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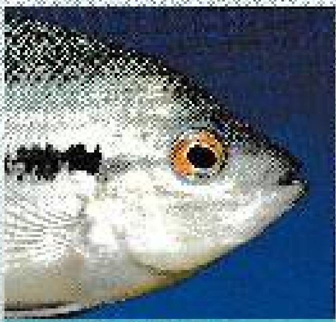

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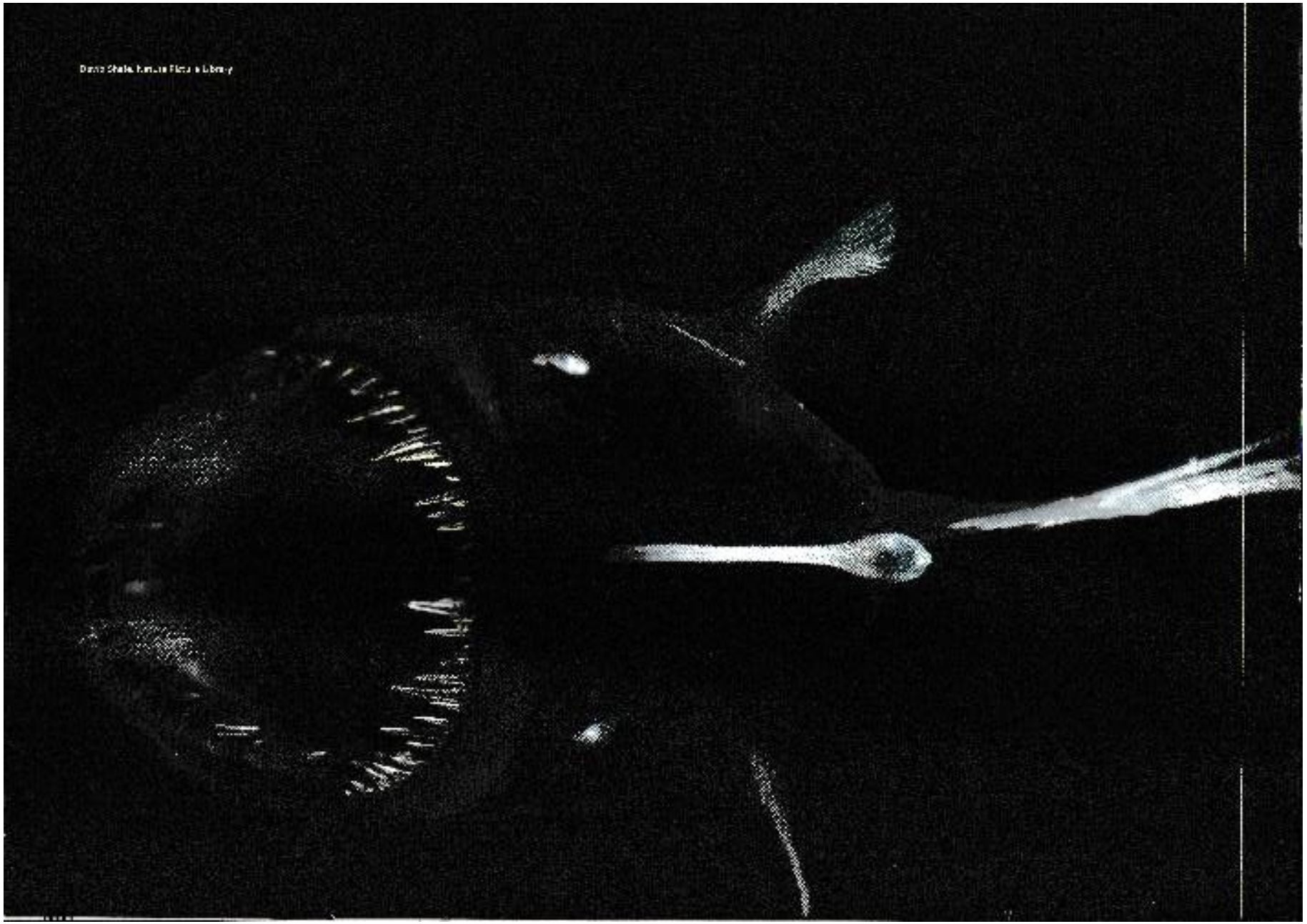


PREVIOUS PAGE: Deep sea Anglerfish: from about 120 species belonging to 17 families, Anglerfish made a recent screen appearance in the animated film, *Finding Nemo*.

In recent years the trend in our society has been to push all boundaries to the limit. Whether this is to maximise profits, go bigger and better or live faster, humans are taking things to the edge.

Fishkeeping has begun to follow this trend. As technology advances, more aquarists are keeping and breeding species that even a decade ago were thought to be impossible. Nowhere is this more prominent than in the tropical marine area where scientific understanding of the physiology and the ecology of a species has enabled us to replicate whole coral reef ecosystems.

We might think this is a phenomenal achievement, but in the natural world, thousands of species of fish live in habitats that we cannot even begin to imagine, let alone replicate in our aquaria. Over time, these species have adapted to some of the most challenging and difficult environments, pushing their physiological systems to the edge.

Some like it hot

A few thermophilic bacteria can live above 100°C/212°F, and many organisms can survive freezing, even in liquid nitrogen −196°C/−320°F. But in the grand scheme of things, animal life is limited to a very narrow range of temperatures, from a few degrees below the freezing point of pure water to about 50°C/122°F.

Tropical fish species that hobbyists keep are limited to an even narrower range. Freshwater species are kept at around 25°C/77°F, although some such as Discus, *Symphysodon* spp., prefer it slightly higher at 28°C/82°F. Marines generally prefer temperatures 25–26°C/77–79°F. But a number of species can live at the extremes at which active life can survive.

The vast majority of fish are ectothermic (cold blooded) and so the temperature of the water that they inhabit governs their body temperature and the rate of chemical reactions within their body (metabolism). The higher the temperature in your tank, the higher the metabolic rate and the more active the fish will be.

They need to eat more food, but growth rate will be increased and time taken to reach sexual maturity reduced. But they will also live their lifespan effectively more quickly by living their lives in the fast lane.

Unfortunately, living in the fast lane is dangerous and there are always trade-offs. And one of the main ones is the carrying capacity of water for dissolved oxygen (DO). Although oxygen consumption is increased at higher temperatures – in larvae of Zebra danios, *Danio rerio*, an increase of just 6°C/43°F doubled the oxygen consumption – the carrying capacity of water for DO is reduced, with pure water holding 12.8mg per litre at 5°C/41°F, reducing to 7.6mg per litre at 30°C/86°F. Above 30°C, the DO requirement of many fish is higher than the capacity of the water.

However, there are some species of fish that have adapted to even higher temperatures. The world record holder is the Desert pupfish, *Cyprinodon macularius*, which has been found in water with a temperature of 47°C/117°F.

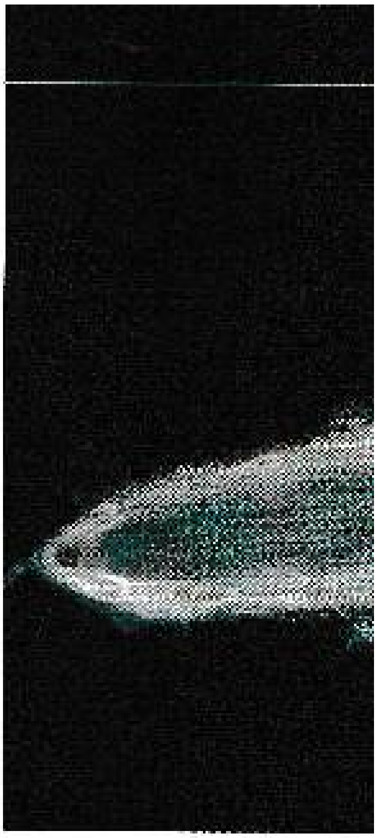
This Somali species lives in hot springs in Mexico and the USA. It not only has to contend with low DO levels, but enzyme systems and cell membranes of normal fish at this higher temperature are also damaged. The pupfish has adapted to this extreme temperature by biochemically altering its enzymes and physiological changes to extract sufficient oxygen.

...but some don't

We all know that water freezes at 0°C/32°F, and as ice is less dense, it floats. This anomaly is a lifesaver for many freshwater fish. When rivers and lakes are frozen at the surface, the bottom water often remains at 4°C/39°F as this is the temperature at which freshwater is densest and, therefore, sinks. Many species of fish tolerate this temperature for short periods of winter until spring returns.

By contrast, seawater freezes at −1.86°C/28.6°F as salts lower the freezing point of water, so this temperature is present throughout the sea even if there is ice at the surface. This means that there are many species of fish from polar seas that live permanently in water at −1.8°C. The presence of solutes in the body fluids of fish also depresses the freezing point of the fish, but only to −0.8°C, so these species should theoretically freeze.

However, they have evolved a number of methods to live permanently in this extreme habitat. Some fish that live in the bottom of deep fjords in Labrador, Newfoundland, have body fluids that are permanently supercooled. As long as they do not come into contact with any ice, their body fluids will remain liquid, but if they contact ice, then crystals form rapidly, causing instant death.



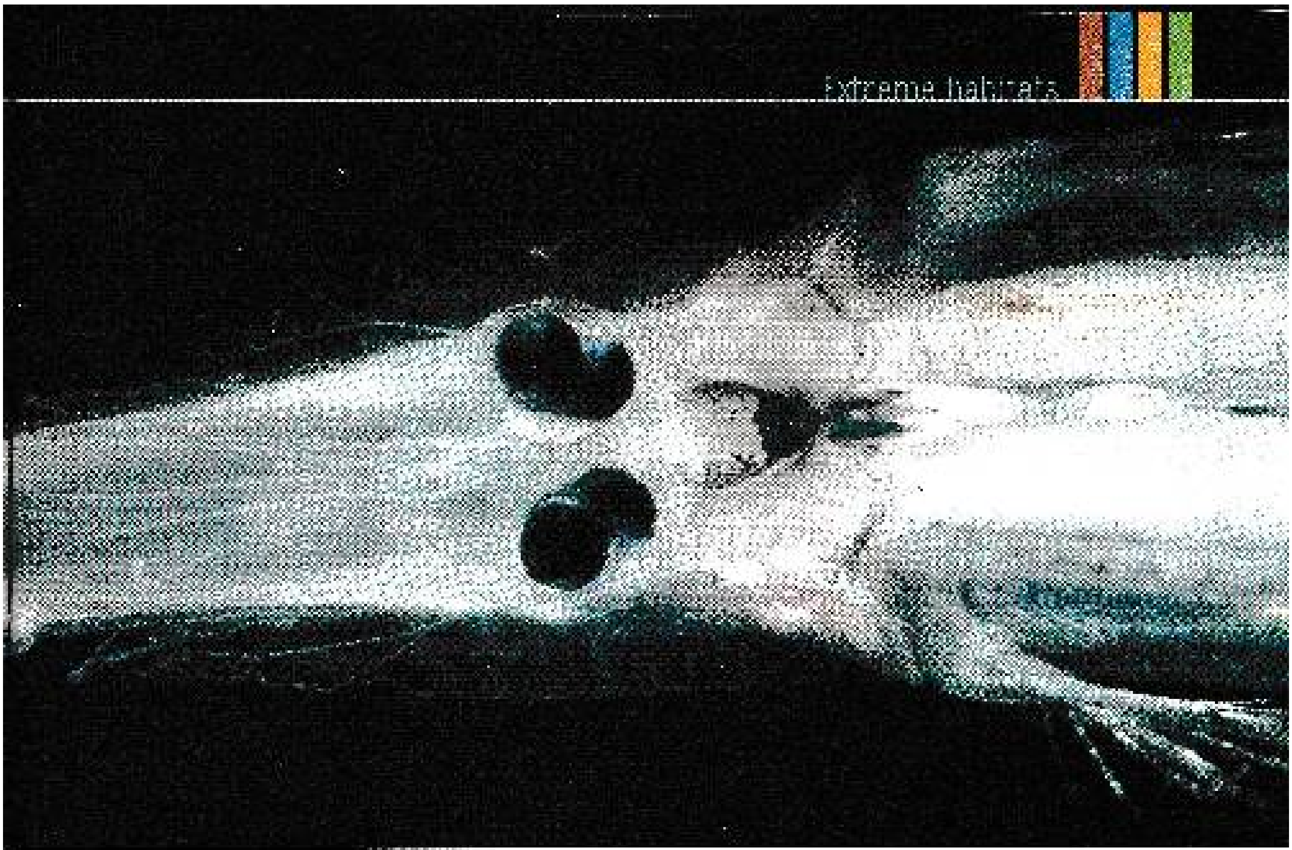
Yet many Antarctic and Arctic fish are exposed to ice on a prolonging [illegible] basis. They produce antifreeze compounds in their body fluids which prevent the growth of ice crystals by binding to the ice and inducing it to grow in a shape that is energetically unfavourable. These proteins may make up to 3% of the protein content and can be either glycoproteins or smaller peptides, and have been found in at least [illegible] families of currently studied fish.

Current research is investigating the insertion of genes that code for these antifreeze proteins into salmon and other commercially important species, enabling the aquaculture industry to extend the range for farming into colder areas.

A very brief thermal history of time...

Fish inhabit a vast range of aquatic habitats that have a myriad of different temperature regimes. Yet tolerance to changes in temperature is something that can be manipulated; the tolerance range of fish is dependent on the thermal history of that species.

Take the common goldfish, *Carassius auratus*, not known for its adaptations to extreme habitats. Yet this species has an exceptionally wide tolerance range in comparison to other species. Acclimatising individuals over a number of days to different temperatures can mean



Above: Spookfish, *Bathylychnops* sp., a deep-sea species occurring in the twilight zone. Pictured off Cape Verde Isles, Atlantic.

that individual fish can tolerate a temperature range of nearly 40°C/104°F. For example, a fish acclimated to 30°C/86°F has an upper lethal limit of 38°C/100°F and a lower limit of 9°C/48°F. But when acclimated at an initial 20°C/68°F and the lethal limits are shifted downwards, with the upper limit now at 35°C/95°F and the lower limit at [illegible].

Although the time needed for acclimatisation in some species can be very short, the bullhead catfish takes less than 24 hours to adjust fully when it is moved from 20°C/68°F to 28°C/82°F, the speed and extent of this are species-specific.

Species that come from ecosystems where they are exposed to minimal temperature fluctuations, such as coral reefs or the deep-sea, will have the lowest levels of tolerance. The most tolerant are those that live in shallow-water habitats, such as the goldfish, or inter-tidal species that can experience daily changes of over 15°C/60°F in minutes as tides inundate rock pools that have been warmed during low tide.

Under pressure

The average depth of the ocean is about 4000m and pressure increases with depth by 1 atmosphere (equivalent to 1 bar or 14.7psi) for every 10m. As a large number of fish species are permanently exposed to extreme pressures, with the deepest recorded fish at 8370m experiencing pressures of up to 840 atmospheres.

The adaptations of animals to these extremes were, until recently, poorly understood, mainly due to the problem of bringing deep-sea organisms collected in trawls back alive. The advent of submersibles and ROVs (Remotely Operated Vehicles) with pressurised tanks has enabled scientists to collect, and bring to the surface alive, a wider range of deep-sea animals.

Pressure affects any reaction or system that involves a change in volume, and at a biochemical level, these are most biological systems of an organism. Enzymes control the metabolism of organisms, and the structure of these large proteins is critical for their substrate binding properties.

As pressure increases, the volume of the water in the molecule that binds the substrate is altered, reducing the efficiency of the enzyme. The way in which fish protect enzymes from these effects is not fully understood, but changes in composition to strengthen proteins to reduce compressibility is thought to occur.

Pressure also tends to compress membranes, making them less fluid, altering its electrophysical properties and the ability of the cell to transport molecules across the membrane. Increasing the amount of fatty acids in the membrane can compensate for the loss of fluidity to maintain function.

A characteristic of bony fishes (teleosts) is the gas-filled swim bladder used to maintain buoyancy. The specific gravity (density) of marine fish is higher than seawater, thus approximately 5% of the fish's volume must be filled with gas to achieve neutral buoyancy and that volume maintained at varying depths.

Although counter-intuitive, certain effects of pressure changes on the swim bladder are more a problem for surface-dwelling fish.

As pressure increases by 1 atmosphere for every 10m increase in depth, moving from the surface (1 atm) to 10m (2 atm) doubles the pressure and so, according to Boyle's law, halves the volume of the bladder.

By comparison, a fish that lives at 1000m (101 atm) would have to sink to a depth of about 2000m (201 atm) to halve the volume of the swim bladder. Surface-living fish will encounter the largest pressure changes, so some do not have functioning swim bladders (such as tuna) and instead rely on hydrodynamic lift.

The major problem for deep-sea fish is secreting gas, mainly oxygen, from the blood into the swim bladder to maintain the volume, and to remain neutrally buoyant. This becomes more difficult as the pressure in the swim bladder

increases at greater depths.

To avoid this, many deep-sea fish have lost their bladders or filled them with fat to adapt to the extreme pressure. But a number of species have a special network of blood vessels to maximise the oxygen secreted to the swimbladder, such as the deepsea Armed grenadier, *Coryphaenoides armatus*, caught at depths of 4500m.

Into the darkness

Ever since life began on Earth, organisms have been exposed to regular day/night cycles, and so it is no surprise that the daily rhythm of night and day influences animal life. The photic environment is as varied as the ecosystems present on Earth, and fish have evolved countless ways to use the day/night cycle to exploit these habitats. Yet there are habitats where there is total, permanent darkness, but fish still exploit and adapt to these darkest corners.

Below about 1000m, there is no residual light that is detectable to the organisms that live here, yet many still have functional eyes. These eyes are used to detect bioluminescence. Up to 70% of the deep-sea fish use light organs (photophores), and although present in some shallow water species such as the midshipman *Porichthys* sp., none have been found in freshwater species.

The majority of deep-sea fish have emission and absorption maxima shifted towards the shorter wavelengths (around 485nm), so they produce light towards the blue end of the spectrum.

Just as colour and markings are used by shallow water species, bioluminescent light production by deep-sea fish is used for a range of purposes from camouflage and signalling to other individuals, to luring prey.

Some species have even gone as far as using their light organs as torches to locate prey, and this has resulted in even more remarkable adaptations to this extreme habitat. The black dragonfish, among others, of the Malacosteus family illuminates its prey with light organs situated on the head or underneath the eyes. The problem is that the vast majority of animals in the deep-sea are either brown or red, but these are difficult to detect using normal blue-producing bioluminescence as this is not reflected.

These species have solved this problem by producing infrared light (700nm) which illuminates the prey yet is not detected by the prey. To achieve this, blue light is emitted in the photophore and then absorbed by a pigment that emits it as red light and is then filtered through special lenses. The eyes of these species also have additional infrared photoreceptors to detect this light. Others have a photosensitiser derived from a chlorophyll-like molecule that captures the energy from this light and transfers it to the blue-detecting visual pigments.

Evolution of bioluminescence in the deep-sea has taken millions of years, but a common aquarium fish has, in comparison, only adapted very recently to living without light.

The blind cavefish, *Astyanax mexicanus*, is found in a series of limestone caves in the north of Mexico. In these cave systems there are at least 29 cave forms and an eyed surface form that has a wide distribution.

Evidence suggests that the eyed form has repeatedly invaded separate cave systems and that specific cave populations are between 10,000 to one million years old. Different populations have been found with varying degrees of adaptations to this existence, so each is some way towards meeting the challenges of a cave existence depending on when it entered the caves.

The most obvious adaptation is a reduction/loss of the vision system. Although this is present in the developing embryo, it arrests at an early stage. But transplant and interbreeding experiments suggest that the ability to develop an eye (eg. the genes) has not been lost, but has just been switched off.

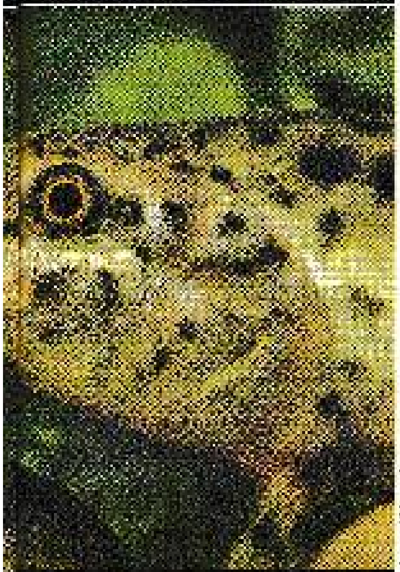
Pigmentation is also lost as is schooling ability. To compensate for the loss of visual perception, taste buds and cranial neuromasts have increased so the fish can forage and locate food and other individuals by chemical signals rather than visually.

Every breath you take...

The ice creams have sold out, the expanse of exposed pale flesh increases, and goldfish in ponds are gasping at the surface. This is evidence that the all too few hot days of a British summer are here.

In ponds, the result of these warm days is a rapid reduction in dissolved oxygen (DO) concentrations. Goldfish breathe with up to 130 gulps per hour at the surface, and this can double the concentration of oxygen in the blood.

In goldfish, gulping is a temporary response to stressful conditions that must be avoided by increasing the oxygen levels in the pond. But



many fish inhabit areas that have permanently low DO levels such as tropical swamps, where stagnant water has a high temperature and high organic load and supports high levels of micro-organisms. Many species have become specially adapted to these extreme DO levels by extracting oxygen from air through a variety of systems.

At least six of the 31 catfish families can breathe air, including many of the loricariids such as *Hypostomus* sp. and *Ancistrus* sp. which take air into the stomach, while *Megalechis* sp. uses the intestine. In contrast, the weather loach, *Misgurnus* sp., absorbs oxygen from the rectum.

The common eel, *Anguilla anguilla*, uses its skin to supplement up to 10% of the total oxygen uptake. This species is also able to travel across land for considerable distances and, while on land, the skin supplies two-thirds of the oxygen. Although the gills are still of some use on land, the overall supply of oxygen is insufficient to meet the metabolic needs, so there is a build up of lactic acid as the eel undergoes anaerobic metabolism.

The most famous air-breathers are the lungfish, but unlike most air-breathing fish, they can breathe with their lungs and gills simultaneously.

Both the African, *Protopterus* sp., and South American lungfish, *Lepidosiren* sp., are obligate air-breathers – they must have access to the surface or will drown. On the other hand, the Australian species, *Neoceratodus* sp., uses its lungs only when DO levels are reduced. All three species gulp air, passing it [illegible] the buccal cavity into the lung.

The Australian species uses its gills primarily for oxygen uptake and carbon dioxide removal, while in the other two species, the lungs supply the majority of the oxygen, but carbon dioxide is released in approximately equal amounts from both gills and lungs.

As the Australian species is an aquatic breather that only uses its lung to supplement oxygen at low DO concentrations, placing [illegible] results in a decrease in oxygen levels in the blood and will lead to [illegible] death.

By contrast, both of the other species' rates of oxygen consumption remain unchanged in air, although the breathing rate of *Protopterus* sp. increases from one breath every five to seven minutes to one every one to three minutes. This reflects their ability to survive for long periods out of water as their habitat is prone to droughts.

What it means

Thermal history: [illegible] thermal regimes.

Ectotherm: [illegible] animal [illegible].

Cranial environments: [illegible] on the head.

Supercooled liquids: [illegible] temperatures below its freezing point but, in order [illegible] around which the crystal structure can form. [illegible]

Boyle's law: The pressure of a gas is dependent on the volume and the [illegible].

Bioluminescence: The production of light by living organisms, the result of [illegible].

Thermophilic: [illegible]

Extreme tanks

This tolerance to extreme conditions can sometimes happen in our tanks, but goes unnoticed until it's too late. Poor water quality, excessive feeding or overstocking can quickly lead to an increase in toxic substances. Ammonia and nitrite are extremely toxic to fish, but even elevated levels of these substances can be tolerated if the increase occurs over an extended period.

Nitrites are actively transported across the gills and readily oxidise [illegible] to form methaemoglobin, resulting in severe hypoxia that quickly leads to death. Nitrite levels should be virtually zero, but some species can tolerate higher levels. If they have been acclimatised over a number of months, this can cause problems if a new fish that has not acquired this tolerance and consequently dies, or there is some stress, including the one that has the [illegible] over the edge, they've become aware of these problems.

Clearly prevention is the best cure, so regular testing of the water and immediate appropriate action if there are any changes in levels of ammonia, nitrite and nitrate (as well as other important parameters like pH) are vital in any tank.

There are over 25,000 fish species so far described and they have adapted to survive in nearly every type of aquatic habitat.

As we examine these habitats in greater detail and technology continues to improve, we will be able to keep many more of these species as we are able to replicate their requirements. But, however extreme the habitat of the fish may be, research about its requirements and good husbandry are required to make sure that the tank does not become an extreme habitat for more than the fish and stress to its occupants.

TOP: The Weather loach, *Misgurnus* sp. absorbs oxygen from the rectum.

MIDDLE: Desert pupfish, *Cyprinodon* sp.

BOTTOM: The Blind cavefish, *Astyanax mexicanus*.

News

The latest events in the fishkeeping world and dates for your diary.

On the PFK website this month

Reader recommended shop tour

Dyed fish

Fish meet on your website

www.practicalfishkeeping.co.uk

Male rivalry link to colour

Competition between rival male cichlids from Lake Victoria for breeding sites is suggested to be behind colour diversification, which eventually leads to the development of new species.

Research undertaken by Victorian cichlid gurus Dr Ole Seehausen of the University of Hull and Prof Dolph Schluter of the University of British Columbia suggests that scientists have been overlooking male-male competition for too long.

Published in the Proceedings of the Royal Society of London, the paper studied 47 species of haplochromine cichlids at over 40 locations throughout Lake Victoria.

The species found that live alongside each other, although closely related, have male colouration which is strikingly different to that of neighbouring species. Some males have blue or yellow colour patterns, while their neighbours might be predominantly red. Many species also have polymorphisms such as blotched morphs within a single species population.

Seehausen and Schluter say that there is a link between male competition and the distribution of these colour forms.

"Territories of males of the same colour are negatively associated on the spawning site, and that the distribution of closely related species over habitat gradients is determined by nuptial colouration in the fashion predicted by our hypothesis. Whereas among unrelated species those with similar nuptial colour are positively associated among closely related species those with similar colour are negatively associated and those with different colour are positively associated.

"This implies that negatively frequency-dependent selection on nuptial colouration among closely related species is a sufficiently strong force to leave its own effect on species distributions."

Deep frozen fish

The Frozen Ark Project

Fish fact

Trade help sought for KHV research

Defra and OATA are funding new research into the deadly carp virus KHV and are looking for trade backing to help fund the project.

The detection of KHV predominantly uses the polymerase chain reaction (PCR) technique to amplify tiny amounts of genetic material.

Although the PCR technique is extremely effective, more work is needed to perfect the PCR procedures used to detect KHV.

What's needed, say the experts, is a comparative study of the competing techniques in PCR to determine which one is the best for the analysis of KHV in order to assist in the control of the virus and thereby protect both native fish stocks and the fish trade.

The research project is expected to cost around £30,000 to complete.

Defra has offered £15,000 in funding, with the Ornamental Aquatic Trade Association (OATA) offering a further £2500.

Members of the trade wishing to donate funds to the research project should contact Keith Davenport at OATA on 0870 043 4013.

In America, scientists now believe that KHV may have killed 20,000 carp in two lakes in May. According to The State, biologists from Auburn University detected the virus in fish.

In Japan, [illegible] have seen KHV [illegible]. The virus killed a large number of carp across Japan late last year.

Noise busters

If you play loud music near your aquarium, perhaps you ought to start offering your fish a diet rich in vitamin E.

A new paper published in the journal of *Comparative Biochemistry and Physiology, Toxicology and Pharmacology* says that high doses of vitamin E can help reduce stress in fish exposed to high levels of noise.

The scientists exposed Fathead minnows, *Pimephales promelas*, to different levels of white noise and supplemented their diet with different amounts of vitamin E to see whether it could protect the inner ear from the noise.

By monitoring the auditory brainstem response, the scientists were able to see how the minnows responded, and how well they recovered from exposure to the loud noises.

The results showed a link between vitamin E and noise in cyprinids, and the team says that at high levels, it's capable of protecting fish against noise exposure.

Look what's turned up...

A rare seahorse has been found in the waters off Plymouth Sound.

This is Plymouth says that the short snouted seahorse, *Hippocampus hippocampus*, is probably the first ever recorded from the waters.

It was discovered during a survey of [illegible] shells by divers from the Marine Conservation Society.

And off the Dorset coast, large numbers of [illegible] triggerfish were found, miles away from their homes in the Mediterranean.

According to the *Telegraph*, the Grey triggerfish, *Balistes capriscus*, were caught by biologist Dr Ken Collins.

He said: "Ten years ago it would be rare for them to come this far north. But in recent years they have been known to stray up into our waters in summer.

"I have only seen two of them at a time, and what is exciting about this discovery is the large number. There were about a dozen, including one or two smaller members.

"This may be the first sign of them breeding here and this would indicate that they are staying for longer periods."

News in brief

NEW SPECIES DESCRIBED: Several new species have been described this month including [illegible]. For more details of these and other new species as they're described, check out the PFK website.

GOLDFISH BOWL BAN: The Italian town of [illegible] has banned the keeping of goldfish in bowls. "A fish kept in a bowl has a [illegible] because of this," council official [illegible] generally doesn't have a [illegible] oxygenation of the water." – Sky news

COUPLE WED IN SHARK TANK: An Italian couple have tied the knot in a shark tank. Daniele Consolaro, 31, and [illegible] were lowered in a cage into the tank at [illegible] coast on Saturday. The couple [illegible] Bull sharks and [illegible] Nurse sharks – went to [illegible] shark fins in soups in Asia. – Reuters

Diary dates

[illegible]

The people's poll

Should manufacturers declare their ingredients?

Some manufacturers are reluctant to tell us the constituents or the concentration of their additives and treatments. Should they tell us what's in them?

It's a controversial one, this. Com Oak has provoked literally thousands of comments, and countless tales have abounded as to what the key ingredient could be. Within our hobby some manufacturers remain steadfastly tight-lipped, defending their silence by saying that if they reveal the content, it will be open season for competitors to jump on their success.

Straight off we have one reader, who's been a shopkeeper and works for a manufacturer. Preferring to remain anonymous, he says: "Proper research and development is costly and time consuming, and is one that manufacturers do not have the financial resources to do it. As a result, many smaller companies produce 'me too' products which are essentially pale imitations or outright copies of leading brands.

"Although I can appreciate that people want to know which products to avoid, is it fair for manufacturers to be forced to disclose the details of their research to allow others to clone their products?"

Mike Vivian in another email resists this assumption: "Copyright, patent protection and intellectual [property] rights legislation is already in place to protect manufacturers and developers, so the 'competitors developing this' argument is, in many cases, void."

"I can't help but feel that the real reason manufacturers won't divulge more information is so that we would see just how poor value some of these products really are."

Another View is also frustrated by current practice: "It seems ludicrous that these companies don't have to state the ingredients and concentrations.

"People have a right to know what they are buying," Mike says. He fears pond keepers are often being ripped off and, for all we know, are being sold what could be just coloured water.

This suspicion is echoed among a number of readers. Andy Cordon says he could end up paying several pounds for something which has got overall fed.

"Also there is a safety aspect," he says. "Some medications contain substances like formalin, and if a child roasted some, it would be fair to see if medics could be informed quickly what the child has swallowed rather than have to refer to lists or access names."

Tracy Money also questions this aspect of labelling. "If I treated or pre-disease treatment package the wording 'If swallowed, consult your physician immediately and show them the product package'.

"Nowhere on the packaging were any ingredients listed and there was no notion of the level of toxicity of the product to humans. I thought such products were covered by the same kind of regulations as garden chemicals. Apparently not."

The potential toxicity of the product is also brought into question as regards the actual fish.

Many of you say the concentrations should be revealed. Carl Jacobs feels not stating this is cowardice: consumers cannot tell what a product on the market is more powerful.

"Products that have lower concentrations will obviously have to be used more often, making them more profitable in the long run. But without actually listing the levels, the average consumer is left in the dark.

"The instructions might say 'add weekly', but if you can't measure the effect, how do you know you're not being ripped off, or adding too much?" he asks.

Yet perhaps the final comments should rest with Mike Partridge, who has a different slant.

"There are lots of products that make claims that probably can't be cured, a viral feature to me. Your reviews have shown several of them for what they really are.

"Obviously, few of us will understand the complexities of the products if they were printed, and few would be bothered to calculate which offers best in terms of value for money.

"I mean, if manufacturers can't get as much profit from a formula because someone else sells it at a lower price, the fishkeeper suffers because manufacturers will have less money to spend on research."

Next month's poll

We all love visiting fish shops, but what is it that most makes you want to visit a new store? A good range of dry goods, low prices or an amazing selection of unusual fish? Vote online and tell us via the PFK website.

Should manufacturers declare their ingredients?

Yes	94%
No	3%
Maybe	3%

www.practicalfishkeeping.co.uk/thepeoplespoll

3 easy projects

If you'd like to have a go at breeding fish, the Glowlight tetra, Cherry barb and Honey gourami are perfect for beginners says **John Rundle**, who also shows how.

I often get asked what I consider to be the best species of fish to use for a first-time breeding project. As a general rule, characins (tetras), barbs and gourami is are good bets. However, I also look at the characteristics such as adult size, ease in getting breeding stock, ease in breeding, tolerance to varying water conditions and the feeding requirements of new fry. I also prefer to choose fish that do not require very large tanks to breed in. Once these factors are considered, the list narrows considerably to the Glowlight tetra, *Hemigrammus erythrozonus*; Cherry barb, *Puntius titteya*; and the Honey gourami, *Colisa chuna*.

1 Glowlight tetras

The Latin name '*Hemigrammus erythrozonus*' means 'with a red zone or stripe'. Since it first came to Europe in the 1930s from Guyana, it's been through the 'change the name' game.

A tentative identification was *Hyphessobrycon gracilis* (Reinhardt). This was not accepted because Reinhardt's material was from a different locality, it was also of a different build and colour, more allied to *Hyphessobrycon heterorhabdus*, the Flag tetra.

The obvious red glowlight stripe runs the full length of the body, with a basic background of olive to yellow-green. There are silver areas in the belly region, and the dorsal and tail can show white tips. Adult fish are around 4cm/1½" in length.

Normally Glowlight tetras seen in dealer's tanks are of a size that can be easily sexed. The males are slim and have a slightly sunken belly region. The females are larger and fuller. When the females become round in the belly region, it's time to select a pair for breeding.

I use a tank 38 x 18 x 30cm/15" x 7" x 12", but any size within this range up to 60cm/24" is fine.

The tank is well cleaned - I use a strong salt solution for this task. I also leave the tank bare, so it has no gravel as a substrate.

This little tetra is tolerant of varying types of water - you'll find it in tanks all over the country doing fine, but when it comes to breeding, try not to exceed a pH of 7.2 and 8°GH. Although I am sure they will breed above this, you'll probably see a smaller number of eggs.

I am fortunate to have water that comes out of the tap at a pH of 6.5-7.0 and 3-4[illegible]GH, thus giving no problems for breeding tetras.

I set the heatstat to 25°C/76°F - do not go above 26°C/78°F. I also use an open-ended airline to agitate the water for 24 hours to disperse the chlorine. At this stage, there is no filtration.

I use nylon wool spawning mops that are sterilised by soaking in hot water. Newcomers often place too many mops in the tank. If you do this, the fish will eat more. For Glowlights, you only need a couple of mops on the base of the tank and one suspended on a strip of polystyrene placed over the sunken ones.

Of course, optimum conditions mean nothing if the female is not in condition (carrying eggs) and no eggs are produced. With the

Glowlight tetra, a female that is ready is very rotund in the belly area. The males, on the other hand, are much slimmer, almost being skinny. There is no noticeable colour difference between the sexes.

I have always placed tetras of this type in the tank in the evening and allowed the early morning light to enter the tank. Interestingly enough, this seems to trigger spawning, as does fresh water. And when I visited the fish farms in Singapore, they were done in almost total darkness. I have copied this 'darkness' by covering the tank with towels, and the fish promptly spawned. Since then I have bred other fish in this way.

Of course Glowlights will breed without being covered, but do not like strong light over the tank.

I have often watched the Glowlights spawn; a sight worth watching. The male drives the female over the spawning medium where the pair appears to quickly lock fins, embrace, and do a somersault while eggs are expelled and fertilised. This action is repeated until the female releases all her eggs, which are slightly adhesive.

The Glowlight is a prolific egglayer, with around 200 eggs being laid from an adult pair, which are easily spotted. Once spawning is over, remove both parents or they will eat the eggs.

I cover the tank over [illegible] because the eggs, as well as the fry, are sensitive to strong light.

Within 24 hours, they will hatch [illegible] on the tank glass. Glowlight larvae do not seem to be as light sensitive as various other tetras, so the tank covers can now be removed. I also use the opportunity to fit a small sponge-type filter.

The larvae will feed on their yolk sac for about three days and then become free-swimming.

At this stage, I feed them on my own prepared infusoria. The new brood will soon take newly hatched brine shrimp as their first food. You can also offer [illegible] powdered [illegible] food – just be careful how much you feed.

Once the fry are free-swimming, carry out weekly 25% water changes and remove any bits of uneaten food such as brine shrimp from the base.

With care and good conditions you could raise over 100 fry. When they are [illegible], move them to larger tanks to grow on.

RIGHT: The male Cherry barb has a bright red body, while the female's is more subdued.

LEFT: Glowlight tetras are prolific egglayers.

2 Cherry barb

[illegible] *Puntius titteya* [illegible]

[illegible] the Cherry barb [illegible]

[illegible] The male [illegible] gives the Cherry barb its common name. The female has a more subdued [illegible] colouring [illegible]

[illegible] in a breeding tank [illegible] measuring [illegible]

[illegible] suspended or a strip of polystyrene and one laying on the tank base. I also fit a small sponge filter and set the temperature to 25-26°C [illegible].

The Cherry barb is not at all demanding when it comes to water conditions, and [illegible] pH 7.0 [illegible].

I select the pair [illegible] breeding tank [illegible] the tank [illegible] hours before [illegible].

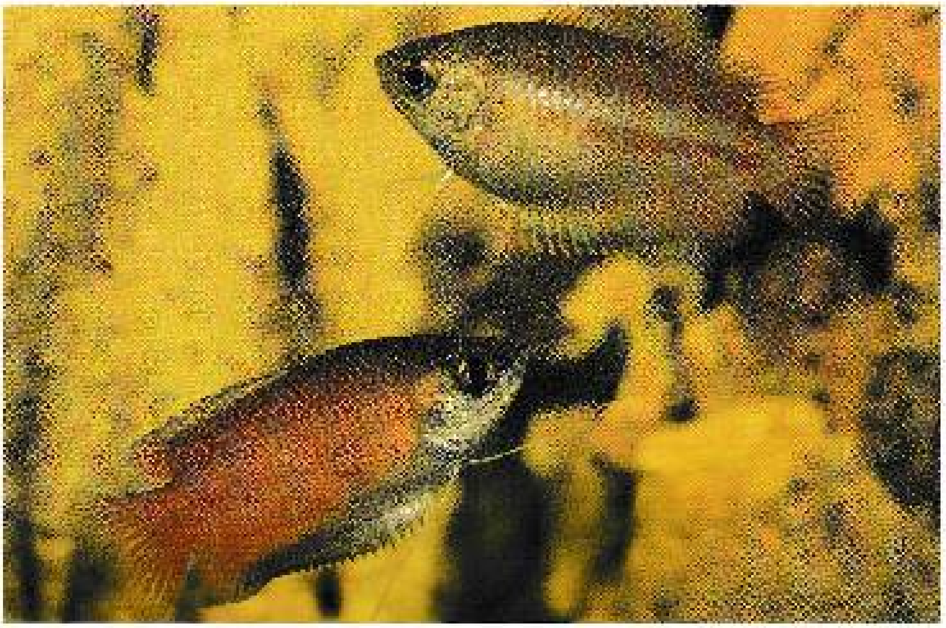
[illegible] the female [illegible] new adhesive eggs. This continues until the female releases about 200 eggs.

Once spawning is complete, remove the pair because they will [illegible] their own eggs.

The eggs hatch in one to two days and [illegible] their yolk sacs for [illegible] days. [illegible] during this period.

When the fry are free-swimming, they will need [illegible] for food. The [illegible] brine shrimp [illegible] move them to larger tanks.

Preparing for breeding
While it is possible to buy one pair of [illegible] for these breeding projects, I suggest that you select a small group of fish, say [illegible], and select young adults and then condition them with a good varied diet of dry and frozen foods before breeding. [illegible] live foods such as [illegible] will [illegible] their diet. They should soon [illegible] up.



RIGHT: The Honey gourami is a smaller, less aggressive gourami species, and therefore more appropriate for beginners.

3 Honey gourami

Size must be considered with beginner projects, and when selecting a gourami, be aware that some will produce hundreds of fry, which can be a problem if you are restricted to only a couple of tanks.

The Honey gourami, *Colisa chuna*, is quite small and can be very attractive when the male is in his breeding colours. His main body colour is orange/tan, with a lower belly of dark blue to black, and the dorsal fin yellow. If there are no females around or the water conditions are not right, he can lose these dazzling colours.

Females are a light tan to brown, even when breeding. Males also have a pointed anal fin, whereas the female's is more rounded. Males are also slightly smaller.

These gouramies are small at 5cm/2" and can be bred in a reasonably small tank. However, it can produce 200 eggs or more, and this means you could end up with a large brood. A 45 x 30 x 30cm/18" x 12" x 12" tank will be all right for a breeding pair, but by no means try and grow on a large brood in the same tank.

You have a couple of options: breed them in the smaller tank and then move them to larger tanks, or breed them in a larger tank and use it to raise enough fish to suit the capacity of the tank.

I set up a tank 50 x 20 x 20cm/20" x 8" x 8", again as a bare tank. On the surface I place some floating plants like Indian fern, *Ceratopteris*, while on the bottom of the tank is Java fern, *Microsorum pteropus*, and Java moss, *Vesicularia dubyana*. The Indian fern is for the male to attach his bubblenest, and the other plants are for the female to take refuge if the male gets too boisterous!

Some aquatic books will tell you that gouramis have to be bred at high temperatures. This is not so for the Honey gourami – I find that at 25°C/77°F, they will spawn readily.

The selected pair must have a female that is in breeding condition. This can be seen by her being very fat in the belly area. Within a couple of days after being placed in the breeding tank, the male should start to build his bubblenest using the floating plant to aid the construction. If this does not happen and the male just chases the female, remove her and try another.

It is fascinating to watch these fish spawn, with the male a deep orange colour trying to entice the female to come into a position under the nest. When she is ready, the two fish come together and embrace in the typical fashion of bubblenesting gouramis. Locked in this embrace, the female will release a number of eggs that are immediately fertilised by the male. The pair will seem to be in a trance and the female will slowly sink to the bottom of the tank. She soon recovers and rejoins the male to continue spawning.

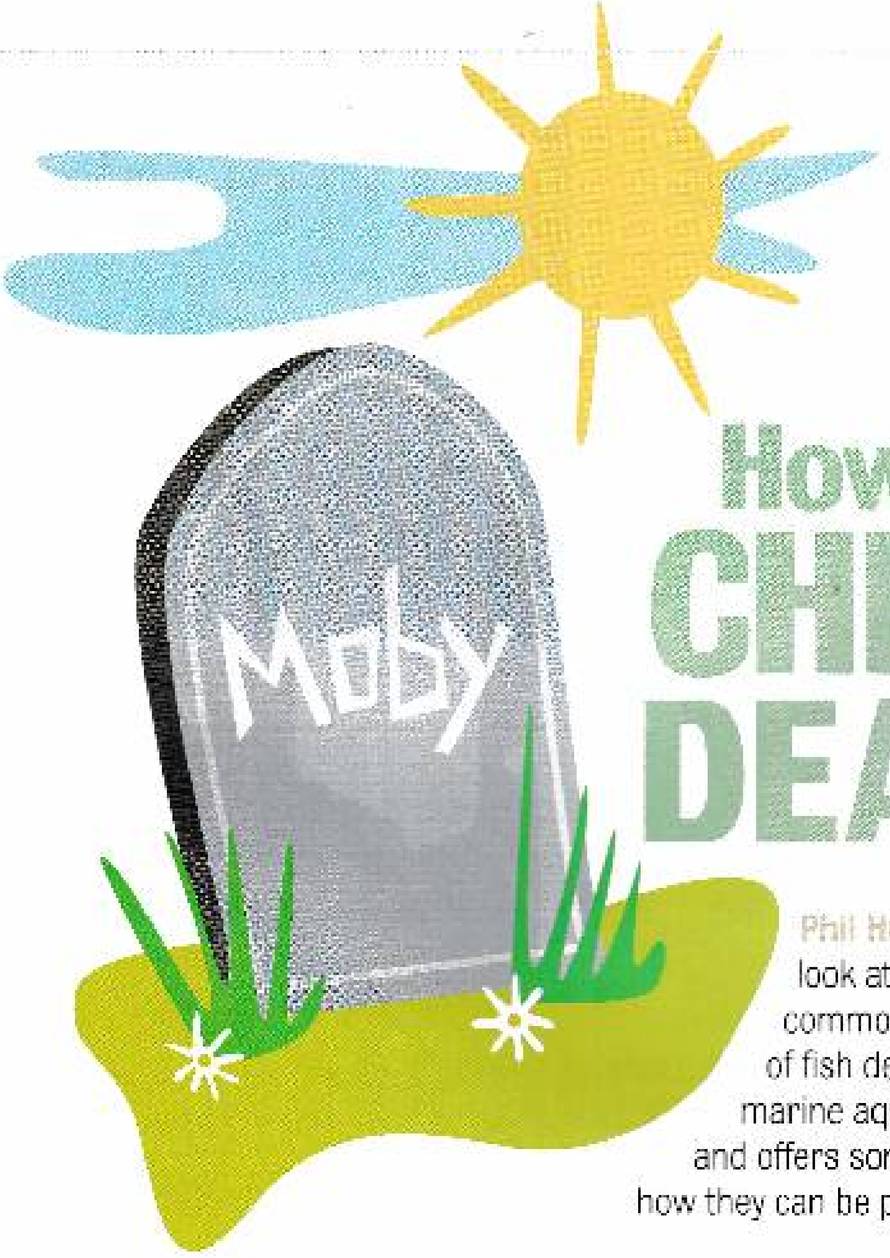
This is repeated several times before all the eggs are produced. Once spawning is complete and the male has collected all the eggs and placed them in the confines of the bubblenest, she must be removed. The male turns aggressive and guards the eggs against everything, including the female.

At 25°C/77°F, the eggs will hatch within 48 hours. The male tends the nest, retrieving any of the dark-coloured yolk sac larvae if they drop out of the nest. In another three days, the fry will have used up the food in their yolk sacs and become free-swimming. The male can get frustrated when trying to return the fry at this stage to the nest, so it is best to return him to the main tank.

Free-swimming fry, while clearly visible, need to be fed on infusoria for a first food until they can take live brineshrimp nauplii, in about seven days. They tend to grow at different rates. To cut down the chances of losing the smaller fry to the larger ones, pick out the larger fish and put them in another tank.

I hope that this selection of fish will tempt you to try your hand at breeding fish. I am sure that if you are able to raise a brood of these fish, you will have no problem moving them on to friends or even a friendly dealer.

NEXT ISSUE
Three more species that are not quite as easy to breed.



How to CHEAT DEATH

Phil Hunt takes a look at some of the common causes of fish deaths in the marine aquarium, and offers some advice on how they can be prevented.

There's a saying that there are only two things in life that are certain – death and taxes. In our fish tanks, death is sometimes due to system failures. A heater thermostat could fail and cook or chill the aquarium inhabitants, or a prolonged power cut might result in asphyxiation due to a lack of gas exchange. At other times, it's down to straightforward incompetence. But for the reasonably competent fishkeeper with reliable aquarium technology, there are four main causes of fish deaths – and they are all avoidable.

Beat these diseases

There are two diseases likely to cause problems in the aquarium – white spot and velvet. The former is more common, although both can occur together in a particularly nasty syndrome. Most other diseases are pretty rare.

Wild fish almost invariably carry parasites, including *Amyloodinium ocellatum*, which causes velvet disease, and *Cryptocaryon irritans*, which is responsible for white spot.

Place fish under any kind of stress – transport them halfway around the world and put them in a series of aquaria culminating in yours or mine, for example – and the parasites might overcome the diminished immune responses of their host and create an infection.

When doing so, their numbers increase enormously, leading to a high concentration of their infective stages in the aquarium. The result is a disease outbreak in which even fish with fully functioning immune systems find their defences overwhelmed by the sheer number of parasites.

Tangs, wild clowns (but not captive bred ones), some angels, anthias, butterflies, puffers and boxfishes are the most susceptible.

How can it be prevented?

Quarantine is the key to preventing fish diseases. A quick two to three weeks in a tank on its own enables a fish to recover from the stresses of shipment and handling before it has to deal with the hurly-burly of the types of marine community aquarium.

During this period, the fish can get used to aquarium foods, and to the person who feeds them, without having to compete with tankmates. It can be checked for disease, and if infections occur, they can be treated much more easily in a quarantine than in the display tank.

It is possible to go a step further and use low-salinity quarantine. This involves keeping new fish in water at a specific gravity of 1.010-1.012 (rather than the usual 1.022-1.026) for a few weeks. This method helps fish to shed their parasites, which are less able to tolerate low-salinity conditions. When using this method, it's important to keep the alkalinity up to normal seawater levels, tested frequently and adjusted using buffers.

A quarantine tank is a necessity if you are going to try to prevent disease in this way. All you need is an internal power filter, ideally one that is oversized for the tank, a heater-thermostat, and a fluorescent tube to provide lighting. You should put in something to provide shelter, plus a layer of sand for fish that need it, such as jawfish and some wrasses.

If you think you haven't got space, think again. It's usually possible to fit one on the lower shelf of a tank stand or inside a cabinet. Given that fish will not be in it for very long, the tank can be small. I would be happy to quarantine fish up to 7cm/2¾in long in a 30cm/12in tank, up to 10cm/4in long in a 45cm/18in tank, and up to 15cm/6in long in a 60cm/24in tank. All you need is to be sure that the biological filtration keeps up to the job, hence the need for an oversized filter. Maintenance is easy in these small tanks and you can easily change most of the water between fish.

Fish that won't eat

Sometimes fish that seem otherwise healthy get thinner and eventually die, in some cases despite apparently feeding heavily, in others after refusing to eat anything you offer. Typically the fish succumb to some disease, often infecting their tankmates as well.

Planktivores such as *Pseudanthias* species, some angels and tangs, some butterflies, some smaller wrasses and some gobies (eg sleeper gobies) are most likely affected.

There are different reasons why fish may starve. At the most basic, some fish are unable to adapt to an aquarium diet. These may be species that have fixed dietary needs, such as coral polyp-eating butterflies, or some wrasses (*Macropharyngodon* and *Anampses* species) are [illegible] that need a supply of small, live invertebrates. They also include species such as tangs and angels, that are expected to eat aquarium foods, but don't because they have been bought when too old and large to adapt easily to aquarium foods.

Sometimes your fish may eat but still starve because they either don't get enough food [illegible] in the wrong way, or they eat the wrong food. Herbivores such as tangs are typical of this group.

How can it be prevented?

First, be sure to choose fish that will adapt to an aquarium diet. Most marine textbooks give a clear indication of which species of butterflies, for example, to avoid, and there is no excuse for keeping obligate polyp feeders.

Other 'non-adapters' are fish that are bought at the wrong stage in their lives. Although large adult tangs and angels are stunningly beautiful fish, they find it much more difficult to adapt to aquarium life than younger specimens.

For large angels, buy them just as they are changing from juvenile to adult colours. As many species grow to 30-40cm/12-16in, this tends to happen at 7-10cm/2¾-4in. For tangs, many of which grow to 20-40cm/8-16in, 5-10cm/2-4in juveniles are the best buy.

One thing that can help with these 'non-adapters' is to keep them in a mature aquarium with lots of living rock. This works especially well for fish such as mandarins and some of the smaller angels [illegible] a supply of small living crustaceans. Some grazing fish also seem to do better in such tanks. Examples of these would include some of the more difficult tangs and pygmy angels.

The next point is to choose the right food, which doesn't just mean whatever the fish in question will eat. This is a particular issue for fish that are predominantly herbivorous, such as tangs and some angels. These fish will often eat meaty foods, but because they need algae in their diets to provide adequate supplies of vitamins, they can become malnourished, typically manifested as head and lateral line disease, despite a good food intake.

Having found the right foods, you need to feed them in the right way. Typical aquarium husbandry is to feed once a day. Some species are fine with this, but for others, it isn't enough – even if they have full bellies after feeding time.

Many marine fish are adapted to feeding more or less continuously. This may be because their food comes in a little but often way: planktivores such as *Pseudanthias* species hover over the reef and snatch their food from the water column, so have difficulty dealing with large, infrequent meals.

Another reason may be inefficient digestion. This is typical of herbivores. Algae is often tough stuff, and each mouthful yields little nutrition. As a result, the fish has to have a large throughput of algae, which means browsing all day. Again, small concentrated feeds do not suit.

The solutions are to feed planktivores as many small meals as possible during the course of the day, and to keep a supply of food continuously available – algae growing in the aquarium, or dried seaweed in a lettuce clip.

> Many species, if threatened, will dart rapidly upwards. This is fine if there are several metres of water overhead, as is the case in the wild.

The escape artists

Fish disappear and then you find them dried up on the cover glasses or condensation trays, or on the floor. In my experience, this is a frequent cause of fish losses.

A variety of [illegible] is escaping [illegible] shooting out. This is more or less only seen in eels, but is equally fatal. That said, finding a fish [illegible] on your living room floor can be just as traumatic for the fishkeeper (and the rest of the family) as it is for the fish. Small wrasses, dartfishes, firefishes, [illegible], jawfishes, [illegible] and eels are the main culprits.

Fish jump for several reasons. Many species, if threatened, will dart rapidly upwards. This is fine if there are several metres of water overhead, as is typically the case in the wild. [illegible] there's only 30cm/12in of

ABOVE: Regal tangs are very susceptible to parasitic infections.

BELOW: Take steps to ensure your Moray doesn't decide to go for a once in a lifetime slither on your carpet...

water above, which is often the case in nature. Often this turns into flight and the fish ends up on the floor.

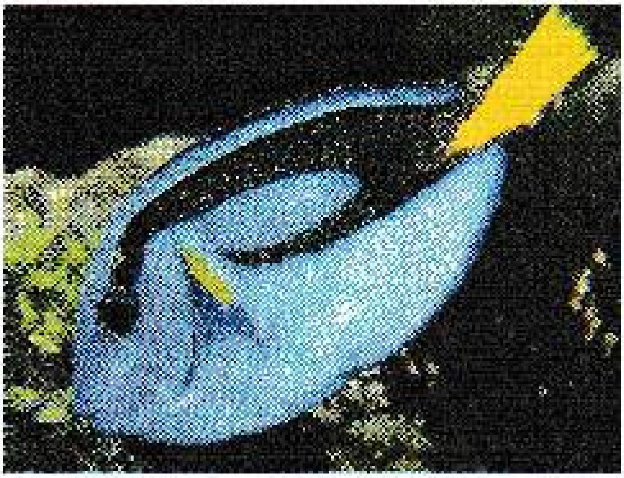
Rapid upward swimming is also part of the courtship display and/or spawning behaviour of many species, and in the heat of the moment, a failure to appreciate the limited depth of water can lead to the courtship becoming airborne.

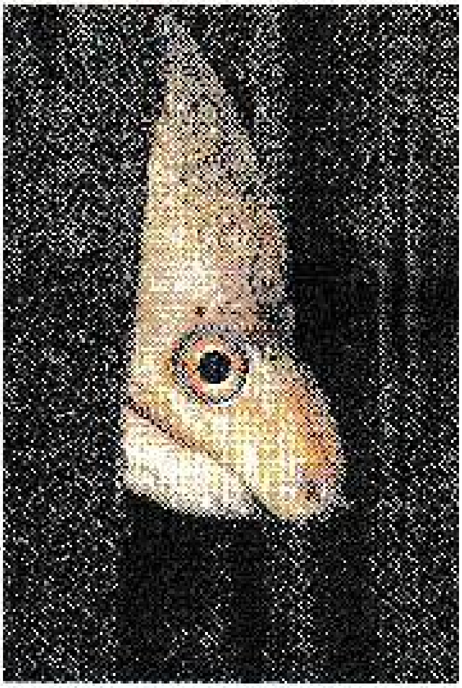
Some fish will also jump out of the water in an attempt to catch insects flying above the tank. Small wrasses and hawkfish, which happen to have very keen eyesight, are particularly likely to do this. Whether the fish realises it is jumping out of the water or thinks the insects are underwater is not clear, but the results are the same.

How can it be prevented?
Put a lid on it! Cover the tank, but do so carefully. You need to have enough air space around the covers to permit gas exchange, so don't hermetically seal the tank, but having cover glasses or condensation trays with a gap just big enough to allow the passage of tubing is actually worse than having an open-topped tank.

Open-topped tanks tend to have high evaporation losses, which means replacing lots of purified water to balance the losses. These high evaporation losses also tend to make the room that houses the tank damp, due to condensation.

That said, there are advantages in an open-topped tank, a fish that





jumps will probably land back in the water. A fish that jumps through a small gap between cover glasses has little chance of finding the gap again, so close these gaps.

Weak players

When fighting, fish that appear to be chased back into cover every time they come out to feed. They can end up thin and out of the tank or develop parasitic infections. Anything sharing a tank with an unsuitable, more aggressive companion is affected. Offenders include triggers, damsels, many basslets, some tangs and angelfishes.

On the reef, resources are scarce and fish often have to defend their territories. Specifically, they need to keep away other fish that are competing for the same food source, hiding place or mate. In many cases, this means members of their own species, but includes competition from other species. Typically an invader is chased away, perhaps with a special threat display. Often there isn't much physical contact.

In the aquarium, a fish being chased away has nowhere to go and this is the source of the problem. The victim can be harassed endlessly to the point where it can't come out to feed and actual physical violence – in the form of biting, butting or attacks with spines or blades – can occur. Very few fish are directly done to death by their tankmates, but this type of territorial behaviour can easily end in fatalities.

A fish being chased may jump out of the tank, but the end result is more usually a stressed, malnourished fish that cannot feed or is picked on by the aggressor then becomes susceptible to disease.

How can it be prevented?
Preventing territorial conflict is largely a matter of research and choosing your fish community carefully. For a successful community, there are several specific techniques that can be used, either singly or in combination.

- Keep fish that are not likely to perceive each other as rivals. For example, a tang will ignore small planktivores but might attack another member of its own family.
- Keep fish that are generally passive. Despite the reputation of marine fish for territoriality, there are plenty of peaceful species, and doing your homework will provide you with a selection of candidates.
- Keep fish of a similar level of territoriality so that no one fish is more aggressive than the rest.
- Keep plenty of fish with many "targets" to make it so easy for an aggressor to single out a victim.
- If you want to keep species that are likely to fight together, make sure your tank is as large as possible. Dramatic territorial wars are often dissipated in spacious aquaria.
- Use rocks and invertebrates, if you have a reef system, to break up sight lines across the tank. If territorial rivals are not forced to always be in view of each other, they will often coexist more peaceably.

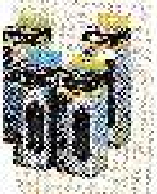
There are many reasons that we lose fish, but these four causes probably account for the vast majority of casualties.

All can be avoided without too much difficulty, so it's not so hard to cut those marine mortality rates.

Ask the Experts

Got a query or a fishkeeping problem? PFK's expert team of fishkeepers is on hand to help.

TROPICAL LETTER OF THE MONTH



[illegible]

Pitfalls of old tank syndrome

Q **Having lost a large percentage of the new stock for my community tank, I took a sample of water to my dealer who found the ammonia level sky high, nitrite acceptably low, but pH at 5.4. The tank has been established for nine years. Despite adding an internal power filter and some bacterial filter start, raking the gravel and large partial water changes, the problems have persisted. Another dealer has suggested that I stop using the undergravel filter. The ammonia level remains high. What do you say?**

PETER DAVISON, GAINSBOROUGH

A This sounds like a case of old tank syndrome, resulting from a long-term build-up of waste bringing about falling pH, high nitrate levels and, in some instances, ammonia problems. The internal power filter will help, although it will take several weeks before it functions adequately, so I would carry on running your UG in parallel.

If you decide not to use it, in which case the internal power filter must be capable of handling the biofiltration on its own, you could remove the plates from the tank, or all the dirt collecting below will remain without the benefit of oxygen, and could cause more pollution.

Another advantage of using a power filter with a UG is that it will take over some of the mechanical function, reducing the levels of dirt in the gravel.

Beware of changing large volumes of water when the tank has a high ammonia reading and a low pH. If you do, as water is changed, the pH will shoot up and your fish may suffer serious ammonia damage to their gills. This is because ammonia exists mainly as the much less toxic ammonium at a low pH, but converts to the highly toxic ammonia at an alkaline pH.

Don't overdo the gravel cleaning. The high ammonia reading indicates that biofiltration is not coping, so you need all the bacteria in the gravel that you can get.

Your ammonia level may remain high until the bacterial population has re-stabilised, after which you may see a peak of nitrite. This time will allow the tank to find its biological balance. During this time, feed lightly to minimise waste. Don't add any new fish, of course.

A new bacterial culture may help, but controversy surrounds the usefulness of these products.

Along with the new filter, keep partial water changes of up to 25% a week and minimise the dirt in the gravel using the gravel vac, your tank should remain healthy with zero ammonia and nitrite levels and a stable pH close to your tap water.

SEAN EVANS

Can I take my fish to Canada?

Q **I have a 13cm/5" catfish and a 5cm/2" Corydoras that I wish to take with me when I return to Canada. Do you have any advice about transporting fish? I shall be setting up their tank prior to their arrival.**

[illegible]

A The best method of transporting fish by air is to place each one into a bag, using a second bag over the top in case one is punctured. Fill the bag one third water, the rest with oxygen, which you can obtain from most good fish dealers. Then pack the bags into a polystyrene fish box.

There are some legal issues in exporting fish which you need to check beforehand so Contact CATA ([illegible]) for more details.

RICHARD HARDWICK

Sponsored by Tetra - experts in fish health

There is no scientific confirmation that Swordtails can change sex.

Swordtails appear to change sex

Q **I once read that 30% of female swordtails change sex, and this seems to be happening with one of mine. It started behaving strangely towards another female, and it has grown the characteristic long, narrow tail. Will I now have a breeding pair?**
ALLEN VEITCH, EASINGTON

A Sex reversal is well documented in the marine world, and the wrasse is a good example. However, while it has been discussed for a long time, there is still no scientific confirmation of the same thing happening with swordtails. The conclusion is that the so-called females are, in fact, late-developing males.

When breeding these fish, the longer it takes for a male to develop his sword-like tail, the better. These usually mature into the biggest and best [illegible] specimens.

If your fish has signs of thickening [illegible] and [illegible] the start of a gonopodium, then there is no reason why you cannot use this fish for breeding, as long as your other female is not another late-developing male.
JOHN RUNDLE

Xenomystus nigri

Just watch which species you choose

Q **I have a spare 120 x 45 x 38cm/48" x 18" x 15" tank in which I should like to keep *Polypterus* and one of the smaller knifefish species. Would they co-exist happily?**
JANE FLETCHER, BUXTON

A A knifefish and *Polypterus* can live in the same tank; it's a case of choosing the right species. For instance, the African knifefish *Xenomystus nigri* will live happily with *Polypterus senegalus*, one of the smaller species. They are generally around 20-30cm/8-12", whereas the African knifefish gets to 20cm/8". More and more shops are stocking [illegible] fishes – unfortunately not necessarily knowing how to care for them.
RICHARD HARDWICK

YOUR TROPICAL EXPERTS

[illegible]

Fish tend to live longer in the aquarium than they would in the wild, due to plentiful food and a lack of predators.

A good innings for a Fighter

Q I have had a male Siamese fighter for three years, and it was adult when I bought it. I read that 18 months is a good age for this species, so is it unusual for mine to have lasted this long? The fins are a bit tatty, and it only swims to the surface when food is offered, but it seems happy enough living in a tall planted tank with neons and cardinals.

A [illegible]

ANDREW SMITH

Hard to get rid of these worms

Q Could you advise on a case of *Camallanus* in my Guppies? I am limited as to medication as their tank contains Amano shrimps.

A [illegible]

PETER BURGESS

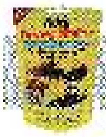
Camallanus worm larvae are vented with the faeces.

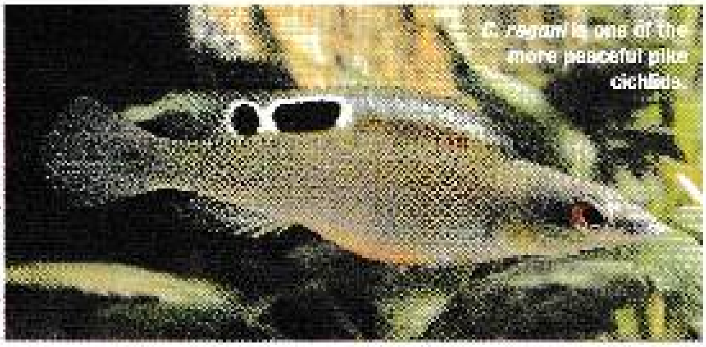
King is alive and well in PFK

Q I should like more info on the pleco used to illustrate the March article on fish health (pages 86-89). Does it have a common name or an L number?

A [illegible]

CHRIS RALPH





C. regani is one of the more peaceful pike cichlids.

It's pointless to generalise

Q I am setting up a 180 x 60 x 60cm/6' x 2' x 2' tank into which I plan to transfer four Shark catfish, *Arius seemani*, from a smaller, brackish aquarium. Once in, I plan to slowly dilute the salt with water changes, then add some large, freshwater predators. Fish I have in mind are snakeheads, Siamese tiger fish, Silver arowana, bichirs, a *Paratilapia polleni*, and possibly some pike cichlids. I realise that a 180cm/6' tank will not hold all these fish long-term, but I am prepared to upgrade when the time comes. Is my selection compatible?
KARA BERRY, VIA EMAIL

A When we talk about compatibility, we can only generalise – a formula that works for one person could spell disaster for another, because many cichlids have individual temperaments. My main fear is that your *Arius* cats could easily attain 45cm/18", and at this size, even the *Polypterus* are at risk from their wide jaws.

The Madagascan cichlid, *Paratilapia polleni*, and some pike cichlids, *Crenicichla* spp., are, in my experience, persistent troublemakers, although very beautiful.

As the saying goes, sometimes you have to suck it and see. The best advice I can give is to buy all your fish as juveniles and let them progress together. Sexually mature fish are far more difficult to acclimatise to a community environment.
RICHARD HARDWICK

Perfect easy breeders

Q I want to breed my Zebra danios in a 30 x 15 x 15cm/12" x 6" x 6" tank, but do not know how many fry to expect from a pair.
WILLIAM WILLIAMS, BIRMINGHAM

A Zebra danios can produce broods of up to 400, so your tank is too small to raise the fry. Your breeding set up would be a bare tank with a heater/stat, a small sponge filter and a woollen spawning mop. Temp at [illegible].

Remove the pair after spawning. Eggs hatch after 36 hours. Do not feed the yolk sac larvae for the first five or six days. After that, offer ZM powdered foods, and later move them to baby brineshrimp or crushed flake.
JOHN RUNDLE

FACTFILE

Common name: Penguin tetra
Scientific name: *Thayeria boehlkei*
Origin: Upper Amazon River basin in Peru and the Araguaia River in Brazil
Size: [illegible]
Diet: Carnivorous; takes to the usual aquarium foods.
Aquarium: 60 x 30 x 30cm/24" x 12" x 12" minimum; well planted, with plenty of open space for swimming.
Water: Temperature [illegible]; pH [illegible].
Notes: A hardy, peaceful choice for the community tank. Best kept in groups of five or more. Swims at a slightly upward tilted angle.

CICHLID LETTER OF THE MONTH

THE WINNER OF THE CICHLID LETTER OF THE MONTH

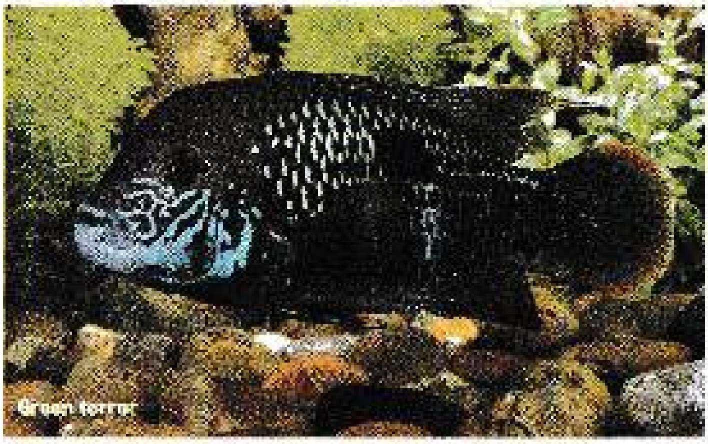
Beware of false test kit readings

Q I have a pair of Green terrors in a 136 l/30 gal. tank with a sand bottom, plenty of rockwork, water at pH 6.5, zero nitrate and temperature 26°C/79°F.

When I first got the fish they were very active, but now they seem to just hang around on the bottom, looking very drab, although they still eat. The female is full of eggs and the male chases her around.

Is the problem the pH, which may be too low? Or is it something more serious? I know they will need a larger tank.

ROSS WATT (14), SHETLAND



Green terror

A You are probably right about the pH. Green terrors are South, rather than Central, American cichlids, but not from the Amazon basin. They come from the west coast area, where the water is moderately hard and neutral to alkaline.

I am also concerned about your apparent zero nitrate reading. Unless your tank is heavily planted (hardly feasible with Green terrors), then it is unlikely to be a true reading. Nitrate test kits have a short shelf life.

It's likely that you have a positive nitrate level, perhaps quite a high one, which could account for both the sluggishness in your fish and the low pH, as nitrate has an acidifying effect.

I suggest several 25% daily water changes over a three- to four-day period, which should bring down any nitrate to tolerable levels. I assume your water is naturally soft, so you need to add some coral sand or crushed shell to your substrate or your filter as a buffer.

I am not sure if you have shell sand deposits in Shetland. If you do, I can think of nothing better to buffer your pH, as long as you wash it well.

In the wake of the sand-sifters

Q Could you give me information on *Cyrtocara moorii*? I plan to keep them in a 120 x 38 x 45cm/48" x 15" x 18" tank with a river sand substrate, and maybe planted with some onion bulbs.

MICHAEL BLACK, VIA EMAIL

A In nature, *Cyrtocara moorii* inhabits open sand with *Vallisneria* beds. Other plants will be fine, but I'm not sure about the onion bulbs. Make sure they are true aquatics.

C. moorii are not particularly aggressive. In nature, they follow large sand-sifters such as *Taeniolethrinops* and *Fossorochromis rostratus*, feeding on stirred up scraps and invertebrates.

As they aren't easy to sex, buy half a dozen small youngsters and keep them all. You should get at least one of each sex. However, if most are males, you will probably have to re-home some.

Tankmates should be other small to medium-sized, peaceful sand-dwellers - *Aulonocara*, *Lethrinops*, *Placidochromis electra* - or open-water dwellers such as utaka (*Copadichromis*). Not mbuna as these are too boisterous and aggressive. Besides, you'd need so much rockwork that there wouldn't be enough open space for the *C. moorii*.

You can stock at the rate of 50-55cm/20-22" of fish per sq ft of bottom area. If maintained properly, they should breed without any special extra attention.

Cyrtocara moorii

A dominatrix among mbuna

The Malawi forum I use has a thread about female *Melanochromis auratus* changing colour. Have you any experience of this phenomenon, and a possible explanation?
SHARON KRANZ, VIA EMAIL

I have studied this subject in some detail since my female auratus changed colour to the other coloration, some 30 years ago.

The phenomenon is not restricted to auratus. Other longitudinally banded *Melanochromis* do it too, as does [illegible]. I thought my auratus was a male until she spawned.

In all cases, the trigger appears to be that the female finds herself in a position of dominance, with no male of the species present, or ones that are smaller. It is very common for females to change when moved to breeding tanks for peace and quiet. Once changed they can never revert to the original drab gold/black colour, only muted, like a subdominant male.

Wild females change as well, but this is a rare occurrence as there are usually males around.

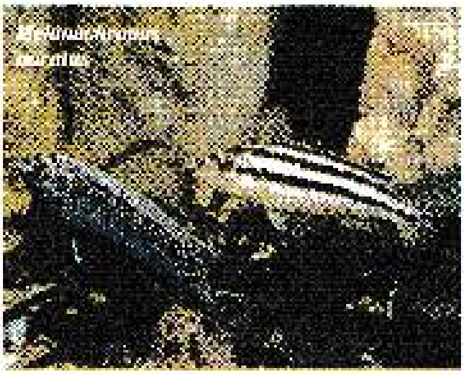
Females that have changed colour continue to produce eggs, so this is not a sex change. Males do not appear to have a problem with the females being the 'wrong' colour. Mate choice in mbuna is the province of the female, so if the male-coloured female is happy with the male, her behaviour towards him becomes the relevant factor in his recognising her as a spawning partner.

We tend to think of sexual dichromatism as just that, but what if the colour difference has nothing to do with sex, but with rank?

Of course, a territorial fish has a permanent food supply and doesn't have to forage throughout the habitat, constantly being chased by others.

A further advantage may be that other fish will show more respect for a [illegible] than for [illegible].

If [illegible] mbuna [illegible] were [illegible] the females would change – or maybe just those that were the strongest and could grab a territory in competition with their weaker sisters, assuming there weren't enough territories for them all.


Melanochromis auratus

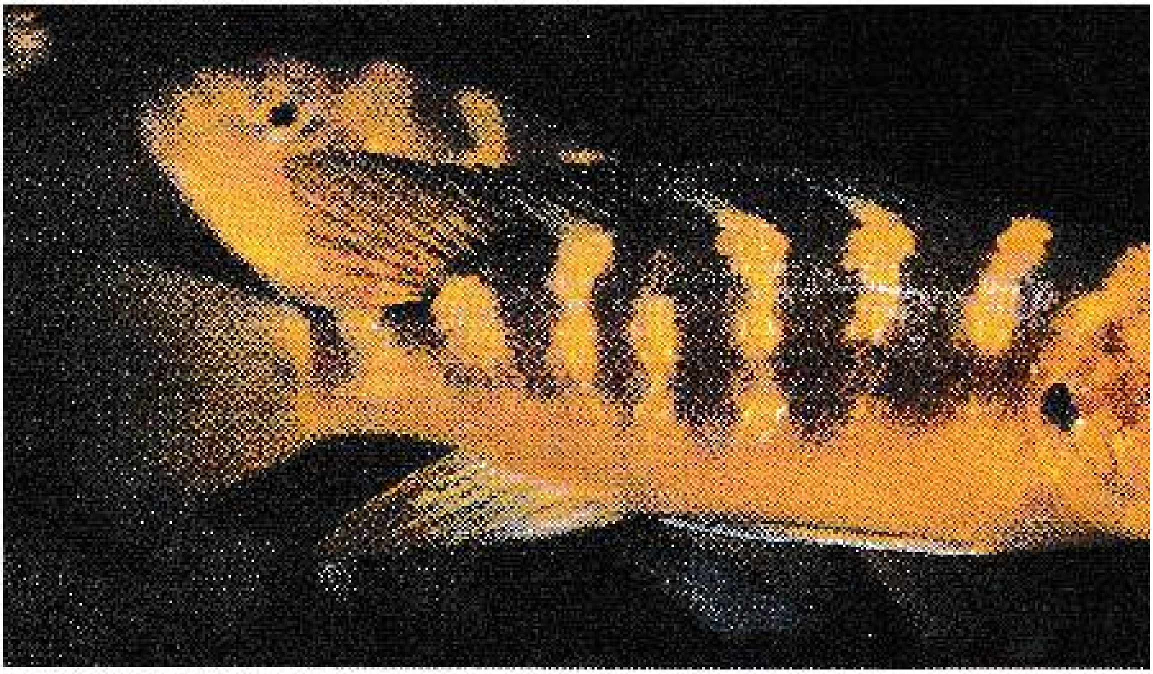
YOUR CICHLID EXPERT

[illegible]

FACT FILE

Common name: [illegible]
Scientific name: [illegible]
Size: [illegible]
Distribution: [illegible]
Habitat: [illegible]
Aquarium: [illegible]
Water parameters: [illegible]
Temperature: [illegible]
Diet: [illegible]
Sexing: [illegible]
Breeding: [illegible]

Similar species: [illegible]
Others: [illegible]



Frequently asked questions about...

Mbuna

Jeremy Gay of Maidenhead Aquatics answers some of the most common questions he gets asked on these incredibly popular African cichlids.

How heavily can I stock a tank for mbuna?
There's no exact calculation on how to stock mbuna tanks, but overstocking tends to help reduce aggression in a tank. I find communities do best when consisting of 20 or more similarly sized individuals. Add them to the tank in groups of six or more or, if the water quality allows, put half or all the stock in at once. Buy the fish young and grow them on.

Young fish are less aggressive than adults, and it is much harder to integrate new adult fish into a hierarchy.

Understocking can cause problems as individuals can become singled out and pursued [illegible] by dominant fish. And dominant males don't tolerate [illegible].

Tanks permanently kept at a stocking of six or less risk dropping down to just one, which will then view any new fish as a rival.

With an average adult size of up to 12cm/5", I'd only really recommend mbuna to be kept in tanks of 120cm/48" long or larger. Buy tall, deep tanks that can accommodate plenty of rockwork at the back and still hold over 181/40 gal of water.

Will I need additional filtration?
Yes, because you'll be keeping more fish in a given space than is usually recommended, and ammonia is more toxic when present in the hard, alkaline conditions that these fish prefer.

Add a large external power filter to the setup and fill it with biological media, which will be colonised by beneficial bacteria and break down the waste. Don't be too concerned by a high turnover of water in the tank as Lake Malawi is more like a huge sea.

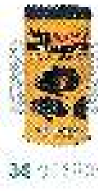
My tank volume is turned over six times an hour, and the filter flow is deflected a bit by the rockwork. Leave room in the filter compartment to use carbon, which will make the tank water crystal clear, and nitrate removal resins help you to keep on top of nitrate between water changes.

Consider adding an air pump as these fish are demanding of oxygen and it will benefit the aerobic filter bacteria, too.

What should I be feeding mbuna?
Mbuna are mostly herbivores in nature. They have evolved to graze [illegible] form a type of [illegible] algae that grows on the boulders in the lake.

Aufwuchs will contain some small invertebrate life, but not a lot, and the diet is poor in nutrients.

By contrast, aquarium diets are [illegible]



of all the good stuff in every serving.

Regular feeding of high protein foods can have long term effects on mbuna. They grow too quickly and can get to twice the size in captivity that they grow to in the wild. But the rich diet will shorten their lifespan and is frequently found to be behind something called Malawi Bloat, which is not so much a disease as the result of a prolonged wrong diet [illegible].

The solution is to feed vegetable/algae based sticks and foods with high spirulina content. Veg flakes are a good [illegible].

Avoid general cichlid sticks which may be aimed at predators like Oscars and not herbivorous mbuna.

As for frozen foods, small feeds of mysis, brineshrimp and [illegible] are OK, but avoid bloodworm and beef heart for the above reasons. Feed twice a day and skip feeding one day a week to encourage them to graze the algae on the rocks.

Can all mbuna species be mixed?

All mbuna species have a reputation for being aggressive, but some can be more aggressive than others. The usual suspects include *Melanochromis auratus*, *Metriaclima lombardoi*, *M. crabro*, *Pseudotropheus saulosi* and *Pseudotropheus demasoni*. All can be on your list from time, but grow your other species on first and then add the above a few months later.

Incidentally, these species can still be available but have only gained the reputation over the years after being added at a larger size than other tankmates, causing males to become hyper dominant and a real pain. If added correctly, they can all be worthy additions.

Species known for being more peaceful include *Iodotropheus sprengerae* and *Labidochromis caeruleus* 'Yellow'. Both are excellent for the mostly mbuna tank.

With all species, just keep one male of each species per tank regardless of tank size. Keep more than one female of the species so each male can spread his attentions and female harassment. In tanks of over 20 fish, just keep the male of the species as a specimen fish with no females.

Avoid keeping similar looking species together as this will result in more fighting and possible interbreeding.

Pseudotropheus estherae is available in many variants with differing colours, but is largely intolerant of any other *Pseudotropheus* species. So if you have yellow fish, mix with blue fish. If you have vertically striped fish, mix with horizontally striped fish around your collection, or a varied mixture of colours and patterns. Stick to this and you will see fewer problems.

Can I mix mbuna with 'Haps' or *Aulonocara*?

In my experience, *Aulonocara* can be mixed with mbuna, but only in the following situations.

First, keep only one species to avoid any hybridisation. Secondly, keep only one male, as any other subdominant males will not colour and will spend their time desperately trying to look like a female. And add *Aulonocara* at a larger size than the mbuna because they are not as aggressive or competitive as the mbuna and will need a head start.

'Haps', short for *Haplochromis*, is the collective name that covers all other cichlids in Lake Malawi that aren't mbuna or *Aulonocara*.

They have all been renamed from being called *Haplochromis*, but this name is now sometimes used for Lake Victorian fish. Generally, they are OK to mix as they grow to a larger size than mbuna, and most adult Haps are well able to take care of themselves as they have a more aggressive bite.

However, some species are piscivorous so avoid them if you have small fish or if you are wanting to raise fry in the main aquarium. These include all *Nimbochromis*, *Aristochromis*, *Champsochromis* and *Dimidiochromis*.

Conversely, some Haps are too delicate to be kept in busy mbuna tanks and should be kept in an altogether quieter tank. These include *Placidochromis electra*, *Cyrtocara moorii* and, again, *Aulonocara*.

Can I mix mbuna with non-Malawi cichlids?

The answer to this is not so much can but should you mix mbuna with other cichlids? You should not mix them with other cichlids for the following reasons:

» Water parameters. With their liking for hard, alkaline water mbuna should not be mixed with any fish that naturally occur in soft water. That rules out dwarf cichlids and Tilapias which are also African and roughly similar in shape, but the comparison ends there.

» Mbuna are aggressive and territorial.

» They are maternal mouthbrooders, meaning that during mating, the female collects the eggs and holds them in her mouth, negating the need for a territory to rear the fry. Subsequently, aggression, competition [illegible] comes on as normal.

» The specialised diet should not be compromised to accommodate other diets.

So that leaves us with the moral question. A hardy Convict could be added to a mbuna tank and not be killed overnight, indeed a pair may even breed, but you need to consider stress as the biggest factor for those species that have not already been ruled out.

Stress can be a slow killer, and as responsible fishkeepers, we must provide an environment that is correct for every species that we keep.

Malawi mbuna, like all other species, have evolved to fill an ecological niche which should be replicated in the tank, not compromised.

LEFT: *Metriaclima crabro* is one of the more aggressive mbuna.

DISCUS LETTER OF THE MONTH


[illegible]

A struggle to find medication

Q I have been trying to get hold of Droncit wormer for my Discus, but as soon as you mention fish to any vet in Aberdeen, they lose interest. Do you know of another oral medication for internal worms? I also asked for Metronidazole at the vets, but they had not heard of it.
MIKE YULE, EDINBURGH

A Both the drugs you mention are prescription only and [illegible] Droncit contains Praziquantel.

If you [illegible] problems of supply and/or [illegible], ask your vet to obtain from the Royal Veterinary College a list of [illegible] that are prepared to treat [illegible] [illegible] increasing number [illegible].

[illegible] organisations [illegible] should have similar details. Contact [illegible] Davenport on [illegible].

Alternatively, call the [illegible] who has [illegible] and others who are willing to treat fish.

[illegible] worms [illegible] Discus usually within an hour or two of eating the medicated food, [illegible].

[illegible]
MARK EVENDEN

Always risky without RO

Q I have a 150 l/33 gal. tank which has been set up for some time as an overspill for community fish.

I wish to add five Discus - do you think the tank will be big enough? I don't wish to buy an RO unit at present, but will this jeopardise their health?

The pH is 6.5, 1°KH, 3°GH, and nitrate 20ppm, with zero nitrite.
NEIL RICE, CREDITON

A [illegible] your tank will be [illegible] for [illegible] established. On the face of it, your water conditions are fine, but if you do not use an RO, you will subject your Discus to various [illegible] and metals which [illegible] will cause [illegible] problems.

By using an RO, you are eliminating this risk. You will also have greater control over your water chemistry, especially pH.
MARK EVENDEN


Using RO water eliminates the risk of pollutants stressing your fish.


Low flow rates are often advised for Discus

Flow-rate is not a problem

Q I am about to set up a 84 gal./380 l. tank for Discus. One retailer says I need a large, powerful external filter, whereas another tells me I need only an Eheim 2324 to give the modest flow rate that Discus prefer. Who is right?
NEIL RICE, CREDITON

A [illegible] 2324, you would have [illegible] your tank had only 250 [illegible]. Even then, you might experience problems [illegible] in the substrate.

[illegible] professional [illegible]

Don't forget, the flow rate [illegible] is the maximum and does not account for [illegible] caused by the media.

If you are [illegible] upsetting your Discus, [illegible] professional range is [illegible] to slow the output.

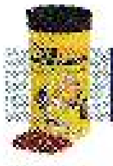
Alternatively, you can use a T-piece [illegible] the return outlet [illegible].

[illegible] 500 l [illegible] gal. [illegible] tank containing Angels which also prefer slow moving water.

This is filtered by [illegible] 2026. The high flow rate does not bother them at all [illegible] frequently spawn.
JASON SCOTT

YOUR DISCUS EXPERT

[illegible]



Letter from America

What do you do when Aiptasia rears its head in your tank?

US expert Julian Sprung has some advice on dealing with these pest anemones in the reef aquarium.

Q I need help to control *Aiptasia* in my 409 l/90 gal. tank. Copperband butterflies fail to eat them. I've heard that *Chaetodon striatus* will eat them, but I'm unsure about the safety of my corals. I have three Peppermint shrimp that have no effect.

MARC PRICE

A Shrimp that eat *Aiptasia* are [illegible] and [illegible]. The name 'Peppermint shrimp' is used for several shrimps [illegible] do you have the correct species? [illegible] for photos.

[illegible]

Stocking densities are approximately as follows:

25 shrimp - [illegible] gal.

50 shrimp - [illegible] gal.

75 shrimp - [illegible] gal.

[illegible]

[illegible]

Another important point: if you have a [illegible], the shrimp will end up as food before they can make a dent in the *Aiptasia* population. Some large [illegible] also appreciate the shrimp for their taste.

Butterflyfish are not always predictable, but I can tell you that [illegible]

[illegible] Australian specimens tend to be very large, so you need to specify the size.

Another source of good Copperband butterflies [illegible] MAC (Marine Aquarium Council) certified specimens from the Philippines. MAC Copperbands are net-caught and properly handled, and have a good survival record.

[illegible]

[illegible]

Although Copperband butterflies [illegible]

[illegible]

[illegible] Copperband butterflies (below left) are more easily kept now than they used to be, but still may not be your best bet to control Aiptasia (right).

MARINE LETTER OF THE MONTH

THE SENDER OF THE MARINE LETTER OF THE MONTH wins a Tetra test [illegible]

Big trouble on the reef

Q **Every time I try to introduce fish to my reef tank, they die. When I got the tank, it was cleaned and filled through a DI unit. After a week I added 27kg of cured live rock, 25kg of dead rock and 15kg of coral sand. This substrate is supported on a plastic tray.**

The water tested fine, but two clownfish were both dead inside four hours. My dealer gave me a Polyfilter, which after a few days turned brown. He thought there might be metal in the tank. I checked, and found a few wee pieces in the sand, which I removed.

Subsequent tests came back OK, and the dealer was satisfied that all toxins had been taken out. Two more clownfish went in, but both were dead within eight hours.

The shop then suggested I do a full water change and allow them to take back the live rock while they filled my tank through their RO unit.

Have you ever heard of a problem similar to this, and what advice can you give me before I take the big step of emptying the tank?

MARC BEATTIE, VIA EMAIL

A It can be a bit difficult to solve something like this from a distance, but the first thing [illegible] was your mention of a DI unit. Is this designed for aquatic use? Some domestic units are unsuited to the purpose.

What's the plastic tray in the bottom of the tank for, and is it food safe?

You can use a magnet to pull any ferrous metals out of the sand. I doubt, though, whether these are to blame.

What I would like to know is, are there any signs of life from your rockwork? Are there any small animals wandering around: worms, copepods, mysis, gammarids etc? This could help determine the nature of the problem.

If these animals were around, I'd suggest the fish were suffering from an ailment. If not, a toxic environment springs to mind.

TIM HAYES

Marc responds: Both the DI unit and plastic tray are designed for the aquatic trade. I ran a magnet through the sand and found no metal. My live rock had worms, and algae was growing on it.

Since my original email I have emptied the tank, cleaned it with freshwater, and cleaned my coral sand and my dead rock as well as the pumps, pipework and skimmer.

I then refilled the tank through the DI unit, added the salt, put the sand and rock back in and, once it was testing OK, added two clownfish.

Thankfully they are still with me.

I could find no reason for the deaths of the first four fish, and can only conclude that the tank contained something toxic that was not fully removed when I first cleaned it.

MARC BEATTIE

Declaring war on bristleworms

Q **I recently found a bristleworm in my marine tank, and I know where it lives. Do these animals really do much harm? I haven't got any corals, only a *Heteractis magnifica*, but I seem to remember reading that bristleworms can be a real pest. If so, how do I get rid of mine?**

ANTHONY DADAS, VIA EMAIL

The hair-like spines on a bristleworm are poisonous.

A These polychaete worms come into the aquarium with living rock, and can grow to 25cm/10" – big enough to damage corals, anemones and clams. Aquariums with substrates that are overfed make very good breeding grounds for these pests.

However, small specimens are among the best scavengers you can have, so long as you remember that the stiff, or hair-like spines along its sides, are poisonous and can break off in your skin.

A good way to get rid of bristleworms is to tie a plastic practice golf ball [illegible] with [illegible] shrimp or fish flesh, and then wrap the whole lot loosely with nylon fishing line to make entry difficult.

Place the bait, weighted down, on top of a large net, late in the evening. Early the next morning the worms should be inside, [illegible] and feeding on the bait. Simply lift the net out quickly and you've got them.

A variation is to use short lengths of drilled plastic pipe, baited as before, and plugged each end with [illegible] Filter media. Lift the pipe out and push a rod through the pipe to extract them.

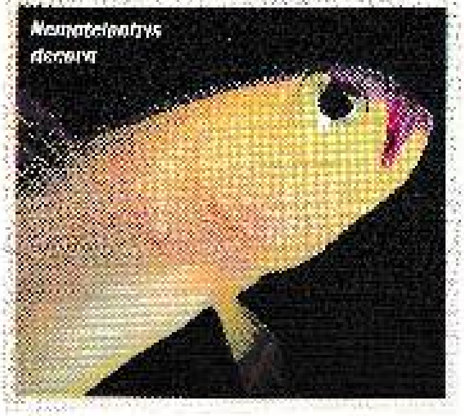
Natural predators include Banded coral shrimp, Arrow crab, and the dottyback, *Pseudochromis fridmani*.

BOB GOEMANS

Sponsored by Tetra - experts in fish health

FACTFILE

Common name: [illegible]
Scientific name: [illegible]
Origin: [illegible]
Size: [illegible]
Diet: [illegible]
Aquarium: [illegible]
Notes: [illegible]
Price: [illegible] depending on size and availability.


Nemateleotris decora


Make sure there are empty shells for hermits to move into.

Hunt for a compatible algae clean-up crew

Q **I have a green algae problem in my marine fish-only tank, and would like to add some turbo snails or hermit crabs as I have read that these will graze on it. But I have also read that you cannot mix the two, as the crabs will pull the snails out of their shells. Which would you advise?**

LEE WILSON, VIA EMAIL

A You can keep hermit crabs and snails [illegible] ... to move into as they grow. [illegible] ... before you introduce the [illegible] and they should then be able to stop the algae growing back.

PHILIP HUNT

You are being over-ambitious

Q **Will the following be OK for a 130 l tank, 85cm/33" long: Copperband butterfly, Flame angel, two Common clowns, three Golden damsels, Yellow tang, Powder blue surgeon, a few anemones, hermit crabs and a starfish?**

SAM CAVANAGH, VIA EMAIL

A If you buy all these fish, your tank will be grossly overstocked. Your tank has a maximum capacity of [illegible] of fish, and those you suggest will grow to a total of [illegible].

Yellow tangs, Powder blue surgeons and Copperband butterflies all grow far too large for an 85cm/33" tank. The Powder blues and Copperbands are quite difficult to keep, and even Flame angels aren't regarded as beginners' fish (I'm guessing that you are new to marines).

[illegible] anemones don't usually do well in aquaria, even in the hands of experienced reef keepers, so avoid these.

[illegible] in your tank, I wouldn't keep a fish likely to grow to more than [illegible].

Common clowns are a good choice, and you could keep one of the [illegible] such as a Coral beauty, [illegible] or [illegible]. A pair of [illegible] these angels would leave you with a number of [illegible] space.

Yellow-tailed damsels are [illegible] but they are territorial, and putting three in a small tank might be asking for trouble. Instead, get [illegible] such as a [illegible] [illegible] and make a [illegible].

Small hermit crabs [illegible] in terms of a starfish, I'd go for a [illegible] maybe one of the [illegible] white ones, as these are more likely to do well than [illegible] starfishes.

PHILIP HUNT

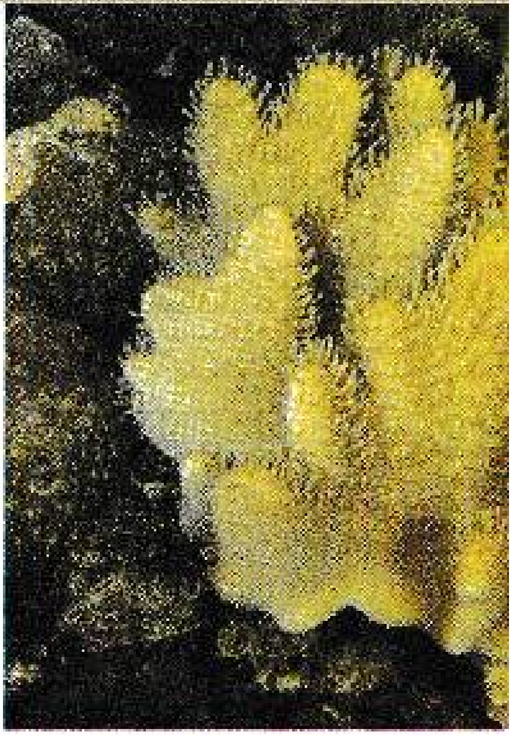

Cherub angel

YOUR MARINE EXPERTS

[illegible]

How to...
Grow your own phytoplankton

Perfect for reeftanks and to feed larval fish and invertebrates, phyto is dead easy to produce at home. **Tim Hayes** shows how.



BELOW: An element of a commercial modular design of phytoplankton reactor. These can be linked together to produce a reactor of the size required.

Recently there's been an upsurge of interest in using phytoplankton in reef aquaria. I use a lot of live phytoplankton for my deep sandbeds, soft corals and for culturing food for larval fish and invertebrates. The following is the method I use to culture phyto – it works for me and I can see no reason why it shouldn't work for you. It ain't rocket science!

What you'll need

One drink – vital to keep you in a constant supply of 2-litre clear plastic drink bottles, rigid airline tube, standard airline tube, airpump, a couple of air valves, 60cm/2ft 18W fluorescent tube with ballast and reflector (or a power compact or energy saver bulb could be used), 500ml live phyto and phyto food such as Cell-Pharm's Phyto-Max. If no one near you cultures phytoplankton, you can buy cultures of phyto in the form of an agar disc.

How to do it

Split your starter culture between two 2-litre bottles at room temperature and aerate briskly. You don't need to use an airstone; rigid airline tubing is best.

Make up one litre of water to a specific gravity of about 1.015. I mix full-strength salt water 50/40 with tapwater. Tapwater is OK for this as any nitrate or phosphate are additional nutrients for the plankton.

Tapwater is OK... any nitrate or

Add 1ml phyto food to the mix and split between the two bottles. Wrap a strip of filter floss around the airline to block the mouth of the bottle; this helps to limit atmospheric contamination (essential if culturing rotifers nearby). Add water and food daily until both bottles are full.

When full, start a third culture and stop feeding bottle number one; this is the one you'll start using in about six days' time. Then more or less repeat the procedure you started with: use half the culture from bottle number two to start a third 2-litre bottle, add another airline valve plus a length of flexible airline tubing connected to a length of rigid airline tubing, top up both of these bottles with 1.015 sg water, and feed each bottle with 2ml of Phyto-Max. Don't forget the strip of filter floss.

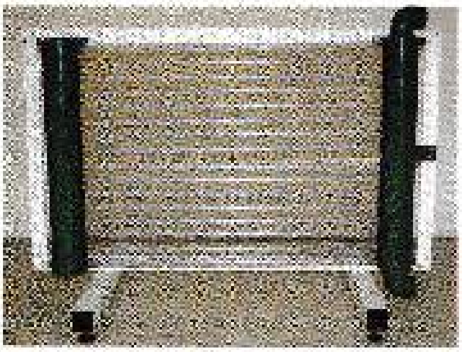
In this way you can expand your culture to whatever volume you want, bearing in mind the capacity of your airpump and whether you can sufficiently light the bottles.

Start using the culture when it's a rich green colour, at six or nine days, say 500ml. When your culture is down to the volume you started, repeat the feeding process.

Periodically you'll need to clean down your culture bottles with a bottlebrush to remove the green slime build-up, or replace them with fresh ones. For the hobbyist, this is the advantage of using drink bottles over dedicated phyto reactors.

When things start to go wrong

Phyto can crash – this is where your green culture can go clear overnight to



Commercially available reactors

There do not seem to be [illegible] phytoplankton reactors available in the UK [illegible] of the Aqua Medic plankton light reactor [illegible] phyto [illegible] about 25 [illegible] without lighting [illegible] culturing [illegible] phytoplankton [illegible]

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phosphate are nutrients.

become useless. Crashes can be caused by different factors: temperature, airflow and contamination being the most likely.

Symptoms to look out for are clumping or clearing. This is where the culture becomes 'lumpy': you may be able to save it by pouring through a net and then restarting it.

Another phenomenon to look out for is where your culture loses colour over a couple of days. This is contamination: [illegible] is eating all that lovely phyto. If you look carefully, you'll see a burgeoning population of rotifers or brineshrimp.

If you're desperate for green water, try pouring the culture through a rotifer net and then restarting it. Or use it as a zooplankton culture.

If one of your cultures does crash, it's worth smoking the bottle vigorously. Don't forget to put a top on or you'll 'green wash' your room, or even blow into the bottle yourself. It's possible the pH of the culture has risen as it's used up the available carbon dioxide.

By shaking or blowing into the culture, you're reintroducing CO_2 and reducing the pH. Once you've done this, restart the culture. Sometimes this will allow it to recover.

If you do successfully recover the culture it may mean you need to increase your airflow. Don't forget that apart from keeping the phytoplankton in suspension, the air bubbles you're introducing bring with them small amounts of CO_2, and this is needed for photosynthesis. Indeed, commercial farming of phytoplankton will often incorporate carbon dioxide injection into the process.

A tip from Dr Jonathan Mortimer, MD of Oilpharm, is to use carbonated mineral water (not lemonade!) as this solves low CO_2 problems at a stroke.

The problem of contamination is particularly real if you're culturing rotifers nearby.

Always work on your phyto cultures before attending to rotifer cultures, or you should have a tendency to turn into zooplankton. And always keep rotifer cultures and phytoplankton cultures separated, in different rooms if possible — not at opposite ends of a room. If you're stuck for space, try keeping the phyto above the rotifers.

Lighting requirements

Phyto are not too fussy about the type of lighting used. I'd say daylight-rating lamps (around 6500 Kelvin) are your best choice, but in reality, nearly any white light will do. Similarly, when it comes to quantity of light, the greater amount of wattage used, the faster phytoplankton will grow.

I find I can culture up to six 2-litre bottles or five 3-litre bottles in front of a single 60cm/2' long, 18W fluorescent lamp (with reflector) mounted horizontally. Currently I'm using an old Arcadia Marine White tube that's past its best for tank use, but still gives great results with phyto.

As far as length of photoperiod goes, anything between 16 and 24 hours a day will be fine. I feel the law of diminishing returns comes into it somewhere, as having moved up from 16 hours a day to 24 hours a day I'm seeing very little difference in the density of culture that I'm now producing.

Formerly I used a photoperiod of about 16 hours, not wanting to stress the rest of the creatures living on the coral farm with 24 hours a day lighting, but now, with each running sumps at 24 hours a day and seeing no problems, I light the phyto cultures for 24 hours a day.

I use plastic mirror tiles to increase the amount of light available to the cultures while partially shielding the light from the rest of the room.

It may be of concern if you're keeping terrestrial animals in the vicinity of your phyto culture station, though I now find that the amount of light spilling over from my sumps and phyto is nothing to be worried about, and probably represents no more than the amount of light available on the reef at night.

Reference materials

[illegible] by [illegible] Wilkerson, published by [illegible] Aquaristics, [illegible] provides information on [illegible] in a user-friendly [illegible]. 'Plankton Culture Manual' by F.H. Hoff published by Florida Aqua Farms. This is an [illegible] if you want to [illegible] phytoplankton in depth, go for the book though be [illegible] to find [illegible] [illegible].

ABOVE LEFT: Phytoplankton is a fabulous food for soft corals.

Starting a culture from an algal disc

An algal disc contains an agar substrate onto which a pure culture of microalgae has been grown.

To start from a disc, first remove the seal, add enough sterile water to moisten [illegible], replace the cover and place under a white light for 24 hours.

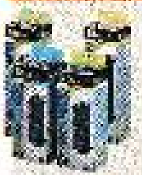
[illegible] surface of the culture then, [illegible] with a clean finger [illegible] with the water [illegible] to around 1.020 sg.

[illegible] between two 24 hrs [illegible] 200-300ml of saltwater, along with [illegible] phyto food [illegible].

Note: [illegible] is water by [illegible] or more [illegible] salt, [illegible] [illegible] sterile [illegible] algal culture [illegible] [illegible] microwave [illegible]. This may be important in commercial aquaculture when feeding [illegible] [illegible], but I don't feel it's as important when it comes to feeding coral [illegible] [illegible] another food source [illegible].

[illegible] are available from Oilpharm. [illegible] website at www.oilpharm.com

COLDWATER LETTER OF THE MONTH



[illegible]

Depth isn't written in stone...

The climate where you live should be considered when you decide how deep to dig your pond.

I recently entered my pond dimensions into the volume calculator on the PFK website, and was shocked to see that according to your recommended minimum depth of 75cm/30", I should not have any goldfish in the pond!

My dimensions are 1.8m x 1m x 40cm/6' x 40" x 16" deep - I do not have any Koi. I have kept 16 goldfish in this pond for a number of years, and all have overwintered and bred successfully.

In order to make my pond slightly larger for the fish and save a bit of money by not starting again with a brand new sheet of rubber lining, I was thinking of changing to a pre-formed pond. Then I realised that some of these have a depth of 48cm/19".

How can they be sold for fishkeeping if what you say is correct about the absolute minimum depth?

D. WATKINS, VIA EMAIL

I have to say that very little in fishkeeping is absolute, and that I have seen many successful goldfish ponds much shallower than 75cm/30". Your fish, by their actions, are telling you they are content, and I think you'd run a far greater risk moving them to another pond than leaving them where they are.

Lines have to be drawn somewhere, however, allowing for what I term [illegible] the [illegible] factor. In other words, if PFK were to recommend 60cm/24" as the minimum, some would go down to 50cm/20" and say that's enough.

By setting the standard at 75cm/30", there's a larger margin for self-deception and compromise before the fish will come to harm.

Then there is climate. In my part of western England, winters are exceptionally mild and I'd expect a sheltered 75cm/30" goldfish pond to be OK - but that same pond high on the Pennines and it would be a different story.

NICK FLETCHER

Koi tip of the month

[illegible]

No harm to fish is likely

On moving a large planting container in my recently installed garden pond, I noticed a number of small, black, tadpole-like creatures. These creatures also live in the margins of the pond at the surface, and the goldfish seem to prefer eating them to their normal flake food.

I am rather worried that they might pose a risk to the health of my fish. Please could you give me some idea as to what these creatures might be, and if I should be concerned? How can I eradicate them from the pond?

MARK SHERBURNE, DORSET

Whatever these creatures are (and I am afraid that I cannot be totally certain from your description), they are almost certainly harmless. They could be mosquito larvae and their comma-shaped pupae, planarian worms, or even small, harmless leeches, which do look a bit tadpole-like at rest when they are not extended.

The insect theory is the most likely, as mosquitoes will quickly colonise any body of water, however small. In a bare pond their larvae are quickly devoured, but in your case they found temporary sanctuary around the planter.

As a general rule, anything that fish will eat is not going to harm them, directly or indirectly, and I really do think that in this case you have no cause to worry about these creatures.

NICK FLETCHER

Don't blame the vacuum

Last season I bought a pond vacuum cleaner to remove some of the rubbish from the bottom of my Koi pond before it could find its way into the filters.

Even though I have two filters, each rated at 1000 gal. for my 1200 gal. pond, the media - various grades of foam - still blocks on a regular basis.

I was disappointed at the performance of the vacuum, partly because of the disruption caused by switching the unit on and off and allowing it to drain, and partly because of the waste of water involved. And the nozzle seemed to disturb more rubbish from the bottom than it vacuumed up.

Would filling the tank with filter floss, to act as an in-line filter, allow me to return cleaned water to the pond?

[illegible]

[illegible]

Rosy red minnows will eat gnats.

Plagued by gnats

Alongside my garden pond is a smaller frog pond 90 x 60 x 45cm/3' x 2' x 18" deep. There are millions of gnat larvae. We can't go into the garden in the evenings without being eaten alive by them. Is there a small fish to control them without detriment to next year's tadpoles?

[illegible]

[illegible]

Pot plant gives me clear water

I know of many remedies for green water in ponds, but do similar products exist for goldfish tanks? Mine, which gets a lot of natural daylight, is plagued by a greenish-brown algal encrustation on the glass, which I have to scrape off twice a week in order to see the fish. Would barley straw extract help control it?

[illegible]

[illegible]

[illegible]

YOUR COLDWATER EXPERTS

[illegible]

Why not a pond filter for a tank?

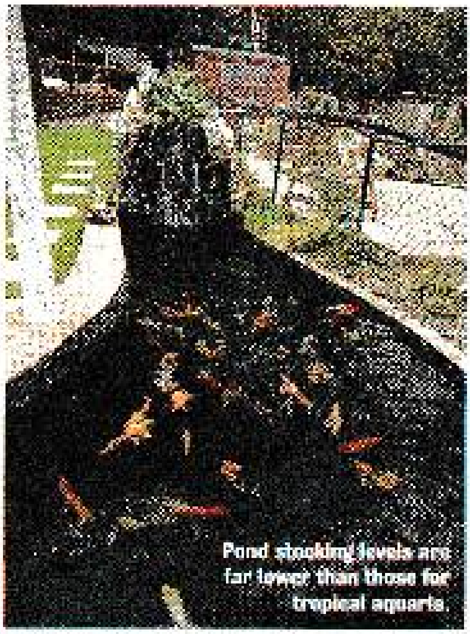
Q I will soon buy a 180 x 60 x 60cm/6' x 2' x 2' aquarium for plecs and tetras, and would like to know if I could use a canister-type pond filter instead of one made for indoor fishkeeping. It seems that the principles are the same, except that the pond version turns over four times as much water and is only half the price. If I did take that route, would the integral UV pose any problems?
CRAIG STEVENS, REIGATE

A You are right, pond filters do turn over more water per pound than filters designed for aquarium use, the reason being that pond stocking levels are far lower.

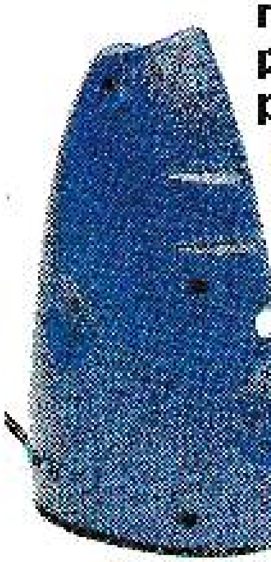
A mature pond is fully stocked at 2.5cm/1" of fish per 10 gallons, while for a tropical freshwater aquarium, the figure is 5cm/2" per gallon (20 times greater).

So a mature external canister filter designed for a 150 gal tank will support [illegible] of small fish, whereas a mature pond filter for a 1000 gal pond will support only [illegible]. High temperatures increase the efficiency of filtration, but not to the degree where I would recommend you use a pond filter.

The UVs used on outdoor filters are designed to combat single-celled algae and will have little effect on disease. Aquarium UVs, on the other hand, run a higher wattage per gallon and [illegible] many diseases.
JASON SCOTT



Pond stocking levels are far lower than those for tropical aquaria.



Deep tanks need powerful pumps

Q What sort of air pump would you recommend for a tank 38cm/15" wide and 60cm/24" deep? The pump will be on a table, so the air will have to travel up and then all the way down again to the bottom of the tank to feed an air diffuser.

I have tried an Aqua Air AP1, but it does not seem to have enough pressure.
GRANT BARNES, VIA EMAIL

A The Interpet Aqua Air AP1 is only designed for small aquariums up to 40cm/16" deep. Yours is 60cm/24" and requires something much punchier.

Have a look at the Interpet AirVolution pumps (pictured left), the successors to Aqua Air. They are more powerful and quieter. The AV2 can [illegible] single 20cm/8" airstone, while the far more powerful AV[illegible] can handle one 30cm/12" [illegible]ing.

Don't forget that in deep aquariums, you will not get the manufacturer's stated output, due to the water pressure.

If your air pump is sited below water level, you should always use a non-return valve to prevent water syphoning into the pump in the event of a power cut. JASON SCOTT

Removing those stubborn stains

Q My turbo snail has left several slightly sticky, grey, circular marks on the glass. I would like to sell the tank, but I cannot get rid of them.

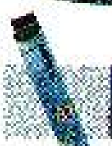
I've tried bicarbonate of soda, toothpaste, ammonia, even scraping with a razor blade. Do you have any other suggestions?
HELEN [illegible], EDINBURGH

A Assuming the tank is made of [illegible] and [illegible], I have several ideas that may work.

Vinegar is acidic and makes an excellent glass cleaner. It can remove even stubborn marks. Just pour a small amount onto a soft cloth or piece of newspaper and rub.

I also find that wallpaper strippers fitted with replaceable blades can remove even the hardest deposits.

Take extra care with such tools, especially when working near silicone sealant. The sharp blade could remove not only the marks, but also the sealant holding your tank together!
JASON SCOTT



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How to guard against floods

I was awakened by a neighbour in the flat below when water poured through the ceiling. I found that a hose on my external canister filter had worked loose and was emptying my tank all over the floor. Luckily my fish were OK... Is there anything I can do to stop this happening again?
AMANDA [illegible], BRISTOL

It is very unusual for the pipes to come loose from an external filter. They are normally fixed onto the motor part of the unit with locking rings, as are the taps. These tighten around the hoses, making them very difficult to remove.

I guess your hose could have come loose if it was old and had lost some of its flexibility, or was not supported properly. It is a good idea to check all connections weekly and replace the hoses every year or so.

Renewing the flexible pipe not only reduces the chances of leaks, but also maintains water flow as the inside of the hose becomes covered with bacteria and algae and this can slow output considerably.

I advise against using any kind of glue to attach the pipes as this would make maintenance difficult.

Instead, try cable ties on the hoses. Take care not to over-tighten – this could crack the plastic fittings.
JASON SCOTT

Carbon - don't expect miracles

To remove residual medication from my tank after the treatment is finished, I use a Fluval 2 filled with carbon. Would it be OK to remove this, dry it out, and use it after any further treatments, or does carbon leach toxins into the water?
MIKE YULE, ABERDEEN

If carbon has been used for even a short time to remove medication, chances are that it will be exhausted after just a day or two. Carbon or carbon pads are not that expensive, and I would be inclined to throw them away rather than to use them.

Carbon is excellent at removing dyes from the water, either tannins or residual medication. It gives that extra sparkle, but I disagree with its continuous use in an established tank as it may remove vital elements, especially in reef or planted systems.

The long-term use of carbon also brings with it the risk of pollutants being released back into the water when it is exhausted.

A more logical solution would be to use carbon every few weeks for a period of up to 48 hours. That way, it removes the harmful substances without bringing about a permanent deficiency of beneficial elements.

If you use carbon permanently, you will know when it needs changing because the water takes on a yellow hue – obvious if you pour some in a white bucket.

It is not possible to reactivate carbon without specialist equipment.
JASON SCOTT


The tannins in bogwood can turn your water yellow, but carbon will remove them.

Trade secrets with brineshrimp

I live two minutes from the sea and wish to hatch and grow brineshrimp to their full size. When the eggs hatch at 24-26°C/75-79°F, do I switch off the heater and continue with light and aeration? And what do I feed them - green seaweed, kelp, or just green freshwater algae? Do I have to keep a light on all the time?
BRIAN COTTON, COLWYN BAY

Use seawater, but ensure it's collected from a clean area. If you live that close to the sea, I suggest you collect it fresh every time you need it, rather than storing it.

Small glass or plastic tanks make ideal growing-on containers, the exact size depending on how many adult brineshrimp you need – 1 ml of eggs alone can be about 300,000 shrimps at an 80% hatch rate, so do not overstock.

Brineshrimp are filter-feeders, so seaweed will not do. They require food with a particle size of 5-15 microns maximum.

In the wild they feed on phytoplankton algae. While it is possible to culture this, it's easier to use commercial liquid food such as Interpet's Marine Liquifry or 'NT Labs' Brine Shrimp Food. I'd also aim to keep the temperature at 25-27°C/77-80°F, and use no filtration, only light aeration.

Brineshrimp can be grown on in light or dark conditions. It depends on what you are feeding them: if algae, then you need a continuous light cycle. It takes about 14 days to reach full size.
JOHN RUNDLE

YOUR EQUIPMENT EXPERT

[illegible] **questions@practicalfishkeeping.co.uk** [illegible]

Silver swarm

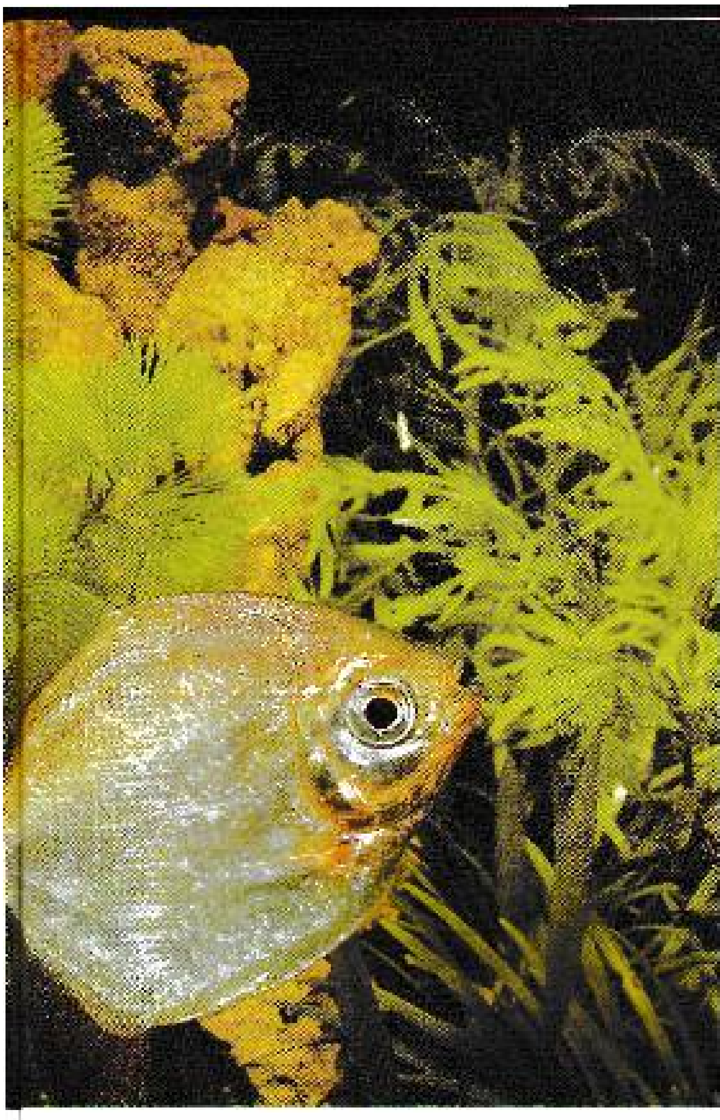
When housed in a shoal, Disc characins are a truly stunning sight, says **Richard Hardwick**, who also warns that they will strip your tank bare...

They may be the aquatic version of locusts. These attractive fish form huge shoals in the wild, and with their laterally compressed silver bodies, cut through the water at high speed and devour [illegible] anything [illegible] though [illegible] plant life in evidence. [illegible] referring to the Disc characins from the Amazon and its tributaries.

Not surprisingly, perhaps, these disc-shaped fish are the closest living relatives of the piranha, and their [illegible] makeup is so similar that they are often mistaken for the carnivores. However, their jaws – although powerful – are largely made up of rows of molars, more appropriate for its omnivorous life.

Apart from their obvious body shape, their eyes are wide, round and [illegible], and their [illegible] fine scales [illegible] a heavy mucus membrane. They are gaining in popularity [illegible] kept in large [illegible].

If you are [illegible] plan to keep these



fish, note that they are only suited for tanks of 180 l/40 gal or more. Anything smaller and you run the risk of injury as they are very skittish. So, un prepared them that before switching on their tank lights, it is better to turn the room lights on to prepare them.

Despite this tendency to panic, these are remarkably tough cookies. However, because of their huge appetites, water parameters can quickly change – sudden high levels of nitrate coupled with a low pH will cause disastrous symptoms of distress include a loss of appetite, cloudy eyes and rapid gill operations. Frequent water changes and close monitoring of parameters are critical.

All species of the family do well on a diet of flake and food sticks, preferably with a vegetable content of spirulina. This should be supplemented with some animal protein such as bloodworm, chopped earthworms, mussels, prawns, etc.

As far as the tank goes, apart from being large, you can simulate an Amazon biotope using twisted roots or beech. Sand looks best, with the odd small smooth boulder to complete the theme. As for plants, you'll have to go for the artificial variety or you'll just be providing free snacks. However, before you wince at the thought of fake plants, have a look at what's available in shops – I think you'll be pleasantly surprised.

These fish need good water quality and plenty of oxygen. Use external as opposed to internal to give that extra biological capacity. Keep temperatures to 24-26°C/75-79°F, and ensure the water is well oxygenated.

Silver dollar, *Metynnis argenteus*

This is by far the most commonly available member of its genus – it's so popular that it is spawned and raised in its thousands purely for the aquarium trade.

Available in sizes from as small as a £1 coin, they can grow alarmingly into fee the correct diet. You'll really need to buy three or four and house them in a tank minimum 120cm/48". Very often, fish of about 10cm/5" are brought into the shop as trade ins for smaller species.

The Silver dollar is found in the Rio Negro and its tributaries among weedy backwaters. Males have a long, lobed anal fin which turns red with sexual maturity. The body, as its name implies, is plain, silvery white with clear fin edge, though a few black flecks are sometimes present in the dorsal fin.

A very similar species is *M. hypsauchen*, though this species has a less rounded body and the males a yellow-orange tint around the operculum when adult.

Spotted Silver dollar, *Metynnis lippincottianus*

These share exactly the same characteristics as the above, but also have beautiful body spots which give it its common name. It is sometimes called *M. maculata*. However, it is only rarely imported and sports fewer and larger spots.

It is found in Brazil and French Guiana and reaches 12cm/4¾".

Red shoulder spot dollar, *Metynnis mola*

This is another gem to read. These shoals, it grows to the same size as its spotted cousin, but its body is deeper and more rounded. Its colour is so bright that it almost looks white. It is found in the Rio Paraguay-Parana basin.

Studying these fish in our shop recently with some colleagues, we came to the conclusion the males, with the broader, more round and ... had a darker red spot than the

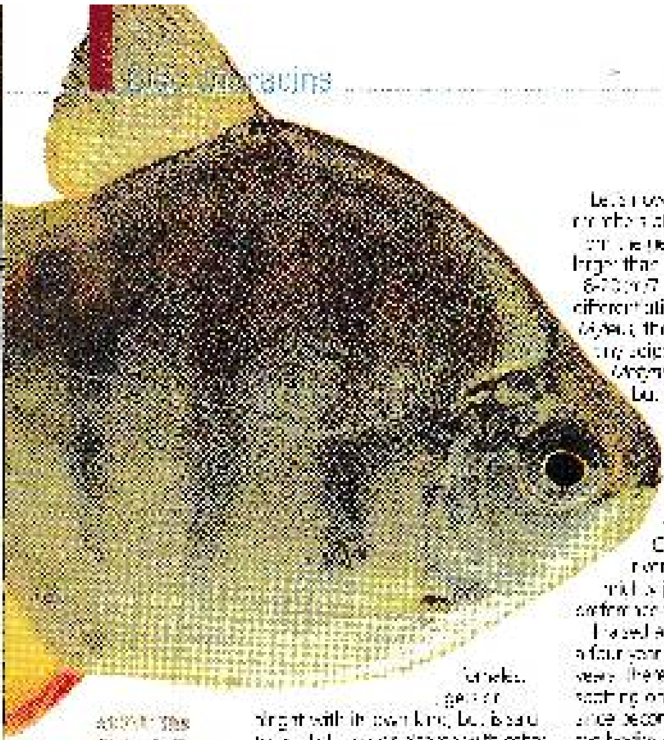
Panic attack

This peaceful ... as far as the *Metynnis* concerned is a ... understatement. [illegible] ... on its side.

... the experts switch off the tank lights and ... upright position ... [illegible] ... about 20 minutes.

LEFT: Red hooks start out fairly plain, but develop bright colours when mature.

These disc-shaped fish are the closest living relatives of the piranha, and their genetic make-up is so similar that they are often mistaken for the carnivore.



...female... ...get on alright with its own kind, but is said to be slightly snappier with other species of [illegible] characins.

ABOVE: The Striped silver dollar is quite rare in the shops.

BELOW: The Silver dollar is the most common species on sale in the UK.

Striped silver dollar, *Metynnis ([illegible]) fasciatus*

I have been very lucky to have seen them more than a couple of times in recent years as these are rare imports. I grab them if you ever see them in the shops.

It grows slightly larger than the others here, to about 12cm/5.5in. Males can be distinguished as they have a longer anal fin [illegible] with a hook at the end.

Let's now look at the larger members of this fascinating family, from the genus *Myleus*. These are larger than *Metynnis* and grow to 8-20cm/3-8in, though the main differentiating aspect is that with *Myleus*, the dorsal is long with tiny adipose fin, whereas with *Metynnis*, the dorsal is short, but with a longer adipose fin.

Red hook *Myleus rubripinnis*

Hailing largely from Guyana in the Amazon river system, this species has thick jaws, indicative of their preference for seeds and nuts.

I raised a group of Red hooks over a four year period. For the first two years there was no sign of orange speckling on the flanks. However, since becoming fully fledged adults, the bodies of both sexes have become densely decorated with orange spots. Sexes can be told by a wave in the anal fin in males, referred to as a [illegible] anal fin.

Myleus schomburgkii

This has a single vertical black bar that starts in the middle of the dorsal and finishes in front of the anal fin. A shoal swimming among tree roots and [illegible] looks the [illegible] of Amazonian [illegible] along with a shoal of [illegible].

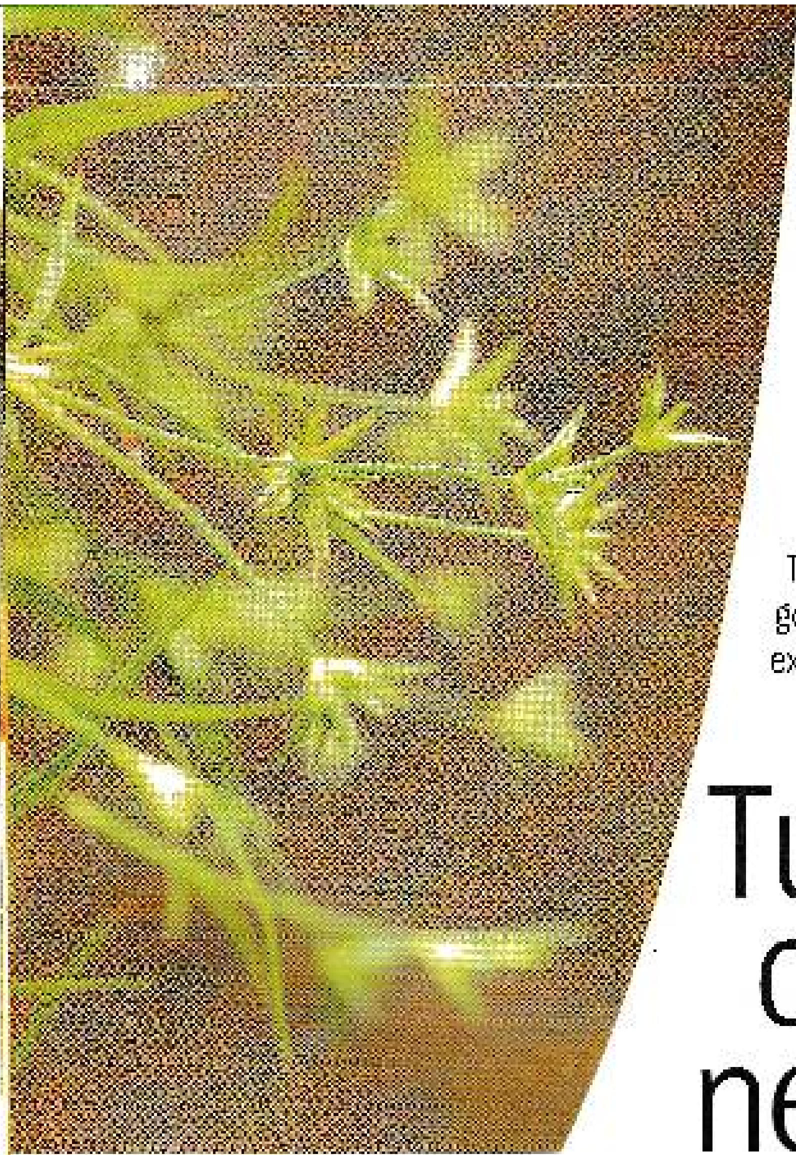
There are currently three recognised variants of this species. Two forms look very similar, but I suspect that the first will soon be considered as a different species. This variant sports blue-[illegible] with an extremely broad vertical black band, while the other two have a red anal fin and a narrower black band.

The species is however only imported from time to time, and is collected from Brazil, notably the Rio Negro, Xingu, Araguaia, Venezuela and the Orinoco.

It is common for these fish to be imported with what looks like black spot disease. These black spots are scattered over body and fins and are smaller than a pin head. This is also common in wild-caught Angels and [illegible]. Although unsightly, there is not really a problem. They are probably just "glochidia" – a larval stage of a freshwater mollusc.

What happens is the free-swimming larvae attach themselves to a host (the fish) and wait until it is swallowed whole by a particular bird. The mollusc larvae then travel through the bird's digestive system, which triggers metamorphosis, before finally being excreted in the bird's faeces back to the river bed... so you don't have to worry about them spreading in your tank!

As the fish grows, these spots get covered by layers of skin tissue [illegible]. So don't let this problem get in the way of you enjoying the fish – unless you have a kingfisher or five [illegible] in your living room!



A recent visit to Tropica in Denmark got Peter Bradley all excited over their new aquatic plant introductions.

Turning over a new leaf

Chances are that, at some point or other, you will buy a tropical aquatic plant from Tropica. Based in Denmark, it has a 6,000m² [illegible] maintained nursery and each year cultivates two million aquatic plants which are exported worldwide. Now that's a track record. However, what always excites me are their new introductions.

First is Acorus [illegible], a North American plant by Karen Randall, an aquatic hobbyist and author. Not to be confused with the normal Acorus variety (a terrarium plant), this little beauty is easy to grow. Capable of reaching heights between 20cm and 40cm/8 [illegible] 12", it tolerates a wide temperature range (15-30°C/ 59-86°F) and water conditions.

Another new plant not yet in Tropica's catalogue is Bacopa [illegible]. Don't let the name deceive you, for this plant hails instead from Brazil. It is a tiny plant which prefers soft to medium-hard, slightly acid water. It likes good light and CO_2. It is a lovely compact plant with a creeping appearance.

Another winner is a fern, *Microsorum pteropus* 'Philippine', and yes, this does originate in the Philippines! This variety has long, hammered leaves and is found in tidal areas, growing below and above the water, so is one of few aquatic plants that can tolerate salt.

While most Microsorum ferns need to be attached to rocks or bogwood, this can be planted directly into the substrate. It is classified as very easy to grow, and I think over the years it will be a standard.

Another easy plant is *Zosterella dubia*, which has been known to the hobbyist for many years but is out of public eye. It resembles *Heteranthera zosterifolia*, but is far easier to grow and is tolerant of a wide range of water conditions from soft to hard and pH 5.0-8.0. It also tolerates cooler conditions and low or high light. It is very easy to grow and is recommended for beginners.

I call this a 'cut and come again' plant – when it grows too tall, simply trim and replant the cutting.

I saw these plants on a visit to the company's premises, the highlight of my aquatic year. I was also able to look around the experimental tanks, one by Ole Pedersen, where plants are under development.

I particularly liked [illegible] these [illegible], which is like a floating sugar cane. The downside is it is very large – you'd really need a 2.7m/9' tank to house this monster.

For Echinodorus fans, there is a new red variety, 'Red Special'. This

plant grows abundantly in a compact shape and is a very attractive solitaire plant. It is a hybrid of several different varieties and is characterised by copper-coloured, spatula-shaped leaves, some of which are a lovely dark red.

It is more compact than most and is classified as easy to grow. As expected, it will tolerate a wide range of conditions from very soft to very hard, pH 5 to 8.0, and low to high light levels. I have found *Echinodorus* thrive with added CO_2.

Other plants include some interesting introductions from Cuba such as *Hemianthus callitrichoides* 'Cuba', one of the smallest aquarium plants in the world that creeps over the bottom with millimetre-sized round leaves. It is a lovely carpeting plant which is fairly undemanding, tolerating soft to hard water, low to high light and, like most plants, would benefit from CO_2 injection. A soft, fine substrate is important.

Another is *Proserpinaca palustris* 'Cuba', which is also found in the southern states of North America. When grown above water it has sawtoothed leaves but underwater, the leaves are long, fine and needle-like which, in good light, turn a rich copper. In the USA it is given the common name 'Mermaid weed'. A fairly undemanding plant, it prefers soft water and would benefit from slightly acid water and CO_2 injection.

A third Cuban plant added to the range is *Ludwigia inclinata verticillata* 'Cuba'. It grows in swamps and has oval leaves. However, when grown under water, the green leaves lengthen and become narrow, making it look like a completely different plant. These new leaves also develop copper streaks. A slow grower, it is also fairly straightforward.

ABOVE: *Microsorum pteropus* 'Philippine'.

TOP RIGHT: [illegible]

LEFT: *Bacopa australis*.

Retail round-up

Our monthly forum for Britain's retail shops forms an important part of every issue of Practical Fishkeeping. We help you find the best shops with those all important high-quality fish, and we hunt out the specialists in every area...

New shop opens in Aberdeen

A new aquatic retailer has opened in Aberdeen. The proprietor, Brian Gell, has many years' experience in the fishkeeping hobby, particularly with Discus and marine fish, and has spent a number of years in the aquatic trade, both in retail and in tank maintenance.

The shop has 56 tropical tanks and 28 marine tanks. Brian tells us: "All systems are bare bottomed to display the fish at their best and also eliminate organic build-up in the system. The systems overflow into the 272 l/60 gal. sumps in the cellar and are then filtered before returning to the tanks via TMC UVs and in-line bag filters.

"Both systems were designed by myself and Ben Williamson from the Marine Laboratory, who helped me plan the pumps and filters in.

"The skimmer we use is the Aqua Medic Turbo Twin. This can be seen on the shop floor working away, along with [illegible] bio towers and their rotating spray bars. Nothing is hidden – all can be viewed, just ask!"

The shop stocks products from Aqua Medic, Deltec, Tunze, [illegible], Clear Seal Aquariums, Reef One BiOrbs and many more.

Brian tells us that at the moment the tropical stock is quite basic as the systems are still relatively new, but over the coming months he will be stocking unusual fish and plants.

He says: "This is just phase one of three of the shop; next year we will have our own [illegible] systems in the basement for our marines, tropical and coldwater fish, and hopefully have a Koi and Goldfish room which will also house our imports of true German Discus."

> Aquatic Pets is at 36 Bank Street, Aberdeen AB11 7SX. Tel. 01224 210717. It's closed on Mondays, but opening hours for the rest of the week are as follows: Tuesday-Thursday 11am-8pm; Friday 11am-6pm; Saturday 10am-6pm; Sunday 12pm-5.30pm.

Pondfish from the local farm...

[illegible]

A Discus retailer's view

It's funny how so many people buy fish from shops without thinking about quarantine. Yet, without it, things can go very, very wrong – and it's many people's first mistake.

Quarantine is a simple, effective method of ensuring your new arrivals don't harbour any nasties, and won't infect your main tank.

As a further advantage, quarantining fish minimises stress, which in turn assists in trouble-free fish-keeping, while increasing their colour and condition.

All fish carry pathogens which are disease-causing organisms. Yet before you worry, a high percentage of these are a natural part of the environment and don't normally cause disease.

For instance, fish carry protozoan parasites that feed on their slime and are kept under control by the immune system. So in an ideal environment, fish and pathogens live quite happily with the control of the immune system.

However, once this balance and you have a different picture. For example, a change in the environment (such as different water parameters) can stress the fish, which can overload its immune system and result in disease.

Netting, handling or introducing new conditions, new water or other fish can also stress a fish.

But it isn't only the new arrival that can be at risk. Existing fish in your tank have built up an immune system to the pathogens for which they are kept, but can't cope and succeed against new pathogens that may be introduced.

Apart from monitoring for potential disease outbreaks, quarantine is a chance for you to introduce your fish to the water you use and preventing the introduction of disease into your tank.

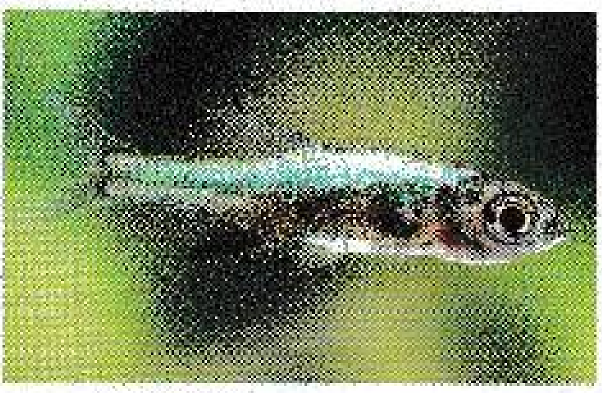
Keep your new fish in a quarantine tank for at least four weeks, using separate or sterilised equipment. Study your fish for any signs of disease and treat accordingly. High temperatures in this tank will speed the lifecycle of pathogens, and so the fish will show earlier signs of disease than at lower temperatures.

Dominic Alexander and Dawn French Alexander, Royal Discus.

> Royal Discus is a family-run business based in St Helens, Merseyside, that breeds and imports Discus. All fish are guaranteed for one calendar month. Tel. 01744 635559 or 07866745886. www.royaldiscus.co.uk

Interesting imports

Matt Clarke and **Andrew Smith** look at some of the new and unusual fish in the shops at the moment.



Fact File

Scientific name: [illegible]

Origin: Indonesia – [illegible] around the [illegible] and Kapuas [illegible] in Borneo.

Size: [illegible] just 2-3cm/ [illegible] at most.

Diet: Small zooplankton, such as Daphnia and Cyclops.

Water: Very sensitive, ideally needs an [illegible] saltwater system of [illegible]

Aquarium: This [illegible] delicate species needs to be housed in a small [illegible] with small [illegible] and [illegible] [illegible] well. Plant heavily and add plenty of bushy plants.

Notes: This is currently the only known [illegible]. Not much is known about the relationships of the [illegible] to other fishes, but they're currently grouped with [illegible] [illegible]. Interestingly, it's said to make a [illegible] noise when disturbed.

Similar species: This species was described in [illegible] [illegible]. There are at least two different [illegible] forms including red, blue and green. The blue and green forms are similar, but the red one looks more different. These morphs may be distinct species.

The red one is said to come from [illegible] in western Borneo, while the bluish forms are said to be from [illegible] Sumatra.

Identification: [illegible] lack [illegible] and a lateral line. The small [illegible] should have five branched rays.

Sexing: [illegible] are [illegible], but males are more [illegible] with more blue on the flanks and [illegible] and red [illegible] fins. These are often reddish in males, but black in females.

Breeding: No published reports of aquarium spawnings as yet.

Availability: Wholesaler [illegible] imported all three colour forms recently and may supply your dealer.

Price: Quite rare, so expect to pay around £[illegible] each.

Matt Clarke

Fact File

Scientific name: [illegible]

Origin: Recorded from the [illegible] River system in Panama and the [illegible] and Bosque [illegible] National Wildlife Refuge in Costa Rica.

Size: Adults around reach at least [illegible]

Diet: Wild fish feed on the larvae of aquatic insects, snails, detritus and plant material, and the foliage and seeds of overhanging plants. Tank specimens will take pellets and flaked foods, [illegible] frozen foods.

Habitat: Lives alongside the giant cichlid [illegible] in lakes in Costa Rica, but also in large rivers and streams. [illegible] ([illegible]) says the fish is found in moderate flow over a sandy substrate.

Water: Most cichlids from this region are unfussy, providing the water is moderately hard and alkaline. Data for other cichlids from the region suggests a pH of [illegible] [illegible]

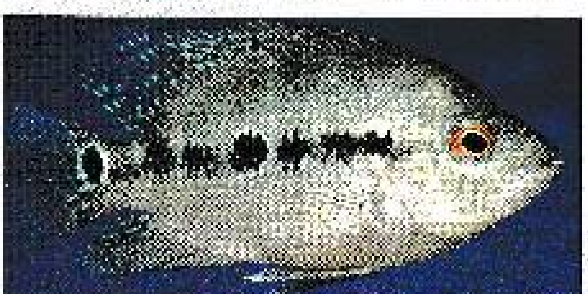
Aquarium: A large tank is a must. They probably occupy a big territory in the wild and aren't keen on being kept in close proximity [illegible] [illegible]. Start with six youngsters in a [illegible] [illegible] tank and keep only the natural pair when formed. These might need larger quarters when fully grown. Keep an eye on the female. Furnish with bogwood and [illegible] rocks and provide a substrate that allows [illegible] digging.

Notes: Adult males take on an orange-yellow base colour with red markings on the ventral surface and the fins. The eight [illegible] black [illegible] markings [illegible] [illegible]

Availability: Quite rare in the hobby. These were in Wholesale Tropicals in London.

Price: Around £[illegible] each.

Matt Clarke



Fact File

Scientific name: *Acrochordonichthys rugosus*

Origin: *A. rugosus* has been collected in Java, Sumatra, Thailand and Malaysia.

Size: Around 10cm/4".

Diet: This small predatory akysid catfish is said to feed on small, bottom-dwelling loaches, such as nemacheilines, so be careful what you mix it with. They are nocturnal so don't expect to see much movement during the day.

Habitat: These tend to live among leaves and bogwood in deep, fast-flowing, sandy or rocky bottomed forest streams.

Water: They don't like being kept too warm, 20-25°C/68-77°F is fine. They appear to be quite adaptable to more alkaline waters, but pH 6.0-7.0 is ideal. Keep the water well oxygenated.

Aquarium: A South-east Asian riverine biotope tank with a bogwood and leaf litter base, and plenty of water movement, is good.

They can be kept in groups and leave most fish alone - if they're not snack-sized.

Breeding: Probably never bred in captivity. Females are said to be fatter and males have a narrow genital papilla in front of the anus.

Identification: Difficult to identify correctly as they undergo ontogenetic changes in morphology and colour. The importer says this fish is *A. rugosus*, however these catfish vary in colour and morphology so it may be one of 12 other species in the genus. Some specimens of *A. chamaeleon* look similar to this fish.

Similar species: The genus includes *A. chamaeleon, falcifer, guttatus, gyrinus, ischnosoma, mahakamensis, melanogaster, mononema, pachyderma, septentrionalis, strigosus* and *varius*. Five of these were described in 2001, but *gyrinus* was only described last year.

We can't tell from this picture, but *A. rugosus* should have one dorsal spine and three to four soft rays, four to six soft rays in the anal, and serrated pectorals. See Ng and Ng (2001) for more details and a dichotomous key to 11 of the 12 *Acrochordonichthys*.

Notes: The tuberculate skin on these fish, like that of South American banjo cats, is warty and sometimes sloughed by the fish. Two species get their names from the texture of their skin, *rugosus*, which means rough, and *pachyderma*, suggesting the skin is elephant-like.

Availability: These were imported directly from Thailand by Maidenhead Aquatics in Farnborough North.

Price: Surprisingly cheap at around £3.50 each.

Matt Clarke

Fact File

Common name: Brown betta

Scientific name: *Betta fusca*

Origin: Pekanbaru, Central Sumatra.

Habitat: Pools and flowing water courses.

Size: 11 to 12cm/4¾".

Diet: Zooplankton, insects and insect larvae. Aquarium fish do very well on virtually all prepared foods.

Aquarium: Needs to be kept with fishes of a similar size, as all fish can get boisterous and small fish might suffer. Keep in pairs or trios - I have pairs in 45 x 25 x 25cm/18 x 10 x 10" tanks, where they spawn and release fry.

Water conditions: pH on the neutral side or slightly alkaline. Lower than pH 6.0 is not really necessary, but don't let it get too much higher than pH 7.5. Keep the nitrogen cycle and stable pH. High temperatures are also unnecessary; 24-26°C/75-79°F is fine. Filter the water well.

Breeding: Paternal mouthbrooders. The fry hatch and are released after two to three weeks. The female initiates spawning and becomes the dominant fish. She chooses a site, often under cover or a pipe or pot, but also with a smooth base like a piece of slate. Her lateral stripes pale and her belly turns a creamy colour.

The male has green iridescent scales on the gill cover, which intensify in colour, as does the body which deepens to a rich reddish-brown colour.

The female pushes the male into the spawning site and swims across his back. He stays on the site as she swims into his body. He bends his body to accommodate her and they embrace at the base of the tank. The eggs are released and sit in the trough the male forms with his anal fin; the female gathers these up in her mouth and spits them to the male. The whole process of spawning can take two to three hours.

Once complete, she retreats and defends the brooding male for a few days before losing interest. Once released, fry take coarse food.

Notes: The male may take several spawns before holding the eggs for the full term.

Availability: Becoming more common, both in shops and in the Anabantoid Association of Great Britain, as they are easy to keep and breed.

Price: Around £7 per pair.

Andrew Smith

Shoptour

We visit some of the aquatic shops in **North Wales**.

Rhyl Aquaria

What we think

This clean, friendly family-run shop has a fairly simple range of tropicals, and caters more for the average fishkeeper rather than the specialist specimen hunter, although there were a few tanks of more sought-after fish in stock when we visited. Everything looked in good health, and the [illegible] [illegible] [illegible] [illegible] [illegible] section which includes some [illegible] soft corals and [illegible].

4-8 Abbey Street, Rhyl, Denbighshire, North Wales LL18 1NY. Tel: 01745 [illegible]

Open: Mon-Sat 10am-6pm, Sun 11am-4pm.

Directions: Travelling along main promenade (sea on right) past Woolworths, take third turning on left into Abbey Street, proceed 200 yards, we're on the left.

Aquaria: 8 Discus tanks, 70 tropical tanks, 16 coldwater tanks and vats, 5 marine tanks and 2 invert tanks.

Specialist stock? We have a good selection of cichlids and community fish.

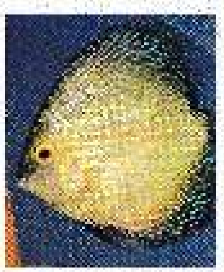
Water parameters: pH 7.4-7.7, GH 6-7 (tapwater), pH varies from 6.5-8.4, depending on stock.

Quarantine facilities? 24 quarantine tanks. All fish are quarantined for at least 5 days.

Is there a guarantee on livestock? 48 hours, subject to water tests.

Future plans and developments: We plan to refurbish the main shop and extend the fishroom to include more tropical, Discus and marine fish as well as inverts.

Best fish on our visit: Mainly a good selection of community fish here, plus some nice marines: Zebra moray eel £50; colourful locally bred killifish £2.50 each; *Scleropages* [illegible] £4.75; *Pterois* [illegible] £1.75; Whirlpool [illegible] £8.95; *Macropharyngodon* wrasse £19.95; well-priced soft corals and polyp colonies.



Meet the expert

Gareth Pritchard

[illegible] since 1970.

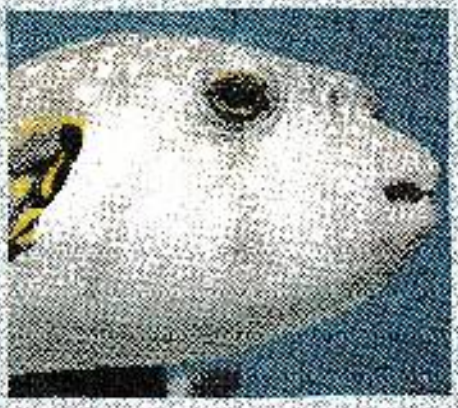
[illegible] [illegible] Keep Discus.

"[illegible]"

[illegible]

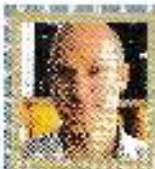
Meet the expert

Sea World Aquatics



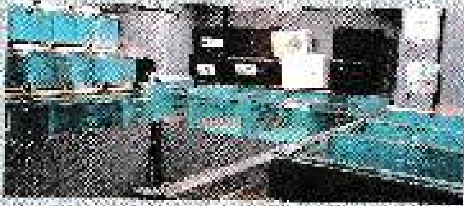
Meet the expert

Moreton Park Garden Centre



Meet the expert

Alison's Aquarium



Best fish on our visit: A few slightly more unusual fish here, as well as a good range of bread and butter fish. We particularly liked the Snake channa £10.95, baby Tiretrack eels £4.99, Chocolate gouramis £2.99, Jaguar cats, [illegible] £23, and Green knifefish, *Eigenmannia virescens* £9.99.

There were also [illegible], *[illegible]*, in the coldwater room, and some baby *[illegible]* £[illegible] (you need a licence to keep these now, however).

What we think

This tiny shop had a wide and interesting selection of healthy freshwater and some nice looking tropical fish on [illegible]. The small showroom and tanks at the back had a good range of fish, which all looked in good health. The marine selection is also pretty good, with quite a good selection of [illegible] growing species for [illegible] systems as well as the more common [illegible] fish and basic invertebrates. Parking nearby is tricky.

selection of catfish. Good range of dry goods.

Water parameters: pH 7.4, ammonia 0, nitrite 0, nitrate 50ppm.

Quarantine facilities? 20 tanks.

Is there a guarantee on livestock? 48 hours.

Future plans or developments: To revamp coldwater area and to expand the reptile and amphibian areas.

Best fish and inverts on our visit: Red Sea *Heniochus* £29.99, Lantern bass £[illegible]; *Centropyge* [illegible] £99.99; Arc-eye hawkfish £19.99; Marble headstanders £11.99; Sparkling gouramis £1.99.

What we think

Some very nice fish on show here, with a particularly good [illegible] [illegible]. The manager tries to get some more unusual marine stock in if he can, and there was certainly plenty of choice of both fish and inverts on our visit. Very clean with enthusiastic staff. Also stocks reptiles and associated equipment.

Aquaria: 46 tanks, all freshwater – Alan doesn't stock marines, but can offer advice on them.

Specialist stock? CO_2 and plant specialist. Tropica plants, the full range of Sera products.

Quarantine facilities? I quarantine all my fish before selling to my customers.

Best fish on our visit: Threadfin rainbows £4.99 a pair, Amano shrimps £1.99. There were also some of the best plants on sale we've seen...

What we think

A little shop compared to some we've visited, but what a find. Proprietor Alan has a wealth of knowledge on aquarium plants and [illegible] [illegible] [illegible]. The [illegible] [illegible]. Tropicals are kept using high [illegible] [illegible] the same way as Tropica in Denmark [illegible]. He says they [illegible] [illegible] better [illegible] the customer's, [illegible], [illegible] checking out and listen to his advice!

[illegible]

PFK Dyed Fish Campaign

Help us to stop the cruel trade in dyed fish by encouraging your dealer to sign our "we won't sell dyed fish" pledge.

So far, [illegible] stores have signed our pledge not to stock dyed fish – that's around 25% of the UK's aquatic shops. We're adding more shops on a daily basis and need your help to hit 100%. Listed below are the most recent additions to the campaign, but you can see the full list online www.practicalfishkeeping.co.uk/campaignmembers/ or by browsing the shop's entry on our Fish Shop Finder – the UK's biggest searchable directory of aquarium and pond outlets.

If your local store isn't listed on our website, please try and persuade them to sign up, either by filling in the form below, or following the instructions on the campaign page on our website.

If you're a dealer, can you afford not to be listed?

PFK Dyed Fish Campaign

Please sign and send your form to: PFK Dyed Fish Campaign, Practical Fishkeeping, Bretton Court, Bretton, Peterborough PE3 8DZ.

PFK DYED FISH CAMPAIGN

As the proprietor/owner/manager of the shop listed below, I pledge not to knowingly stock or sell dyed fish of any species.

Name of shop ....

Address of shop ....

....

....

Postcode

Telephone number ....

Name (print) ....

Signature ....

- [illegible] Aquatic Centre
- Triangle Aquatics
- The Living Seas
- [illegible] Tropicals
- [illegible] Aquaria
- [illegible]
- Pet Centre
- [illegible] Garden Centre
- Fins & Things
- Fishy Business
- [illegible] Aquatic Centre
- [illegible] Garden Aquatics
- Fish 'N' Friends
- Fish Alive
- [illegible] Aquatics
- [illegible] Ltd
- [illegible] Wildlife
- Koi [illegible]
- [illegible] Pet & Aquatic Centre
- [illegible] Aquatic Kingdom
- World of Water, Swindon
- [illegible] Aquatics Ltd
- World of Water, Cardiff
- Cheshire Waterlife Ltd
- Fishy Business Ltd
- [illegible] for Aquatics & Gardens
- [illegible] Tropicals
- World of Fishes
- Aquatica
- Aquatics Direct Ltd
- [illegible] Aquatics
- East Ham Aquatics
- [illegible]
- Westway
- [illegible] Waterlife, [illegible]
- [illegible] Garden & Aquatic Centre
- [illegible] Aquatics
- [illegible] Aquatics
- [illegible] Pets
- [illegible] Garden Centre
- Aqua [illegible]
- Fish Are Us
- Little Fish Shop
- [illegible]
- World of Water, Reading
- Stanley Pets & Aquatics
- [illegible] Aquatics
- Mill Aquatics, Swanley
- [illegible]'s Aquatic Centre
- Mill Aquatics (Cross Hands)
- The Coral [illegible] Aquatic Centre
- [illegible] Aquatic & Pet Centre
- Coventry Aquatics
- Emperor Tropicals
- The Aquarium
- Castle Aquatics
- [illegible] Aquatics
- [illegible] Aquatics
- [illegible] Aquatics Ltd
- [illegible]
- [illegible]
- Waterworld
- [illegible] Nurseries
- [illegible] Water Gardens
- [illegible] Water Gardens
- The Water Pot
- Kingfisheries Aquarium
- [illegible] Garden World
- [illegible] Aquatics
- Kings Lynn [illegible]
- Worthing Aquatics
- [illegible] Aquatics
- Aquatic [illegible]
- Crystal Waters
- [illegible] Tropicals
- [illegible] Place
- The Real Fish [illegible]
- Beaver Aquatics Ltd
- Fish [illegible] Ltd
- [illegible] Delight Aquatic Centre
- [illegible] Aquatics
- Matlock Garden, Waterlife and Pet Centre
- [illegible] Aquatics
- Castle Aquatics
- [illegible] Pets
- [illegible] Aquatics
- [illegible] Aquatics
- [illegible] Aquatics
- Wetpets
- Aquapets Northwest Ltd
- Aquapets Ltd
- World of Water, [illegible]
- Wayside Water Gardens
- Fins 2000 Aquatic Centre
- Aquatic [illegible]
- [illegible] Farm Water Gardens
- Monument Aquatics
- [illegible] Ltd