AQUARIST & PONDKEEPER

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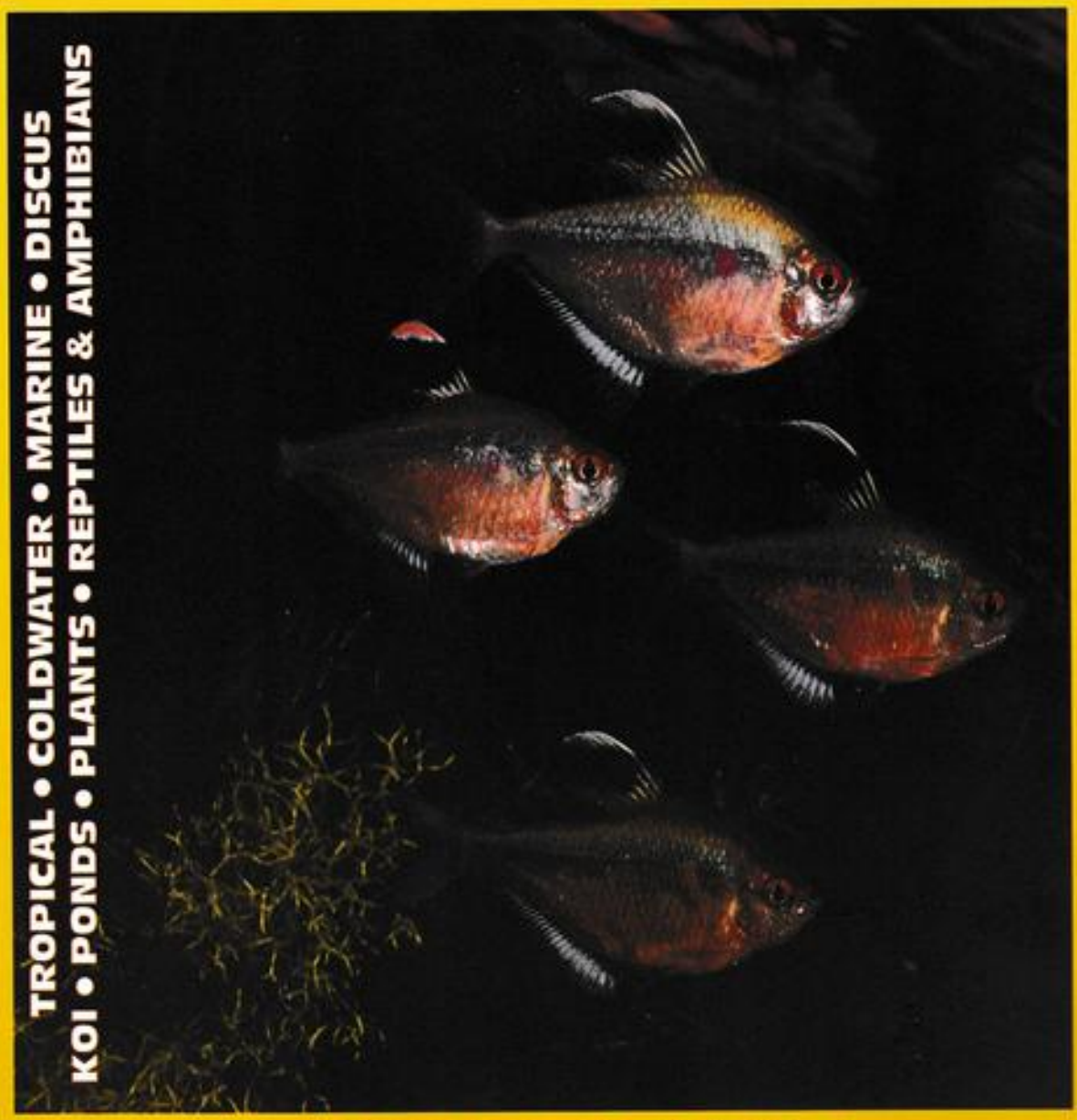

TROPICAL • COLDWATER • MARINE • DISCUS
KOI • PONDS • PLANTS • REPTILES & AMPHIBIANS

Fishkeeping at its best

APRIL 2000
VOL 64 NO 10

AQUARIST & POND KEEPER

EDITOR
Derek Lambert

ART EDITOR
Mick Beeken

ADVERTISING
Lisa Cooper
01622 630469

PUBLISHER
Andrew Standing

PUBLISHED BY
Inline Magazines Limited,
Suite 4, Invicta Business
Centre, Orbital Park, Ashford,
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CHIEF EXECUTIVE
Nick Richardson

FINANCIAL DIRECTOR
Dave Wing

MARKETING DIRECTOR
Alan Hulyer

TELEPHONE:
SUBSCRIPTIONS,
PRODUCTION
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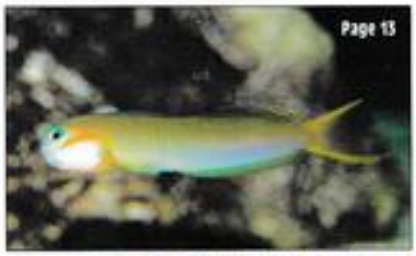

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GENERAL

NEW! **BLUE PAGES – Your Essential Guide to Fishkeeping**

COVER PICTURE

Socolof's Bleeding Heart Tetra (*Hyphessobrycon socolofi*). COVER PHOTOGRAPH: AREND VAN DEN NIEUWENHUIZEN

This fish is far more commonly seen in aquarium shops than the true Bleeding Heart tetra (*Hyphessobrycon erythrostigma*). It makes an excellent community fish which can be combined with other peaceful fish such as small cichlids, corydoras, tetras, and small barbs. They prefer to live in groups so keep at least four together rather than just pairs or single fish.

They prefer soft slightly acidic water but can cope with other water conditions if they are given enough time to adapt. For this reason it is important to only buy fully acclimatised fish from a local aquarium shop. If you do have to purchase some from a shop in a different water zone (there are thousands of these around the U.K.) make sure you recreate the shop's water conditions in your quarantine tank before you release them. Over the next two weeks you can gradually change them over to the water conditions in which they will be permanently living.

They eat all foods and will survive quite happily on a diet of flake with the addition of live Bloodworm or Daphnia once a week. The temperature should be in the 73-81°F range, with 78°F being ideal. Good water quality is important so regular partial water changes must be carried out.

This beautiful tetra appears at first glance to be very similar to the normal Bleeding Heart tetra, although it grows to only two inches (5cm) and the male's dorsal fin is far less extended. The differences, however, don't stop there. They breed differently.

Socolof's Bleeding Heart, in common with most tetras, is a prolific egg scatterer which has been commercially bred for years. The true Bleeding heart tetra has defied all commercial breeders' efforts to breed it and those of talented amateurs have also met with failure. Why this should be remains a mystery as virtually all the other similar looking tetras from this part of the world have been successfully bred now.

For anyone wishing to try breeding Bleeding heart tetras a useful piece of information is that they are usually collected in the Rio Napa, Peru where the water usually has a pH of 5.8. This is much lower than many other tetras require but might be the key to breeding them.

What's in a name?

Many fish have been named after people, but Socolof's Bleeding Heart tetra has been lucky enough to be named after one of the most interesting characters in the aquarium hobby. Ross Socolof first caught the fish bug about 70 years ago when his cousin Carl Kaplan came to live with his family in New York. Carl was already a dedicated fish fanatic and his passion soon rubbed off on six-year-old Ross. The Brooklyn basement which became their fish room soon filled up with home-made, usually slightly leaking, aquariums (made from concrete with a glass front) and before long they were supplying surplus fish to all their local aquarium shops.

Carl was also a keen competitor and the house soon filled up with trophies. In those days the Greater New York City Aquarium Society gave first, second and third place medallions at their shows. These were made out of REAL gold, silver and bronze. Needless to say few of these have survived to this day and Ross says he would happily trade his dog (or even a grandchild) for one!

Ross eventually became a commercial fish farmer in Florida and created the Gulf Fish Hatchery eventually selling up in 1963. By 1966 he was back in the business, this time as Ross Socolof Farms. In association with PETCOA he built up a huge fish farm which supplied a national network of pet shops with high quality fish. Later mammals, reptiles and amphibians would be added to the range of animals this farm produced.

Since new and rare fish species were always in demand, Ross explored many parts of the world searching for new fish to introduce to the aquarium hobby. His many exploits around the world are told in *Confessions of a Tropical Fish Addict* and despite his advancing years and supposed retirement he still treks off into jungles whenever he can in search of something new.

So next time you see a cichlid or tetra with *socolofi* as its species name you will know a little about the man who the fish was named after — a remarkable explorer and aquarist who for the past 70 years has been at the cutting edge of the aquarium hobby.

EDITORIAL

Well, some people are never satisfied! After carefully searching through my archives to find a suitable photograph to go with my editorial, my publishers have said that it was not quite what they had in mind. I suppose it was the hat, so after another arduous search I have come up with a better one of me fishing in Media Luna, Mexico (minus a hat).

This fascinating habitat is full of beautiful cichlids, livebearers, killifish, etc. Many of them are found in only a few springs in this area of Mexico. To take a good look at them you can snorkel in the crystal clear water for hours, whilst watching cichlids care for their babies, beautiful blue mollies court their females and killifish dart in and out of the plants. A truly wonderful scene to behold!

April is the time of year when our garden ponds really start to come alive and we have several pond features for you this month. Ann Telford kicks off a new occasional series on pond filtration by answering the question why we need clear water in our ponds. Peter Skinner starts a series on building your garden pond and after many years in the trade as a professional pond builder he has plenty to teach all of us.

You will also see a new section in this magazine aimed specifically at new fishkeepers. *A&P* has always had features for beginners in it but sometimes spotting them has been a little difficult. With our Blue pages we hope to make it easier for the newcomers to home in on features specifically designed for them, but remember some of these will be of interest to aquarists of many years standing as well.

Until next month ...
Happy Fishkeeping.

D. Lambert

DEREK LAMBERT EDITOR

E-mail Address: aandpeditor@btinternet.com

AQUAZOO COMPETITION
Great prizes and easy to enter!

In this edition of A & P you will find a 4 page insert for Aquazoo.
Visit the Aquazoo website at PRIVATE HREF="http://www.aquazoo.co.uk/competition" MACROBUTTON HtmlResAnchor www.aquazoo.co.uk/competition and match the 3 pictures on the website with 3 pictures in this edition of A & P.
Full details of how to enter can be found on the website.
Good luck.

THE PRIZES ON OFFER ...

1ST PRIZE
★ Two nights in a top London hotel. A night out at the theatre and a VIP trip to the London Aquarium

2ND PRIZE
★ 10 of these to be won: AQUA TEST KITS (contains nine different tests). RRP £59 each

3RD PRIZE
★ 10 of these to be won: 10 pairs of free tickets to the London Aquarium

TROPICAL

ROY OSMINT explains how the labyrinth is an essential part of every aspect of a Gourami's life — from where it lives to how it breeds:

PHOTOGRAPHS: AREND VAN DEN NIEUWENHUIZEN

LABYRINTH

According to my trusty dictionary, the word labyrinth is principally defined as a "maze-like network of tunnels, chambers or paths either natural or man-made". This being the case, it is perhaps not too surprising that I have on a number of occasions been approached by non-fish-keeping acquaintances or newcomers to the hobby to provide some information on the seemingly strange natural habitat of that popular group of aquarium inhabitants commonly known as Labyrinth fishes.

This is a perfectly reasonable misunderstanding! After all, on the face of it the term might well be taken to suggest that these creatures exist in some sort of complex or intricate subterranean environment which perhaps never or rarely sees the light of day. The mystique and fascination of such a notion undoubtedly often adding to the misconception.

In fact nothing could be further from the truth! Not that they are not fascinating, they most certainly are! Not that the labyrinth referred to is not intricate and complex, it unquestionably is! But the appellation has no direct relevance to the circumstances of where the fish lives — but more particularly to how it lives!

Let us then take a detailed look at labyrinth fishes. Why are they so different to all other species? What are their secrets? By gaining an appreciation of their true nature and the way in which they function, our enjoyment of these enchanting aquarium subjects will inevitably be much enhanced.

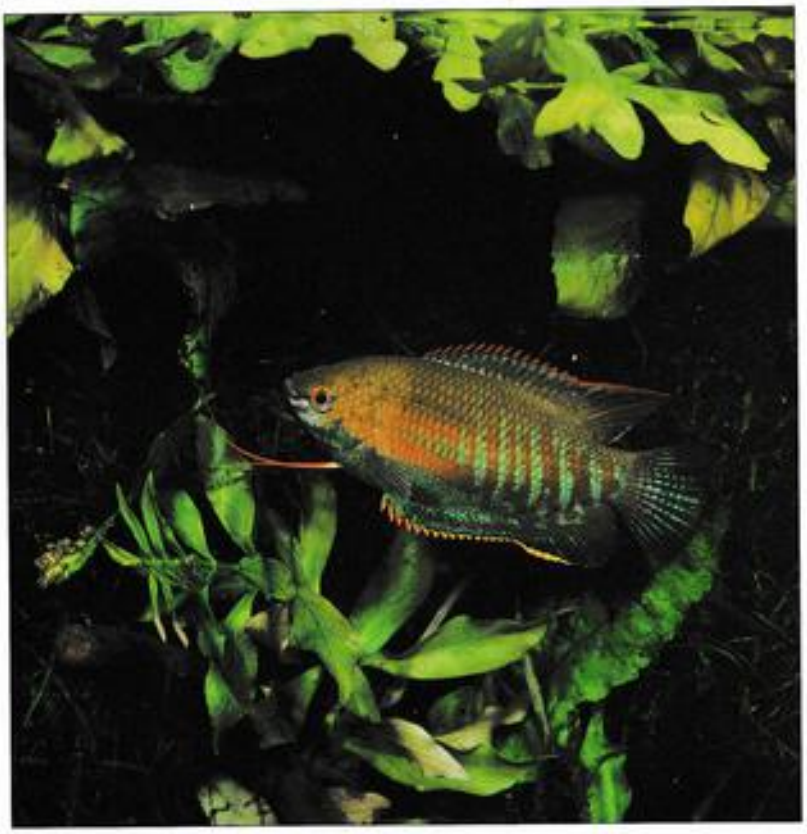
Distribution and form

Labyrinth fishes are members of the suborder Anabantoidei with a wide natural freshwater distribution covering many regions across Asia, from the Indian Peninsula through to China and Southwards into the Philippines and the Malay Archipelago. They are also found throughout most areas of Africa South of the Sahara Desert.

Although this distribution span is extensive, no single species reaches completely across the whole range, with some forms being extremely localised.

Representatives of the suborder, long and justifiably beloved by aquarists for their fascinating behaviour and beautiful coloration and markings, include the many popular forms of gourami, fighting, Combtail and Paradise fishes.

As a group they range in size from the relatively small Crescent Betta (*Betta imbellis* — see last month's Month Planner), reaching a maximum of about 5.5cm, to the comparatively huge Giant gourami (*Osphronemus goramy*) which can attain a length of up to 60cm.



Without doubt, however, the family's most characteristic and remarkable feature, one that sets it apart from most other fish varieties, is an ability to breathe air directly from the atmosphere. This is made possible by the presence of a complex accessory breathing organ commonly known as the labyrinth. It is as a direct consequence of this mechanism that Labyrinth fishes derive their name!

Additional respiration

Observe closely a typical Labyrinth fish for a few minutes and a particular pattern of behaviour will quickly become apparent. The fish will be seen to make frequent and fairly regular visits to the water surface where a gulp of air will be taken.

If you were now to watch another Labyrinth fish in a different aquarium where the water temperature was lower or higher, the frequency of surface visits would be likely to vary.

In what might loosely be described as normal circumstances the fish will average about four gulps every minute. This will increase where the water temperature is higher and decrease where lower. The reason for this being that as the temperature of water rises the quantity of dissolved oxygen within it reduces. Conversely, cooler water has a greater oxygen content.

It is important to remember that the labyrinth is an auxiliary breathing system, standard gill respiration also taking place in the usual manner. It would be true to say that some Labyrinth fish have come to rely on their supplementary apparatus more than others, but certainly many species would effectively die from drowning if denied the opportunity of surfacing for too long.

Why then have these fishes been endowed with a dual breathing system when most others manage perfectly well simply taking oxygen from the water via gills in conventional fashion? I say "most others" because labyrinths are in fact not the only fishes able to take in atmospheric air. They are, however, with the possible exception of the primitive Lungfishes, the ones with the most efficient equipment in this respect.

The answer is, of course, in their natural environment they tend to inhabit waters seasonally deficient in oxygen. Weed choked ponds and streams, muddy drainage ditches, flooded paddy fields and clouded irrigation channels are among the habitats in which they are found. Places where gill reliant species could not hope to survive!

The labyrinth therefore presents a perfect example of the way evolution, through radical adaptation and modification, has enabled these fishes to flourish in an otherwise hostile environment.

The vital organ

The structure known as the labyrinth consists of a number of concentrically arranged bony plates covered by a layer of folded skin located on either side of the gill chamber. The plates are attached to a bony base which is itself connected to the upper end of the fourth gill-arch.

The membranous covering, which is of vascular nature, that is to say possessing many small blood vessels, is supplied with blood by an offshoot of the fourth afferent branchial artery. The outward conveying blood vessel for the organ is attached to the dorsal aorta.

The interior of the labyrinth is kept constantly moist. This is essential to enable the vital respiratory gaseous exchange to take place, a function possible only when in solution. This basic fact applies to any breathing apparatus, be it labyrinth, lung or gill.

As the fish breaks the water surface a gulp of air is taken in and automatically pressed into the labyrinth organ. The numerous surface blood vessels facilitate the gaseous exchange where oxygen is absorbed directly into the blood stream and carbon dioxide waste expelled. The de-oxygenated air being released as a single bubble.

It is worth remembering in this connection, that although these air breathing Labyrinth fishes will not necessarily become distressed or suffocate in overcrowded or poor quality aquarium condi-

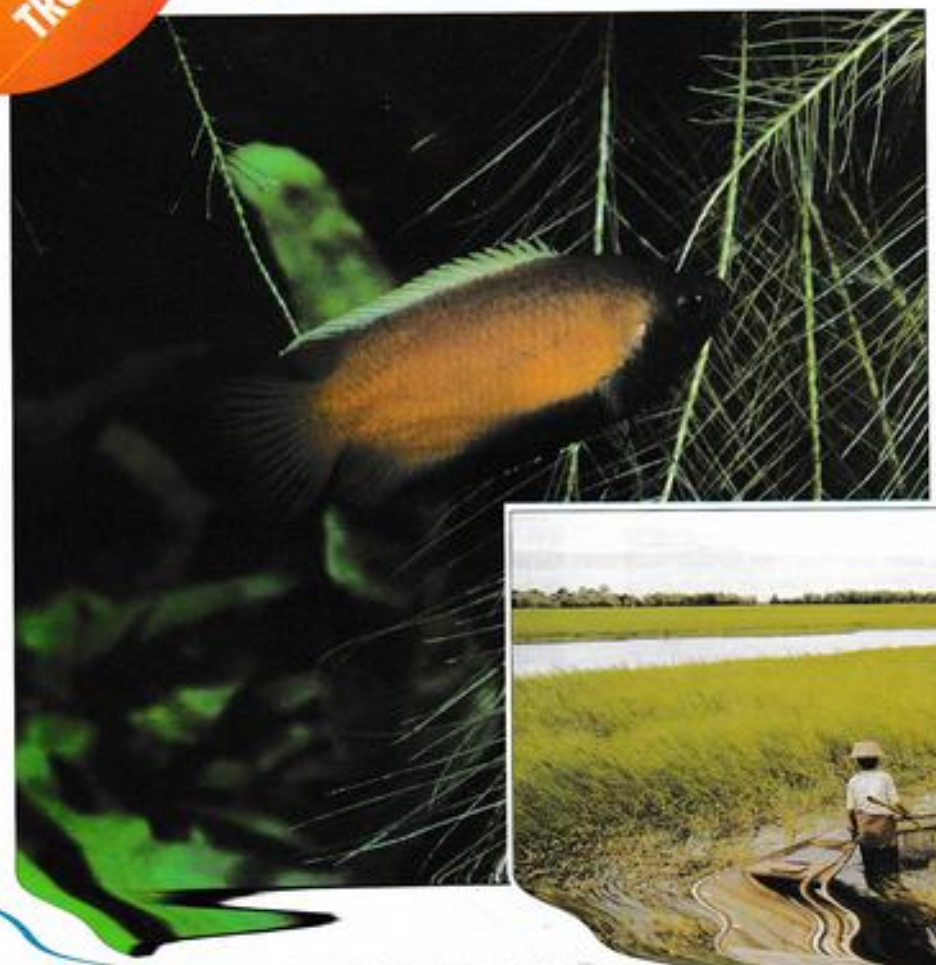
above far left As a group Gouramis range in size from 5cm to the comparatively huge Giant Gourami (*Osphronemus goramy*), which can attain a length of up to 60cm.

far left The Thick-lipped Gourami (*Colisa labiosa*) grows to about three inches (7.5cm) and is an ideal inmate for medium sized community aquaria. This species may spawn in an upturned flowerpot as well as at the surface. Males always build a bubblenest, however, and use plants in its construction to add strength.

left The Dwarf Gourami (*Colisa lalia*) has been bred in many different colour forms. The blue form is one of the most popular now and was first bred by Mr Tan Guk Eng of Singapore in 1978. Other common forms seen include red and orange, both of which were also developed by the same breeder.

TROPICAL

LABYRINTH



left The Honey Gourami (*Colisa chuna*) often looks a plain grey colour with a dark stripe along the body in aquarium shops. Once settled in an aquarium the male's true splendour can be seen. At two inches (5cm) this species is ideal for a small fish community aquarium.

below A typical Gourami habitat. This one in Thailand contains Three-spot Gouramis.

of gills in conventional animals, labyrinth organs enable the fish to obtain oxygen from the water.

The significance of this being, that I have in the past come across fishkeepers who have introduced labyrinths to an already overpopulated and consequently oxygen depleted aquarium, in the belief that because of their unique air breathing capabilities no harm will result.

The truth of the matter is, of course, that in all probability no harm will come to the labyrinths themselves! But what about the other community members that do not have the luxury of an auxiliary breathing system to fall back on? They are likely to succumb quickly to the rapidly deteriorating conditions!

Allowing the absorption of oxygen from atmospheric air is not the labyrinth organ's only function. With some exceptions, at spawning time members of the Anabantoidei family build intricate nests consisting of countless tiny mucus-covered bubbles into which their eggs are deposited. The labyrinth is also instrumental in this process!

Bubble-nesters

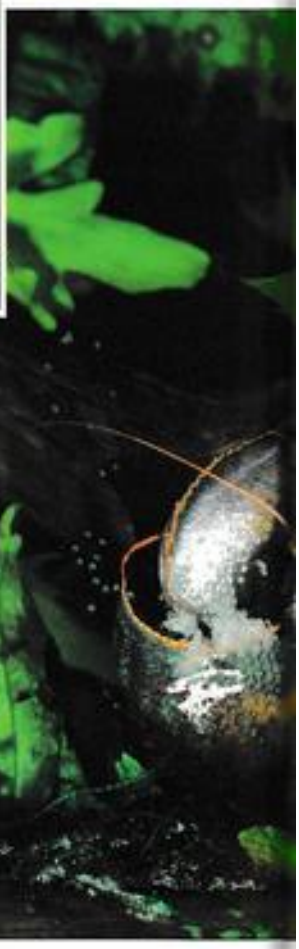
Although the size, location and construction of the nest as well as the actual spawning ritual may vary from species to species, a typical pattern can be described.

The nest is built by the male fish by the
which is coated by a mouth secretion. This
In most species it will be located at the wa
size from 4 to 13cm in diameter. The struc
shape and can sometimes rise to some 5cm
Nest construction can begin at any time
will commence his labours even in the abs
indeed any female at all. For the aquarist w
now is certainly the time to introduce one.
The foamy nursery is frequently located
with plant debris often utilised to reinfo
structure. Where a suitable female fish is p
time, is likely to break off from his work to

LABYRINTH

left The nest is built by the male fish blowing bubbles, each of which is coated by a mouth secretion. In most species it will be located at the water surface although here we can see a male *Colisa fasciata* blowing his nest under a plant leaf.

below The male wraps himself round her in a circular or U-shaped embrace. The pair now begin to slowly fall through the water. As they descend the female releases a batch of eggs which are immediately fertilised by the male. This is a pair of *Colisa labiosa* mating.



does by parading around with fins flared and swirling and greatly intensified colours!

When the nest is completed to a suitable standard the male fish will endeavour to entice the female beneath it to spawn. If she is ready and so inclined this may occur with a minimum of fuss. In many instances, however, she may demonstrate initial unwillingness. This is where trouble can commence!

The male will try to force his attentions upon the female by pursuing, bumping, butting and generally jostling her. This can become extremely violent, to the point that if no available cover exists in which she can seek sanctuary, she may be harassed to total exhaustion or in some instances even death.

Aquarists engaged in a spawning programme should monitor the situation carefully at this stage. Certainly there is no need to take action at the first sign of boisterousness, this is perfectly natural. But if things start to get really rough with no sign of the female submitting, better to remove her to safety for the time being and introduce another, potentially more obliging, partner!

Eventually, when ready to mate the female takes up a position beneath the nest and indicates her intentions with a side to side swaying motion of the body. The male responds by wrapping himself round her in a circular or U-shaped embrace. The pair now begin to slowly fall through the water!

As they descend the embrace tightens and with bodies quivering the female releases a batch of eggs which are immediately fertilised by the

male. This is the trigger for the couple to break apart, gather up the eggs in their months and swiftly spit them into the safety of the foamy nest.

In some labyrinth species the eggs are in fact lighter than water. Following release and fertilisation the majority automatically float upwards directly into the nest. The parents simply gathering up any stragglers that happen to miss the target.

This complete procedure can be repeated many times until all the eggs have been laid and deposited. Depending upon species this can amount to well over 500 in total.

During this latter period the male and female have been working together as a team ensuring that all the eggs reach the relative safety of the nest. Once this has been achieved, however, the whole attitude of the male fish quickly changes!

The female's assistance no longer required

No longer is the female's assistance required or tolerated. Her job done, she is now regarded as a nuisance or a threat. Whilst actively engaged in making necessary repairs or modifications to the nest structure the male fish drives her away from the site, often in extremely violent fashion. For her own safety, in all but the largest aquaria, she should now be removed.

Hatching of the eggs, on average, takes about three days, depending upon species and water temperature. The fry are extremely small at this point and will require the very finest of foods, starting with infusoria or a liquid fry food.

Soon after the free-swimming stage is reached it is a good idea to remove the male fish. Although for a while he is likely to demonstrate attentive parental responsibilities his mood can again quickly and suddenly change!

Although the labyrinth breathing organ in the young fishes starts to develop immediately, this is a gradual process, it will not become fully functional for about four weeks. As the fry mature, however, the apparatus quickly takes on an indispensable respiratory roll — just as for their parents!

To the aquarist these eminently graceful and exquisitely beautiful fishes have understandably long remained a source of fascination and wonder. This, in no small way, is due to the remarkable labyrinth mechanism that has evolved to not only allow life-giving breath to be drawn in an oxygen deficient natural environment, but also to afford the next generation the best possible start in a relatively safe and secure oxygen-rich nursery!

above Gold Gouramis (*Trichogaster trichopterus*) are a man-made colour form of the Three-spot Gourami. This species grows to about four inches (10cm) and is a hardy community fish ideal for a medium sized aquarium.

News Desk ... News Desk

IN BRIEF ... IN BRIEF ... IN BRIEF ... IN BRIEF

A SURFER'S DREAM?

"Huge polar wave rules southern weather", or, "How's this for the biggest automatic water-change ever"?

It sounds like a surfer's dream — an endless wave as high as a mountain — but sclentists in Australia have found exactly such a wave circling Antarctica. As big as the entire Australian continent and a kilometre (0.6 of a mile) deep, the wave endlessly circles Antarctica, takes eight to nine years to complete a rotation and, the scientists say, affects the weather in southern parts of Australia, South America, South Africa, New Zealand and the Pacific.

As it moves, the "Antarctic Circumpolar Wave", most of which moves under the oceans' surface, affects rainfall and climate by switching between warm and cold phases, changing sea surface temperatures to either a degree Celsius cooler or warmer than average. Colder sea temperatures mean less evaporation, less cloud formation and hence less rain.

The wave is also believed to interact with other large weather effects, such as El Nino/La Nina, enhancing or reducing the impact depending on the circumstances.

Brewed by a combination of varying Pacific Ocean water temperatures and atmospheric conditions, an unmodified El Nino produces dry weather in Australia and Southeast Asia and wet weather and floods on the west side of the Americas. Its sister effect, La Nina, produces opposite conditions.

Scientists are still piecing together information on the Antarctic effect, with tracking and analysis requiring satellites, instrumentation and powerful computers not available before the 1980s.

A cold wave in conjunction with an El Nino year would produce doubly dry conditions, a warmer wave in a La Nina year, which usually brings heavy rains to Australia, would produce doubly wet weather but a warmer wave may modify dry conditions from a Pacific Ocean El Nino.

This year, with the Pacific in a La Nina phase, the wave is credited with saving much of the southern world from greater downpours of rain and flooding than they might have had. A huge part of the southern world, from about 25 degrees latitude south, is in the weather domain of the wave including most of southern Australia much of Argentina, Brazil, Uruguay and Chile, all of New Zealand, part of Madagascar and most of South Africa and Namibia.

Australian scientists see an intricate link between the Antarctic Wave and the Pacific Ocean's El Nino/La Nina and an Indian Ocean effect called the Indian dipole. "Like a three-headed dog the challenge lies in predicting which head will bark the loudest," said Peter Baines, leader of the ocean modelling group at CSIRO Atmospheric Research.

Australia's climate was now known to be influenced by three oceans, the Pacific, Indian and Southern, Baines said. This year the polar wave, in its cold phase, is believed to have modified downpours from the fading La Nina effect. Australia's weather so far this year fits Baines' analysis. Persistent heavy rain in Australia's north Queensland has further damaged the region's sugarcane crop, while occasional flash floods hit parts of Queensland and north New South Wales.

DAMSELFISH HOMING

Various creatures in the animal world exhibit "homing" tendencies and all aquarists are aware of the best known examples, the Eel and the Salmon. However, here's another one for the aquatic list.

In the December 16 1999 issue of *Nature*, Matmijan scientists report the discovery that between 15 and 60 per cent of juvenile Damselfish return to the reef where their eggs of origin were fertilised. This discovery, if applicable to other species, could have profound effects on coral reef fishery management.

Acknowledgement: Both the above articles were taken from the October/December issue of Sea Wind, *the Bulletin of Ocean Voice International.*

'BEEF UP INDUSTRY STANDARDS', SAYS MICK SEABY

Ornamental Fish International (OFI) chairman Mick Seaby has drawn up a set of draft proposals for improving quality standards in United Kingdom aquatics outlets after recent television publicity highlighting "unacceptable animal husbandry issues."

Mr Seaby, managing director of Swallow Aquatics, presented his proposals for consideration by the Board of the UK-based Ornamental Aquatics Trade Association (OATA).

Mr Seaby, who is a member of the OATA Board, said: "It's in all our interests to ensure that all aquatic outlets trade at the highest possible standards with top rate water quality and animal husbandry conditions in place. I have asked the OATA Board to look at ways and means of bringing this about in an effort to avoid unfavourable publicity in the future by ensuring that our own house is in order.

"Fortunately the problems highlighted in recent months did not relate to an OATA member, but we need to keep it that way," stressed Mr Seaby.

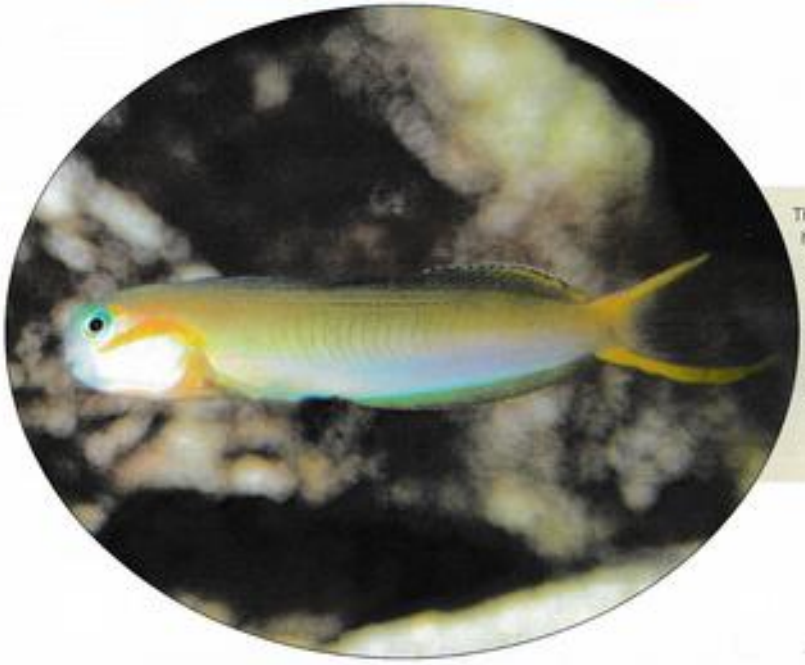
He continued: "OATA has a widely acclaimed Code of Practice in place, but we need to underpin and police this. I am confident that the Board will look at my proposals, improve upon them, and present members with both the ways and the means to stamp out untrained and negligent training practices.

"It's in all our interests to drive up standards in every we can and OATA is to be congratulated for working so tirelessly over the years to bring this about. But, as recent events have proved, there is no room whatsoever for complacency and I am certain that our members will welcome any new initiative to strengthen public confidence in the aquatics industry," said Mr Seaby.

In our regular feature on marine fish this month DAVE GARRATT focuses on Blennies:
PHOTOGRAPHS: MAX GIBBS UNLESS OTHERWISE STATED

MARINE

BLENNIES



The Midas Blenny hails from the Red Sea or the Indian Ocean and will quickly settle into captivity becoming a hardy and eager to feed addition to your tank.
PHOTOGRAPH: LES HOLLIDAY

Fish with Eye-lashes?

The Blennies comprise a large Family of over 300 species (Blenniidae) found throughout the world's tropical and temperate waters. They are inshore fish that spend much of their time hiding in their own bolt-hole retreat, usually a small rock crevice, which they will defend aggressively. They have either very tiny scales or no scales at all, thus giving their bodies a smooth appearance and leading to their rather unpleasant common name: the Slimefish.

Blennies are generally streamlined fish with long dorsal fins. They have elongated rays in their pectoral fins and these are used for perching when the fish is at rest. This is a distinguishing feature used to separate them for the superficially similar Gobies. The Gobies have pectoral fins that are fused into a disc that is used when adopting resting positions. A further distinctive feature of the Blennies is that many species have "furry tentacles" known as cirrhi above their eyes, giving the appearance of the fish having eye-lashes.

Breeding

Male Blennies are usually larger than their partners, they also tend to outshine them and may show colour changes just before spawning. Spawning occurs within the shelter of their crevice or under some suitable rock, the eggs being deposited in clumps and then guarded by the male. When hatched the fry join the upper planktonic layers, returning to their sea bed habitat when mature. Unfortunately raising the fry in captivity has not been successfully achieved yet.

Aquarium behaviour

Because of their natural habit of seeking out burrows or crevices it is essential that any aquarium housing them caters for this need. This point leads neatly onto a another trait that can cause problems in an aquarium, their highly territorial behaviour. The aggression with which they defend their own space is out of all proportion to their body size and innocuous appearance. They will not tolerate their own or similar species and although they generally tolerate unrelated fish they will even launch attacks on these fish if they stray too close to the Blennies' "home".

They are, however, perfectly safe with larger and unrelated fish and can also be trusted completely with sessile and mobile invertebrates thus making them a good bet for a reef tank. Tank mates should be cho-

BLENNIES: Fish with Eye-lashes?

sen with care as large, boisterous fish are likely to upset their somewhat laid back nature.

A good beginners choice

Blennies are relatively disease resistant when in captivity and show very omnivorous feeding habits. These two facts, together with their interesting and curious behaviour, are very good reasons for the beginner to consider these fish. This hardiness, however, is no excuse to ease up on tank husbandry as like most marine fish they will not tolerate poor water conditions. The Blennies show a diversity of feeding methods but many are browsers and they will readily adapt to tank life and feed with relish, even to the extent of foregoing their browsing nature and feeding in midwater close to their bolt holes. Diet can easily be catered for with a variety of frozen brine and mysis shrimp, finely chopped marine foods and marine flake.

Steer well clear

With such a large group of fish it is fairly obvious that only a very small percentage will be available to the hobbyist. What is also a certainty is that within such a large group you will see behaviour that differs markedly from the norm for that group. With the Blennies we have a classic example in the Sabre Tooth Blenny (*Axiodontus taeniatus*). When you look at this fish you would think it was a Cleaner

above left Bicolour Blenny — this four inch (maximum three inch tank size) Indo-Pacific species is perhaps the commonest Blenny seen for sale in the hobby. Here the cute furry tentacles which makes them look like they have eye-lashes can clearly be seen.

left Steer well clear! The Sabre Tooth Blenny looks like a Cleaner Wrasse but when the unsurprising victim presents itself for cleaning, far from performing the expected cleaning duties, the Sabre Tooth uses its razor sharp teeth to take a chunk out of the victim before making its escape.

Wrasse, as would any other fish looking for the services of a Cleaner — a big mistake!

The common name is the major clue as to the unpleasant habits of this species. When approaching another fish the Sabre Tooth looks very much like a Cleaner Wrasse and the unsuspecting victim will present itself to have its cleaning needs catered for. Far from performing the expected cleaning duties, however, the Sabre Tooth uses its razor sharp teeth to take a chunk out of the victim before making its escape. The offending fish can be distinguished from the true Cleaner Wrasse (*Labroides dimidiatus*) by its underslung mouth, as opposed to the terminally positioned mouth of the Cleaner. The under-slung mouth position is similar to that seen in Sharks thus suiting a fish that is certainly a bit of a shark by nature

Steer well clear — or not!

Another Blenny that I personally place in the "steer clear of" category is the Scooter Blenny (*Petroscirtes temminckii*) although most of the marine aquarists I know would disagree on this point. In my experience I have found the species very difficult to sustain beyond a tank lifespan of four or five months, suggesting perhaps a nutritional problem. I have had problems in otherwise successful tanks with very low stocking levels, hence removing any threat of competition for this nervous species, but even then the Scooter did not thrive. Because of its peaceful nature, quirky looks and interesting habits it is a great favourite of reef keeping aquarists. It must be me !

The Scooter Blenny is an Indo-Pacific species that will attain up to four inches in the wild but generally only half of this size in captivity. Many authors list it as an easy to keep bottom grazer, feeding on algae and tiny Crustaceans.

Commonly available species

BICOLOUR BLENNY (*Escenius bicolor*)

This four inch (maximum three inch tank size) Indo-Pacific species is perhaps the commonest Blenny seen for sale in the hobby. The front half of the fish is a grey/brown whilst the seldom seen rear end is a yellowy-orange. I say seldom seen rear because this generally retiring species habitually spends its time in a suitable crevice with just its front half visible as it surveys its domain. This may not sound too interesting a fish, but watching it reverse back into its home after a feeding foray, or reversing in and out of other potential new "homes" presents an amusing sight.

It does show bursts of activity, particularly when chasing off tankmates who stray too close to its territory, leaving its bolt-hole with surprising speed to accomplish this. The Bicolour can actually be quite vicious towards its own or similar species. The fish is omnivorous in captivity and is thus very easy to feed. Aggressiveness aside, its hardiness and safety with invertebrates makes it an excellent addition to a reef tank.

MIDAS BLENNY (*E. midas*)

Hailing from the Red Sea or the Indian Ocean this species is very similar to *E. bicolor* in respect to size, aquarium behaviour, aggression and feeding requirements. It will quickly settle into captivity becoming a hardy and eager to feed addition to the tank.

BANDED BLENNY (*Salarias fasciatus*)

An Indo-Pacific species showing a mottled grey/brown coloration of light and dark bands and spots. Like the species already mentioned it is a bottom grazer feeding on algae and small animals but becoming omnivorous and easy to feed in captivity. Like most of this family it has an elongated body shape and will reach about four inches in its natural state but perhaps only 75 per cent of this size in the aquarium. A peaceful, hardy, shy species that is safe with invertebrates but not hugely popular on account of its muted coloration and its tendency to spend a lot of time under cover.

Other species

Although a large family of over 300 species there are not a great many species seen for sale Others that are sometimes seen include the Red Lip Blenny (*Ophioblennius atlanticus*) and Lyre or Fork Tail Blennies of the *Meiacanthus* genus.

Conclusion

What the Blennies may lack in coloration and activity is compensated for by their hardiness, readiness to feed, general peacefulness (except towards similar species) safety with invertebrates and some quirky behaviour. They are ideal beginners fish that have also found a niche in the realms of reef tanks, thus appealing to the widest possible range of marine aquarists.

right The Banded Blenny is an Indo-Pacific species showing a mottled grey/brown coloration of light and dark bands and spots. It is a bottom grazer feeding on algae and small animals but becoming omnivorous and easy to feed in captivity.

Stepping Stones ... to Success

PHOTOGRAPH: KEITH LAMBERT

Q What is the correct pH range for my fish?

A Freshwater pH 6.5-pH 8; Marine pH 8.2-pH 8.4. However, certain delicate fish and invertebrates have specific requirements, so check before you buy any animal.

Q What is the correct temperature for my fish?

A Freshwater tropicals 70-80°F; Coldwater 55-70°F; Marines 75-79°F. Again some delicate species have very specific requirements, so read up on them before you purchase.

Q How many fish can I keep?

A For freshwater aquaria it is safest to work on surface area rather than volume. We recommend 12 sq inches of surface area per one inch of adult fish. This means you must take into account how big your fish will grow to, not just how big they are when you buy them.

Marines require a different method of working out the number of fish you can house in an aquarium. You need to work on volume here and one inch of fish to every six gallons of water is a safe stocking level for a reef style aquarium. Fish only tanks can house more fish, but the exact level will depend on how good your filtration system is. Again you need to find out how big your fish grow to rather than just measure how big they are now.

Ponds are usually calculated on volume and for a filtered pond you can house an absolute maximum of 100 inches of fish per 1,000 gallons. It is vital to remember this only works when you calculate it on the final size of your fish — not the current size. A six inch Koi will grow to 24 inches long and increase its weight 50-fold. This can happen very quickly and often leads to ponds becoming over stocked with fatal results.

Q How should I light my aquarium?

A Correct lighting is vital for plants, corals and other invertebrates. All too often beginners buy set-ups which are not designed to do what they want to. Make sure you have lighting designed for plant growing and ask your local aquarium shop for advice on marines.

Q Why can't I add fish directly to a new aquarium?

A When a new aquarium or pond is set up you should test for Ammonia and Nitrite every day. Initially you will see ammonia levels rise and then start to fall. Then nitrite levels will rise and fall. After this you can be sure your biological filters have developed a healthy colony of bacteria which will break down fish wastes.

During this initial period the aquarium or pond should not house any fish. Once these two poisons have peaked and dropped back to safe levels again you can start putting a few fish into your aquarium or pond. No more than four to start with followed by a slow build up in numbers over a period of months. This way you will avoid sudden spikes in ammonia or nitrite levels which will harm your fish.

Once your aquarium has become established it is still important to check for ammonia and nitrite every two weeks or whenever the fish look ill. Most health problems can be traced back to poor water quality so it makes sense to look at this first.

Nitrates will build up over a period of time and will also need monitoring. In some areas of the U.K. aquarists have been reporting high nitrate levels in their tapwater. If this is the case in your area you will need to find a way of reducing these before you use tapwater for topping up. A vegetable filter works very well given enough time, alternatively you can buy a water purifier specifically designed to remove nitrates.

Q Are live plants essential in a freshwater aquarium?

A The simple answer is no, but they are beneficial and we strongly recommend you grow some in all but exceptional circumstances. The reason for this is that they remove nitrate from the water. This pollutant is the end product of normal aerobic filtration and whilst at low levels it is unlikely to kill your fish, it will still stress them which can lead to health problems.

Two other important aspects to consider are:
(a) That they provide cover for your fish and create a more natural environment.
(b) Reduce the likelihood of algae becoming a problem.

Q Water changes — how much and how often?

A In freshwater aquaria you should change 10 to 20 per cent of the water weekly. If you live in a water area where chloromine is added to your tap water it is essential to add a water conditioner to the fresh water before use.

The ideal for marines is 20 per cent every two weeks. This will reduce nitrates to a safe level and replenish the vital minerals and trace elements. Never change larger volumes of water than this, however, as large water changes in a marine aquarium may cause osmotic shock or other problems which will harm fish or invertebrates.

Pond fish also benefit from regular water changes but here it is rarely practical to change large volumes on a regular basis. Even so regular water changes should be carried out and ammonia, nitrite and nitrate levels monitored regularly or whenever the fish look in distress. With enough growing plants in the pond nitrate should be reduced naturally and providing your pond is not overstocked or over fed, ammonia and nitrite should always read zero in a mature set-up.

A TESTING TIME!

MARC MACRAE puts testing kits under the microscope

Most test kits ultimately perform the same function — by using chemical reactions of one sort or another they colour a water sample to give a visual indication of the amount of the chemical that you want to identify. Obviously the quantities involved are very small and therefore accurate testing can be difficult. Also, although the manufacturer may state it is suitable for both, the chemical balance of seawater differs from that of freshwater, and so the test's accuracy in one type of water may be very different from that in another type.

Dry tablet tests have the chemicals held in what is a comparatively large volume of binder or filler that is used to form the tablet. To release the active ingredients the tablet must be shaken vigorously and if the results are to be consistent then each shaking must be identical.

In professional laboratories where this type of test is used, it is generally on an "odd one out" basis where there are many samples and the scientist is looking for the sample that is not the same as the others. The non-conforming test is then removed for further analysis. This mass testing is undertaken using a laboratory shaker, which gives the same agitation for the same period of time every time it is used. Now compare this with ourselves who will shake with a vigour and for a time that is determined in no small measure by hobbyist's state of mind, health and possibly recent alcohol input!

The same accuracy problems are found with any form of dry material such as powder, whether loose or encapsulated, and can be compounded if quantitative measurement is required by the hobbyist such as adding small spoons of material.

Liquid tests are often cheaper per test and by definition are more accurate as the problem of release of all the chemical from the binder does not occur but you must check the accuracy of the dispensing dropper. The best tests use pharmaceutical grade droppers, which give very precise measurement.

Once the accuracy of dosing the chemicals themselves is addressed then various other factors should be considered.

The intricacies of chemistry

It may be that your test kit isn't actually testing what you think it is. Because of the intricacies of chemistry it is often easier to test for something completely different which, by adding another chemical as part of the test procedure, will give the result you need calibrated in the desired parameter.

Alternatively, there are some chemicals in water that exist in exact proportion to others and it may be easier to arrange a test for the second substance. Both of these methods are quite legitimate procedures and can be very accurate. However, the chemist designing the test needs to know that he is dealing with a living, working aquaria and so, in some tests, whilst the test may well be accurate in laboratory conditions, testing pure materials, as soon as dissolved organic material is introduced (as in an aquarium!), the chemistry is completely thrown and the results become worthless.

The standard of accuracy of any test is denoted by its "standard deviation". This is how closely it can measure the parameter it is indicating, so if the colour scale is shown in graduations of say 2ppm (parts per million), and the standard deviation of the test is 10ppm, then the scale is meaningless. Similarly, a result of say 15ppm with a standard deviation of 10ppm means you haven't a clue as to whether you have 5ppm, 25ppm or somewhere in between!

A test that has a widely calibrated colourmetric scale can claim to be more accurate than one with a closer scale. Although it is obvious that the second one is better, subject of course to its reagents giving accurate results themselves, the fact that one will give a reading accurate to 5ppm whilst the former may be 1ppm out ironically means the less accurate one is legally more accurate!

You should always view the results in the way the instructions tell you. Looking down through a test tube will generally give a far deeper colour than looking across it. View your sample in the same light each time, which should be as bright as possible as the human eye is not good at differentiating between colours at low levels of illumination. I prefer to do the tests in the kitchen, which has white (colour temperature 3500°K), fluorescent lighting and a nice white cupboard to view tests against.

Remember your own possible failings

Try not to take your reading against an ordinary tungsten light bulb. Also remember your own possible failings! Your own eyesight may well have defects that accentuate colours unevenly, so the next time your eyes are tested ask the optician to look at your colour perception as well as your ability to focus. Even the colourmetric scale should be viewed with suspicion! I recently took three boxes from the same manufacturer and put them side by side and because of variations in the printing process or exposure to light the colours on the boxes were quite different.

Many test kits use standard "textbook" chemistry, which is more suited to the laboratory than the aquarium. Good tests use specifically designed chemistry giving colourmetric scales which are relevant to us. After all there is really no point in measuring nitrite above 1ppm as everything is probably dead anyway, so why make a test which has a scale going to 5ppm or 10ppm when the real accuracy is needed at 0.05 and 0.1. Similar situations arise with ammonia, phosphate, nitrate, etc.

I prefer to plot results on a graph rather than draw up tables as, in general, our sort of testing should be used to indicate trends. Remember, too, that the taking of any measurement, unless undertaken at the same time of day and under the same circumstances, normally does not serve any real purpose. For instance, the pH will vary widely during any 24 hour period and low levels of nitrite will probably appear briefly shortly after feeding. Obviously if you suddenly notice something that is very wrong in the aquarium you should immediately undertake testing to see if it is poor water quality that is the cause of the trouble.

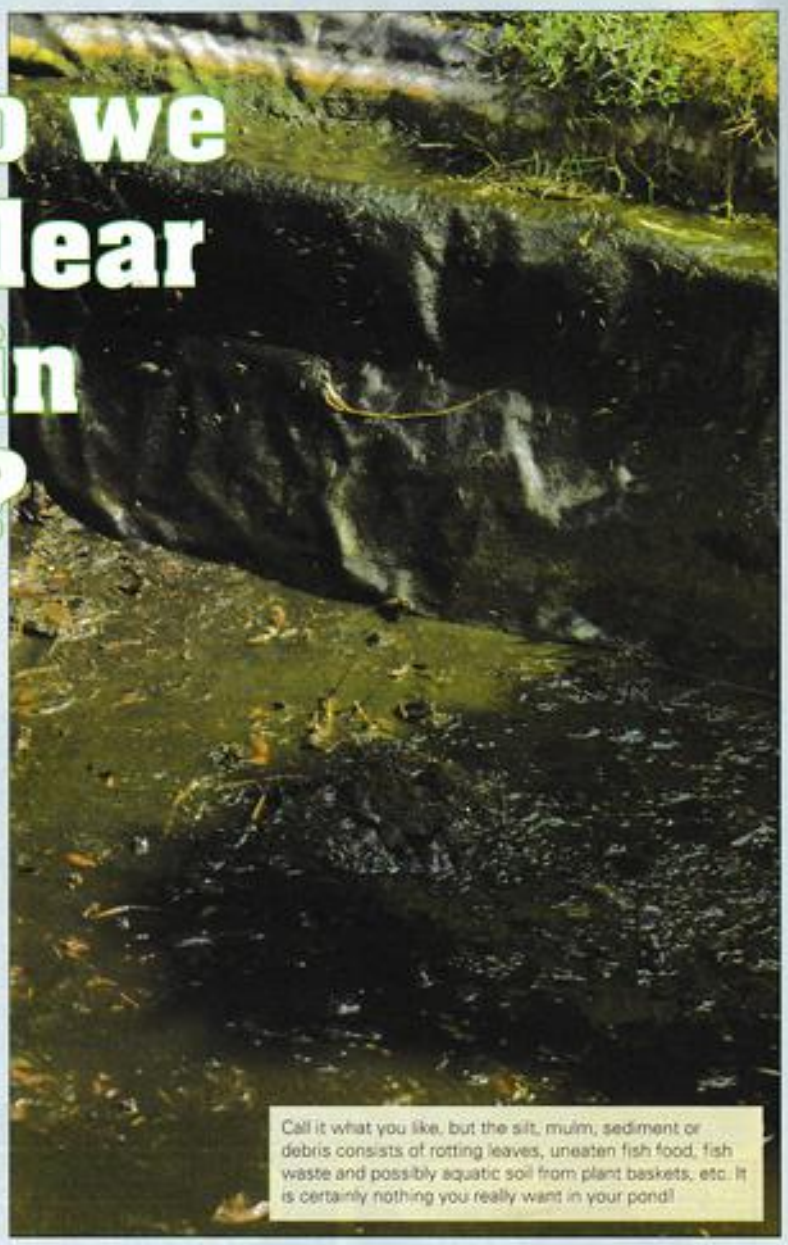
I have spoken to people in shops when they have bought test kits and asked them why they bought specific ones. Normally they tell me the pack price is cheapest! Speaking honestly, what would you prefer to buy — 20 inaccurate tests for, say, £3.50, or 50 accurate tests for £8?

Finally, remember that although any test is only accurate to a certain point it is not necessary to know the pH of your aquarium to three decimal places!

In this occasional series ANN TELFORD of AllClear Water Purifiers explains the whys and wherefores of pond filtration, starting with the most basic of questions:

PHOTOGRAPH: DAVE BEVAN

Why do we need clear water in ponds?



Call it what you like, but the silt, muim, sediment or debris consists of rotting leaves, uneaten fish food, fish waste and possibly aquatic soil from plant baskets, etc. It is certainly nothing you really want in your pond!

What is a pond? Basically, it is a hole in the ground filled with water. Sometimes it is a "natural" pond — which is what we would expect to see in open land or woods. Sometimes it is man-made.

If you look at natural ponds you will tend to see silt and debris lying on the bottom, and the water will probably be cloudy as well. You may even see the occasional small fish in them.

"Copying" a natural pond could lead to making a major mistake when planning to construct a back garden "fish" pond. Basically there is a risk of assuming that silt, debris and cloudy water is acceptable in our home made ponds for keeping ornamental fish.

Cloudy ponds can lead to some major fishkeeping problems and it is important to be aware of them and plan to avoid them.

The simplest problem of all is that you can't see the fish! And presumably if you want to keep them, you want to see them. If you can't see your fish it also means that you have less chance of seeing any developing fish health problems and intervening in time to prevent a catastrophe such as major fish losses.

A nice larder of food

Some "fish" parasites such as body flukes and trichodina go through a free-floating stage during the reproduction cycle. While free-floating they feed on particles in the water. Pond water is cloudy because of large numbers of particles in the water. Therefore, cloudy water supplies the parasites with a nice larder of food, allowing them to reproduce and multiply in the pond. The greater the colony of parasites, the greater the problem for the fish.

By stripping out the particles from the pond water there are two benefits. The benefit you see most easily is gaining a fuller view of the fish. The less easily seen benefit is that you will severely disrupt the reproduction cycle of some parasites simply by ensuring that large amounts of food are not available to them when they are in the free-floating stage. This is a better form of parasite control for the fish than allowing parasite colonies to develop and then having to add chemicals to the pond water to kill them off.

Sometimes pond water can look clear but there is a thick layer of "dirt" at the bottom of the pond. When the fish disturb this "dirt" layer while food hunting you can observe small "dirt" particles swirling up and clouding the water before they settle back down to

the bottom. You can call this "stuff" at the bottom of the pond by different names. The most commonly used names are mulm, sediment, silt or debris. Whatever you call it it will consist of rotting leaves, uneaten fish food, fish waste and possibly aquatic soil from plant baskets, etc. It is something you really do not want in the pond.

Nasty things can start happening

Layers of "dirt" at the bottom of ponds do not contain any oxygen, such conditions are described as anaerobic. As the layer of debris gets deeper and deeper all sorts of nasty things can start happening in it. Short to mid term it provides a breeding ground for anaerobic bacteria, which are decidedly fish "unfriendly". Long term, and we could be looking as long as 10 to 15 years, such things as marsh gas can develop (if you look at an old natural pond and see "bubbles" coming up from the silt to the surface it indicates that gases have developed in the silt and have built up to a point where they need to escape)

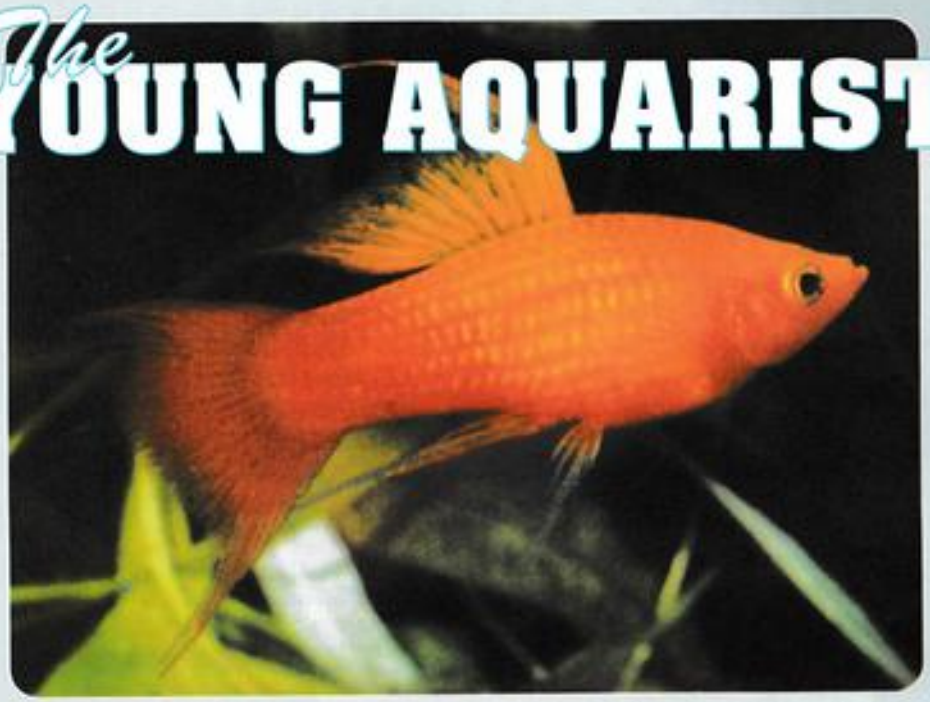
Some fishkeepers keep fish quite successfully for many years in a pond with a silted bottom. One morning they go out to the pond and "bang", they find all of the fish floating on the surface, dead. This can either be linked to insufficient oxygen in the water during a hot night, or it can have been caused by the development of gases in the "muck" at the bottom of the pond.

So there are some very good reasons for keeping the bottom of the pond clean and the pond water clear. It's fine knowing that but how do you achieve it?

There are many gadgets on the market to "trap" and "remove" particles, which can be installed when you build the pond. Ultimately choice rests on whether you want a small ornamental pond, a well stocked fish pond or a Koi pond.

• LATER IN THE SERIES ANN WILL GUIDE YOU THROUGH THE VARIOUS CHOICES

The YOUNG AQUARIST



Fish are very sensitive to changes in water conditions, this is what makes them difficult to keep in the first few weeks you have them.

When you buy a fish it comes along in a bag of water from its aquarium in the shop. This water is a very important part of your purchase. If you throw away the water and put your very healthy fish straight into your prepared tank you could have a dead fish by the next day, if not sooner. It could be that your water is not the same kind of water as the water in the aquarium shop tank, even if the shop is fairly near your home. We had this problem once when our shop was only a mile from home but we lived in a different water area so the tap water was different.

It is well known that fish are pH sensitive and a sudden large change can be a killer. I have seen the beautiful finnage of guppies fall away when the fish have been moved into water with a very different pH. pH measures how alkaline or acidic the water is. Measured on a scale of 0-14, seven is neutral, count down from there and it's acidic, up from seven and it's alkaline. You can buy a test kit that measures this, they are easy to use and it's a good idea to have one, they come with full instructions.

Several years ago a friend gave us two pairs of Goodeid livebearers (we often exchanged fish and our waters were very similar) and we never had a problem with transferring fish. We took the fish home and placed them in their own tank being careful to mix the waters very slowly. The next day the four adults were dead but swimming around in the tank quite happily were 20 healthy young fry (a good brood for this particular species).

We could not understand this, for if something was wrong in the tank you would have expected the weakest (the young ones) to die first — but they didn't, they looked really good!

The problem was solved when our friend rang to ask if the fish were alright. We told him what had happened and he said why he had rung. He had just tested the pH in his tank and from the normal reading of 7.2 his pH was reading 5.6. We had taken fish from 5.6 to 7.2 just like that! (The babies were born in pH 7.2 and that's why they were fine). We always test the water now wherever the fish have come from.

The majority of fish breathe by taking in oxygen over the gills. Polluted water can be low in oxygen, so don't neglect your weekly water changes. Filtration helps but water changes are an essential part of good fishkeeping. Fast moving, lively fish like barbs and danios need well oxygenated water, so a faster air flow is really liked as are the regular water changes. These are generally robust species but ignore the water changes and they suffer.

Some things added to your tap water, although not harmful to you, can be a danger to your fish, so it is a good idea to add a water conditioner to your fresh water. We always fill a glass with water from the tap to see if it runs clear before doing a water change. We have had milky water and brown water at different times, especially after the water has been turned off for maintenance reasons. If this happens do not change any water until the water from the tap runs clear for a day.

Give your fish plenty of swimming room and do not overcrowd the tank, this uses up the oxygen in the water quickly and you will find fish gasping at the surface in overcrowded tanks.

Sudden changes in water temperature can also give your fish trouble. Keep a check on the temperature in your tank, 72 to 78°F is the range for your community tank. When you buy your fish they are coming from a warm place, we usually wrap our fish bags in a blanket and put them in a polystyrene box to keep the water warm. Try to take your fish home as soon as you can.

Always remember that fish in neglected tank water can die just as easily in the water as out of it.

Many of you reading this column will be keeping fish already. Have you had any problems or experiences you want to share with other young aquarists through this column? Do you need help? Then you can write to me at: Pat's Young Aquarist Page, Inline Magazines Ltd., Suite 4, Invicta Business Centre, Orbital Park, Ashford, Kent TN24 0HB. All letters which enclose a stamped addressed envelope will receive a personal reply regardless of whether your letter is published.
Or you can also contact me directly by e-mail at: White.Shark@btinternet.com

See you next time ... **Pat**

HELPING YOUNG FISHKEEPERS BECOME YOUNG AQUARISTS ... HELPING YOUNG FISHKEEPERS BECOME YOUNG AQUARISTS

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Ask A&P

Your queries solved here ... with the featured problem winning a prize from ALGARDE

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STAR LETTER – TROPICAL

Q I have recently "discovered" your magazine and I hoped you might be able to offer me some advice on spring cleaning a tank with the minimum disturbance to the fish. I am a relative newcomer to keeping tropical fish, only moving on from goldfish two years ago.
Could you offer me any advice on:
(a) How to move the fish — will they be all right for several hours in fish bags as I have several large polystyrene boxes which should help to keep them warm?
(b) How long can the fish be out of the tank without becoming stressed?
(c) How do I prevent too much loss of bacteria in the fluidised bed filter?
(d) How much tank water do I need to preserve as I do not normally adjust the pH of the water I add to the tank. My tap water has a pH of 7 and the tank water pH is 6.4 — I assume that this is because of the amount of bogwood in the tank?

Val Ephraim, Gwynedd

A *(a) If you ever do have to remove fish completely from an aquarium then bag each one singly with plenty of air in the bag as well as water. Add Ammolock II to the water and seal the bag up. Place the bags in poly boxes and close the top up. Keep the boxes in a warm (75°F) room but well clear of any heat sources and your fish can survive for many hours without any problems. If you use large enough bags and open them once a day to let fresh air in, they can survive in these conditions for several days.*

(b) Just catching them will stress your fish. The amount of harm such stress causes is a matter for conjecture. Some people say the fish can actually die from this stress, yet those of us who regularly transport fish around the UK and even from country to country don't see such fatalities. In fact providing ammonia and nitrite are not allowed to build up no fish should die from just being distressed in this way.

(c) Keep a fluidised bed filter running at all times. Hypoxia (oxygen starvation) will kill the bacteria very quickly if you don't. If you have to remove it from its normal aquarium then you can keep it running on a bucket of aquarium water.

(d) Try to keep 80 per cent of your own tank water. This will minimise any risk of pH shock.

TROPICAL

Q I have a problem with my young *Aphyosemion gardneri*, offspring of a pair purchased at an auction near Manchester 18 months ago, and now deceased.
The young fish have, typically, grown on a treat to small adult size (say 3-4 cm TL) , then they developed humped backs and both sexes were affected. Not sure if all the last batch is affected too, as they are disparate sizes, but all the larger ones are. This is irritating. Any idea why this has happened?

M. Bailey

A *This problem may have one of two origins. Firstly, it could be hereditary with either or both parents being at fault. Most Killifish enthusiasts tend to breed brother to sister for several generations. This will result in high levels of inbreeding and genetic faults becoming more visible in the offspring. If it was just a certain percentage of the youngsters with this fault, or one/both of the parents exhibited the same fault then I would suspect this was the cause.*
If it is all of the brood and neither parent had this deformity I suspect it is far more likely to be an environmental problem. Temperature, pH, hardness, diet and general water quality (ammonia, nitrite & nitrate) may all affect developing embryos and young fry. My best guess is diet and/or temperature. High temperatures (78°F+) can cause some killifish to become humpy at a young age. Far more likely, however, is diet. Killifish like these need plenty of live food in their diet as youngsters. Since they tend to feed on insects in the wild, newly hatched Brine Shrimp is by far the best food for the youngsters . Daphnia and other pond foods can be fed as well. Micro worms and Grindal worms are also good foods but probably not nourishing enough without Brine Shrimp in the diet. Commercial flake and fry foods are also an essential part of the diet but should not be fed exclusively to youngsters of killifish.

PHOTOGRAPH: DEREK LAMBERT

PLANTS

Q I have never been able to grow Riccia, yet all the books regard it as easy to grow. Please help — I really want to know where I am going wrong.

Jane Turnball, Pontefract

A *Riccia is not easy to grow for most people. Normal aquarium husbandry, such as regular water changes, removal of bottom detritus, plus high light levels, are normally not appreciated by this species. In other words you are being too good an aquarist to succeed with this plant!*
Aquarists with grubby mulm-filled tanks, water which looks like well matured brandy and tungsten lamps, so furred up with lime from water splashes, that they give out light levels like Alpha Centuri on a bad night, have no trouble growing Riccia.
Putting it more scientifically, high levels of plant food (nitrate) in the water combined with only moderate lighting work best. It actually makes an ideal plant for a vegetable filter and will remove nitrate from tapwater very quickly.

ALGARDE

These pages are generously supported by Algarde who are offering a Midi Therm Electronic Thermostat suitable for aquarium or vivarium use as a prize for the featured problem. The unit, with a 300 watt handling capacity, has two heater connections and a fully waterproof probe which senses water (or air) temperature and easy-to-follow instructions.

KOI

Professional Koi pond builder, PETER SKINNER, kicks off his new series on pond construction with a look at pond design:

PHOTOGRAPHS: PETER SKINNER

KOI POND DESIGN

Part One

For many, the two most important considerations when formulating a plan are finance and space. Unfortunately, all too often the conception of a design is evolved cart-before-the-horse; in other words, the first thought is about the location and dimensions of the pond and then the question is asked whether or not the construction cost can be afforded and after that will any resources be left to build a filtration system?

As the design and efficiency of the filtration system will ultimately determine whether or not the pond will be a success, it is vitally important that the filter is made as large and efficient as possible within the constraints relevant at the time. If money is the governing factor it is best to take the time to meticulously work out a complete budget for the construction of the pond and then add say 10 to 15 per cent as a contingency sum. If your budget does not allow for a good filtration system for the pond size you want, either reduce the size of the pond or plan to build the filtration system in such a way that it would be easy to add more chambers later.

If you have limited space for the pond and filter, set aside at least 25 to 35 per cent of it for the filtration. To those new to the hobby of Koi keeping this may seem to be rather a generous amount, but it is better to have a few happy fish in a small well filtered and clear pond than not knowing how many fish you have because the pond is so green that you haven't seen them for months.

above A circular or elliptical shape is ideal from the point of view of water flow and pond cleansing but aesthetically these shapes can be uninspiring. Here a circular raised pond has been used to good effect in a formal situation.

left The most simple means of pond construction involves the use of a liner. Because liners are flexible it is not necessary to create a rigid structure to accommodate the liner, although there will need to be a little support at the top edge

Vast difference in cost

There is a vast difference in the cost of the various construction techniques and so if a restricted budget is a major consideration, it would be prudent to choose one of the cheaper methods.

The most simple means of pond construction involves the use of a liner. Because liners are flexible, it is not necessary to create a rigid structure to accommodate the liner, although there will need to be a little support at the top edge (see liner pond construction later in this series).

The main alternative to a lined pond is concrete or concrete and block construction. On the plus side, this sort of pond can be built any shape you choose without getting unsightly wrinkles as is common with flat sheet lined ponds. Extra care, however, must be taken with this construction technique to ensure that the design and material choices are made with structural integrity in mind. Concrete construction is more expensive than using a liner and there is a lot more work involved, so it is vital that the job is done properly. If the walls are too thin or the footings inadequate and the pond cracks, the extra money and effort will have been wasted, not to mention the headache of rectifying the situation.

For a very small pond the simplest and quickest method of construction is to use a pre-formed GRP or plastic pond. These are very easy to install since all you need to do is locate the moulding on a flat sand base, backfill around the perimeter with sand and then fill the pond with water. Unfortunately this type of pond is usually not suitable for Koi because its size and depth will not be adequate. Some manufacturers are now beginning to produce much larger models in their range to appeal to Koi keepers but, at the moment, most of these are fairly expensive.

Bottom drain

Whichever construction method you choose, if you intend to keep Koi in the pond it is most important that you install a bottom drain. This of course should be done whilst the pond is being constructed. Even if a small box filter is to be used initially, it is still a good idea to incorporate a bottom drain because should you wish to introduce a much larger, gravity-fed filter later, it is a simple job to connect to the pipe where it emerges from the edge of the pond and run the water to the settlement chamber. In the meantime the bottom drain can be used in the discharge box method. That is, it can be opened for a few seconds every day or every few days to allow a few gallons of water and (hopefully) most of the waste to run to waste. This is not as good as feeding a settlement chamber but at least the base of the pond will be kept reasonably clean.

Stocking density

Before planning the construction of any pond it must be decided whether or not the occupants of the pond will be Koi only or predominantly Goldfish varieties and Orfe, Tench, etc.; also the maximum stocking level should be fixed. This is important because such information will determine what type and size of filtration system will be required. Koi have a much larger appetite than the other aforementioned varieties and are also likely to grow much larger.

Size

The size of your pond is important for many reasons. First it must be in keeping with its surroundings and give the right aesthetic effect. If the garden is formal with walls, square patio slabs and lots of straight lines then it sometimes looks odd to have a very natural looking pond with curved sides. In this situation it may be preferable to have only straight walls around the pond and no plants in the water. This will draw the eye to the beauty and colour of the fish and away from the structure itself.

It is usually quite easy to make formal ponds aesthetically correct but informal ponds can create many more problems. The first hurdle is to choose the level of the water. If the surrounding ground is very flat then the pond should only be raised if it is formal. Raised informal ponds rarely look attractive.

If the ground slopes this gives much greater scope for landscape design. If the water level is the same as the ground on the lower side this allows for a high waterfall at the top side. Alternatively, water level can be at the average height between top and bottom, which will mean that the pond will be slightly inset at the upper level and raised at the lower. This design usually looks very attractive and minimises the amount of spoil (waste earth) that needs to be excavated and removed.

Pond shapes

If the ground slopes it is important to ensure that the pond shape follows natural patterns if it is of informal design. For instance, a pear

KOI POND DESIGN

shaped pond in nature would have the slender part pointing uphill, because this shape would have been created by ground erosion from the water feeding into the pond from the higher level. At first, it seems odd taking into consideration what happens with natural earth ponds but if you are trying to create an effect that looks natural you cannot use some of nature's rules and ignore others.

If you are building a very small pond do not try to create an intricate shape because not only will it be difficult to construct but it will not add anything to the attractiveness of the finished pond. If it is kept simple it will look more natural. Large ponds allow greater scope for making complicated shapes indeed if you are aiming for a natural style of pond it is worth taking a great deal of care deciding upon a final shape.

From the pond mechanics point of view the factors which govern pond shape are the avoidence of areas where the water flow is poor which can lead to stagnation. If the water flow is good it will help keep the pond bottom clear of waste material because it cannot settle in the dead areas, instead it will keep moving until it is removed by the bottom drain(s). A circular or elliptical shape is ideal from the point of view of water flow and pond cleansing, but aesthetically these shapes are very uninspiring.

In order to satisfy both the aesthetic and pond cleansing requirements the pond builder will have to reach a compromise. One way of doing this is to make the main shape of the pond bottom conducive to good flow. From about a third of the way down the shape can be flared out to meet the eventual shape above water level. By doing this the construction is made a little more complicated but the pond will look much more attractive.

If the pond is formal and is being built with concrete blocks or bricks, there will be square corners which would cause an interruption in flow patterns. To avoid this it is necessary to radius all corners so that the water can rotate more smoothly.

Depth

It is not easy to recommend an ideal depth for a Koi pond because there are many factors which will affect the final decision. It is possible to keep Koi in water as shallow as two feet, indeed many people have done this successfully, but the temperature fluctuations in such a pond would be quite rapid which will cause the fish to be stressed. In general three feet six inches should be the minimum depth for most of the pond area. A few small shallow areas are acceptable but these should not total more than about 25 per cent of the total surface area.

The ideal practical depth for Koi ponds is somewhere between five and seven feet. The advantage of greater depth is that temperatures will only fluctuate slightly from day to day below about three feet. When the water is cold the fish will stop feeding and enter a semi-hibernation state. If the pond temperature is allowed to fluctuate the fish will be more active and use more energy, although the temperature will not be high enough for them to feed. This will rapidly deplete their bodily reserves and leave them less able to cope with the rigours of spring.

If the pond is made very deep it allows the fish to properly exercise its muscles as it changes its position in the water which helps maintain good body shape. If, however, the pond is made deeper than seven feet it will be extremely difficult to catch the fish, not only because they are so far away but it will be difficult to see them at that depth unless the water is absolutely crystal clear. One must also remember that the deeper the pond, of course, the greater the capacity. This in itself is not a problem until the pond requires some form of medication or chemical treatment. Some of these are quite costly and treating a 12,000 gallon pond can cost a great deal of money.

When deciding upon a pond depth the safety aspect should not be ignored. If children are likely to be near the pond it may be advisable to create a shelf around the perimeter of the pond to allow easy escape. Even an adult would have great difficulty escaping from a slimy sided pond but if the maximum depth was five feet most would at least be able to keep their head above water.

Siting

The location of a pond is very important and deserves much careful thought. For many the Koi pond will be the focal point of the garden and therefore it will occupy a prominent position. Remember, however, that a garden has many other purposes than just Koi watching, and if you are not careful the pond will not be prominent but dominating. Remember also that if the garden has restricted access a badly positioned pond can compound the felony!

right The pond shape should follow natural patterns if it is of informal design. Here the background planting is being used to direct the shape of a new pond.

It is best not to put the pond too far away from the house because regular maintenance and feeding will become a chore during bad weather. It is a good idea to make sure that there is a hard path leading from the house to the edge of the pond otherwise a rat-run would be worn in a lawn with constant commuting, not to mention the tedious requirement for a change of footwear that a muddy route would demand. Another advantage of siting the pond close to the house is that it is easier to keep an eye on things such as the behaviour of the fish and to check that the pump and aeration systems are functioning. There are also obvious security benefits which are particularly important if high value fish are to inhabit the pond.

It is wise to keep the pond as far away from trees and large shrubs as possible because of the effect that constant falling leaves, seeds, twigs and even cones will have on the pond. Most of these will have only a visual effect on the pond but some are toxic and will cause a more sinister effect.

Whichever filter system is chosen, a common problem exists in trying to incorporate such a large item within the garden design without it looking like an eyesore or an afterthought.

Some trees have particularly invasive root systems which can cause havoc if a pond is built too close. Sometimes roots can break through the side of a pond. Some can even have a quite remarkable jacking effect as they grow underneath a structure. Unless the pond is built to resist such hazards structural failure can be expected. Do not attempt to excavate too close to any trees or bushes until you are sure that such disturbance will not cause the demise of the plant or cause it to be unsafe. It is also worth considering that old or unsafe trees may need to be removed in a few years' time, a task which may be difficult at the best of times but can be a nightmare if there is a pond underneath.

If there is a possibility that you may move house within a few years consider that potential purchasers may not be avid Koi keepers. It is not unknown for buyers to be put off buying a property purely because of the enormous water filled crater in the back garden.

Landscaping

The technical merits of a pond design are critically important for the water clarity and for the health of the fish, but no matter how good the system if the pond position, style, shape or landscaping are not chosen with care the pond will just not look as if it belongs.

If there is a particular position from which the fish will normally be viewed, you must take account of this when landscaping the pond. For instance, if you want to be able to see the fish from the kitchen window a high wall around the edge of the pond may prevent this. Small ponds can be viewed in their entirety from one position but large ponds can be made much more interesting if the pond shape and landscaping are planned so that different effects can be created for several viewpoints.

Finishing the top edge of a pond can create several problems because there are several criteria which will affect the decision. If the pond is informal it is important to try to vary the materials around the perimeter of the pond otherwise the use of, for instance, a neat line of uniform sized rocks or slabs looks very contrived. The longer the perimeter the more important it is to vary the effect. This can be done with rocks, slabs, plants, logs, walls, etc., but try to blend each change carefully with its neighbour otherwise, once again, a very artificial look will prevail.

When choosing an edging there will always be a compromise between aesthetic and practical considerations. Koi tend to leap occasionally and therefore high sided ponds are better able to prevent inadvertent escape but they would need to be at least 20 inches high to guarantee this which would look very unattractive. Conversely, very low or sloping sides carry greater risk of fish loss due to jumping or predator attack.

Occasionally it will be necessary to catch fish from the pond and whilst a very ornate and intensely planted pond surround may look nice it is certainly not conducive to Koi catching. A small area at the edge of the pond should be devoted to viewing with perhaps a seating area. This will make the pond much more inviting whilst making access much easier for maintenance purposes.

Waterfalls

The addition of a waterfall to a pond can bring life to a fairly boring creation. The sound of running water is very attractive and relaxing but it is vital that the size and design of the waterfall is in keeping and proportion with the rest of the pond. An insignificant trickle into a large pond looks ridiculous and a torrent into a small one will kill the effect of the pond and the ripples on the surface will obscure the fish.

Do not make the lip of the waterfall higher than the ground level behind otherwise it will look very artificial. It must look as if the water is naturally flowing downhill and into the pond as it would in nature. Failure to do this instantly creates a pseudo effect which will spread to all other aspects of the pond.

All waterfalls create noise which may be pleasant and soothing to you but on still nights that noise can be very invasive and can cause neighbourly friction. To avoid this turn the waterfall off at night. However, if part of the filtration system is discharging onto the waterfall it must be kept going all the time and therefore a bypass system will be necessary so that the water is diverted back to the pond through a pipe. This design feature is important in the winter because a waterfall can have a marked cooling effect on the pond and will cause the fish to stop feeding sooner in the autumn.

If you have the space it is worth considering the construction of a stream around the perimeter or leading up to the pond which can be planted with vigorous growing plants. Not only will this look very attractive but the plants will be absorbing nutrients from the water and significantly contributing to the water purification effort.

If the pond is very large the addition of an island can greatly enhance an otherwise average design. Islands are commonly overlooked by pond designers but they are not difficult to construct and allow many new design opportunities such as a bridge or stepping stones. One disadvantage of an island is that it can make it much more difficult to catch an individual fish.

Disguising your filter

Whichever filter system is chosen a common problem exists in trying to incorporate such a large item within the garden design without it looking like an eyesore or an afterthought. This problem is compounded

KOI POND DESIGN

Square ponds can be interlinked in a series like these have been to create an attractive formal design incorporating two small waterfalls. These add life to this water feature.

by the fact that you will need to gain frequent access to the filter for maintenance purposes, so it is not practical to grow creeping plants over the filter or to cover it with rocks. Sometimes it is possible to hide the filter behind a wall or hedge but on many sites this is not possible. In these cases really the art of making the filter look as if it belongs is to try to make a feature of it rather than trying to hide it.

For instance, if the filter is put in the ground where you normally stand to feed the fish then you can cover it with removable timber decking and perhaps put a wooden handrail where the decking meets the edge of the pond. This will look as if you have purposely made a viewing area, which may add to the attractiveness of the pond. Another way of losing' the filter is to make it the same width as a path which connects to one end and continues at the other.

Covering filters can cause a headache because most materials that look good and are strong enough to take pedestrian traffic will be too heavy to lift for access to the filter or they will not last. Timber is the most commonly employed material but most types of timber will absorb moisture if not treated and so will get heavy and may rot. It is possible to treat the timber with preservative but care must be taken when choosing a treatment because many well known brands would contaminate the water if allowed to be washed into the pond by rain. There are a few safe products but really you need to read the instructions on the cans to see which are suitable for this purpose. It is best to be on the safe side and telephone the manufacturer's technical department for advice.

Other materials suitable for covering a filter are plastic and GRP. Plastic is light, inert and durable but usually looks too sterile to be used in a garden. GRP lids seem to be the best answer for covering filters because they are strong, durable and light. They come in a variety of colours, and textured surfaces are available which make them look like timber or stone. However, the high cost of these lids means that many people will choose to make do with one of the less hi-tech methods.

Bridges

A bridge over a pond can greatly enhance the character of a pond, conversely it could look ridiculous if the wrong design is chosen. The first consideration is whether the pond is large enough to accommodate a bridge and then is there must be a reason for one to be there? If a path is interrupted by a pond and there is no obvious alternative route then a bridge is justified but if an alternative route and a bridge are in close proximity to each other the bridge will lose its authenticity.

It is also important that a bridge is in keeping with the surrounding landscaping. Inevitably the structure will be a focal point and if it is too dominant in appearance it will spoil the pond. If the pond is small it may be best to have a flat bridge with no rail so that the view of the rest of the pond and garden features are not obscured. Care, however, must be taken to ensure that safety aspects are not compromised by this design.

A bridge can offer an alternative viewing position and make the pond look more interesting but practically it can cause problems particularly when netting fish. Obviously the more obstructions around or over the pond the more difficult it will be to catch the fish.

If you are planning a small goldfish pond and you get on well with your neighbours then you may as well reach for your spade now but, if your plans are far more elaborate and neighbourly relations are less than ideal, it may well be worth checking with your local planning officer to see whether or not planning consent is required. It is extremely rare for average sized Koi ponds to attract bureaucratic involvement but one does hear of the occasional elaborate sand-pit!

Bob & Val Davies's

FROGS & FRIENDS

BREEDING PROBLEMS

Some weeks ago we saw a newly imported snake that was obviously gravid. It had been imported as an Indonesian "garter" snake; its scientific name was given as *Natrix sittata*. The correct generic name was probably *Xenocrophis* as *Natrix* formerly contained many species that have since been renamed. This specimen was bulging with eggs but to see individual eggs so clearly outlined is unusual. Had someone bought this snake in the hopes of quick breeding success the result would have been disappointing as it died a few days later. Dissection showed only 12 eggs — not an excessive number.

Since some *Xenocrophis* can produce exceptionally large clutches — in *X. piscator* around 100 eggs have been documented although 17-32 is more normal it is possible that this female had previously contained an exceptionally large clutch and had deposited those in the posterior part of the body prior to being packed for export. Once packed she may have been reluctant to drop the others in the unfamiliar confines of the cloth bag. An exceptional number of eggs could explain why some were so far forward. This had been observed in a female chameleon — practically the whole of its body was packed with eggs, the skin stretched as tight as a drum with the outline of each egg clearly visible.

She did not survive as she was unable or unwilling to pass the eggs; whatever the reason the result was death from egg retention. It is possible that a large clutch can actually interfere with respiration due to pressure on the lungs. Unlike the snake mentioned above she was not gravid on arrival — some other reasons for egg retention are mentioned below.

One opinion is that animals in an advance gravid state should not be exported. It is not uncommon for importers to find eggs or live young which have been expelled during transit. Live young are often crushed by the adults; eggs, if not broken, occasionally hatch but the adult female is often traumatised and may expire shortly afterwards. In many instances the eggs are retained in which case they may start to decay inside the female or she continues to coat them with further layers of calcium making them too large to pass with resultant egg binding.

Egg retention (or binding), technically known as dystocia, can be caused by numerous factors. As above the lack of a suitable site is one major reason. In some cases it is difficult to tell why a female snake or lizard will not use the site provided — it could be too wet or too dry, not large or deep enough, lacks privacy, could be too cool or too hot or the presence of others may inhibit egg deposition.

Large clutches and oversized or abnormally shaped eggs are other possibilities. A low ambient temperature over a long period may also be detrimental. Gravid females, livebearers or egg-layers, tend to spend more time basking than normal in order to provide a suitable internal body temperature for the developing eggs/young. Some gravid livebearers have been observed twisting the body to expose the sides of the belly to the heat and light.

This behaviour has been seen in pink-tongued skinks, blue-tongued skins, several small chameleons and boa constrictors among others. Blue-tongues and boas also seem to benefit from some form of "belly-heat" at this time — they will lie on heater mats although strictly speaking (according to manufacturer's instructions), a heater mat should not be covered with anything that blocks the infra-red rays as this causes a build-up of heat which can ruin the mat. A low ambient cage temperature will force the creature to spend more time on the mat so basking lights should be used also.

Regarding large clutches; this may be appealing to the breeder who is out for commercial gain but it is not always good for the animal. Veiled (or Yemen) chameleons and giant African spur-thighed tortoises are noted for producing large clutches in captivity but according to reports they normally produce smaller clutches in the wild. In the vivarium they have regular food (with added nutrients) and fairly constant, stable temperatures which are conducive to regular and prolific breeding.

In the wild food may be in short supply, temperatures may vary (reducing the metabolism) and low population density may mean that a mate is not always readily available at the right time. There is actually a species of gecko that according to breeders' reports will literally breed to the point of exhaustion unless controlled by cooling and by separating the sexes to prevent too much breeding. While many species are relatively "easy" to breed and do so on a regular basis, problems can arise even with these and we hope to discuss this in a future issue.

left Female snake showing extra large eggs.

PHOTOGRAPH: BOB & VAL DAVIES

HERP FACT FILE: Miscellaneous Facts

- One Australian species of gecko (*Diplodactylus williamsi*) produces extremely sticky "threads" from glands in the tail to entangle attackers.

- Many species of aquatic turtles have a supplementary respiratory mechanism, known as bursae, inside the cloaca (vent). Some can absorb oxygen through their skin and throat lining. Using these methods they can stay submerged for long periods.

- Some leaf chameleons (genus *Brookesia*) from Madagascar vibrate when they are disturbed. Since they are fairly defenceless, apart from their cryptic coloration and some spiny scales this is probably an anti-predator function.

- Eggs of the Australian gastric-brooding frog (*Rheobactrachus*) are swallowed by the female and complete their development in her stomach — she "coughs up" the young froglets.

- Male Jordan's salamanders (*Plethodon jordani*) "slap" the females' face with their head during courtship. This transfers secretions from a gland on his face which stimulates mating behaviour.

- African helmeted turtles (genus *Pelomedusa*) are said to clean ectoparasites from rhinoceroses when they enter the water to cool off.

- Alligator snapper turtles (*Macroclemys temminckii*) have a small worm-like lure on the tongue to attract fish into their jaws.

- Marine iguanas (*Amblyrhychus cristatus*) of the Galapagos islands possess nasal glands to extract excess salt. Spraying jets of watery salt is often used in disputes.

- The green blood skink (*Prasinohaemo virens*) of New Guinea is unique among vertebrates — it has green pigment in its blood. Its tongue and dorsal surface is green; it also lays green eggs and scares attackers with its green tongue and mouth lining.

- An African black mamba (*Dendroaspis polylepis*) was clocked doing 11.2 km/hr (7 mph) chasing a man who had tormented it.

- Snakes have no external ears. A single earbone inside the head is attached to the jawbone. This enables the snake to detect low frequency sounds but not high frequencies. It is said that a rattlesnake cannot hear its own rattle.

- In a few frog species, although the tadpoles are free swimming they do not feed. The eggs contain sufficient nourishment to take them through to meta-morphosis.

above Softshell turtle (*Trionyx spiniferal* submerged oxygen intake is around 70 per cent via the skin; 30 per cent via the throat lining. PHOTOGRAPH: BOB & VAL DAVIES

WONDERS OF NATURE

above Cuban treefrog — good roadholding? PHOTOGRAPH: BOB & VAL DAVIES

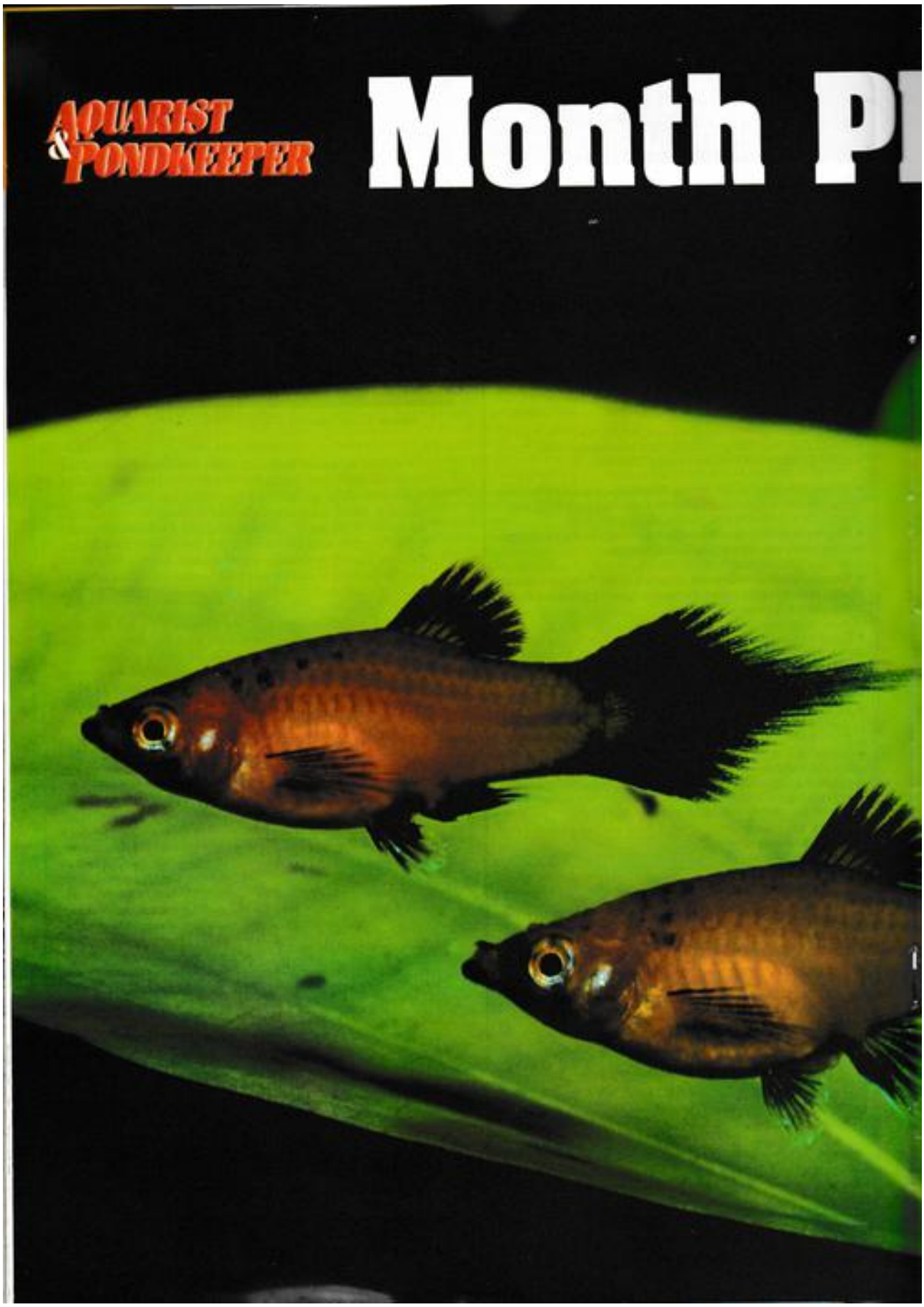
A study of the natural world soon shows that many of the ideas and inventions which have contributed to human technological advance have consciously or unconsciously been copied from principles already existing in nature. A simple example such as snowshoes — broadening the surface of the feet to prevent sinking into a soft medium already existed in certain birds and mammals that live in sandy areas but had also been adapted by creatures (including some reptiles) living in soft sand. Streamlining to increase speed had developed in various groups of creatures (particularly fishes) long before humans ever used the principle on their ships, aeroplanes or cars.

Chemical warfare is a relatively new invention but it has existed in nature for countless years — one example being the bombadier beetle. Certain fish, amphibians and reptiles also use toxic or noxious chemicals in their defence as do some plants. The snorkel had developed in the softshell turtles' elongated neck and snout, insulation in birds' feathers, mammal's hair and the blubber aquatic mammals; hypodermic needles (snakes' fangs); ball and socket joints; frogmen's flippers — the list is almost endless and makes for interesting reflection and speculation.

No doubt humans will look even further into nature for ideas — this trend is already increasing in the current search for new medicines among the plant kingdom and there is still much to be learned from animals.

A recent field of inquiry has been the study of the adhesive toe discs on tree frogs. The frogs in the study were 14 species found in Trinidad but other arboreal species possess the ability to climb and cling to even smooth surfaces such as glass. The clinging ability can vary according to species and has been found to be more effective in heavier frogs. Adhesion is achieved by means of transverse grooves in the toe discos and special hexagonal cells lining them. Mucus glands produce secretions to enhance surface tension between the cells and smooth surfaces. Adhesion is also aided by the belly skin — also by surface tension. On rougher surfaces the epidermal structure enables the toe pads to conform to the substrate thus enabling adhesion.

The study mentioned was aimed at the possibility of improving tyre treads by using principles similar to those found in the frogs' toe discs. One "sticking point" (pardon the pun) may be the part played by the mucus secretions in adhesion. Another possible focus of research could be the adhesive toes of geckos (*Frogs & Friends*, December 1999), which do not need mucus secretions.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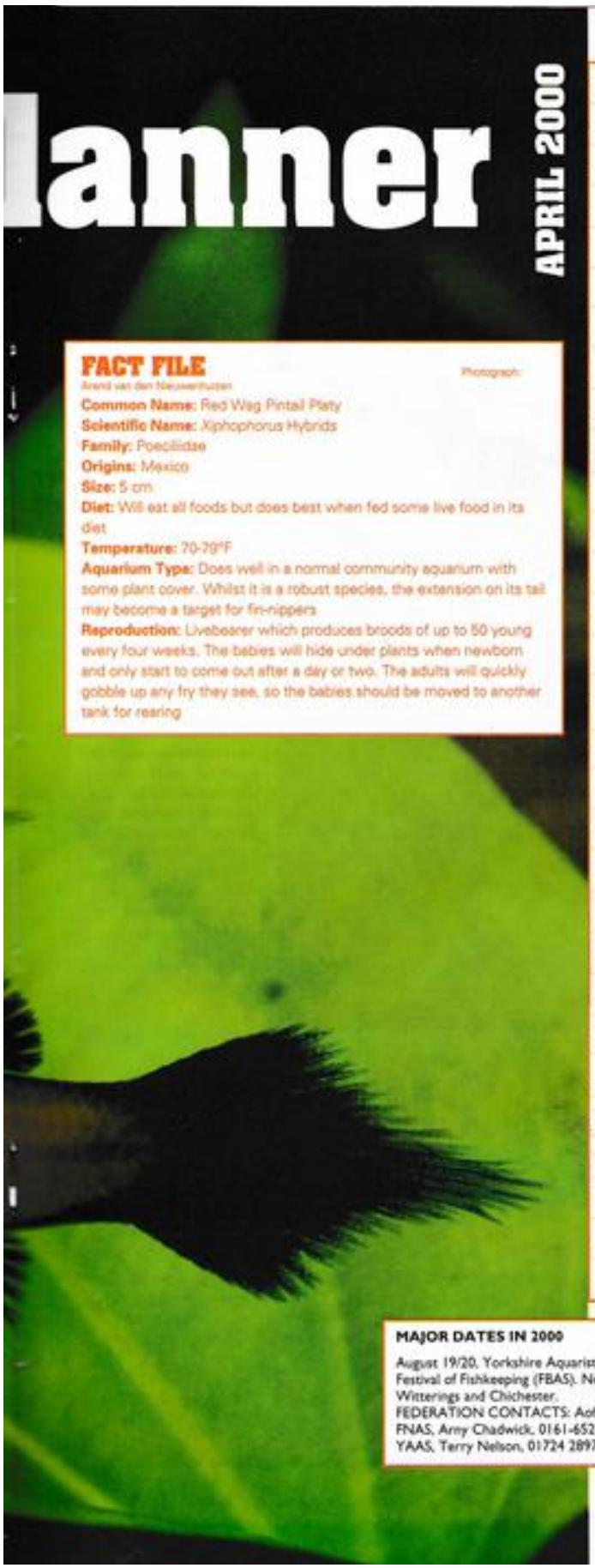


FACT FILE

Photograph: Arend van den Nieuwenhuizen

Common Name: Red Wag Pintail Platy
Scientific Name: Xiphophorus Hybrids
Family: Poeciliidae
Origins: Mexico
Size: 5 cm
Diet: Will eat all foods but does best when fed some live food in its diet
Temperature: 70-79°F
Aquarium Type: Does well in a normal community aquarium with some plant cover. Whilst it is a robust species, the extension on its tail may become a target for fin-nippers
Reproduction: Livebearer which produces broods of up to 50 young every four weeks. The babies will hide under plants when newborn and only start to come out after a day or two. The adults will quickly gobble up any fry they see, so the babies should be moved to another tank for rearing

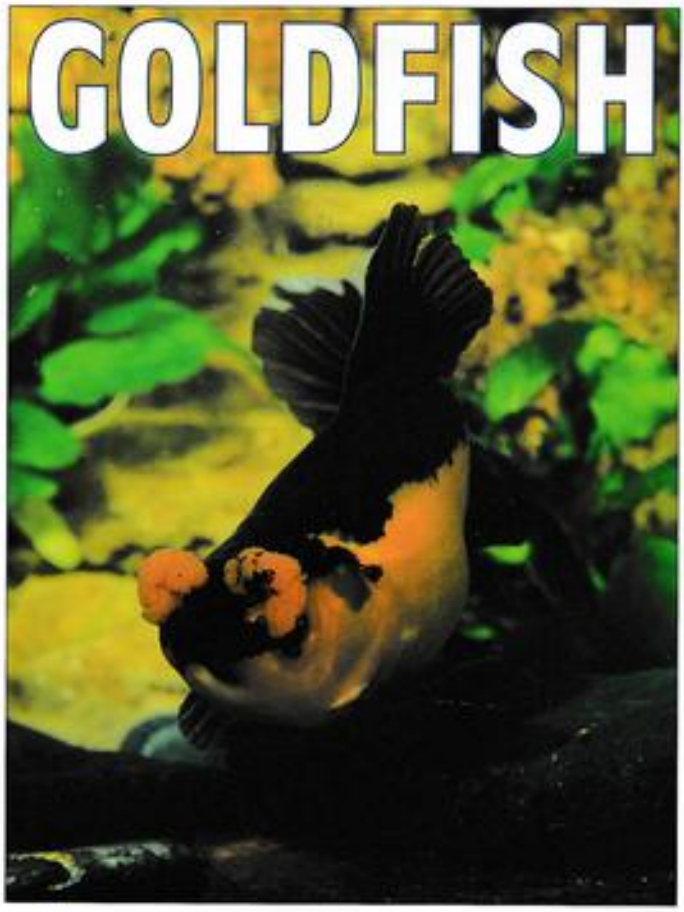
Sat	1	SHIRLEY AQUATICS. Open Day. Grand reopening of Coldwater Section. Contact 0121-744 1300
Sun	2	
Mon	3	REDGATE & REDHILL. Bring & Buy. Contact 01293 512932
Tue	4	SOUTHEND & LEIGH. Club Meeting. Contact 01702 305740 GLOUCESTERSHIRE F.C. Club Meeting. Contact 01453 824810
Wed	5	CORBY & D.A.S. Club Meeting. Contact 01536 761706 HOUNSLOW. Club Meeting. Contact 01784 259230
Thur	6	
Fri	7	
Sat	8	
Sun	9	BRITISH CICHLID ASSOCIATION CONVENTION. Contact 01553 671610
Mon	10	ILFORD & DISTRICT AQUARIST'S & PONDKEEPER'S SOCIETY. Club Meeting. Contact 0181-550 7329
Tue	11	
Wed	12	
Thur	13	TELFORD & D.A.S. Meeting. Contact 01902 372945
Fri	14	ANABANTID ASSOCIATION OF GREAT BRITAIN. Weekend Convention. Contact 01653 618971 for more details
Sat	15	ANABANTID A.G.B. ANABANTID G.B. Weekend Convention. Contact David, 01653 618971
Sun	16	ANABANTID WEEKEND AUCTION STROOD A.S. Open Show. FBAS. Contact 01634 389362 PRESTON & D.A.S. Spring Auction. Contact 01772 321145
Mon	17	
Tue	18	SOUTHEND & LEIGH. Club Meeting. Contact 01702 305740
Wed	19	HOUNSLOW. Club Meeting. Contact 01784 259230
Thur	20	
Fri	21	
Sat	22	
Sun	23	EASTER SUNDAY MALVERN & D.A.S. Open Show. FBAS. Contact 01684 563233
Mon	24	
Tue	25	***A&P* ON SALE** LINCOLN D.A.S. Meeting. Contact 01522 880863
Wed	26	
Thur	27	
Fri	28	
Sat	29	SOUTHEND & LEIGH A.S. Open Show. FBAS. Contact 01268 732531
Sun	30	HULL A.S. Open Show & Auction. YAAS. Contact 01482 801389 OLDHAM A.S. Open Show & Trade Stand. FNAS. Contact 0161-652 6207

MAJOR DATES IN 2000

August 19/20, Yorkshire Aquarist Festival (YAAS), Doncaster Exhibition Centre. October 20/22, Supreme Festival of Fishkeeping (FBAS). New Horizons, South Downs Holiday Village, Bracklesham Bay, near the Witterings and Chichester.
FEDERATION CONTACTS: AofA, Chris Ralph, 01703 560318; FBAS, Paul Corbett, 01983 721246; FNAS, Amy Chadwick, 0161-652 6207; FSAS, Hugh Bowie, 0131-539 2790; USA, John Reid, 01738 634689; YAAS, Terry Nelson, 01724 289736

The millennium (depending upon how you count it) has prompted all manner of reviews of the past 1,000 years. In keeping with this peering into the past, JOE SMARTT brings us his review of 1,000 years of the Goldfish:

PHOTOGRAPHS: MAX GIBBS UNLESS OTHERWISE STATED



left Red Magpie Pom-pom. Fishes in the course of 'colouring' (i.e., demelanization), would frequently show a very striking red and black coloration. We seem to have made some progress at the present time in stabilising this combination as has already been done in Koi.

Fish of the Second Millennium

The Goldfish is one of the most popular pets in the world and its history is inextricably linked to that of China. The domestication and development of the goldfish in all its diversity has occurred principally in the second millennium. While it is not possible to pinpoint exactly the point in time when the goldfish was domesticated it seems probable that this could have occurred as early as the Tang dynasty, 618-906 AD, when references to coloured fish in the wild were recorded. Whether these were actually goldfish is not certain but not improbable. What is clear is that during the Sung (or Song) dynasty, 960-1279 AD, goldfish domestication was a fact and that pond culture of xanthic (coloured) goldfish had been established.

A very important factor in the domestication of goldfish was the introduction to China from India of Buddhism in the third century AD. The consequences of this have been considered by the great Chinese goldfish scientist Chan in the 1950s. Ideally the Buddhists respect all forms of life and, as far as possible, refrain from eating the flesh of animals (including fish). This is a council of perfection and force of circumstances may dictate (as in Tibet) that this practice cannot be followed. Where this is so, as an act of piety Buddhist monks will from time to time rescue live fish from markets and liberate them in ponds which become fish sanctuaries. Understandably, the more conspicuously coloured fish would tend to be selected, as they would be more readily seen than those which merged with the background.

At the present time, Buddhist monks in Bangkok have stocked their ponds with albino channel catfish which are highly visible. Such visibility would be a great aid in the contemplation of the living world, and Chan implies that this whole development could have been a very important stage in development of breeding populations of coloured goldfish.

In addition, farmers (especially rice growers), who caught fish from the wild in times of abundance, might well have kept surplus fish indefinitely in small irrigation ponds and established breeding populations. In the course of time these could become inbred and various mutant genes appear which might produce colour differences and different coloured strains would develop. There could even have been a selection process in favour of coloured fish, the drab ones might well have been selected for eating while the brighter ones might have tended to be left and eaten only in times of scarcity. All this is, of course, speculative but quite plausible.

Art as an historical journal

It was probably during the period of the Sung dynasty that the goldfish cult really became assimilated into Chinese culture and at this time that the charming folk tales concerning the goldfish came into being. The goldfish became a favoured subject for artists who depicted its graceful form on wall hangings, paintings and ceramics. The remarkable thing is that these depictions could be extremely detailed and accurate. For the student and scholar wanting to trace the development and evolution of goldfish varieties these are absolutely invaluable. Chinese art and artefacts have been intensively and extensively studied in the West and individual works of art can be dated with reasonable accuracy. These can provide us with a record of progress which, while not as complete as we would like, gives us a good basic picture of the probable course of events.

The goldfish pond makes its debut

During the Sung Dynasty (960-1279 AD), apart from the establishment of the Buddhist temple ponds of mercy (or fish sanctuaries), well-to-do people introduced a number of aesthetically pleasing adjuncts to their homes. These included ponds stocked with ornamental aquatic and marginal plants which were beautifully set off by the presence of brightly coloured ornamental fish. It is a great delight to visit a Chinese garden with a large water feature and to observe (clarity of the water permitting!) the movement of goldfish shoals and their wonderful interweaving and separations.

This development brought fish and humans into ever closer contact, interesting variants could then be observed and selected, increasing the range of variation and the interest of the pond owners. At the end of the Sung Dynasty we can conclude that the goldfish had produced a range of colour variants and it is probable that in addition to self-coloured (red, orange, yellow and 'white' fish), there were bicoloured variants most notably red and white. Fishes in the course of 'colouring' (i.e., demelanization) would show frequently a very striking red and black coloration. We seem to have made some progress at the present time in stabilising this combination as has already been done in Koi.

The most important development during this period was the wide distribution which the goldfish is thought to have achieved. This led to the development of a very extensive gene pool which greatly facilitated the explosive development of goldfish varieties in the two major dynastic reigns which followed. (the Ming and the Ching). The Tang, Ming and Ching dynasties did not follow each other directly, short lived dynastic reigns intervened. This may have been fortunate, because one consequence of political upheavals is often a very violent reaction against the previous regime and all its works. However, if the time frame of such reactions is short the status quo ante may in effect be restored. If this surmise is substantially correct, we can conclude that in the second millennium we have had a reasonably continuous development of the goldfish.

Goldfish bowls the key to new exotic forms

The Ming dynasty is famous in the West on account of the extensive development of ceramics. Most Westerners would regard the Ming period as the Golden Age of Chinese culture. The Chinese themselves do not regard it as the cultural pinnacle we take it to be but regard the Tang period as such. As far as goldfish are concerned, the most significant development was the production of large ceramic bowls in which goldfish could not only be kept but also induced to breed. This protected environment meant that the possibility of survival for bizarre (but attractive) mutants was enormously increased.

The principal such mutation was the one resulting in duplication of the tail (and anal) fins. What is often not fully appreciated is that the expression of the mutation we commonly see today is not necessarily what attracted the breeder in the first place. Refinement and further development came about by sustained patient selection and highly selective breeding. The complete duplication of caudal and anal fins,

left The true Pearlscale, like this beautiful specimen, is thought to have become extinct in China once it ceased to be a commercial fish. There is now some interest in re-establishing true Pearlscales in China and British breeders of the variety may be able to assist in the rescue and re-establishment of this once quite popular variety.

PHOTOGRAPH M.P. & C. PEDNOR

GOLDFISH – Fish of the Second Millennium

which many regard as the essential features of all twintail varieties, probably came about progressively through major intermediate phases of the tripod tail and the web tail. The same can be said of hood development in the Lionhead and Oranda, where the magnificent development we sometimes see today was the outcome of long sustained selection.

Golden age of the goldfish

During the Ming period at which time the two-tailed character, the globe and dorsal-less fish were known, the stage was set for what might be called the 'Golden Age of the Goldfish', the Ching Dynasty. It was at this time (1644-1912 AD) that the greatest diversity of goldfish forms occurred. The end of the Empire in 1912 does not seem to have had any recognisable effect on goldfish development. The worst period for goldfish culture, perhaps in the whole history of the goldfish, was from the mid 1930s with the start of the Sino-Japanese war until the end of the Cultural Revolution. The Cultural revolution in particular affected the whole of China with great severity whereas in previous periods of difficulty effects were probably localised and not of equal severity. However, the cult of the goldfish has survived and shown enormous resilience in bouncing back after these troubled periods and continues to develop in novel and interesting ways.

Development still underway

China is such a vast country with a very large population and the goldfish is found everywhere, hence there has been enormous scope for development of local and regional strains and varieties. This has continued to the present day and appealing novelties, such as magpies and butterfly tails, have been launched recently and very quickly become popular. The only recent parallels from elsewhere in the world are the 'sky blues' and 'midnights', which have been developed in the USA from Shubunkin stock and are in effect two different types of true breeding, highly coloured matt Goldfish.

Rather more questionable is the development in the Far East of new varieties which combine the special characters of two (or more) varieties. Most of the Celestials exported from the Far East have pom-poms in addition to their characteristic eye form. We in Britain, especially breeders who show fish and select to standards, find such fish unacceptable. Another example is the Hamanishiki which combines pearl scales with its unique head growths.

The consequence of this 'development' is that the pure Pearlscale has ceased to be a commercial fish in China, is very rare there and may even be extinct. There is now some interest in re-establishing true Pearlscales in China. British breeders of the variety may be able to assist in the rescue and re-establishment of this once quite popular variety. This example shows how easy it is to lose even well established varieties. The Japanese Jikin and Tosakin (beautiful varieties both) are only rarely seen these days, even in Japan. The reason for this seems to be the difficulty in maintaining the expression of the special characters at an acceptable level.

left A young common goldfish just beginning to colour. While it is not possible to pinpoint exactly the point in time when the goldfish was domesticated it seems probable that this could have occurred as early as the Tang dynasty, 618-906 AD, when references to coloured fish in the wild were recorded.

A modern day British development

The Bristol Aquarist's Society, made their mark between the wars in developing the Bristol Shubunkin in the first place and brilliantly continued the development in the post WW2 period. As a professional scientist and academic (retired), I have to admit that this wonderful development owes absolutely nothing to scientific research or scholarship. So much so that we cannot be absolutely sure how it was achieved. The enlightened amateur breeder (who I admire enormously) is focused almost exclusively on the development of excellence in his chosen breed or variety. The scientists and scholars are concerned with their professional status, they must publish or their reputations will perish. The amateur is not motivated by such considerations, the drawback is that the amateur may leave no record of how his success was achieved, leaving those subsequently interested in how these feats were accomplished to speculate on how they were actually done. There is of course the distinct possibility that they would not be prepared to divulge the relevant information and may well have taken their secrets with them to the grave.

In these days of sophisticated biotechnology it may well be possible to reconstruct through DNA studies the probable evolutionary history of the goldfish over the last millennium. This would be an extraordinarily interesting if prohibitively expensive project and I fear not one to be undertaken without the support of a multi-millionaire philanthropist with a passionate interest in the history of the goldfish.

A family tree (or phylogeny) of goldfish varieties, however, can be constructed putting together the historical evidence which can be gleaned from a variety of sources. Matsui was the first to devise one and what is represented here is basically a simplified version of what Matsui proposed. He included some varieties which have never achieved much popularity or a wide distribution and these are omitted from the present scheme.

A goldfish 'family tree'

To summarise briefly the change which set the whole process of the development of the myriad varieties of goldfish in motion was the fixation or establishment of the xanthic mutation in the initial domesticated populations. This led to the development of various coloured forms which became widespread in the domestic pool culture of the Sung period.

The second crucial development was the establishment of the twin-tail mutant coupled with the development of what might be called bowl culture during the Ming Dynasty. This enabled controlled breeding and selection of variants among goldfish to become really effective and for the establishment of more delicate forms to take place which in practice would probably not have occurred in the rough and tumble of pond life. A point which can be overlooked, which I would like to re-state and emphasise, is that the form of the mutant as it originally occurred is not necessarily that with which we are familiar today. The best example of this is the twin-tail, the complete duplication of caudal and anal fins we see in today's best specimens was the outcome of a refinement process brought about by sustained selection over many years. There is evidence from artefacts which suggest that 200 years ago complete duplication of the caudals was the exception rather than the rule.

The globe-eye mutation appears to have become established before the development of the deep-bodied twintails. Eighteenth century depictions of goldfish indicate both long and short bodied globe-eyes. We do not know exactly when the almost explosive proliferation of variants occurred but it would seem that the stage was well and truly set during

above Panda Butterfly-tails are one of the new varieties which have been introduced to the hobby from China in recent years.

right Lionheads with a magnificent development of the hood were the outcome of long sustained selection after the initial mutation occurred.

GOLDFISH – Fish of the Second Millennium

above It is easy to lose even well established varieties when fashions change. The Japanese Jikin is only very rarely seen these days, even in Japan.

the Ming period and the establishment of the modern types came about during the Ching dynasty.

In the case of transparent scales, a century ago this was a feature of the nacreous globe-eye (calico telescope) but earlier references to this feature pre-date this by a century or more in a different variety. We have to face the possibility, even the probability, that some characteristics have been lost or have become rare and later rediscovered and come back into prominence. There is also the problem of disagreements on interpretation of the evidence which can be very scanty indeed.

I live in hope that the scientifically minded goldfish enthusiast may be stimulated into carrying out a little research into the ways in which our present modern goldfish varieties may have evolved. Speaking for myself my own studies with hybrids of the goldfish with the Crucian carp have been informative far beyond the simple objectives which I set myself. It would be a very fitting way to welcome in the second millennium of the cult of the goldfish to initiate a co-operative international study of this interesting area.

Koi judge KATE McGILL continues her series on Koi appreciation:
PHOTOGRAPH: ANDREW McGILL

Koi: A Living Art Form

Although there are numerous guidelines for general comparative appreciation of Koi in structured terms, for example, desirable shape or conformation of the Koi, the quality of its skin, colour and pattern, the way in which the Koi swims, its alertness and grace, it is also valuable, and fascinating, to look at Koi as individuals. They are living art forms and, like any art, reveal more to the observer with time and study. This series will look at many different Koi, the "oddities" as well as the classics, hopefully bringing to the reader's attention specific points of interest and beauty. They may or may not appeal! Koi appreciation, as with any form of art, is a highly subjective study.

The second Koi in the series is as simple as the first was complex and presents a very different appeal. It is an ogon, which means "golden", classed in Hikarimuji as a single coloured, metallic Koi. Ogon have been around for some considerable time, being first produced in the 1940s from wild carp found to have golden stripes. They appear in a variety of colours, from the pure white "platinum" or "purachina" ogon to a deep orange or red.

Some present a contrasting dark centre to each scale, giving a reticulated pattern, the so called "matsuba", or "pine cone" ogon. Hikarimuji are often the Koi which first attract hobbyists, with their wonderful shiny appearance, but sadly, for this very reason, they are sometimes denigrated by Koi keepers as being "beginners fish". In fact, the contrast provided by such a simple, but beautifully finished Koi, as this example demonstrates, would look well in any collection.

Lacking a pattern, appreciation of ogon requires that the figure or conformation of the Koi is particularly good, this Koi being an excellent example. A metallic finish provides "hard" edges, making any defects in the figure very obvious. Colour should be even in appearance, including the finnage, and show no spots or stains. Again, this Koi, although perhaps not a deep enough gold to be classified as a true yamabuki ogon, clearly demonstrates this appreciation point. The shine or lustre of a metallic Koi is not easy to see on a photograph, but is another vital feature for a top quality Hikarimuji.

This large ogon, photographed at the All Japan show in Tokyo, January 1998, shows a lovely clean finish to a powerful figure. Neatly arranged golden scale lines, or kokenami, are highlighted by the slightly lighter, surrounding skin which provides a delicate mesh effect, or fukurin. Although a very simple Koi, its beauty is well worth appreciating at any level of the hobby.

Liz Doutaa's

KOI CALENDAR

KOI

Well, at last it has arrived — the first of this year's Koi shows are just a couple of weeks away (April 29/30). This year Koi Show UK 2000 is the first of the season and to herald the new century DJ's has been able to move this show to a completely revamped (£2.8 million worth of revamp!) Milton Keynes Leisure & Exhibition Centre, Princes Way, Bletchley, Milton Keynes.

The main hall has natural daylight which means you will be able to see the Koi in all their glory. The show is open to the public from 9.30am to 5pm both days and parking is free. For further details telephone 01922 493290.

The next show on this year's calendar is on the weekend of May 6/7 and is the South East Koi Chapter of ZNA. This one is being held at Fleming Park Leisure Centre, Passfield Avenue, Eastleigh, Hants. Once again this is a new venue with 11,000 sq ft of floor space which we are told will be filled with "lots of interesting themes". Be that as it may, we are all probably more interested in seeing the Koi and at this year's show there will be some of the finest examples of Koi in our hobby including many champion fish from 1999. AllClear Water Purifiers are treating the watere at this show so exhibitors will have no worries on that score. Tel: 01722 340313 or fax 01722 313340 for further details.

SHOW CALENDAR

APRIL
29/30 D.J.s Koi Show, at Milton Keynes. Contact 01922 493290.
MAY
6/7 SAEKC OF ZNA. At Fleming Park Leisure Centre, Passfield Avenue, Eastleigh, Hants. Tel: 01722 340313 or fax 01722 313340 for further details.
29/30 BKKS South Hants Section 9th Open Show in the Sports Hall, South Downs College, Crookham, nr. Havant. Also features an outside marquee to accommodate extra number of dealers wishing to attend. Contact Rod Isted on 01243 572762.
JUNE
10/11 BKKS Worthing & District Section Open Show at Worthing United Football Club, The Robert Albon Memorial Ground, Lyons Way, Worthing, West Sussex. Contact Dennis Cross, Show Chairman, on 01903 218171 or 07801 296100 (mobile).
10/11 BKKS Yorkshire Section at Temple Newsam (M1 Junction 46). Contact Fred Harston, Show Chairman, on 01226 722578, or Mike Fullerton, Show Secretary, on 01226 727311.
18 Scottish Koi Club Closed Show at OKI (UK) Ltd. Cumbernauld, Central Scotland. Contact David Rivett (Chairman) on 01292 317947 or Marc Raeburn (PRO) OS 01236 731908.
JULY
15/16 South West Koi Club at the Royal Bath and West Showground. Contact Colin Baker on 01934 822620, John Sprouting on 01934 822620 or Dennis Hunt on 01884 258710.
16 BKKS South Wales Section. Closed Show at Maidenhead Aquatics, Cambran.
23 BKKS Essex Section Open Show at Aveley Sports Ground, Aveley, Essex. Contact Ian Prior (Show Chairman) on 0181 592 3268; Esther Ball (Show Liaison (Dealer Bookings) on 0181 6327; Margaret Spurr (Vat Bookings) on 01702 292766.
30 Yorkshire Koi Society (celebrating its Silver Jubilee) at York Racecourse. Contact Jeff Glasspole (Show Manager) on 01845 526164.
AUGUST
5/6 International Koi Show, organised by D.J.s Koi, at Billing Aquadrome, Northampton. Contact 01922 493290.
SEPTEMBER
2/3 BKKS Isle of Wight Section Show.
3 BKKS Leicestershire Section Annual Show at Farm World, Gartree Road, Oadby, Leicestershire. Contact Nigel and Pip Ostell on 0116 220 1522.

KOI SOCIETY MEETINGS/ EVENTS

MARCH

23 Witham Valley Koi Society, Alan Harriman, Bonsai. Contact Ray Lee on 01522 872733.

There are numerous Koi clubs/societies throughout the UK and we will publish details of their meetings each month as and when we receive details. However, don't forget to include a contact name and number.

THE BRITISH KOI-KEEPERS' SOCIETY SECTIONS

Central, Pat Stevens (Membership Secretary), 0121-588 2446.
Cheshire & District, Keith Grainger, 01782 773592.
Crouch Valley, Brenda Scott, 01375 642321.
East Pennine, Betty Koerner, 0114 2341151.
Ireland, Trevor Geary, 01247 466865.
Isle of Wight, Kevin Driscoll, 01983 291676.
Kennet Valley, Peter Gilmour, 01635 821684.
Leicestershire Koi, Karen Boyton, 0116 233 0797.
Manchester & District, Sue Ennis, 0161-480 5821.
Middlesex & Surrey Border, Jim Freeston, 0181-641 2686.
Mid Staffs, Val Stokes, 01543 276359.
Northants, Peter Parker, 01908 311021.
Nottingham & District, Shirley Hind, 0115 981 0923.
Potteries & District, Tina Burgess, 01782 617526.
South East, Mick Wright, 01634 718943.
South Hants, Di Harrison, 01705 596099.
Suffolk & North Essex, Alan Carter, 01206 866011.
West Wales, Basil Evans, 01554 772190.
Worthing & District, Carole Coote, 01903 231277.
Yorkshire Section, Andrea Thornton, 01924 275749.

INDEPENDENT KOI CLUBS

Birmingham and West Midlands Koi Club, Alan Smith, 0121-422 3896.
Black Country Koi Society, Tony Bennett, 01384 395299.
Bristol & West Koi Club, Larry Lerway, 01454 898207.
Cambrigeshire Koi Club, Graham Hagger, 01487 711129.
Dorset Koi Keepers, Alison Allen, 01202 875437.
East Coast Koi Club, Alan Wright, 01502 587116.
East Midlands Koi Club, Richard Jones, 01283 224973.
Eastbourne & District Pondkeeping Club, Brian Dale, 01323 731389.
East Yorkshire Koi Society, Steve Mattinson, 01964 527863, or Chris Hill, 01482 346777.
Fylde & District Koi Club, Chris Ingledew, 01772 635581.
Heart of England Koi Society, Paul Stacey, 01203 674821.
Merseyside, Syl Bennett, 01942 204948.
Midland Koi Association, Keith Hanson, 01527 545230.
North East Koi Club, Jean Hope, 0191-416 3794.
North Lincs Koi Club, Ken Bush, 01472 883377.
North of England ZNA Chapter, Yvonne Muse, 0114 289 1437.
North Wales Koi Society, Keith Parry (Chairman), 01492 580503 or Dave Davies (Membership), 01352 762149.
Northern Koi Club (ZNA Friendship Club), Glynnis Morgan Davies, 01706 218243.
Norwich Koi Club, Jenny Allen, 01603 452932.
Oxfordshire Koi Club, Kevin Newton, 01865 874008.
Plymouth & District Koi Keepers' Society, Sandra Crocker, 01752 219138.
South Devon Koi Club, Stan Mowing, 01803 843019, or Christine Brockstone, 01803 833472.
South Essex Koi Club, Mick, 01702 342460, or Barry, 01268 565739.
South West Koi Club, John Sprout, 01934 822620.
Wessex and Southern Koi Society, Mrs Jenny Lenton, 01425 276885.
Wirral & District Koi Society, Dave McCulloch, 0151 677 1582, or Steve Cope, 0151-327 7457.
Witham Valley Koi Society, Ray Lee, 01522 872733.
York & District Koi and Pond Fish Club, Andy Hudson, 01904 340185.
Yorkshire Koi Society, Rita Thomson, 01723 864867.

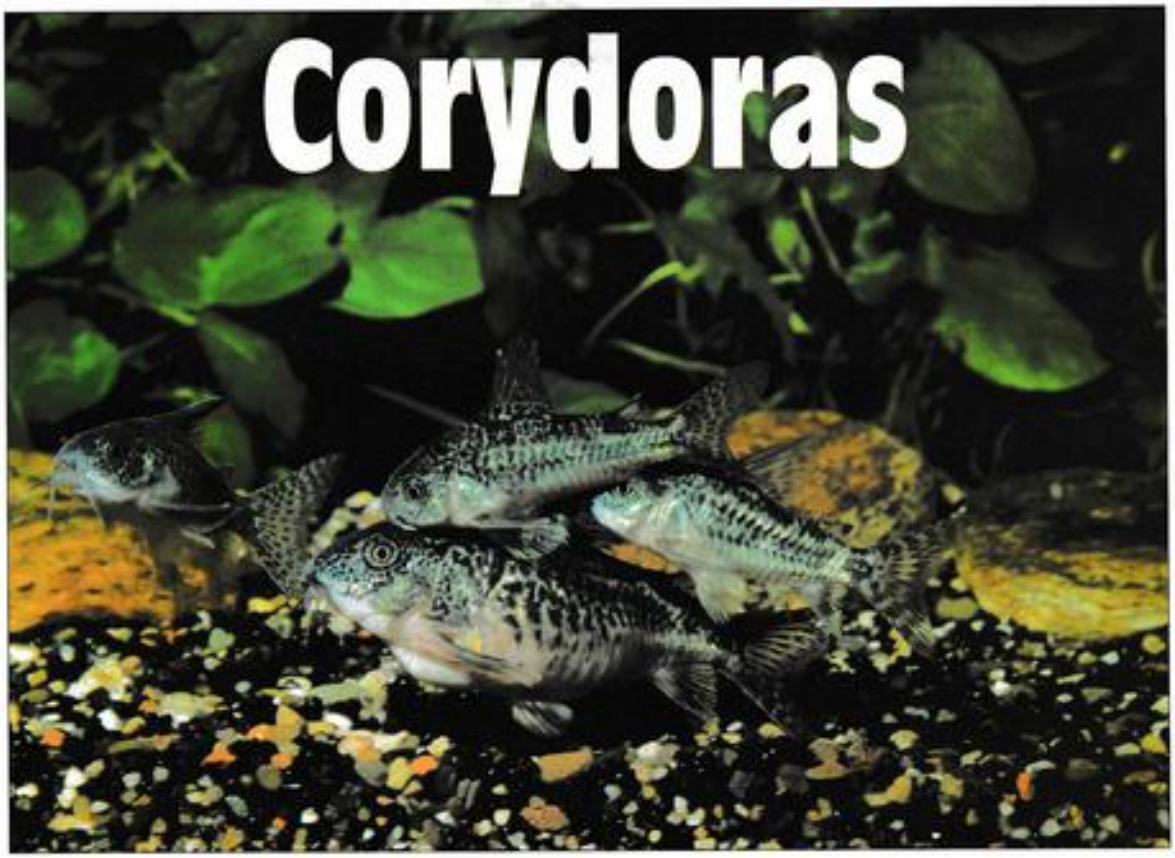
Copy for Koi Calendar should be sent to Aquarist & Pondkeeper, Solus Magazines Ltd., Suite 4, Invicta Business Centre, Orbital Park, Ashford, Kent TN24 0HB. Telephone 01673 885202 or fax 01233 500821.
Copy deadline four weeks before publication date.

TROPICAL

Corydoras are one of the most popular aquarium fish in the world and they are often one of the first egglayers fishkeepers actually see breeding. It is a truly remarkable sight watching a group of these catfish indulge in an orgy!:

PHOTOGRAPHS: AREND VAN DEN NIEUWENHUIZEN

Breeding Corydoras



For many of us the wonder of watching these fish breed is enough, but for the more scientific enthusiast the question of how they fertilise their eggs has always hung in the air like a question mark hovering over the hobby as a whole. Just how they spawn has been photographed frequently (although rarely as explicitly as with these photographs of Arend's) but how sperm and egg get together has never been answered. Finally, *A&P* can explain all, thanks to four Japanese biologists who found a very simple and easy way to watch what happens. First though, we should explain how to breed Corydoras.

The breeding set-up

First of all they are best moved to a separate breeding tank. This does not have to be anything fancy — just a 24 inch aquarium with a heater/stat set at 75°F and a bubble up sponge filter. The aquarium needs to be as clean as possible and can include some substrate, although many species are quite happy in a bare tank.

Ideally, the water quality should be soft and slightly acidic, however, with many of the common species, such as Peppered Corydoras, normal hard alkaline tapwater is fine. Once the aquarium has been up and running for a few days you can introduce your breeders.

Sexing

Sexing Corydoras when they are young can be difficult, however, once mature and in breeding condition it is easy to spot the differences. Females are much plumper (this is most easily seen from the top rather than the side) and males have elongated dorsal and pectoral fins. In wild

caught *Corydoras paleatus* the males' fins are very much elongated as well.

Conditioning

Once you have a pair (or better still a group of two females and four males) you can start conditioning them for breeding. This is done by feeding plenty of live foods. Bloodworms, Daphnia, White and Grindal worms are best for this. A good quality flake or tablet food should also be fed during this period.

When in breeding condition the males will be looking particularly bright in coloration. Females will be plump and full of eggs. Now you might think everything will go like clockwork and your breeders will be up and running as soon as possible. The truth is, however, that fish do not spawn to order. Your wonderfully conditioned adult pair may very well just sit there and do nothing for weeks or even months. Given patience, however, your Corydoras will start spawning. This usually happens the morning after a partial water change with cooler water. Now you can sit down and watch their antics.

The spawning

Early one morning when sunlight first hits their aquarium (or about an hour or two after turning on the lights) male Corydoras will be seen chasing a ripe female around the aquarium. They frequently nudge her in the belly region and will be seen fondling her with their whiskers. After a few minutes of this sort of stimulation she will be well worked up and start to take an active part in the spawning.

Watch closely and you will see her approach a male and fondle him around his vent. At this time they are in what is called the "T" position and you may well see the male shudder. Next she moves away and sits on the bottom for a few minutes. Eggs are then expelled into a pocket formed by her pelvic fins.

Now she moves off looking for a suitable site to stick her eggs. She frequently mouths areas of glass and plant leaf and eventually will find a spot just to her liking where the eggs are pushed onto.

The chase begins again and after another "T" position with the same male as before, more eggs are expelled. These are splattered onto another spawning site.

The bizarre truth

The question has always been just how did the male's sperm fertilise the eggs? Most watchers assumed it happened by the female taking sperm into her mouth and then placing it on the spawning site before pushing her eggs on to it. The truth of it, however, is far more remarkable. By using a marker dye our biologists found that the female did indeed stimulate the male to release his sperm when they were in the "T" position.

What happened next was more interesting. Having taken the sperm into her mouth she swallowed it! A few minutes later the sperm came out of her vent followed by a batch of eggs being released into the pelvic fin pouch. With the sperm the researchers' dye was also released so they could see it had actually passed right through the females gut and come out the other end!

Proof positive of how *Corydoras aeneus* (the test subjects) breed.

above right A pair in the classic "T" position. It is at this point the female is actually drinking sperm!

right Females rest for a few minutes to allow the sperm to pass through their body after which the eggs are also released into the ventral pouch.

TROPICAL

BREEDING CORYDORAS

Aquarists can now fill in the gaps because we have been observing many different species of Corydoras breed and so far every single one of them forms the "T" position during their mating sequence. So do the closely related Aspidoras and Brochis.

Hatching and rearing

As soon as spawning is complete you should remove the adults and leave the eggs to develop by themselves. About a week after this the fry will hatch out and become free swimming a day later. Now they should be fed with newly hatched Brine shrimp and Micro worms. This can be supplemented with powdered fry food but make sure you swirl this into the water so it sinks quickly. Larger foods can be fed as the fry grow. These should include tablet foods and other catfish treats. Once the babies are three months old they should be large enough to be moved into your community aquarium or sold to local shops.

REFERENCE

Masanori Kohda, Masayo Tanimura, Miyako Kikue-Nakamura and Satoshi Yamagishi (1995). "Sperm drinking by female catfish: a novel mode of insemination". *Environmental Biology of Fishes*, 42: 1-6.

left Plastering fertilised eggs on the front glass. A typical place for Peppered Corydoras to lay their eggs. Other species prefer floating plant roots or a clump of fine leafed plants.

FISH PROFILES

RED-EYED TETRA (MOENKHAUSIA SANCTOEFILOMENAE)

By Iggy Tavares, PhD

Moenkhausia sanctaefilomenae, the Red-eyed Tetra, with its silver coloured body off-set by its red eye and the black spot on the tail, is an attractive deeper bodied characin. It is sometimes called the Yellow-banded Moenkhausia after the yellow band on the caudal peduncle. The other fins are all transparent. Male and female fish are very similar in shape and size, reaching three inches TL (7.5cm). Mature females tend to be a little plumper than males.

The Red-eyed Tetra is an ideal inhabitant for a community aquarium as it is an active yet peaceful fish. It does best when kept in a shoal of at least six, when all its natural characteristics and coloration will be displayed to the full. Taking the size of these fish into consideration, the community aquarium should be at least 36 inches long, so as to provide sufficient swimming space for the shoal of Red-eyed Tetra and other similar sized fish that will occupy the tank.

A well planted tank arranged with a free-swimming area at the front allows one to enjoy these tetras. Although the natural biotope of the Red-eyed Tetra is the Amazon rain forest where the water is soft and acid, the tetra adapts well to ordinary tap water that has been aged before use. Filtration for such a tank could be under-gravel powered by an air pump, while a heater thermostat is used to maintain temperature at around 25-28°C. These tetras will take all commercial foods offered but do enjoy live food such as Whiteworm and Daphnia as well frozen Bloodworm.

Although the Red-eyed tetra will live happily in hard water, when it comes to trying to raise a new generation, soft water is needed for development of the eggs. Hence a separate tank filled with soft water and Java moss is needed for spawning the Red-eyed tetra, which needs to be acclimatised to soft water slowly if it has lived in hard water. Males and females should be separated for about two weeks and then brought together in the spawning tank. After spawning the adults should be removed. Eggs hatch in a couple of days and when free swimming should be fed on infusoria to start of with before progressing on to larger foods as they grow.

The Red-eyed tetra, without being too showy, is an active and attractive fish. It is a hardy, undemanding tetra that will grace any community tank.

PHOTOGRAPH: DEREK LAMBERT

RED-EYED TETRA CV

Family: Characidae
Species: *Moenkhausia sanctaefilomenae*
Origins: Amazon, Brazil, Paraguay, Peru, Bolivia
Aquarium Type: 36 inch community tank
Feeding Position: Top and mid-water
Size: 7.5cm
Temperature: 75-78°F
Diet: Flake, small live food, frozen Bloodworm

The ANGEL FISH

By Richard Fricko

No self-respecting cartoonist, advertising designer, or any non-fishkeeping person who wanted to draw or depict an aquarium would fail to show it containing an Angel Fish. The very shape of this ornate species seems to epitomise the hobby to anyone not a member. For sure there could not be a better ambassador for delicate style of fins, colour and deportment — temperament is another matter. Angelfish are cichlids. There seems little point in describing the flattened triangular body, as everyone must have seen the fish at sometime, and it will have made a lasting impression.

There are many colour variants in the trade today, as selective captive breeding has taken strides to produce variation for the customer. This at the expense of the original coloration, which was a silver body, having a slight green sheen, the fins are light blue brown with a splash of blue green dots all over, there are seven black bands running top to bottom of the body, although you might be pushed to see more than the predominant four the others being very feint. The one through the head passes right through the red iris of the eye.

Colour variants include: gold and the black (which not surprisingly are gold and black all over as the names suggest); marble — a mixture of silver, black and light brown, and the newer additions in the trade of the Koi Angel with bright coloured blotches on a white body.

The Angel Fish comes from the Amazon basin, hiding in the roots at the edge of the huge rivers. Hide they need to do as they share their habitat with Piranha, large cichlids and even freshwater Dolphins. As with many of their fellow inhabitants of this region, they move out into the surrounding forest as the floods arrive where they breed before returning to the rivers.

The staple diet in the wild is insects, shrimps and small fish. So they are not so angelic when it comes to your community fry. The adult fish can reach six inches being nearly as tall as they are long they make an impressive sight. They will enjoy life in a community tank, but should you wish to try your hand at breeding for the sake of the Angels and the other fish, a species tank is the better option. Here a temperature of 82°F, pH 6.5-7 is the optimum.

While Angel fish may not be totally angelic, they certainly set off a balanced stocking of a community tank.

PHOTOGRAPH: IGGY TAVARES

ANGEL FISH CV

Family: Cichlidae
Most Likely Species: *Pterophyllum scalare*
Origins: Amazon Basin
Aquarium Type: Community, or species tank for breeding
Feeding Position: Mid water — surface
Size: 6 inches
Temperature: 76-82°F
Diet: Flake with live food as a treat

MARINE

ANDREW CAINE, BSc, of Aqua-World, continues his look at invertebrate life in the oceans:

PHOTOGRAPHS: LES HOLLIDAY UNLESS OTHERWISE STATED

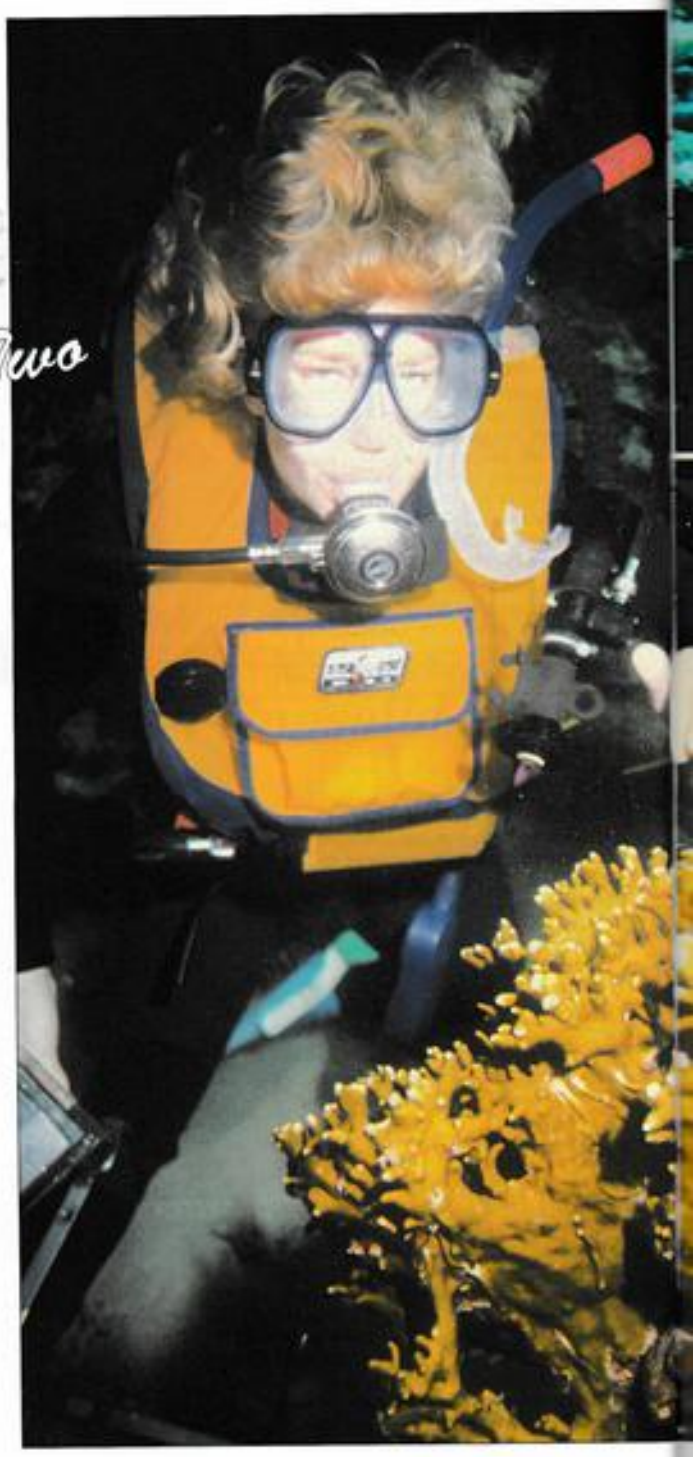
Life in the Oceans *Part Two*

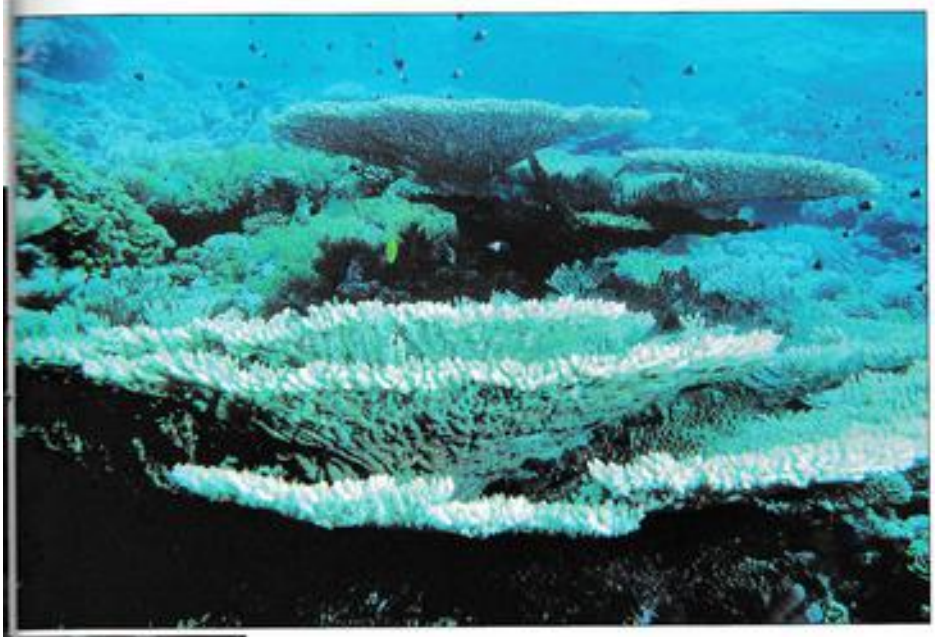
The Cnidarians: Hydroids & Corals

The Hydroids

These occur in both fresh and salt water, taking the form of either solitary animals or colonies all joined by a common connection. A colony structure is best considered as a very long railway line, with many stations along it, the line being the common connective structure and each station being an individual animal. Extensive rock areas can be covered by the same species' which often resembles a fern like covering. They commonly attain a height of between 5/15cm, though much larger and more dangerous species exist. Apart from a rocky substrate they are found on shellfish, crabs, free floating and seaweed fronds. Take a powerful hand lens down to the shore, find a seaweed with brown moss growing on it, place this in a jar of water, then you will be able to observe the structure more closely.

The best known hydroid is the Portuguese man-of-war, commonly thought to be a jellyfish, but which is in fact a hydroid colony containing tens of thousands of individual animals. It has no bell, and is supported by a float under which the tentacles trail. Each tentacle is, in fact, a very long railway line armed with separate feeding animals, each passing some energy up the connective structure to maintain the carbon monoxide filled float. These are common in the tropics and sub tropics, with species ranging from a float length of one to 30cm. They can also be seen in the North Atlantic when a storm blows them out of the gulf stream. If you encounter a large one when taking a dip, the best advice is to get the hell out of its way, as a sting can be dangerous! Fatalities are mostly due to drowning through





the resulting muscle seizures and cramps, and not directly from the sting.

Another hydroid commonly mistaken for a different animal, and which has caused suffering to many divers, is the fire coral. As the name suggests, it comes with a very painful sting. Like corals it builds a calcium carbonate skeleton, the difference being that it is surrounded by living tissues, whereas in corals the calcium is on the outside. A hydroid it is, a coral it is not.

BODY PLAN: An animal is made up of three polyps, each with a distinct function, feeding, reproduction and defence. The connective structure is called the stolon.

FEEDING: The defence polyp is the only structure to contain stinging cells thus it acquires food and passes the prey to the feeding

far left Hands off! This is not a harmless coral but Fire Coral. Despite the name and appearance this animal is a hydroid which comes with a very painful sting. Like corals it builds a calcium carbonate skeleton, the difference being that it is surrounded by living tissues, whereas in corals the calcium is on the outside. A hydroid it is, a coral it is not.

above There are three basic colony growth shapes of hard corals, massive (rounded), branching (tree-like) and tabular (flat), with coral species being able to develop any two or three of the growth forms. This is a classic tabular colony shape.
PHOTOGRAPH: MAX GIBBS

left Klunzinger's soft coral (*Dendronephthya klunzingeri*) is often better known in the trade as Red Cauliflower Coral. A startling animal whatever it is called!
PHOTOGRAPH: MAX GIBBS

polyp for ingestion. Their prey consists of mainly zooplankton but the larger sized colonies can take small fish.

REPRODUCTION: This takes two forms, asexual and sexual. The colony increases in size via asexual reproduction, where buds form on the leading tip of the stolon. These buds form clones of the original polyp, the stolon thus increases, another bud forms, and so the colony grows. Sexual reproduction ensures the mixing of genetic information, thus allowing evolution to occur. It is diverse between species and may include the direct shedding of eggs and sperm into the water column.

Fertilisation occurs and a planula larva is produced, which settles and metamorphoses into a young hydroid, to start a colony. The reproductive polyps can also shed fully formed medusae, which look like microscopic jellyfish and allow dispersal via water currents. The medusae then release eggs, each of which develops into a planula, and the cycle continues. A seven centimetre colony of one species released 4,450 medusa in three days, a very prolific animal indeed.

The Corals

In 1723 a French scientist proposed that corals were indeed animals and not underwater plants! How dare he! He was ridiculed by the scientific community of the day, and gave up science.

Corals are probably the most famous of the marine invertebrates, though again not for themselves but for the structures they produce, and the array of colourful fish that inhabit the reefs, this making the areas very popular for tourism. It is a pity that the reefs attract such commercial interest, for it may well be their downfall. They are grossly understudied, as Scuba has only been developed to a high standard within the last 30 years.

It is also fact that they tend to occur in underdeveloped countries where cash, for research not leading to profit, is not available. This is another area of public misinterpretation. Science knows relatively very little about coral reefs. To emphasise, it has been calculated that species on the world reefs number some 423,000, of which less than 10 per cent have been named, and the majority of these are devoid of study. The only intensive study around reefs is for bio-research, which involves taking animals and mashing them up, as many produce chemicals which have the potential to cure cancer and other diseases. On the whole we know very little.

We have two separations here, the soft corals and the true corals, with the distinguishing feature being the development of tentacles. The soft corals, or octocorals, have eight, or multiples of eight, tentacles and the polyps are enclosed in a flexible framework. The tentacles always have branches on the side for filter feeding.

The true corals have six, or multiples of six, tentacles, and are enclosed with a calcium carbonate skeleton. Two separations occur here between ahermatypic (non reef builders) and hermatypic (reef builders, stony corals) which all contain algal cells within their own cells. The soft corals and non reef builders have a global distribution at all depths.

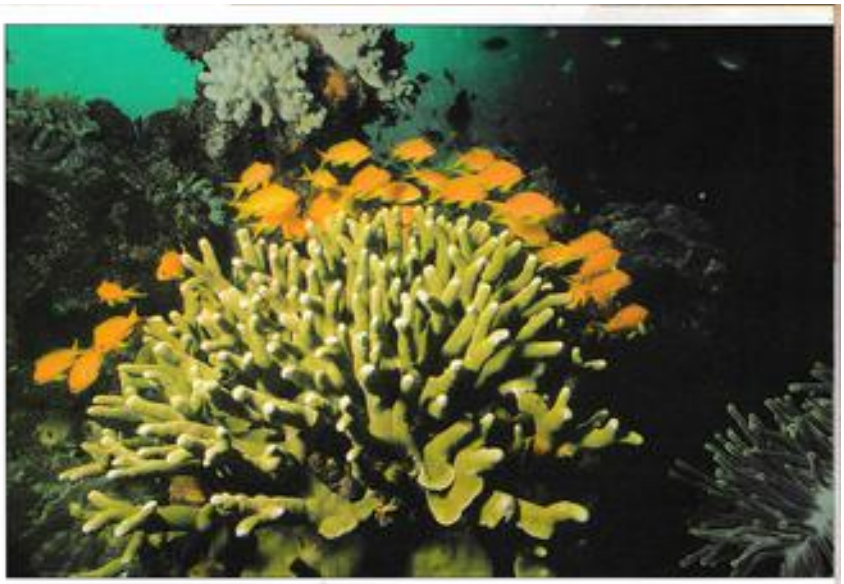
The soft corals can live in colonies and take a wide variety of shapes from elaborate fans to single strands, many metres in length or diameter and reaching a maximum size before 30 years, after which breakages occur. They are active during the day whilst the other corals are mainly nocturnal. Non reef builders take a solitary form, with a single polyp enclosed in a small calcium carbonate structure. The tentacles are often elongated to act as legs, either to move up with the rising sediment, avoiding being buried, or to drag the carbonate "house" along the bottom. Deep sea species are extremely slow growing, some individuals being recorded at over 300 years of age.

The hermatypic corals are distributed within the Tropics of Cancer and Capricorn, with the exception being the Red Sea. The best growth is in clean, clear, well oxygenated water at a temperature of between 23-25°C. They do not tolerate high turbidity, temperature above 30°C or below 18°C, or low salinity. They are found in surface waters down to 100m, with most growth between 10 and 30m, forming colonies which can weigh over 100 tons.

There are three basic colony growth shapes, massive (rounded), branching (tree-like) and tabular (flat), with coral species being able to develop any two or three of the growth forms. Growth of a colony is achieved by depositing calcium carbonate on the surface, thus the skeleton increases in size. The dead structures found at 100m depth, were thriving in surface waters when the Romans invaded England.

BIOLOGY OF THE STONY CORALS: The basis of the marine food chain is phytoplankton and algae, which require inorganic nutrients from the surrounding sea. We have a problem in the tropical waters as there are very few nutrients and phytoplankton, so how do coral reefs exist in waters that cannot support the high density of life which is found? This is an extremely important question, when we sit and think about it, because without corals, the oasis of life that we know would not be there, so what allows the corals to exist?

The answer lies within the coral polyp and the population of algae that lives there. This is the basis of the reef ecosystem. Older texts refers to the algae as one species within all corals and other Cnidarians. Research has proved this to be untrue. The algae are collectively referred to as *Symbiodium* sp., the "sp." referring to species, as many are unnamed. In fact only ten have been positively identified and named and the remainder are merely "sp.". They exist at a density of six million cells per cubic metre of polyp tissue, and are also responsible for the



process of calcification, so their importance cannot be underestimated. Without the presence of the algae, the land which they surround would look completely different today, through coastal erosion. The Maldives and other atolls would not exist.

The algae are found in the cells lining the polyp gut. During the day, by photosynthesis, they leach simple compounds from their cell walls into the cells of the polyp. The compounds include glucose, glycerol and amino acids, which are utilised by the polyp, either directly in energy releasing reactions or utilised as building blocks for more complex molecules such as proteins. However the alga cells need nutrients themselves. These are supplied as waste compounds from the polyp's own metabolism, so that we have an extremely efficient recycling system. The polyp feeds the alga and the alga feeds the polyp.

In the surface waters the alga can supply over 100 per cent of the coral's needs, but with the deeper corals, less light penetrates reducing photosynthesis. Thus the corals become less dependent on this source of nutrition. Even with over 100 per cent of nutritional needs the corals must actively capture zooplankton to supply the cells with essential nutrients which are not supplied by the algae.

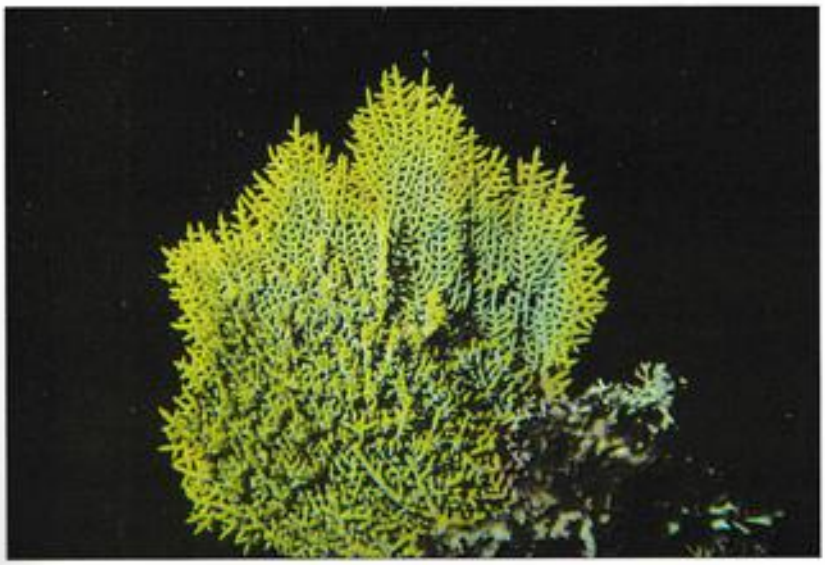
So this symbiotic relationship allows an oasis of life to exist within a nutrient deficient sea. However it is not as simple as that. The alga cells divide at nine times the growth rate of polyp cells, so really the cells should burst. The algal biomass is regulated to a constant level, again we do not know how. It is unlikely that they are consumed as no such evidence has been found. We know that corals are capable of releasing all the algae to the surrounding water when stressed. In the Caribbean a few years ago a temperature rise occurred, which resulted in many coral deaths through "bleaching". In fact, the corals expelled all their algae and died. The current belief is that old cells which are not as efficient are expelled from the body, and act as a source of nutrition for others.

The growth of the colony is by asexual reproduction of polyps and an increase in the calcareous skeleton. Each polyp sits in its own little depression called a corallite, and the pattern of this cup is used in identifying species, each being different. Microscopic crystals have been observed leaving the polyp and being deposited here, so growth is occurring. From measuring the growth over 24 hours it was discovered that, at night, growth reduced by 14 times that at midday, indicating that algae were also responsible as they are more active in the daylight.

Here we have to enter a bit of chemistry to explain the process. One of the main substrates that the alga utilise is waste C02, from the coral. This increases the amount of carbonate within the coral cell fluids to dangerous levels. Through a series of chemical reactions the coral forms a carbonate crystal, thus reducing the levels and producing a building block for growth. As in the above situation, this is an ongoing process, with the alga and coral working together.

Growth is by no means conservative, but always slow. The branching corals are the fastest where growth is at the tips. These can attain 10cm per year maximum. The slower growers, the massive and tabular corals in deeper waters, may only grow 1mm a year. Asexual budding of the polyps causes the circumference to expand: and the old polyps are covered by the new growth, only the surface corallites containing living tissue.

REPRODUCTION: Sexual reproduction is similar to that described for the anemones, and dispersal of the species is achieved. This is best seen in the colonisation of ship wrecks. Within 10 years small colonies are evident all over the superstructure, and a new mini reef is produced. On the west coast of Africa, offshore oil terminals are now covered in corals and their associated inhabitants. This area is species deficient, and this new unique production is utilised by local fishermen as a source of protein.



far left *Tubastrea faulkneri* is a hard coral with bright orange polyps. This specimen was photographed in its natural habitat in the Indo Pacific.

left The Venus sea fan (*Gorgonia flabellum*) is a soft coral found in seas around Bermuda, the Caribbean, Columbia and Florida. It is found from the surf zone down to a depth of about 90 feet.

above Here a colony of *Acropora* sp. is crowned with a shoal of fish. This is a hard coral which is often seen growing in this branching shape.

TROPICAL

STEVE PUNCHARD & GARY COWBURN continue their monthly column with a look at Discus diseases and other health problems:

PHOTOGRAPH: STEVE PUNCHARD

The Discus Pool

This Tangerine Discus jumped out of the breeding tank and knocked itself out, never recovering. On close examination we discovered a tumour which was pressing on vital organs. The swollen area can be seen in the abdominal area.

Probably the most difficult health problems of Discus keeping that hobbyists have to deal with are complications, such as swimbladder, tumours, tapeworm infestation and bacterial and flagellite infestation.

Diagnosis is very difficult, even by the more experienced hobbyist or professional, and sometimes the problem can't be found until the Discus has died and the fish has been dissected and examined under the microscope. By this time it is too late for the fish concerned but this will help future Discus by educating the hobbyist or professional. As most hobbyists don't have access to a microscope they rely on breeders and books which can be limited in their information.

Here at S. & D. Punchard Discus we carry out routine microscope work and have more in depth examinations carried out by The Ministry of Agriculture, Farming and Fisheries (MAFF). We have been helped a great deal by a specialist member of staff who is himself interested in fish health. I (Steve) have undertaken a course at Sparshot College which helped a great deal when it comes to understanding the management of stress and the environment.

When Discus keeping is discussed the main topic is usually water quality which is vital to successful fishkeeping. Bad water quality can lead to bacterial infestations and many of the ailments listed previously.

Let's look at a few case studies:

CASE NUMBER 1

Symptoms — Discus have what looks like popeye — their eyes are twice their normal size and are popping out of their sockets. If not treated they get so big that they look as if they are going to burst and the head begins to show signs of what look like worms being forced out of the head region. This is actually puss produced by the fish due to stress. This is caused by poor water quality, not usually by non treated water but by lack of water changes, inconsistency in checking pH and a heavy nitrate/organic bacterial load in the water. This poor environment leads to stress which in turn leads to disorders such as popeye, hole in the head etc.

The solution is simple: Immediate large water changes with water of a correct pH value. This will reduce the nitrate level (provided your freshwater does not have high levels of this pollutant) and reduce the bacterial load in the water. This should be enough to make the popeye and puss slowly disappear. To help things along an excellent product called Octozin made by Waterlife, available from your local aquatic retailer, can be used following the manufacturer's instructions and after water quality improvements have been made. The most important point is to be consistent and don't let this happen again — as the saying goes an ounce of prevention is better than a pound of cure.

CASE NUMBER 2

Symptoms — Discus suddenly darting and crashing around the tank — in this case a breeding tank. Possible causes are cold water, toxins, incorrect pH, internal parasites, bacterial infestation, tumour and tapeworm.

The Tangerine Discus in the photograph actually became so nervous that it jumped out of the breeding tank and knocked itself out, never recovering. On close examination we discovered a tumour which was pressing on vital organs. The swollen area can be seen in the abdominal area. This fish was worth over £250 and was lost to natural causes which was unlucky for the Discus and me.

When the symptoms above show and a swollen abdomen exists this could also be due to taperworm and if a hard lump appears then it could

possibly be either a tumour, abscess or tapeworm.

Other diseases which cause sudden and unusual behaviour are hexamita, spironucleus and body and gill flukes.

Swim bladder problems

The swim bladder in fishes is a gas filled membrane, the principal function of which is to provide buoyancy. The process involves a complex gas exchange system between the swim bladder and the circulatory system.

Interruption of this process can lead to abnormal swimming behaviour and can be due to various factors such as extreme temperature changes, excessive transferral of fish from tank to tank, poor water quality over long periods, constipation (due to a poor diet lacking in roughage) and fat deposits putting pressure on the swim bladder and surrounding organs.

Early signs of swim bladder problems are shimmying which is followed by the fish virtually standing on its head whilst trying to maintain its equilibrium — known as a "head stander".

Early detection is the key in most cases, however, exact diagnosis is extremely difficult due to the variety of symptoms. For example swelling of the abdomen may be the result of constipation which will cause the abdomen to feel hard, whereas if a swim bladder problem is the result of a bacterial infestation the abdomen will feel soft. Consequently netting out the fish and gently feeling the abdominal area is necessary to discover what exactly you are dealing with.

From my own experience swim bladder problems tend to be more prevalent in older fish, usually males of two years and over.

Treatment of swim bladder problems

Treatment is difficult in most cases and fish generally succumb to this ailment, however there are some treatments which are worth a try.

If bacterial infection is suspected (soft abdomen) a metronidazole bath at 25mg per gallon for five days may prove successful. . A commercially available drug such as Aquafuran may also be used according to the manufacturer's instructions.

If constipation is suspected (hard abdomen) you could try using a laxative such as Epsom Salts (magnesium sulphate) at a rate of one tablespoon per five gallons of water. Before applying this you need to carry out a 30 per cent water change (adjust pH accordingly to match the current values) and raise the temperature to 92-94°F for three to five days.

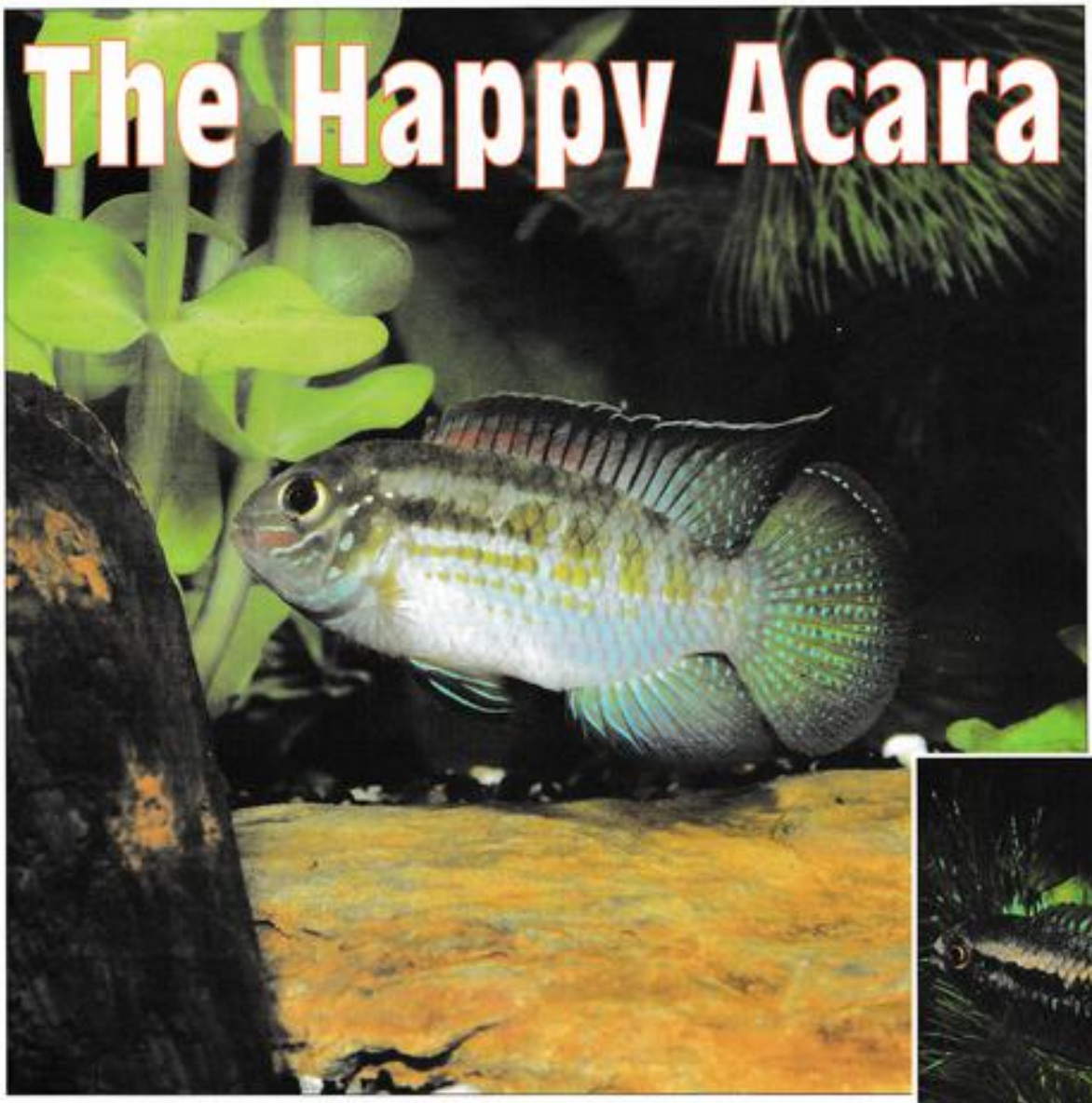
• Many Discus health problems are directly related to poor water conditions. The motto here is "Look after the water and your fish will look after themselves!" •

TROPICAL

Whilst Cichlids are tremendously popular in the hobby, only a few of them are really suitable for community tanks. MARY BAILEY of the British Cichlid Association looks at the "Happy Acaras" which were many an aquarist's first experience of this group.

PHOTOGRAPHS: M.P. & C. PIEDNOIR UNLESS OTHERWISE STATED

The Happy Acara

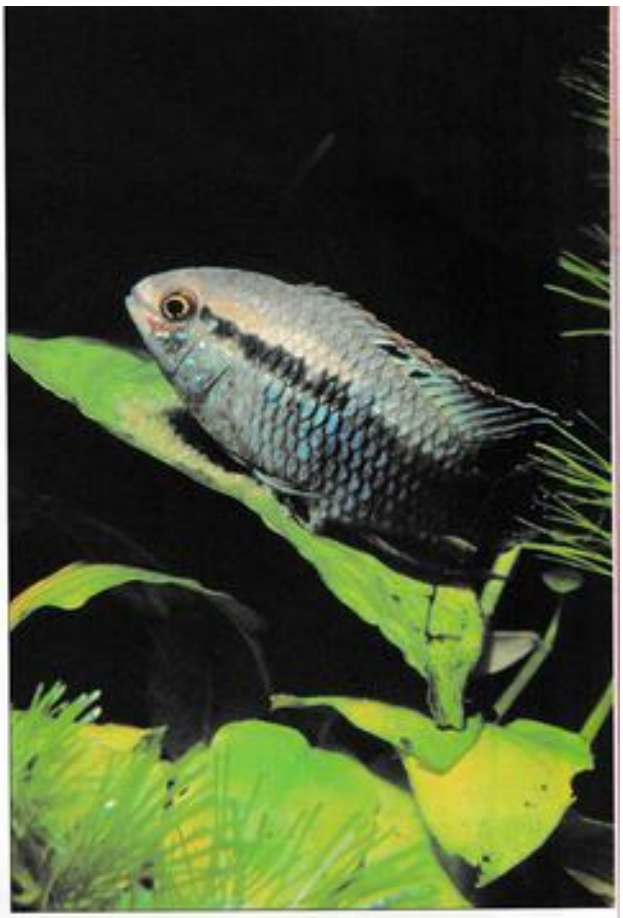


When South American dwarf cichlids are mentioned, most people tend to think immediately of the Apistogramma genus, and, of course, the Ram (*Microgeophagus ramirezi*). But these are by no means the only South American dwarfs, and I am not thinking of the exotica such as *Crenicara*, *Biotecus*, *Tamiacara*, and *Dicrossus*, either. There are two other genera, known to the hobby long before the Ram was discovered or any of the Apistogrammas became popular, but now often almost forgotten. Yet the

above *Laetacara* sp. "hump-head" is rarely seen in the UK. This is a juvenile which has yet to develop the hump of its common name.

PHOTOGRAPH: AREND VAN DEN NIEUWENHUIZEN

right A pair of Flag Cichlids (*Laetacara curviceps*) laying eggs on a large flat rock. This is a typical spawning substrate for this species.



right Female Flag Cichlid (*Laetacara curviceps*) laying eggs on a leaf. Whilst most pairs will spawn on a rock, if a suitably quiet location is unavailable a pair will make do with an alternative.

dwarf acaras, *Nannacara* and *Laetacara*, are by far the best introduction to the group for beginners, and have much to offer the experienced cichlidophile as well. One of the species most readily available is *Laetacara curviceps*, the subject of this article.

You may know this fish better as *Aequidens curviceps*, usually a rather drab-looking little fish when seen in retail tanks — one of the reasons it is so often ignored in favour of other more obviously attractive or positively gaudy fishes. Advanced hobbyists, who are often real snobs in their choice of fishes, may be aware of its potential glory, but tend to write this and other dwarf acaras off as "old hat", been around for decades, not worth bothering with. But sometimes, as we all know, ugly ducklings can turn out to be very fine swans indeed, and the fact that a fish has been around for many years does not make it any the less interesting if you personally have never kept it before!

When you're smiling ...

So why the name? Well, for a long time *Laetacara curviceps* and its close relatives were thought to be small, but close, relatives of the blue acara, *Aequidens pulcher*, and it is true that they are distant cousins. But it became apparent that *Aequidens* was in fact a "composite genus" made up of a number of different groups of species, each with a different ancestor species, ie different genera. In fact work is still being done to sort out the various groups from one another and give them new genus names where appropriate.

But it was obvious right from the start that the species that now constitute *Laetacara* were a discrete group. Not only are they smaller than most of the others, but they all have a feature in common that is seen in no other cichlids: their facial markings make them look as if they are smiling! In fact aquarists had spotted this long before scientists started thinking about it (often the case!) and called them the "smiling acaras". And their new scientific name took this fact as its basis — the Latin adjective "laetus" means "happy" or "joyful". "Acara", as many aquarists will already be aware, is a South American native name for many types of cichlid, and one which figures in many of their scientific names as well as in hobby names such as "brown acara" ... and "smiling acaras", of course.

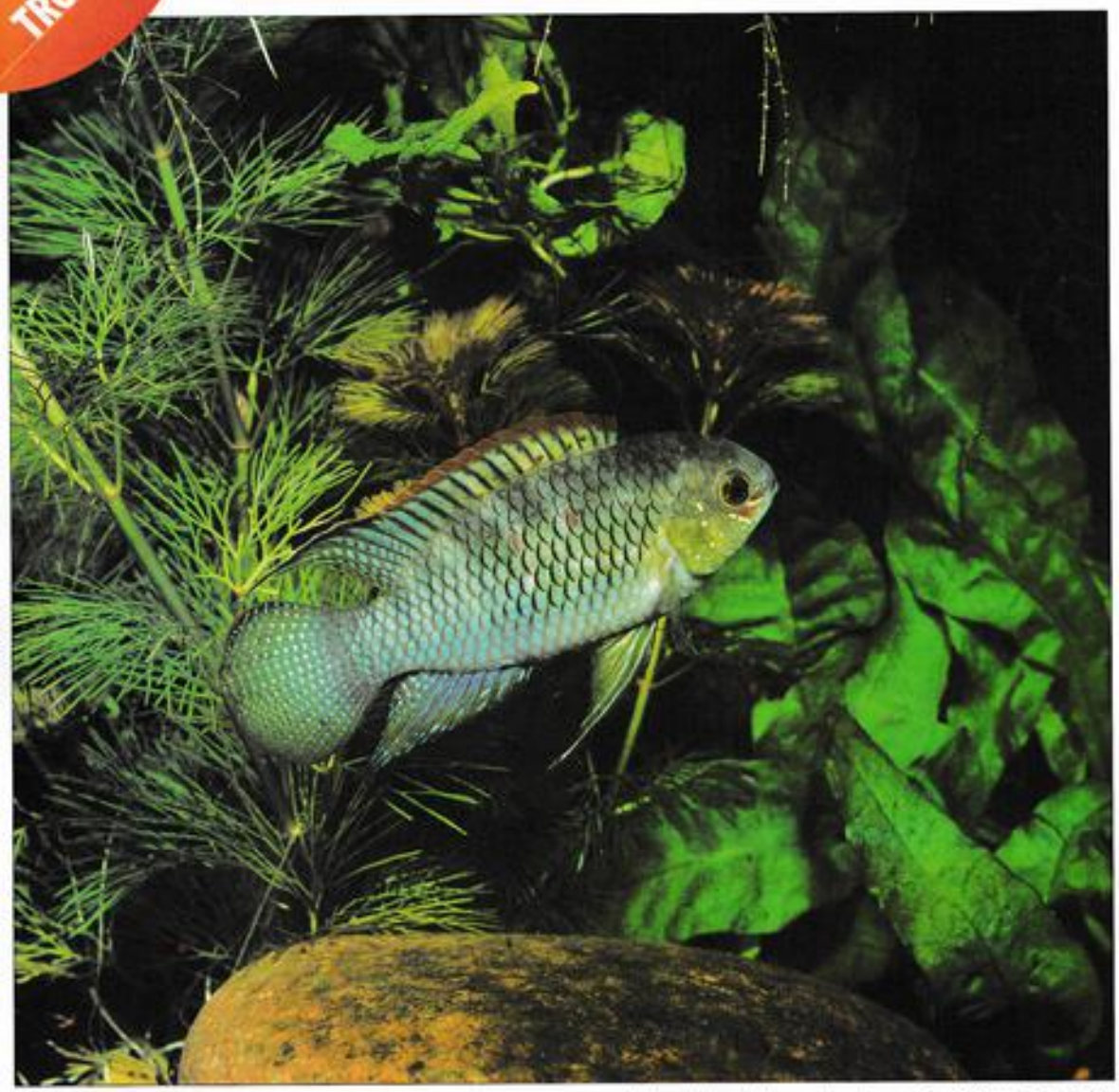
The specific name curviceps, meanwhile, means "with a curved head", referring to the convex upper head profile of the species. In fact all the smiling acaras have this feature, but it is slightly more pronounced in this species than in the other ones known at the time when it was given its name.

In the aquarium hobby this species is often known just as "curviceps" and also as the "flag cichlid". Unfortunately the latter name is also sometimes applied to a very different and much larger South American cichlid, *Mesonauta festivus*, better known as the "Festivum"; and it is not unknown for confusion to occur, namewise, with the "flagfish" or "American flagfish", *Jordanella floridae*, which is not a cichlid at all (it is a cyprinodont). For these reasons it is best not to use the name "flag cichlid" unless you use the Latin name as well, to make it clear just which fish you mean.

A wide-ranging smile

The natural range of *L. curviceps* is said to be the eastern Amazon drainage, from Santarem down to the mouth of that great river, as well as the tributaries on either side, including the Tapajos, which joins the main river at Santarem. It has also been reported from the Brazilian state of Amapa, north of the Amazon, bordering the river, the Atlantic, and Guiana, and containing part of the highland area known as the Guiana Shield. But the data are rather vague, and this is a rather large range for such a small fish — males to just over three inches (8cm) and females to two and a half inches (6cm) — so it may turn out that there are other species involved as well. Certainly slight variations in colour (shade and extent) are known from different sites along the mainstream Amazon, though these do

THE HAPPY ACARA



appear to represent just a single species.

It should be stressed that the normal habitat of these cichlids is not the main stream areas of the large rivers, where it would be rapidly swept away or devoured by large predators. Instead it is found in shallow regions along the shore zones, as well as in small tributary streams, oxbow lakes, pools, marshes, and other areas where there is cover and little current. Sometimes the surrounding terrain is rainforest, but in this part of Brazil there is open savannah habitat as well. Cover in these shallow waters is provided by aquatic and marginal plants, trailing terrestrial vegetation, leaf litter, tree roots, as well as fallen trees, dead branches, and so forth.

It almost certainly enjoys a variety of water conditions across its wide range, from acid (pH 5.2 has been reported) to neutral or slightly alkaline (typical of the main Amazon in this part of its course), although hardsess is probably minimal in all biotopes. Temperatures cited range from 26-40°C, which undoubtedly reflects seasonal as well as geographical variation. Under no circumstances should these little cichlids be deliberately subjected to constant, or even occasional, very high temperatures just because they have been recorded at them in the wild. We do not know how long (or if!) those simmering at 40°C survived the experience.

One of the hardiest dwarfs in captivity

Be that as it may, the variable conditions encountered in nature are possibly an explanation of why this species is one of the hardiest dwarfs in captivity, tolerant of almost any water chemistry. Of course it has also been in our hobby for so long that it has become thoroughly acclimatised; to the best of my knowledge aquarium populations are descended from the original imports decades ago. In the event that new importations of wild specimens occur, they may prove to be more demanding.

Laetacara curviceps is a peaceful little cichlid which can be kept in a

community aquarium without mayhem resulting; but it will, of course, defend its young against any other fishes that come to near, so if it is to be kept in a community situation the tank should be large enough to permit tank mates to stay well clear. Thiry six inches (90cm) should be regarded as minimum tank length for this type of maintenance, and 48 inches (120cm) better.

Alternatively, a single pair can be housed in a tank of their own, which should be at least 24 inches (60cm) in length. In this amount of space it would be unwise to expect them to tolerate other fishes when breeding. Smaller tanks are not suitable — very few cichlids, even dwarfs, can be kept in a very small aquarium without the risk of dangerous friction occurring between the pair.

The aquarium should be well-planted, bogwood and the cichlid-usual flowerpot caves can also form part of the decor. Lighting should be appropriate to promote plant growth — the plants will offer the cichlids shade from any glare, but obviously this requires that the plants be growing well before the fishes are introduced.

The filtration should be biologically efficient, but with a fairly slow through-put as this species does not appreciate strong currents. Air-powered filtration is ideal for a 24 inch set-up. Water quality parameters should be zero ammonia and nitrite, nitrate <25 ppm, ideally <15 ppm. It is true that this species will tolerate higher nitrate levels, but that does not mean this is good for the fishes in the long term, especially as nitrate levels in their natural habitat are generally barely measurable — if at all.

There is some evidence that high nitrate levels are associated with the occurrence of hexamitiasis (hole-in-head disease) in this (and other) cichlid species. Regular partial water changes of about 15 to 20 per cent weekly should suffice to keep nitrate low in the curviceps-only aquarium; more may be necessary in a community tank with a higher fish population relative to water volume.

As already discussed, this species is hardy as regards water chemistry; however optimum conditions are generally regarded as being fairly soft (up to about 6°dH) and slightly alkaline to neutral (pH 6.5-7), with a temperature of about 26°C (80°F). Hard alkaline water should be avoided if dealing with wild specimens.

Tankmates, if applicable, should be other small peaceful fishes suited to the tank conditions (decor and water), and may include other cichlids — other dwarfs, keyholes (*Clelthracara maroni*), Angels (*Pterophyllum scalare*), Discus (*Symphysodon aequifasciatus*), provided there is sufficient territorial space for each species. Angels and Discus are not in direct competition for space as they are not bottom-oriented, but in general other dwarfs will be. Although in nature *L. curviceps* is sympatric with larger cichlids too — eg, *Hypselecara*, *Mesonauta*, *Heros*, *Satanoperca*, *Acarouna* and *Crenicichla*, these are all too large; small fishes tend to be nervous if kept with significantly larger ones, and with justification in the case of the last two genera listed, which are predatory!

No longer ugly ducklings

The natural diet is probably largely aquatic invertebrates plus any terrestrial ones that find themselves in the water. In the aquarium this diet can be simulated with live foods such as Daphnia, Bloodworm, mosquito larvae, Artemia, Mysis, Whiteworms, and Cyclops, or their frozen equivalents if available. Frozen Tubifex can also be given, but avoid live Tubifex, as this can introduce disease. Chopped earthworms, shrimp, prawn, and mussel are also taken, as are dried foods; in fact these cichlids can be maintained on dried foods alone, but a more varied diet may have psychological benefits (would you like to live on space rations, however adequate a diet they may represent?!), and may be required to promote breeding.

Given the optimal conditions and diet described, the drab little cichlids from the dealer's tank will soon settle in and begin to mature and show their true colours. What was once just plain silver (but with the smile!) now becomes blue or green-blue, not unlike the colour of a blue acara. There are usually a number of red markings on the cheek below the eye, hints of red in the dorsal, and a red edging to the upper lobe of the tail. As well as the dark facial markings there is a blackish band from the eye to the caudal peduncle, and a black spot in the middle of the dorsal.

There are no appreciable colour or pattern differences between the sexes, but the male is generally larger on an age for age basis, and also has longer soft parts to the dorsal and anal fins, which are prolonged into points above and below the tail, respectively. It is often possible to pick out a pair in the shop on this basis, as those offered for sale are usually the best part of two inches (5cm) in length, sometimes even larger; but if you aren't sure, they are quite cheap and buying half a dozen to grown on is an affordable exercise and will ensure a fully compatible pair.

Lots more (little) smilers ...

Provided the aquarium conditions are as suggested, then breeding will usually follow in due course. However, although some aquarists have been successful with an alkaline pH, success appears to be more likely if the pH is round about 6.5, or a little lower (down to 6). A diet of natural rather than dried foods may also now prove beneficial.

The first sign that something new is afoot is usually the female becoming more rounded as she fills with ripe eggs, and the pair will start to display to each other, quivering and spreading their fins, often in a slightly head-down position. Next comes the selection of a spawning site — often with interludes of further display. This species is not normally a cave-spawner but usually spawns on a slanting solid surface sheltered by plants. The outside of a flowerpot cave may be chosen, or a smooth stone. If no suitable surface is available, then you must provide one, and this can be a useful way of persuading the pair to spawn at one end of the tank — by siting a selection of spawning surfaces there.

Resist the temptation to put them in the open where you can watch what is happening — they prefer a private site, among or behind the plants. There is no point in visible spawning sites if the fishes won't use them!

left A mature male Flag Cichlid (*Laetacara curviceps*).
PHOTOGRAPH: AREND VAN DEN NIEUWENUIZEN

right *Laetacara dorsigera* is even prettier than Flag Cichlids (*Laetacara curviceps*). They have a lot more red — mainly in the lower body — and are usually available in the hobby, though, like curviceps, they are not all that common — both may need to be tracked down.

THE HAPPY ACARA

The spawning substrate is cleaned by both parents before the eggs, numbering 100-500 depending on the size and condition of the female, are laid in close-packed short rows, each fertilised by the male after it has been laid. The rows together form a roughly square patch of eggs which are tended by both adults in apparently equal shares. If any other fish ventures too close it is "seen off" by the "off-duty" parent, with the other coming to help if required. Both parents usually turn rather dark at this time and during the rest of brood care.

The eggs hatch after 36-48 hours and the larvae are now carried by the female, in her mouth, to a small pre-dug nursery pit in the gravel among the plants. They will probably be moved to further pits at least once per day — this is a natural mechanism, used by many open-spawning cichlids, designed to protect against predation, largely by nocturnal catfishes, which can "scent" the fry but will hopefully be misled by an increasing number of "fry-scented" pits.

Remember that cichlids are not active at night and cannot guard their brood effectively when it is dark. We must assume this works in the wild as the species still exists, though undoubtedly many broods are nevertheless lost. In the aquarium catfish predation can be a problem as there simply isn't room enough — a resident catfish cannot help but stumble across the brood in its routine foraging round the tank. If you have catfishes present and don't want to remove them, leaving a lamp on in the room (not the tank light — constant bright illumination would stress all the fishes) should provide just enough light for the parents to be able to guard the vulnerable larvae until they are free-swimming, which takes about six days from hatching.

The fry can be offered newly hatched Brine shrimp and Microworm as first foods, and will also forage for micro-organisms occurring naturally. They soon learn to take tiny morsels of their parents food. The parents continue to guard the brood for a further two to four weeks, during which the fry gradually become more independent. In a community tank situation they are best removed about two weeks after they become free-swimming, before they disperse too much — to be instantly eaten by the other occupants of the tank!

... and a few more bigger ones

Laetacara curviceps is not the only member of its genus; another three scientifically described species (*dorsigera*, *thayeri* and *flavilabris*) and two undescribed ones are known. Of these, *L. dorsigera* (which is even prettier, with a lot more red — mainly the lower body) is usually available in the hobby, though, like curviceps, not all that common — both may need to be tracked down.

The other two described species are also occasionally seen. Both are a little larger; *flavilabris* is probably the least colourful (greyish with yellow on the face), while *thayeri* is largely yellow on the upper body and face, with a lot of broken red below the mid-lateral dark band. *Laetacara* sp. "hump-head" (the German name "Buckelkopf" may also be seen) is blue with red/orange tones on the face and (especially posterior) body, and a red band in the dorsal fin; it is only older males that develop the hump of the name.

And finally, *Laetacara* sp. "Orange-fin" is green-blue with — you've guessed — orange finnage. The last four species are all more common in Germany, but do show up in the UK from time to time. All six are pictured, in full adult colour, in Linke and Staeck, 1995 (see references below).

All the smiling acaras are relatively easy and well-behaved, attractive and interesting, little cichlids, deserving of far more appreciation by aquarists than they usually receive. So don't be put off by their lack of colour in a bare or sparsely decorated shop tank, but bring a smile or two home for your aquarium!

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Richter, H.-J. (1989). *The Complete Book of Dwarf Cichlids*. TFH Publications, Neptune City, NJ, USA. 208 pp.

There is a British Cichlid Association information pamphlet on this species, price 50p + SAE from: BCA Sales (A&PO), 29 Peppers Green, Kings Lynn, Norfolk, PE30 3DA.

Derek Lambert's Cutting Edge

PHOTOGRAPHS: DEREK LAMBERT

• OUR MONTHLY LOOK AT RARE FISH AND THE SHOPS THAT SUPPLY THEM •

This month I am focusing on a couple of shops well worth seeking out if you are interested in rare and unusual fish. The first one is Wholesale Tropicals, 220 Bethnal Green Road, London, E2. Telephone: 0171-739 5356. This is an old style family run aquarium shop which I discovered as a youngster living in London.

Parking can be a nightmare and the shop has a very small frontage on a main road so at first glance you might not think this little shop could hold much of interest to the discerning aquarist, but in fact it does — big time.

Once through the dingy front door turn right and carefully work round the tanks. There are lots of rare and interesting catfish lurking in these tanks. Large pairs of Pigeon Blood Discus were in stock last time I visited, as well as a whole host of interesting Corydoras, Characins, etc.

Now climb down a steep flight of steps to the basement. Here is where you find Killifish, Anabantids, and a whole host of pretty little fish which are rarely seen in the hobby. Information on all of these can be obtained from Terry who will help guide you through the labyrinth of small tanks which make up the basement.

All the tanks are well maintained and fish of a good standard. Prices are reasonable and they are willing to have club visits if you can find a member daft enough to drive through London! Personally, I prefer to visit by underground. The problem with this is that a short walk from the tube seems to be ten times further when you are weighted down with a box full of fish. In fact, in the rush hour, it all becomes something of a nightmare — but the fish are worth it.

Now let's move north to Wigan. Pier Aquatics, in Great George Street, off Wallgate, Wigan, WN3 4DL. Telephone: 01942 236661. Whilst this shop has good parking, finding it is far more difficult. Somewhere on an estate is the best I can do, so I cheat and have a friend take me over there. I do have to admit I can get lost in a paper bag, so perhaps it is me, rather than the shop, that is the problem here.

Once there, you walk through a reasonable coldwater section and into the main shop itself. This is a multi-roomed building with several different sections for freshwater and one room for marines.

This shop has always been known for its rare Catfish but you are just as likely to find rare Cichlids here as well as a host of other unusual bits and bobs. On my last visit they had a couple of beautiful four inch Blue Diamond Discus (£32 each) for sale, as well as *Corydoras* sp. "Asher" (£9.50) and some particularly nice *Corydoras robineae* (£6.95).

The marine department looks to be well run and has a good range of fish and invertebrates for sale. Whilst not a huge section, it is still large enough to warrant a visit from aquarists living a reasonable distance away.

Overall this is a good venue well worth trekking a long distance to visit. It is also close to a number of other shops well established on the "rare and unusual" circuit. However, leave plenty of time (and money) for this one as you will probably need both!

• Next month I will be visiting another shop on the "rare and unusual" circuit. If you know of a shop in your area which is worth a visit then contact me by telephone on 01673 885352 or e-mail at aandpeditor@btinternet.com

SPOTLIGHT on ...

Madagascan Rainbow (Bedotia geayi)

The Madagascan Rainbow first arrived in fishkeepers' tanks in 1958. However, it was not until the 1970s that it was more readily available and even today it can be hard to find in aquarium shops. This is a real shame as it is an attractive Rainbow which grows larger than most (up to six inches) and yet is still a perfect community fish.

They adapt well to most conditions and will live and breed in very hard, alkaline water as well as soft, acidic conditions, however, any change in conditions must be done over a period of time, as they can be sensitive to sudden swings in pH. They eat all foods including flake and can live for up to five years or more.

The ideal aquarium for them should be on the large side with four feet being the minimum. They love to shoal, so keep a group of four to six individuals. They are a peaceful fish and can be combined with most other community fish providing these are large enough not to be considered food.

Whilst some cover should be included in the set-up, make sure there is plenty of swimming room for them as well. Include good filtration and some aeration. An external power filter is probably the best option with the addition of an airstone or two. The filter should have the capacity to turn over your aquarium's water volume twice an hour.

Apart from filtration it is important to do regular partial water changes to reduce nitrate levels. About 20 per cent every two weeks is the minimum but you should aim for 20 per cent every week if possible. If your tapwater contains chloromines then it is essential to add a water conditioner to the freshwater before you use it.

Sexing this species can be a little tricky when young but as they mature males will develop longer and more pointed dorsal and anal fins as well as more colour in the finnage. Actually encouraging them to spawn is easy (most adults spawn every few days just after first light) providing you feed some live or frozen foods as well as dried.

The eggs are laid in clumps of fine leafed plants and take a week or so to hatch. The adults will eat new born fry (as will any other fish in a community aquarium) so it is a good idea to spawn them in a separate aquarium and remove the adults after a week, when they should have produced well over 50 eggs.

The real difficulty occurs when the fry are free swimming. They need to be fed enough infusoria to grow and develop but not so much that oxygen levels in the aquarium crash. This is a difficult balancing act which few aquarists can achieve every time — hence their reputation as difficult fish despite being prolific breeders. To tip the balance more in your favour include gentle aeration in the fry tank and feed very little at a time, but five to eight times a day.

When they are large enough to take newly hatched Brine shrimp your problems should be over, providing you make sure water quality is maintained at a high level. Worms and other foods which sink to the bottom are relatively useless for this species as they feed only at the surface and in midwater. Food that reaches the bottom will rot long before these Rainbows will go in search of it. For this reason it is a good idea to include some bottom dwellers in the set-up to clean up any uneaten food. Corydoras are particularly good for this but Loaches could also be used.

Many fishkeepers think Rainbows only come from Australia but that is far from the truth. The order Atheriniformes contains seven different families all of which aquarists would call Rainbows. They come from such diverse places as Australia, Madagascar, New Guinea, Sulawesi, various oceans and even Mexico and other Central American countries.

This beautiful fish hails from Madagascar where it is increasingly threatened in its natural habitats. Pollution, deforestation and exotic species introductions have had devastating effects on many native species. Its long term survival may well rest with aquarists who love this beautiful Rainbowfish.

PHOTOGRAPH: M.P. & C. PIENOIR