readers will be pleased with the results on these pages.

Photography over, it was time for the grand tour of the dealers' stands. I say 'grand tour' because that's really what it was: almost 40 dealers, thousands of fish, and a very wide range of Koi-related dry goods.

I didn't spot any innovations this year, but there was a fantastic variety of new pond filtration systems on offer, as well as the usual range of Koi foods and filter media. The allied hobby of Bonsai and a Craft Fayre tent helped cater for the less-Koi-fanatical members of the family.

Several stalls were selling Koi videos, covering all aspects of our hobby, including pond design, Koi varieties and healthcare, so it is very easy

1. Grand Champion Koi 94 (John Fallows)
2. John Fallows, right, receiving his prize for Grand Champion from BKKS chairman Gary Pritchard, left, and Derek Slater of sponsors Hikari.
3. BJ The Clown

nowadays to put together a Koi-related video collection of knowledge for a modest outlay.

Over the weekend a series of highly informative lectures were given by well known names in the Koi world, Kate McGill, Barry Goodwin, Paula Reynolds, Brian Parker and Bernice Brewster, while Peter Adams gave a Bonsai slide show. Just to prove that Koi keeping really is a family hobby, the organisers provided the obviously expected large numbers of children with B.J. The Clown and his friends, who provided entertainment by way of face painting, balloon modelling, uni-cycling, stilt walking, juggling and comedy magic.

The real magic was, of course, in the centre of the showground,



4. The Dealers did brisk business at Koi 94
5. Best Shows.
- Second Best Size 6. (Grant Clifton).
6. Best Size 3 Kohaku, 2nd Best Size 3 (Gill Colman).





4

onal to date

6



5



where some magnificent Koi were competing for the 180 awards on offer. In recent times, there has been a drift away from the 'Japanese' style of showing Koi to the original 'English' style, where each exhibitor has his/her own vat. Even though this method can make judging very much more difficult and time-consuming, the KOI '94 judges Roy Winterbourne, Keith Bertie, Walter Reed, Alan Rogers, Kate McGill, Gary Pritchard, Carol McCall, Ian Stewardson, Geoff Kemp and Val Frost worked hard and came up with all the important decisions.

Meeting old trends at a show

like this, watching beautiful Koi lazily swimming around the vats, enjoying a carvery meal at lunchtime (a very welcome improvement) and a warm sunny summer's day as well, made this the best show for me yet. My thanks therefore go to Gary Pritchard (Chairman BKKS), Paul Jarrett (Show Chairman) and their team of hard and willing workers who made this year's National a great event. Thanks too to Pip Ostell for introducing herself and putting yet another face to name. Thanks again everyone.



Koi '94 statistics

The most important statistic from the visitors' point of view was the number of Koi on show in the competition. A magnificent **469 Koi** were entered (almost **45% higher** than last year) by **56 exhibitors**.

Almost **3000 people** attended the show on the first day and over **6000 people** on the second day. The total figure for the weekend was **9615** which, by my calculation, was more than **10% up** on last year.

I am sure that these figures were received with delight by the BKKS who organised KOI '94, Hikari who sponsored it and the dealers who supported it. Well done to them all.

KOI '94 Roll of Honour

John Fellows, Grand Champion Size 6 Kohaku, Mature Champion Size 6 Sanke;

Geoff & Janet Wilson, Adult Champion Size 3 Showa;

Gill Coleman, Baby Champion Size 2 Kohaku;

Mick & Paul James, Best in Size 5 (Showa);

Gill Coleman, Best in Size 4 (Showa);

Geoff & Janet Wilson, Best in Size 3 (Showa);

Gill Coleman, Best in Size 2 (Kohaku);

Maureen Howcroft, Best in Size 1 (Tanchu)

David Slater was given the American Merit Award.

Shirley Aquatics, Dealers' 'Grand Champion' (Kin Gin Rin Sanke)

Other prizewinners were:

Keith & Kath Nind, **Steve Otham**, **Bill Johnson**, **Nail Sanderson**, **David Watts**, **Carl & Rita Morley**, **Jack Howcroft**, **Doug and Doris Raby**, **Luke Hagstrom**, **Ian and Janet Prior**, **Tony Price**, **Gary Found**, **C.R. Brune**, **Corrine Britten**, **Colin Benford**, **Sid Bowles**, **Grant Clifton**, **Nigel & Pip Ostell**, **Tracey Westerman**, **G. Bowman**, **Ernest & Alan Crampton**, **Dave Scriven**, **Pete & Dot Robinson**, **John Byles**, **Steve Ferris**, **Phil Adamson**, **Paul Bailey**, **John Knight**, **Steve Coleman**, **Mathew Corino**, **Nicholas Wood**, **Alan Purnell**, **George & Kathy Rooney**, **Martin Parker**, **Sandra Wilson** and **Maria Groves**.

Catfish group dates

Northants District Catfish Group has released dates for its meetings over the next few months. According to member **Michael Emerton**, there is no regular venue for meetings, and people wishing to attend should telephone Michael on 01604 542679 before each meeting for details of venue.

Meeting dates for 1994/5 are: 20 October, 17 November, 15 December, 19 January, 16 February, 16 March, 20 April, 18 May, 15 June, 20 July.

Details from: **Michael Emerton**, Northants Catfish Group, 30 Horsewell Ct., Moulton, Northampton NN3 7XB.

A of A Euro Show

The Association of Aquarists (A of A) is to hold a further European Aquatic Fair next year. According to the A of A, the aquatic trade is already making stand bookings, and organiser **Malcolm Goss** commented: "With the

opening of the Euro Tunnel, and with Luton Airport only a few minutes from the venue, it is hoped that many aquarists from across the English Channel will not only be visiting, but also exhibiting fish."

Next year's event will be held at **The Queensway Halls, Dunstable**, near Luton, on 1-2 July 1995; it is intended that society information stands will be increased. For further information, contact: **Judith Aymer**,

Secretary of A of A, 5 Napoleon Drive, Basingstoke, Hants RG23 8DW. Tel: 0256 53793.

MAPS AGM

The first annual general meeting of **Midland Aquarists and Pondkeepers Society (MAPS)** takes place at the Conservatory Tea-Room of Ullesthorpe Garden and Aquatic Centre, near Luttenworth, Leicestershire, on **Thursday 10 November (7.30pm)**.

The society has enjoyed considerable success since its formation last year, according to society Chairman, **Keith Watson**, who reports that the membership is in excess of 40 aquarists with interests across the spectrum of fishkeeping. Meetings are held on alternate months to enable fishkeepers to enjoy membership societies, and a Newsletter is published in intermediate months.

A main speaker forms the highlight of each meeting, together with a 'table talk' from a member. Among this year's main speakers have been ASP

contributors **Stephen Smith** and **Gordon Kay**, with a comprehensive cast of speakers planned for the forthcoming year.

Membership is £5.00 per person, or £7.50 for a family membership, and members are entitled to a discount on aquatic goods purchased at Ullesthorpe Aquatic Centre. For details, contact chairman **Keith Watson**, 39 St Marks Court, Pool Close, Bilton, Rugby, Warks CV22 7RW. Tel: 01788 811587.

Strathclyde Festival

This year's **Strathclyde Fishkeepers Festival** will be held on the weekend of **21-23 October** at Greenock High School, Inverkip Road, Greenock. This is the second event organised in a collaboration of **Clyde AS, Inverclyde Aquarist Circle, Greenock and District AS** and the **Scottish AS**.

According to Show Secretary **Hugh McGuinness**, the principal aims of the show are to promote, increase, and educate the general public in all types and aspects of the fishkeeping hobby, including ecology, aquarium suitability and the ease with which an aquarium can be successfully kept in the home.

"Last year we displayed tropical, coldwater, and native marine set-ups and we had lectures from **Dick Mills, Derek Lambert**, and **Dr Roberts** from Stirling University; we also held an Open Show with 62 different classes under FSAS rules."

"Speakers at this year's event will include **A and B Brown** with a talk on Anabantids, and **Paul Baker** will provide a talk on Killifish. An additional item in this year's Open Show is a presentation of the FSAS Supreme Championship on the Sunday (23 October).

For details and sponsorship, contact: **Hugh McGuinness**, 10a Mill Road, Cambuslang G72 7QG.



JOHN DABIES

The A of A stand in the main exhibition area at this year's European Aquatic Fair

DIARY DATES

October

Saturday 1
Goldfish Society of Great Britain — Annual Open Show, St Paul's Church Hall, Chigwell Road, Woodford Bridge, Essex. Auction: 1pm. Refreshments available all day. Contact: **Bert McMurray**, Secretary. Tel: 01202 523173.

Sunday 2
Fordton AS — Auction. Details: **Gary Newsome**, Secretary, 11 Beech Heys Drive, Weaverham, Cheshire CW8 3BT. Tel: 01606 853771.

Halifax AS — Open Show and auction, Forest Cottage Community Centre, Cousin Lane, Ovenden, Halifax. Booking-in: 11.30am-1.30pm. Judging and auction: 1pm. Details: **David Shields**: 0422 360116.

Milton Keynes ASG — Open Show, AofA Superbowl round. Details: **Nigel Ridley**, 1 Lynott Close, Crownhill, Milton Keynes, Bucks MK8 0DJ.

Washington AS & Pondkeepers — Open Show, Albany Junior School/Stella Maris Catholic Club, District 2, Washington, Tyne & Wear. Details: **Mrs M. Jacques**, Tel: 0191 416 7292 or Ian, Tel: 0191 410 6390.

Tuesday 4
Gloucestershire AS — Meeting with a talk on Koi, at the Bell & Gravel Pub, by the cattle market, St. Oswalds Road, Gloucester. Details: **Andy Ramsbotham**, Tel: 01452 521609.

Tuesday 4 & Thursday 13
Fordton AS — Meetings. Details: **Gary Newsome**, Secretary, 11 Beech Heys Drive, Weaverham, Cheshire CW8 3BT. Tel: 01606 853771.

Sunday 9
Grangemough AS — First Open Show, Community Education Unit, Abbots Road, Grangemough. Benching: 10am-1pm. Public viewing: 4-5pm. Details: Show Manager **Bob White**, 6 Braeside Place, Leunstun, Falkirk FK2 9NN. Tel: 01324 621559 or Secretary **Jim Wilson**, 36 Tinee Cresc., Polmont, Falkirk FK2 0UX. Tel: 01324 713558.

Sunday 16
Basingstoke & Dist AS — Open Show, A of A Superbowl round. Details: **Chris Ralph**, 610 Abbey Road, Popple, Basingstoke, Hants RG24 9ET.

Leeds AS — Annual Open Show, Collingham Village Hall, Collingham, W. Yorks. Details: **Harold Pullan**, Chairman, 17 Lynwood Rise, Dixon Lane, Leeds LS15 4AY.

Solway AS — Second Open Show and Auction, Squires Motel, Collin Village, Dumfries. Benching: 10am, auction: 1.15pm; viewing: 4.30pm. Details: **John Cowan**, 'Etouvet', 7 Warranhill Road, Greenlea, Collin, Dumfries DG1 4PW. Tel: 01387 75666.

Monday 17
Reigate and Redhill AS — Bring-and-buy sale, Strawson Hall, Albert Road, Horley, Surrey, 7.30 for 8pm. Details: **Jeremy Spence (PRC)**, 60 Ralley Road, Northgate, Crawley, W. Sussex RH10 2BZ.

Sunday 23
Tyne-Tees FBAS — Annual Open Show. Details: **R. Graham**, Secretary. Tel: 01 388 767145.

Sunday 30
Fordton AS — Auction. Details: **Gary Newsome**, Secretary, 11 Beech Heys

Drive, Weaverham, Cheshire CW8 3BT. Tel: 01606 853771.

November

Tuesday 1
Gloucestershire AS — Meeting with a talk on Wetlands and their importance by **Simon Pickering of Wildfowl and Wetlands Trust**, at the Bell & Gravel Pub, by the Cattle Market, St. Oswalds Road, Gloucester. Details: **Andy Ramsbotham**, Tel: 01452 521609.

Tuesday 1 & Thursday 10
Fordton AS — Meetings. Details: **Gary Newsome**, Secretary, 11 Beech Heys Drive, Weaverham, Cheshire CW8 3BT. Tel: 01606 853771.

Sunday 20
OASIS (Ordinary Aquarists Society in Sunderland) — Auction only. Thompson Park Community Centre, Monkwearmouth, Sunderland. For details contact Secretary, **Mrs Avril Banks**, 122 Moor Crescent, Gilesgate Moor, Durham DH1 1DL. Tel: 0191 384 1433.

Fordton AS — Auction. Details: **Gary Newsome**, Secretary, 11 Beech Heys Drive, Weaverham, Cheshire CW8 3BT. Tel: 01606 853771.

Import/Export limits

Recent reviews have set new limits on the availability and movement of the following species of reptile and their products:

1 Ball Pythons (*Python regius*) from Ghana.

In December 1993, the EC CITES Committee implemented a total restriction on the importation of Ball Pythons from Ghana into the European Community — a development which I reported in the May '94 edition of *Frogs and Friends*.

This total restriction has now been lifted and the following annual quotas have been introduced: 7,000 wild-caught

Beautiful South American Red-foot tortoises will continue to be imported in strictly limited numbers from Surinam.



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specimens and 10,000 captive-bred snakes can now be imported into the European Community.

2 Export of Tortoise-shell to the USA.

Some items of "tortoise-shell" derived from members of the marine turtle family Cheloniidae were recently exported to the USA for sale. These items were subsequently seized by the US Customs.

The Wildlife Trade Licensing Branch of the Department of the Environment (DoE) have been informed that all species of marine turtles are protected under the US Endangered Species Act, 1973. This is in addition to CITES regulations.

The US legislation is much more restrictive than CITES and requirements under both this Act and CITES must be met prior to export. If the necessary documentation is not obtained, tortoise-shell items are likely to be seized by the US Customs.

Generally, there is not a

problem with items of tortoise-shell which are antiques, if the export documents clearly state that the items are more than 100 years old.

If the items are less than 100 years old, they can only be imported into the USA if they pre-date the US Endangered Species Act, ie the Chelonia were held in captivity or in a controlled environment on or before 28 December 1973. The wildlife must not have been held for commercial purposes.

When items derived from members of the family Cheloniidae are exported to the USA, the age of the items must be included on the application form for the export permit.

3 Reptiles from Surinam.
The precise 1994 quotas for the world-wide export of reptile species from Surinam in north-east South America have been agreed as follows: 330 Anacondas (*Eunectes murinus*), 1,010 Common Boas (*Boa constrictor*), 925 Spectacled Caimans (*Caiman crocodylus*),

633 Red-foot Tortoises (*Geochelone carbonaria*), 692 Yellow-foot Tortoises (*G. denticulata*) and 572 Yellow-headed Sideneck Turtles (*Podocnemis unifilis*).

Throughout their range in South America, land-living tortoises and freshwater Sideneck Turtles are widely consumed by the local people as part of their diet. The last three species are all extensively hunted in the Guianas including Surinam (formerly Dutch Guiana). In particular, the meat of *P. unifilis* is reputed to be particularly fine.

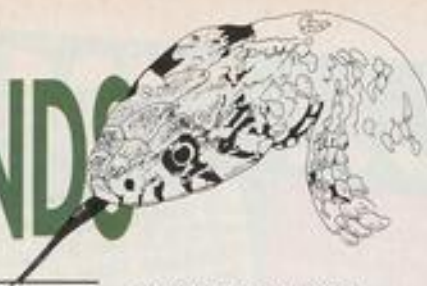
One last point about the distribution in the wild of two of the species listed above: Yellow-headed Sideneck Turtles have been released in the Miami region of Florida, North America. Spectacled Caimans have also had their range unnaturally altered by uncontrolled human actions. These aquatic Central and South American reptiles have now become established in parts of the USA.

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FRIENDS



By JULIAN SIMS

Crickets plus

It is a regrettable fact that the diet of many reptiles and amphibians maintained in captivity is deficient in essential minerals and vitamins. For example, crickets are a convenient source of food for insectivorous species of lizards and frogs. Unfortunately, although they are a good source of protein, crickets are usually a poor source of calcium.

It is therefore common practice among herpetologists to dust crickets with a multi-mineral and vitamin powder to improve their calcium and vitamin D₃ value. This is not an ideal answer to the problem, because, unless the crickets are caught and eaten quickly, these insects groom the

powder off from the outside of their bodies using their long and jointed legs.

Cricket Diet Plus adopts a radical new approach to improving the nutritional value of these insects. The powder can either be fed to the insects dry or mixed with cold

water and used as a paste. It is then possible to shape the paste into round pellets.

Diet Plus must be used at least 48 hours before the crickets are to be used as food. Extra calcium and vitamin D₃ are then present **inside** the insects when they are eaten. The fact that both calcium and vitamin D₃ levels are simultaneously increased is

very important, because the absorption of calcium from the gut into the bloodstream remains low, unless vitamin D₃ is also present.

Cricket Diet Plus is sold in sealed plastic tubs at a cost of £4.95 for 150g.

Each tub also contains a capsule of extra vitamin D₃. This provides the option of increasing the D₃ content of the powder to improve calcium absorption from the gut of the predator.

A word of caution, however. Skeletal deformities can develop with some reptiles and amphibians if high concentrations of vitamin D₃ are present in their diet. Therefore, the use of the additional vitamin D₃ is only recommended for certain animals. These include those kept in conditions of low ultra violet (UV) light (ultra violet rays present in sunlight are used by some animals to synthesise vitamin D in their skin).

Other groups of animals which would benefit from vitamin D₃ supplementation include breeding females, especially those of oviparous (egg-laying) reptiles which lay eggs with calcareous shells, and rapidly growing juveniles which are increasing the size of their skeleton.

Further details about Cricket Diet Plus can be obtained from the wholesalers of this product:

Amazon Veterinary Products,
The Cottage in the Wall,
Dawley Road,
Hayes,
Middlesex.
Tel: 081 573 4311

Incidentally, I also use Cricket Diet Plus as an additive to the lean beef I feed to my freshwater turtles. These reptiles eat the treated meat with relish and are thriving on the essential minerals and vitamins this powder provides.

HERP FACT/JUST A BALL OF CELLS?

When frogs reproduce, eggs are laid by the females of the majority of species. However, amphibian eggs are very different in structure, compared with the 'shelled' eggs laid by female reptiles. For example, the eggs of Common Frogs (*Rana temporaria*) are the 'black dots' in a mass of gelatinous spawn, with each egg being individually surrounded by its own sphere of protective jelly. One clump of frogspawn may contain several thousand eggs.

When first deposited, every egg is composed of two different parts — an animal pole which, if fertilisation has taken place, will develop into an embryo — and a vegetative pole. As its name suggests, the vegetative pole will provide the nourishment for the developing embryo and is often called the 'yolk', although it is more correctly known as endoderm.

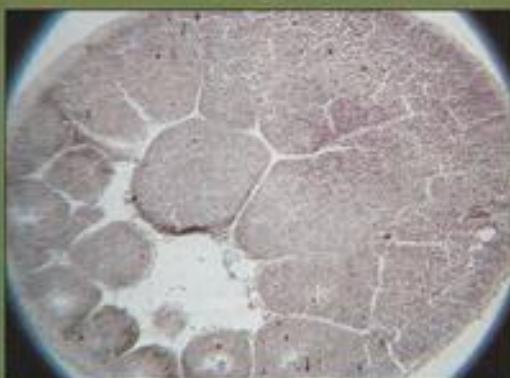
The two parts of the egg are not of the same density: the yolk of the vegetative pole is more dense. The cells of this denser region divide at a slower rate and remain larger, compared with the cells of

the animal pole. Quite quickly, the rapid cell division at the animal pole causes the two parts of the egg to become separated by a space called a blastocoel. In fact, at this point in time, the entire developing egg is called a blastula.

The large number of small cells being formed at the animal pole run out of space and 'spill over' the edge of the blastula to engulf the yolk cells of the vegetative pole. This overgrowth is called epiboly and results in the cells of the animal pole forming an entire embryo around the nourishing yolk cells of the original vegetative pole.

When embryonic development is complete and the young tadpole struggles free of its protective jelly, the remains of the yolk still cause the abdominal region to be swollen.

After escaping from the spawn, the tadpoles of Common Frogs do not move very much for their first few days of freedom. They continue to be nourished by the remains of the yolk before they start to search for algae and other water plants.



A vertical section through a developing frog egg (blastula stage) as seen under the microscope. Numerous single cells are visible at the animal pole, with fewer, larger cells at the vegetative pole. The two regions are separated by a cavity: the blastocoel.



JULIAN SIMS

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QUESTION TIME

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All letters must be accompanied by an S.A.E. and addressed to: Question Time, Aquarist & Pondkeeper, 9 Tufton Street, Ashford, Kent TN23 1QN. Herpetology, Julian Sims. Koi, Alan Rogers. Tropical, Dr David Ford. Coldwater, Pauline Hodgkinson. Plants, Barry James. Marine, Gordon Kay.

KOI

Ulcerated Koi

I have a small pond with just a few small Koi. It is filtered with a Cyprio Biozorb 1000 + UV and all fish except one appear happy and healthy.

This 8in Koi has developed a bad ulcer in the area of the anal fin, and the fin and part of the body have been partially eroded away. I have treated the area with a solution of potassium permanganate and Orabase cream, as suggested by a local dealer.

Will a wound as severe as this be likely to heal and if so, how often should it be treated?

This rather sounds as though you have a typical symptom of an *Aeromonas* bacterial infection with this Koi which can possibly lead to further outbreaks with your healthy stock.

It is not unknown for healthy Koi to survive such ulcerated wounds to body and fins, although severe cases will need specific antibiotic treatments once the species of *Aeromonas* is correctly and professionally identified. This sort of outbreak is often the result of poor and diminishing water quality and is frequently attributed to high levels of stress within individuals. Stress directly weakens the resistance to all pathogenic infections.

I have successfully treated similar ulcers and wounds by applying the treatment that you have described and, on stubborn cases, 2 or 3 applications, with a 5 to 10 day interval between medications. Once the Koi is anaesthetised, always clean the wound and remove any dead tissue or damaged scales very carefully. The Orabase cream will



ALAN ROGERS

Treatment of ulcers of this size can only be effectively carried out on an anaesthetised Koi.

act as an antiseptic, while providing a water-resistant protective barrier.

Look for the wound being less aggressive in appearance and encouraging signs of healing by the formation of whitish new skin, which should not be further disturbed once formed. In water temperatures around 65°F (18°C), healing progress can be very remarkable, and often, within a few months, a faint scar may be the only visible reminder of the problem.

Be vigilant for any further outbreaks within the pond and, if

necessary, isolate any further affected fish in a well aerated and, if possible, heated treatment tank.

Post-treatment cloudiness

I have used Malachite Green and formalin a number of times in my pond for parasite treatments as and when necessary, and, on each occasion, my pond clarity subsequently diminishes quite noticeably. I have tried reducing the strength of the mixture and adding extra aeration to the external filter, but not very successfully.

As it takes several weeks to restore clarity back to normal, I am unable to see the Koi at the bottom of the pond during this time. Have you any suggestions?

The use of Malachite Green and formalin together is quite effective in controlling certain flukes and parasites, but it is of paramount importance to know the exact gallonage of your total pond and filtration system.

Reducing the mixture may well have little effect on the medication if, in fact, you are undertreating, and speculation of your gallonage is extremely harmful to your Koi and bacteria culture within your filter if this results in overtreatment.

The loss of your pond clarity is unquestionably the destruction of a large percentage of the active aerobic bacteria within your filter. Both formalin and Malachite Green are capable of accom-

plishing this feat. Malachite may be an excellent bactericide, but it is incapable of distinguishing between good and bad bacterial

Your filter may need time, depending on its efficiency, to recover from such chemical treatments, and sometimes, it is advantageous to treat individuals in a short term external bath to prevent such filtration downfall. I am a little concerned that your filter takes "several weeks to recover afterwards", as this usually denotes some form of inefficiency within your system.

I note you have experimented with additional aeration within your filter and this is always very helpful during medications. If you can supply further aeration to your pond for a couple of hours or so, it may help to turn your filterpump flow off while the medication is being applied to the pond. This will reduce the full strength of the treatment having to pass through the filtration system, while Koi and filter receive supplementary aeration. Within an hour or so, the medication will have weakened and the filters can be operated once again.

During this time, maintain good aeration and always observe your Koi's behaviour during any such treatments. If you are purchasing the standard mix from your dealer, the dosage should be 1ml/17.6 gallons and applied with a plastic watering can evenly over the pond surface.

Do not use this treatment at temperatures below 50°F (10°C) and do not repeat the dosage within 7 to 10 days. Never exceed the prescribed dosage stated on the bottle.

COLDWATER

Tap v rainwater

Is it advisable to collect rainwater to use for my coldwater aquarium?

I would not, personally, advise you to do so because it is almost impossible to collect rainwater which is absolutely free from contamination in some form or another. It is very likely that it would contain harmful substances to fish.

Use tapwater which has been allowed to stand for about 24 hours; alternatively, you can use a water conditioner available from your aquatic dealer.

If you are simply topping up a tank or pond, adding only a small amount of water, then you can add it as it comes from the tap, unless it flows through copper pipes, in which case, you should allow the tap to run for several minutes before drawing water for your aquarium.

Pet foods

I have heard that Goldfish can be fed on other types of pet food such as cat or dog foods. Is this suitable for my fish?

Some might well be suitable but, of course, some would not be digested easily and would therefore cause problems, such as indigestion and constipation. Goldfish do not have stomachs, so the food they take in is

digested on its travels through the gut. Some pet foods, like table scraps, could interfere with this and should therefore be avoided.

A good guide would be to consider what a fish might find to eat if it were swimming in a river or lake. The most easily available complete diets and, of course, the best manufactured foodstuffs, are those made by the experts which cater precisely for Goldfish. These foods provide all the minerals and vitamins needed for health and vitality.



PLANTS

Nemachandra alternifolia, a new 'possible' for the aquarium?

Mystery Sri Lankan

On a recent visit to Sri Lanka, our coach stopped at the side of the road for a rest. Growing in the ditch alongside the road were masses of a plant which I couldn't identify. I brought a few pieces back with me and it is growing well in my aquarium.

I enclose a couple of stems and would be grateful if you could identify it for me and give me some information about its culture.

After a good deal of checking I finally managed to identify your mystery plant as follows:

Family: Hydrocharitaceae

Genus: *Nemachandra*

Species: *Nemachandra alternifolia*

Distribution: Found throughout the Central and Western provinces in ditches, ponds and lakes.

Sinhalese name: Diya Pokunurena

This submerged herb has long, brittle stems clothed with clasping, narrow, bright-green leaves with toothed edges, giving the plant a feathery appearance. The leaves are 3in (c7.5cm) wide and 1in (c 1cm) in width. The plant is



easily propagated from cuttings which root easily.

Although the stems you sent me haven't flowered yet, De-Thabrew describes the flowers as white and minute. He also promises it to be an excellent aquarium plant. Time will tell whether or not he was correct in his prognostication.

Disappearing Azolla

Where does all my Azolla go to in the winter? I buy the plant every spring, and it flourishes in the summer, producing bright green carpets of foliage. In the autumn, it turns bright-red, then brown and, by the spring, there isn't a trace of it.

I note from your letter that you live in Derbyshire. Azolla (Fairy Moss) is hardy in the south of the British Isles, but, even here, only a few pieces normally survive to carry on the following spring.

I always take out a handful in the autumn and overwinter it under glass, just in case we have a severe winter.

HERPETOLOGY

Constipated python

I have an Indian Python which I feed on rats and mice every week or two, depending on the size of the food given.

The problem is that my snake has not passed any faeces for 3½ months. It has two, hard lumps about 8in away from the cloaca. They are hard and about 1in long.

How can I ease its problems?

Captive snakes, such as Boa Constrictors and Pythons, which are fed on a diet of heavily-furred rats or thickly-feathered chicks, might produce rather large and dense faecal masses. Lack of exercise for these captive reptiles can contribute to the retention of the faeces, resulting in constipation. A prolonged case of this condition, as you describe with your python, is known as **obstipation**.

As these faecal masses accumulate, they can be detected by touch, as you have discovered. (This type of physical examination is known as **palpation**). They would also show up on an X-ray plate, if taken by a vet.

Constipation and/or obstipation can be treated by the oral administration of a stool-softening agent, such as dioctyl sodium sulfosuccinate or D.S.S. This chemical treatment is available in the form of capsules, and is manufactured by the Hall Drug Company.

With large snakes such as your python, fur-laden faecal masses can be broken down by irrigating

the hind gut, through the cloaca, with a water-based solution containing D.S.S. Alternatively, a water-soluble lubricating jelly, administered through the cloaca, will usually soften the faecal masses and allow them to pass more easily.

Gentle squeezing in a rhythmic action towards the cloaca could help to move these masses along. If they do not move, it might be necessary for your vet to use a pair of long forceps carefully to remove the dense faecal blockages.

Can you suggest a readily available species of snake which feeds on invertebrates and which is suitable to maintain in captivity?

A suitable candidate would be the Rough Green Snake (*Ophiodys aestivus*), one of two species of Green Snake found in North America. The other is known as the Smooth Green Snake (*O. vernalis*) — a smaller species which does not do as well in captivity as other species of Green Snake.

In Asia, there are also at least two other species of Green Snake. One of these is the aptly named *O. major*, a large species which has a yellow underside.

(There will be a full-length article on the keeping and captive breeding of Rough Green Snakes (written by Robert and Valerie Davies) in next month's issue of A&P. Ed.)

Close-up of a Rough Green Snake.

REV. DAVIES



MARINE



GORDON WATKINS

Lionfish can be weaned off live foods quite quickly.

Non-copper treatment

Other than using copper, which I don't like, what is the best way to treat parasites?

Probably the best alternative to copper is a freshwater bath, during which the parasites take in water too quickly and simply burst.

However, be careful that the pH and temperature of the freshwater are as near as possible to that of your tank water. Also keep an eye on the fish while they are in the freshwater. If they show any sign of distress, then take them out. In any event, take them out after five minutes.

Strict polyp-eater

I have put down a deposit on a beautiful butterflyfish which all the books tell me to avoid, because it will be difficult to feed. I would like your advice. The fish is called *Chaetodon larvatus*.

The people who wrote your books didn't do it for their health,

so heed their warnings — the poor creature will die.

This species — known as the Orange-faced Butterfly — eats only coral polyps in the wild and will not eat anything else just because you put it in a glass box.

Food Guppies

I have just bought a Lionfish, and I've now found out that it needs to be fed on baby Guppies. I don't like the thought of this. Are there any alternatives?

It beats me why people buy things without doing some reading first! However, all is not lost. You could find that the fish has already been weaned off live food, in which case, you have the simple task of feeding it things like frozen lancefish, cockles and mussels etc.

If not, then you must feed it live fishes for a while, then wean it off these by introducing frozen lancefishes with increasing regularity and cutting down on the live Guppies (or alternatives) until your Lionfish eats only dead stuff. It won't take long.

TROPICAL



BRONKHUYSER

Two male Rams displaying to each other.

Ram tips

I would like to keep some Rams in a 30in (75cm) tank removing breeding pairs to a separate tank as and when they form.

I have read that, under natural conditions, the pH should be 5.1 and the fish are robust, large and colourful. Elsewhere, I have seen a figure of 6.8. I would welcome your comments.

I would also appreciate some tips regarding the best plants to choose for such a set-up, along with some information on breeding this species.

Rams, Ramirez's Dwarf Cichlid, or the Butterfly Cichlid (*Papilochromis ramirezi*) originates from Western Venezuela and Colombia, where large, colourful specimens exist. The fish has been bred in Far Eastern fish farms for the hobby trade for many years now, giving a smaller, less colourful, and less hardy, variety.

It is therefore quite true for articles based on the wild fish to quote low pH values and describe a colourful, robust species. The fish you are probably buying is the domestic version which fares better in milder conditions e.g. pH 6.8, for breeding.

To identify a pair, note that the female is smaller and the male has a longer dorsal fin. The preferred tank decor is bunched plants for hiding, with open areas for swimming. Water should be soft and slightly peaty at 25°C (77°F).

Clutches of eggs are laid, up to 200 at a time, and both parents look after the family for a short while. Rams are not long-lived fish (about two years), and are sensitive to water chemistry, so

do frequent small water changes during routine maintenance.

Plants can be any variety that bunches, such as *Elodea* (*Egeria*), *Cabomba*, *Myriophyllum* and *Ludwigia*.

Colourless Guppies

I have been an aquarist for some time and am breeding vast numbers of healthy fish with ease. There is, however, one problem that I am finding increasingly noticeable: the young fish that I am breeding, particularly Guppies, are failing to attain the full colours of their parents.

I know that with breeding Guppies one cannot expect to bring up offspring which are like their parents, but when the young fish have matured, they only attain some colour, and this seems to be a rather pastel effect that is not as vivid as their parents.

Will giving the fish a colour food help in any way?

Colour foods will enhance natural colours in the fish but they cannot improve on the genetic quality ... they can't create what isn't there.

I wonder if you are in-breeding your fish. Guppy males inseminate the females at only a few weeks, and since the sperm package will last many pregnancies, subsequent matings have no genetic effects. Of course, breeding is often brother mating sister, with consequent poor stock.

Guppy breeders use lots of mini-tanks to separate males and females as soon as the gonopodium (the male's mating organ) is visible. It is the only way to ensure controlled breeding.

PART ONE

ALGAE: FRIENDS OR FOES?

Chris Rosam begins a two-part, closer-than-normal look at the algae, what makes them tick, and how we can combat undesirable species.

Algae are often portrayed as nuisance organisms which have become the scourge of many an aquarium or pond. Their nuisance value or usefulness is a matter of perspective, however, and it should be remembered that algae are among some of the oldest living organisms.

It is, in fact, widely believed that algae helped create the atmosphere we now enjoy. Around 3.7 billion years ago, early forms of blue/green algae, known as Cyanobacteria, first used sunlight to make food. At this time the earth's atmosphere was thought to contain 98% carbon dioxide (CO₂) and was much warmer than today. The waste product of this early photosynthesis was, as it is today, oxygen.

The presence of oxygen in the atmosphere helped to break down the greenhouse effect of the carbon-dioxide-prevalent atmosphere and helped to cool the earth. The earth's atmosphere now contains 21% oxygen which, in no small part, is sustained by the algae, particularly the phytoplankton.

Varied cornerstones

Apart from consuming and supplying vast quantities of carbon dioxide and oxygen, phytoplankton stands at the beginning of the food chain, clearly forming one of the very cornerstones of life on earth.

Not all algae are unwelcome in our aquaria, of course. Many marine invertebrates and corals have, for example, formed symbiotic relationships with algae known as zooxanthellae.



Beard Algae on freshwater plants, plus, in the left bottom foreground, some Blue-Green Algae.



JOHN DAVIES

Above right, clumps of *Spirogyra* — despite this species being regarded as a 'nuisance' alga — are attractive ... in their own way.

Above, unsightly clumps of blanket weed (with or without a small snake wading nonchalantly through!) can badly spoil the appearance of a pond.

Some unwelcome freshwater species (see text for details).



SCENEDESMUS (0.05 mm)

SPIROGYRA (One cell)



▲ VOLVOX (0.01 mm)

PANDORINA (0.05 mm) ▲▲

These algae live within the tissues of the host, where they photosynthesise, providing them with a supply of oxygen and carbohydrates. This plant/animal relationship has been responsible for the creation of the coral reefs across the warmer waters of the world.

The huge majority of plants that inhabit marine waters are algae, many of which are suitable for cultivation in the aquarium. They serve, not only as attractive additions, but also absorb excess nutrients.

In form, the algae vary from microscopic single cell plants, to the kelps that can measure tens of metres in length. In all, over 28,000 different species of algae are thought to exist, and these have demonstrated tremendous adaptability in colonising every area and type of water, including hot and sulphur springs.

Algal physiology

All algae are plants which photosynthesise, using a substance known as chlorophyll. The rate at which photosynthesis occurs is governed by such factors as temperature, light intensity, CO₂ availability and nutrient supply.

The essential elements required by algae are much the same for any other plant and include phosphorus, nitrate, calcium, magnesium, iron and manganese, as well as trace elements such as molybdenum, copper, boron, cobalt and some vitamins. Of these elements, phosphorus, in the form of phosphate, and nitrate, are often available in abundance in our ponds and aquariums.

All algae are opportunist organisms which, under unfavourable conditions, will lay dormant, waiting for conditions to improve. Given their huge diversity and adaptability, we must assume that they are omnipresent in our ponds and aquaria.

Enemies

To the freshwater aquarist, algae are generally regarded as a nuisance, and the appearance of some species demands immediate action if any aquarium or pond is to be enjoyed. The prevalent algae may also give an indication of water conditions.

The algae most likely to be encountered fall into several categories: the Blue-Greens, Beard or Brush, Brown and Green Algae — both motile and non-motile.

1 Blue-Greens

The blue-green algae are classified under the class the Cyanophyceae, a group which comprises some 7,500 species, both freshwater and marine. These types are very primitive in form and were once classified with bacteria.

In freshwater they appear as a blue-green slimy coating that can spread at an alarming rate. In saltwater they appear as red coloured. If present in quantity, they

will taint the water with a foul smell.

Their presence normally indicates poor water conditions, particularly high nitrate and phosphate. Blue-Greens can be removed by siphoning out, but any attempts to clear them must be in conjunction with a reduction in phosphate and nitrate levels. Some persistence may therefore be required.

2 Beards or Brushes

Beard Algae appear as short grey/black coloured, tightly packed filamentous fibres which grow attached to rocks, bogwood and plants. If left unchecked, they can cover an aquarium.

Despite their appearance, they are, in fact, red algae from the class Rhodophyceae, a group which is predominantly comprised of marine species.

Like the Blue-Greens, the appearance of Beard Algae indicates excessive nitrate or phosphate. They are difficult to remove mechanically, so, for example, affected decor should be boiled and plant leaves removed. Once again, it is important that water conditions are improved concurrently.

3 Greens

Surprisingly, many of the freshwater Green Algae, like aquatic plants, are inhibited by levels of nitrate (NO₃) over 30mg/l, as their requirements are more closely paralleled. When NO₃ levels exceed this, the Green Algae give way to the more pernicious types described above.

Green Algae belong to the Chlorophyceae and vary greatly in form. Anyone who has kept a pond is likely to have witnessed the tangled filamentous mass commonly known as 'blanket weed' or 'mermaid's tresses'. The algae responsible are species of genera like *Gladophora* and *Spirogyra*.

Each filament of *Spirogyra* contains a string of cells inside a mucilage sheath,

which gives it a characteristically slimy feel. The reproduction of *Spirogyra* is often studied in school biology lessons, as this plant is able to reproduce both asexually by fragmentation, or sexually when two filaments touch and conjugate. The resultant microspores or zygotes often lay dormant until the following spring, which is why mechanical clearing of filamentous algae is rarely entirely successful.

Gladophora is superficially similar to *Spirogyra*, but its hair-like filaments are not slimy to touch and are free-floating.

These filamentous algae are non-motile species, meaning that they are unable to propel themselves. Other non-motile species likely to be encountered include *Chlorella* and *Scenedesmus*. *Chlorella* has the distinction of being the smallest plant known to man, measuring just 0.003mm, and often forming the typical algae films. *Scenedesmus* is a colonial alga, each plant being made up of a colony of individual cells that float along with the plankton.

The motile species such as *Chlamydomonas*, *Volvox* and *Pandorina* are the algae likely to cause green water. They are able to propel themselves along by beating short whip-like projections known as flagella. *Chlamydomonas* is a single-celled motile alga which is able to reproduce quickly by division, making water turn green in a matter of days.

Volvox and *Pandorina* are colonial algae that, despite being made up of up to several thousand cells, are still microscopic.

Browns

Algae that appear brown in colour are from the class Bacillariophyceae; they are not strictly brown, but green.

They look brown because the green chloroplast is shielded by a silica-impregnated wall typical of diatoms. The presence of these algae is synonymous with poor lighting and water conditions.

True Brown Algae are all marine, and belong to the Phaeophycophyta.
(TO BE CONTINUED)



The grey/black filaments of Beard or Brush Algae can be seen on the leaves of this Anubias plant. Despite the colour, this type is classified as a Red Alga.



The green water seen 'spoiling' the brilliant white colour of the pebbles is caused by free-floating algae.

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