

AQUARIST & PONDKEEPER



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



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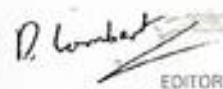
EDITORIAL

Welcome to the Christmas edition of A&P. Once again you will see a few new features in the magazine. These are all part of the ongoing process of renewal that A&P has been undergoing since Inline Magazines Limited took over the title. Foremost amongst the changes this month is a new pull-out and keep calendar. This will be a regular feature of the magazine now and includes as many society dates as possible. Obviously the more of these that clubs send in, the more we can include on the calendar. Shows, auctions and meetings are all welcome — just send them in by post or e-mail.

Another new feature of A&P is our cartoon series by Tokes and Schofield. Since it would appear some people are feeling a little down and full of doom and gloom about the prospect of the new millennium, we thought our first one should try to cheer them up a little!

This month I also have the pleasure of welcoming back to A&P a wonderful aquatic photographer. I have admired Arend Van Den Nieuwenhuizen's work for many years and am sure you will too, once you see some of his photographs. In future issues I hope to bring you some of his articles as well, for Arend is not only a great photographer, but an excellent fish keeper and breeder.

I hope you have a Happy Christmas and would like to take this opportunity of wishing you all a successful New Year/ Century/Millennium ...


EDITOR

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COVER PICTURE

Hyla meridionalis, Stripeless Treefrog.

COVER PHOTOGRAPH: M.P. & C. PEDNOIR



above *Hyla meridionalis*, Stripeless Treefrog.

PHOTOGRAPH: M.P. & C. PEDNOIR

THE STRIPELESS TREEFROG (*Hyla meridionalis*) Boettger, 1874

TEXT BY BOB & VAL DAVIES

One of the only two Hylidae found in Europe, the Stripeless Treefrog, and its relative the Green Treefrog (*H. arborea*) are relatively rare in the hobby today. Before European species were protected it occasionally appeared in the trade although the Green Treefrog was regularly on sale in substantial numbers. Stripeless Treefrogs have a smaller range and are by no means common in Europe being limited mainly to S. Iberia, N.W. Italy, the Balearics, the Canaries and Madeira — it also occurs in N.W. Africa. Green Treefrogs have a larger European range and extend into Asia Minor and Southern Russia. Where their ranges overlap Green Treefrogs tend to live at higher altitudes.

Both species are similarly coloured; bright green with the ability to change through various shades of green and brown, even light fawn in high temperatures. Blue-forms which lack yellow pigment occasionally occur. Stripeless Treefrogs lack the distinctive dark stripe along the flanks — it has a short stripe from the nostril to the shoulders (quite narrow between nostril and eye) but in Green Treefrogs the stripe extends from the eye to the groin. Males of both species develop a yellowish area on the throat.

Another distinction is that the throat pouch in Stripeless Treefrogs shows longitudinal folds when deflated. Green Treefrogs have a more rapid call, two to three pulses per second; Stripeless Treefrogs one pulse per second. Both species reach around two inches (5cm) in length and possess smooth skin, long limbs and adhesive toe discs typical of arboreal frogs. Vocalisation is quite loud in spring and may occur spasmodically during

summer.

For these active, arboreal frogs a greenhouse (with added ventilation) was often the preferred method of housing — they will live in a vivarium but are not likely to breed if it is small. A 48 x 24 x 24 inch (120 x 60 x 60cm) vivarium would house five or six specimens. It should preferably be planted and furnished with logs or driftwood for climbing. Humidity is necessary — this can be supplied by daily spraying, the use of a moisture-retentive substrate and a water dish. In the breeding season a pool several inches deep is required. In nature both species can withstand quite high temperatures and will often be seen exposed to direct sunlight but extreme temperatures should be avoided in a vivarium — specimens kept in a greenhouse would descend and hide in moss when the temperatures reached around 30°C (86°F).

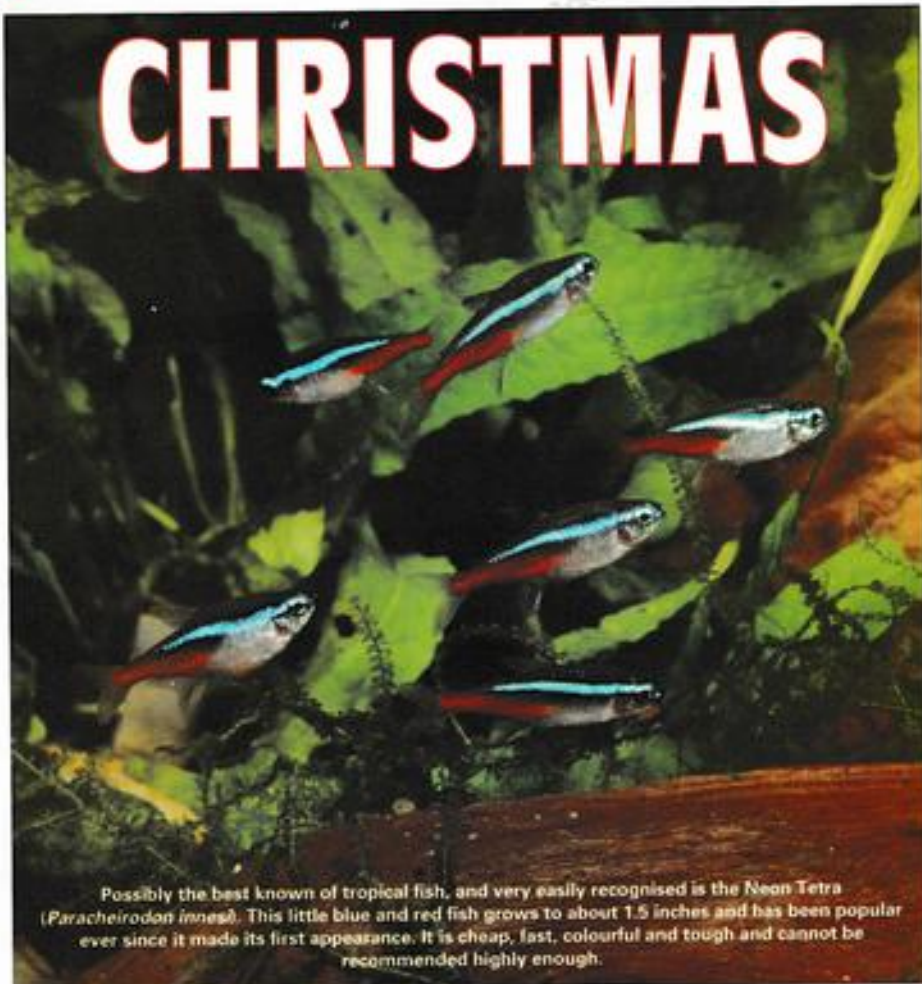
Spawning often coincided with a really heavy downpour when the weather had warmed up. Eggs were laid overnight — some small clumps, others scattered singly. Tadpoles can move in quick almost fishlike darts. Crickets and locusts were accepted but "wormlike" foods such as waxmoth larvae were often disregarded. Generally speaking, European Treefrogs are hardy enough to hibernate in frost-free quarters. Greenhouse inhabitants buried themselves in piles of moss and were covered with two sheets of bubble polythene for extra protection surviving a good number of winters in N.W. England. Captive-bred Green Treefrogs are occasionally offered for sale but it must be more than a year since Stripeless Treefrogs were seen advertised. Neither species is too difficult and both would make a worthwhile breeding project.

TROPICAL

LINDA LEWIS with some festive advice for beginners who have just purchased their first aquarium:

PHOTOGRAPHS: AREND VAN DEN NIEUWENHUIZEN UNLESS OTHERWISE STATED

CHRISTMAS



Possibly the best known of tropical fish, and very easily recognised is the Neon Tetra (*Paracheirodon innesi*). This little blue and red fish grows to about 1.5 inches and has been popular ever since it made its first appearance. It is cheap, fast, colourful and tough and cannot be recommended highly enough.

CRACKERS

It's Christmas morning and the 48 x 18 x 18 inch fish tank you've always wanted finally arrives. The next few days are spent in a haze of frantic activity as you struggle to connect all the bits and pieces — lights, filters, air pumps, heaters, timers and so on. Then you add some water, and turn everything on. It all works. Once the water reaches the required temperature, in go the plants. Many (wet) hours later, the tank looks wonderful, only there's just one thing missing — fish. What do you do now?

- A:** Rush down to the nearest pet shop and buy a job lot of fish.
B: Wait and do nothing.

You know the right answer is B, but option A looks so much more tempting, especially with the whole family clamouring round you making sarcastic or unhelpful comments such as "Haven't you forgotten something, dad?" or "When are the Piranha arriving?". How easy it is to just give in, and go buy some fish — any fish, just to keep the family quiet. The trouble is that stocking a tank for the first time requires time and patience. If you put too many fish in straight away problems will follow. Not immediately of course and that's what can make it so disheartening. Add ten fish the first day, another five the next and so on and for the first week all will be fine. Then, with no warning and no obvious visible change the fish will start to die.

Take a glance through the adverts in local newspapers and see how many tanks there are for sale. Most of these failed within the first few months, simply because they were stocked too fast. There is nothing guaranteed to put someone off of fishkeeping for life than have all their fish die, especially if the person then restocks the tank, only to have the same thing happen all over again.

Reasons obvious

Stocking a tank is a job that needs to be done slowly, and over as long a period as possible. Before putting any fish into the tank at all, it is best to wait a few days. This allows the plants a chance to get established and you to make sure that everything is working properly. The fish that most beginners choose to start off with are guppies. The reasons for this are obvious. Guppies are readily available, very cheap and quite tough. They are also very attractive little fish. So many different varieties are available that the choice is truly staggering. Indeed, a tank stocked with just guppies and a few bottom feeders can make a beautiful spectacle, and if this is the way you want to go, then go ahead. Buy a male and a couple of females, and then add a few more each week until the tank is well stocked. Such a tank will be full of movement as males chase and display to females by waving and fluttering their fins.

But what if you don't want to start with guppies. Are there any other fish that can be used to break in a new tank? There are in fact many different kinds that will do the job just as well. Generally it is better to begin with smaller fish. Large and fast growing fish can bring with them all kinds of problems that the new fishkeeper is not ready to handle. The bigger the fish, the more waste it produces, and the more likely it is to make a meal of its tank-mates. It will also be that much more expensive to buy. In fact, letting the price of a fish be your guide is not a bad idea at first. You will find that a Cardinal tetra costs at least three times as much as a Neon.

The reason for this difference is simple. Neons are easier to breed, and harder than Cardinals. Such price differentials occur across all the many kinds of fish, for example, an



ordinary Goldfish can be had for about £1.

A fancy breed like an Oranda will be much much more expensive. A goldfish may put up with all kinds of rough treatment and live for decades. Not so with a fancy goldfish, they need extra care, more room, greater care with feeding, maintenance, water temperature and so on. If the fish is cheap, it usually means it's easy to keep.

If you start with the cheaper kinds, not only will you be much more likely to succeed in fishkeeping, but should you run into problems, your failures will cost less. This may sound harsh, but everyone loses fish when they start out.

Like any hobby, fishkeeping involves a learning curve. Steep at first, but, with time, levelling out. The great thing for me is that you never stop learning as even common fish retain their ability to interest. I have been keeping tropical fish for twelve years but the fish you will find in my tanks are not the strange, unusual, hard to find specimens that you might expect. Instead, the vast majority of the fish I keep are amongst the most common varieties.

Why should only a few fish be added at a time? The answer can be explained in a very complicated, or a more simple way. The complicated version involves the conversion of ammonia to nitrite through to nitrate, ammonia being highly toxic to fish, and the nitrate, at the other end

top of page The fish that most beginners choose to start off with are guppies. The reasons for this are obvious. They are readily available, very cheap and quite tough. They are also very attractive little fish. So many different varieties are available that the choice is truly staggering.

above Probably the most peaceful of barbs is the delightful Cherry Barb (*Barbus titteya*).

PHOTOGRAPH: MAX GIBBS

left If you want slightly bigger fish in your tank why not consider one of the "other" danios. The Giant Danio (*Danio aequipinnatus*), actually only grows to about four inches. It has lovely colours and a playful, yet peaceful disposition. A group of these makes an impressive sight thanks to their glorious colour scheme.

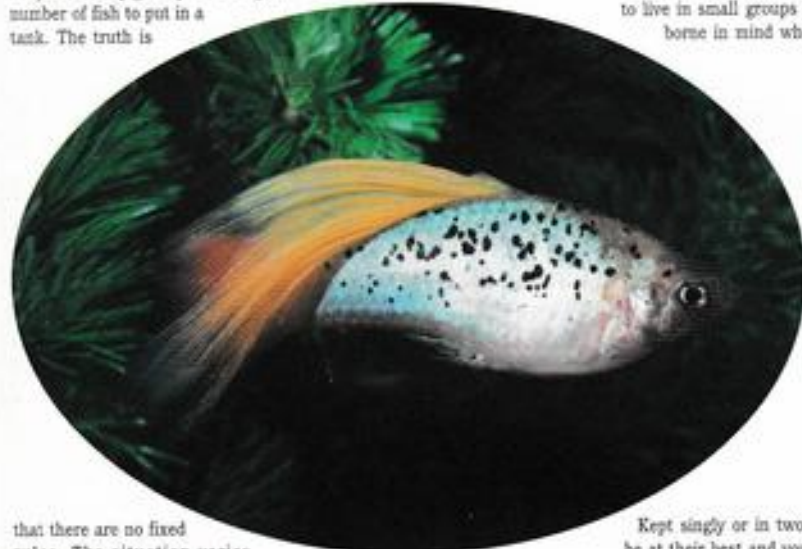
PHOTOGRAPH: M.P. & C. REDNOR

of the cycle, far less so. I am no chemist so will explain things the simple way. Waste produced by the fish is broken down and rendered harmless by bacteria that live in the filter medium. When a tank is first set up, numbers of these beneficial bacteria are tiny. With few bacteria doing the work, only a little bit of fish waste can be dealt with adequately. Once the colony of bacteria begins to grow, a larger amount of waste can be dealt with, allowing the fish keeper to add more fish.

Invest in a testing kit

To keep track of things, the best and easiest way is to invest in a nitrite testing kit. These are incredibly simple to use. By a marked colour change, they tell you whether the water is safe for fish. Once you have an all clear reading, you can introduce a few more fish. If you can wait a week between introducing five small, or two larger fish, at a time, then all should progress smoothly.

Opinions vary greatly on the right number of fish to put in a tank. The truth is



that there are no fixed rules. The situation varies according to the efficiency of the filtration, the amount of food given, and the size and eating habits of the fish. To begin with, it's a good idea to allow 10 square inches of water surface to every one inch of ADULT fish. This measurement does not include the tail. Using this guide, a 36 x 12 x 15 inch tank could comfortably hold 42 inches of fish. A possible selection might be three Platies or six Guppies, two Bronze or Peppercorn corydoras catfish, six Glowlight or Lemon tetras, and either 10 Neons or eight Harlequin rasboras. Of course, as a beginner there are lots of species that you can choose from, and the choice is obviously yours. However, there are one or two things to bear in mind.

Firstly, it is best to keep only fish of a similar size in a tank, unless you want the big ones to eat the little ones! Even if the bigger fish are herbivores (plant eaters), their greater size will unsettle the smaller species. A tiny tetra meeting a much larger fish is going to feel stressed. It will neither know nor care what the big fish's diet actually is.

Secondly, the water in any tank can be divided into three areas. The part which includes the surface and a few inches below, the substrate and a few inches above, and finally the rest — the midwater level. If you keep only bottom living fish, the rest of the water will look empty. Try if you can to stock a variety of fish so that each of the different levels will contain interest.

Bearing this in mind, a selection of fish follows, grouped according to size, any of which should give a beginner little trouble. Guppies, as already discussed, are a very popular choice. They have the added benefit of being livebearers so that with luck, and some plants to take cover in, you should be able to raise fry. Platies are the next best bet amongst livebearers. Buy these when they are still quite small as they will settle in more easily, and, of course, have longer to live than larger, older specimens. They also come in a wide range of patterns and colours.

Cheap, fast and colourful

Possibly the best known of tropical fish, and very easily recognised is the Neon tetra (*Parachanna innesi*). This little blue and red fish grows to about 1.5 inches and has been popular ever since it made its first appearance. It is cheap, fast, colourful and tough and cannot be recommended highly enough. Mid and lower water levels are its favourite. The tetra group as a whole offers many golden opportunities for the beginner as many of the species are small and easy to keep. Most prefer to live in small groups or shoals, and this should be borne in mind when making a selection.



Kept singly or in twos and threes, they will not be at their best and you will miss out on watching the fish chase and display to each other.

If your taste is for something a little less gaudy, consider the Black (or black widow) tetra — *Gymnocorymbus ternetzi*. Young fish are a lovely sooty black and although this fades into grey as the fish ages they remain interesting. Easy to feed, easy to please and reaching just 2.25 inches they will provide a fine contrast to more colourful species. They are usually found near the surface and in midwater levels.

Another great tetra for a beginner is the Glowlight (*Hemigrammus erythrozonus*). One of the hardiest fish I know, yet still attractive, these peaceful little fish, reaching just 1.5 inches, can live for more than five years with ease. It favours the area of water nearest the bottom so is useful for adding balance and interest in this area.

Often overlooked is the Lemon tetra (*Hypheosorbus pulchripinnis*). So called, because, you guessed it, it has a lovely yellow tint to its body. This colour is really beautiful and is set off to perfection by the fish's bright red eye. They reach about 1.8 inches and if kept in a group of at least five will do well. They spend much of their time in midwater.

Similar in appearance to the Glowlight, thanks to its partly see through look, the Water goldfinch or X ray fish (*Pristella maxillaris*) is well worth considering. At first sight the fish is quite plain but once it settles into its new home, more colours will develop and you will see

a bright yellow band on the lower portion of the dorsal and anal fins. Peaceful active hardy and cheap, this is another fish that is easy to recommend.

Most of the above mentioned fish prefer midwater levels so if the top part of your tank is looking bare you might consider a danio or six. Zebras are the most instantly recognisable of the group. Their name comes from their stripes. At first glance the fish appear black and white but a closer look reveals gold, silver and deepest midnight blue. Zebras thrive in a group and live life at a very fast pace. They need lots of room, and kept without company of their own kind, may take to chasing any other fish they can find.

If you don't want several Zebras you can mix them with Pearl and Leopard danios. Leopard danios are actually just a differently patterned variety of *Brachydanio rerio* but Pearls are a distinct species (*Brachydanio albolineatus*). The three kinds will live happily together and as long as you don't harbour thoughts of breeding the perfect Zebra, no harm will be done if cross breeding does occur between Leopard and Zebra. These small danios are cheap and thanks to their pace of life, wear themselves out at a relatively young age, seldom living more than a couple of years.

Still with small fish, how about something completely different? A member of the barb family. Many of these fish have a reputation for being bad tempered, fin nippers but this is not always the case.

Probably the most peaceful of barbs is the delightful Cherry barb (*Barbus titteya*). Often barbs



prefer to live in groups but Cherry barbs are equally happy kept as a pair, or with two females to one male. The male is a wonderful bright cherry red when in breeding condition so selecting a pair is easy. They are small, reaching just two inches at full size, active and so well behaved as to be almost timid, especially in the company of larger fish. Keep them with other quiet fish and they will thrive.

My all-time favourite fish

The last of the small fish to be covered here is my all time favourite fish — it always has been, and will probably always remain so — the Harlequin rasbora (*Rasbora heteromorpha*). Growing to just under two inches in length, these fish ooze character. Not only that but they are gorgeous to look at, especially when in good condition. It is only then that their rich golden and red hues really bloom, making the trademark dark wedge stand out. Make sure you buy at least five, for they thrive in company. Get more if you can — they are not expensive fish and be rewarded over and over again. The fish are active, so hardy that they go on for years (my oldest one is eight) and no trouble at all to keep.

If you want slightly bigger fish in your tank why not consider the "other" danio. Misnamed the Giant danio (*Danio aequipinnatus*) actually

only grows to about four inches. It has lovely colours and a playful yet peaceful disposition. A group of these makes an impressive sight thanks to their glorious colour scheme. A photograph is the best description as their markings are hard to describe adequately in words being a mix of stripes and blotches, coloured with pinks and blues and yellows.

One of the larger tetras is well worth considering. Try the Bleeding Heart Tetra (*Hyphessobrycon erythrostigma*) which grows to just under three inches. This species looks very different from a "normal" tetra with its much deeper chest. Look out for the red marking, just behind the gill cover which gives the fish its common name. Again a group of at least five is best. My final suggestion for a larger fish is the Mosaic, Pearl or Lace Gourami (*Trichogaster leeri*). As you can see by its profusion of lovely names, this fish is a real beauty. Much of the male's body is covered in a pattern of iridescent dots laid over a background of reddish brown whilst the underparts are an orange red. The female is less striking but only marginally so. They reach about 4.5 inches in length and do need space and cover for rival males will chase and display and without a retreat they may harm each other. They can also become timid and pale if other fish in their tank are much larger, or at all aggressive. This species, a bubble nest builder, is one of the hardiest of all the labyrinth fish and can live more than seven years.

Whatever type of fish you choose to keep there should always be room in a tank for a few catfish. Much maligned and often only kept to sweep up



left over scraps. Corydoras catfish can prove to be a much-loved asset. Try Peppercorns (*C. paleatus*) to start with as they are cheap and easy to find. They are also small (up to 2.75 inches) and surprisingly active. Add three or four of these to your tank and you will be amazed at just how busy they are, and not just on the substrate. Occasional dashes are made to the surface so that they can take in a

far left Platies are a good starter fish amongst livebearers. They come in a wide range of patterns and colours. This one is a Hifi Blue Variatus.

PHOTOGRAPH: DEREK LAMBERT

centre Much maligned and often only kept to sweep up leftover scraps. Corydoras catfish can prove to be a much-loved asset. Try Peppercorns (*C. paleatus*) to start with as they are cheap and easy to find.

above One of the larger tetras well worth considering is the Bleeding Heart Tetra (*Hyphessobrycon erythrostigma*) which grows to just under three inches. This species looks very different from a "normal" tetra with its much deeper chest.

PHOTOGRAPH: M.P. & C. REDNOR

TROPICAL

CHRISTMAS CRACKERS

gulp of atmospheric air, but they will also feed from the surface given the chance. Tough, pretty, and the easiest catfish to breed, they deserve their popularity.

Keep both kinds together

A little plainer than Pepperefs is the Bronze corydoras (*C. ornatus*). The albino version of this species is almost as common as the coloured type. Keep both kinds together to increase variety, if you like, but make sure not to keep a single specimen for it will not do as well and will certainly be far less active. There are literally dozens of other Corydoras catfish available. The price they sell at is a good indication of their readiness to breed, and ease of keeping. The rare ones are very expensive, especially if you take into account their small size, and are best avoided until you have gained confidence.

My final suggestion is something a little unusual and which is bound to attract attention — the Upside down catfish (*Synodontis nigricans*). Pretty in its own right, it has the fascinating habit of swimming up side down for much of the time, although it can quickly right itself if it locates a food pellet on the substrate. Be careful when buying this species that you get the right one for there are lots of *Synodontis* and most of these are much bigger and nowhere near as easy going. Watch out too that the fish don't puncture the bag on the way home either. They have sharp spines which they can erect when threatened, and these can easily tear a flimsy bag, be prepared, and take a rigid container with you. I hope this article helps you make your choice, but whatever fish you decide on, common or rare, small or large, remember that fishkeeping is fun.

Relax, enjoy your fish, and have a very MERRY CHRISTMAS.

Often overlooked is the Lemon Tetra (*Hyphessobrycon pulchripinnis*). So called because it has a lovely yellow tint to its body. This colour is really beautiful and is set off to perfection by the fish's bright red eye.

PHOTOGRAPH: M.P. & C. PEDNOR

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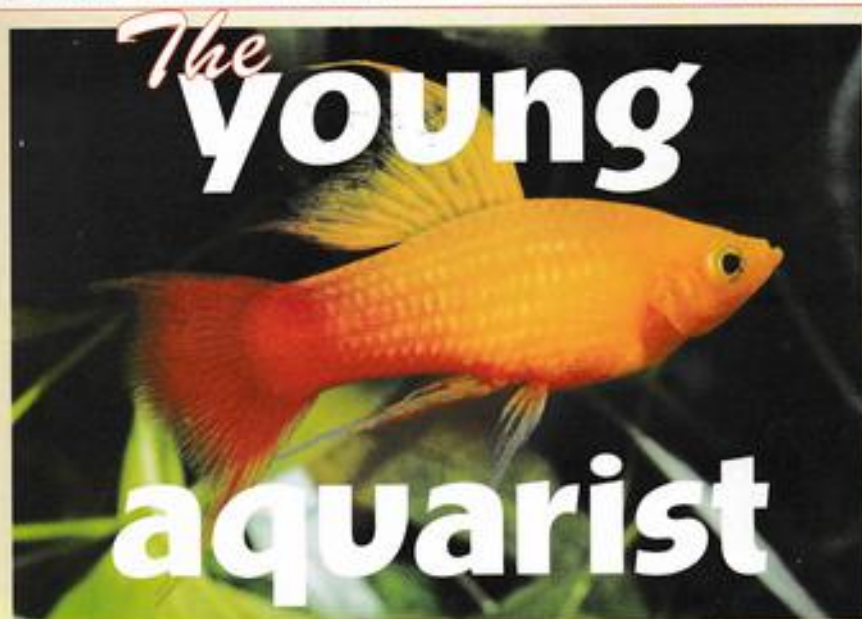
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One of the most important pieces of equipment you can buy as an aquarist is a quarantine tank. When your community tank has been established and is running well, then you need to keep any new purchases in a separate tank for a couple of weeks. Fish that look perfectly healthy can be harbouring disease, for they have suffered many stressful situations on their way to your home tank. Because of this, careful observation is necessary before they are moved to the community. They may be perfectly healthy but it's always best to be cautious. Some diseases can run rampant through your tank and you could lose many of the fish that you have nurtured so carefully.

The quarantine tank should be bare bottomed with no plants and a small bubble up filter in the corner. In this way you have a clear view of the fish and you can also see if all the food is being eaten. If medication is necessary a bare tank is easily treated. There are several small books on fish diseases, look for the symptoms but do not diagnose the ailment yourself. Always consult an experienced aquarist and discuss the problem with your aquarium shop. All shops do not offer the same service, but there are some excellent shops with experienced aquarists running them. They may not always be the closest to your home but you should try to seek them out and buy your fish there.

Well, after the doom and gloom, as it's Christmas, let's have a happy tale. Our first quarantine tank was a 24 inch tank on a metal knock down stand which held our 24 inch community tank. I decided to buy my son a beautiful

Siamese Fighter for Christmas (You'll find a description of these fish in the SPOTLIGHT, November Issue A&P). The jars containing these fishes were on a long shelf in a large aquarium outlet some distance from home. There were many of them in a variety of colours and, on Christmas Eve, we went along for my son to choose. It was difficult for only one male can be kept in a community tank. After much pondering, however, he decided on a beautiful



deep red male which was displaying to the male in the jar alongside him. We took him home and carefully introduced him into the quarantine tank which was in my son's bedroom.

On Christmas morning he woke to find that the fish had started to build a nest of bubbles over the surface of the tank — this pile of bubbles grew larger as the day progressed — we realised he was ready to spawn but we had no female for him. However, it was Christmas and all the shops were closed.

Boxing day arrived and the nest was even larger and expanding all the time. We had to wait until the following day, when frantic phone calls were made to all the aquarium shops in our area. We were asking for a "ripe" ready to spawn female. Ripe females are full of roe and well rounded with a white spot at the anus. We found a female in a shop that had recently had a batch in. It was important to get a ripe female otherwise we would not be able to put her in with the male as he would kill her.

They spawned on the following day and it was a wonderful experience to watch them as the eggs were carefully collected and placed in the tiny bubbles at the surface. This experience all those Christmases ago led to a continuing interest in the breeding of Anabantoids — the family to which *Betta splendens* (Siamese Fighters) belong.

It really is surprising what can happen in a quarantine tank!

left Male Siamese Fighter.

PHOTOGRAPH: K. A. WEBB

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

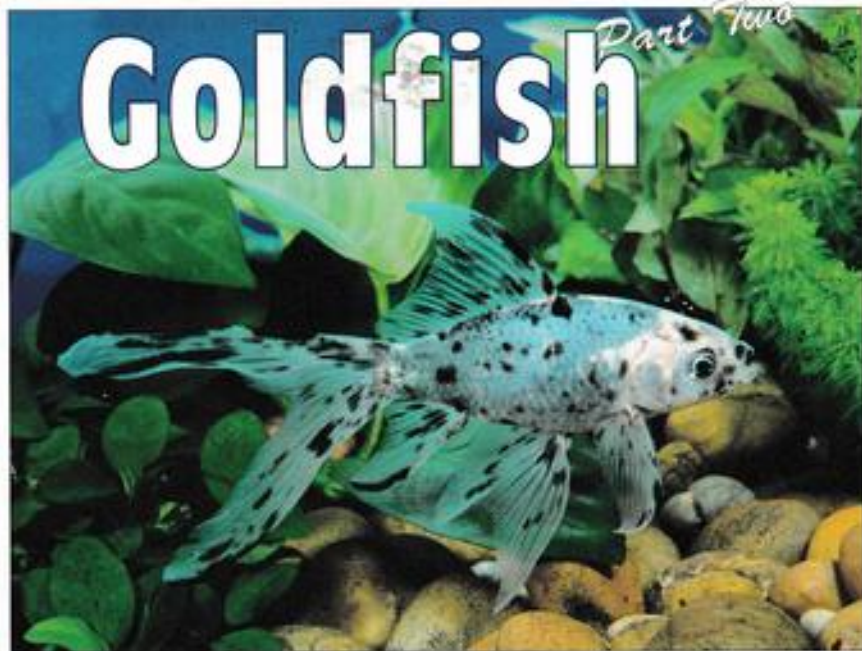
See you next time ... *Pat*

ALEX STEPHENSON with the second of a four-part series on the ever popular Goldfish:

PHOTOGRAPHS: MAX GIBBS

Aspects of

Goldfish



The imported Shubunkin (Calico Comet) is flashy, has a long tail, and will always be a popular fish. This one has good blue colour but lacks red pigmentation.

We all know what a Shubunkin is, don't we? Well, in Britain, there are three main types. First there is the London Shubunkin which is essentially a Common goldfish except for the colour. Second, we have the Bristol Shubunkin which has more finnage and, in particular, a large round lobed caudal fin (tail). The third type is the one most commonly seen and, is often referred to as the Calico Comet because it has long pointed finnage. This last type is the one produced by commercial breeders and imported by the trade in large numbers so it's the one you find in garden centres.

Shubunkins are not the only Goldfish to have calico, or to be more correct, nacreous colouring, many other varieties have a nacreous version as well. So, why do these calicos display nacreous scaling and patterns of many colours? Well, it's all in the genes.

A normal goldfish has a full complement of reflective material called guanine, which is evenly distributed and gives the fish a metallic appearance. However, there are other goldfish which possess no guanine. These mutations, having no reflective material, are referred to as matt. For some reason, not yet understood (at least by me), these matt fish normally have no colour pigments either. The result often being a pinkish-white fish with black "button" eyes. A nacreous fish is half way between these two, having varying amounts of guanine and at different levels within the body wall. Also, hopefully, these nacreous fish

will possess a full complement of colour pigments, unevenly distributed, to give a striking colour pattern.

It's all in the genes

As in all matters involving genetics, the reality can be complex but, the basic principle is fairly simple. A fish inherits half of its genetic material from one parent and half from the other so, this is how the system works. One way to produce nacreous fish is by using one metallic parent and one matt, whichever genes are inherited, the result will be nacreous offspring. However, due to other genetic factors, these offspring may not inherit the desired colours.

The way most breeders produce nacreous fish is by breeding nacreous to nacreous, 25 per cent will be metallic, 25 per cent will be matt, and only 50 per cent of the offspring will be nacreous. However, these have a good chance of inheriting the required colour patterning. With a spawning of this kind, it is usual to cull all the metallics and matts. The remaining 50 per cent will then be sorted and culled as required according to quality.

Goldfish of course, only have three pigments, red/orange, yellow, and black but, by mixing these up at different levels, several other colours

can be produced. For example, black, deep in the tissue, together with a little guanine, appears blue. A good blue is highly regarded as a background colour for nacreous fish. Other colours include violet and brown, as well as yellow and red.

Ideally, most breeders are aiming for fish with a base colour of sky blue with patches of as many other colours as possible, pleasingly arranged, the whole lot "splashed" with black. Not surprisingly, very few fish reach this standard, which is why Shubunkins and other calico types are a challenge. Remember, we expect all this to happen on a fish which already has good body shape and finnage correct for its type. Goldfish fanciers are hard to please sometimes.

An interesting thing about nacreous fish is that the colours are not "fixed" and can change throughout the life of the fish. Some strains have a tendency to fade, while others can darken. It's not unusual, for instance, for fish which have a lot of black "splashes", for these black areas to expand until the fish appears mostly black. In other cases, fish which started out with plenty of blue and black colouring might suddenly lose these. When this happens, there is a good chance it has been caused by crossing a red metallic fish into the nacreous strain. Remember, most metallic strains carry a gene to get rid of the black pigment. If this is the case, it can prove extremely difficult to put right, and will almost certainly involve many generations of careful selection.

A word of caution

One word of caution regarding keeping nacreous fish in an outdoor pond. Because they have much less reflective material to protect against direct sunlight, the chances of sunburn are more likely. Personally, I believe all fish should have adequate shade and not providing it is a form of cruelty. Also, there is a school of thought which believe strong sunlight can fade colours. This is something, about which I have an "open mind", because I think natural light can actually improve the colour of metallic varieties.

Although matt fish are normally culled because they lack pigment, coloured ones do occur

sometimes. When they do, the colour displayed can be vivid. What it needs is for some enterprising breeder to work with fish of this scale group, with a view to producing a really good strain.

Getting back to Shubunkins, here is a brief description of the three main types. The imported Shubunkin (Calico Comet) is flashy, has a long tail, and will always be a popular fish. The quality can vary of course, depending on where they come from. About 10 or 12 years ago I saw some which came direct from Japan. These were true Calico Comets with correct pointed finnage and a caudal fin about as long as the body. Unfortunately, I've seen nothing as good since. No one in Britain, as far as I know, breeds this type of fish. It would be nice to see someone take up the challenge and eventually produce show quality fish.

The London Shubunkin has been around a long time, and is a very worthwhile fish. As with the Common goldfish, good ones are not at all common. I think the reason is that the fish is uncomplicated and so needs to be close to perfect. For example, if you are keeping something more exotic, such as Pearlscales or Jikin, these fish are difficult to



produce anyway, therefore, a few minor imperfections may be acceptable. With a London Shubunkin however, a minor fault becomes a major disaster as far as the show bench is concerned.

By far the most popular amongst amateur breeders, and show exhibitors, is the Bristol Shubunkin. The development of this fish began only about fifty years ago when just a few dedicated goldfish enthusiasts decided to work with Shubunkins. So successful was the result, that in Britain today, there are probably more people breeding 'Bristols' than any other goldfish variety. Remember, goldfish organisations in this country have "show standards" for all these fish, so a lot more information can be obtained by joining one of these societies.

above A good quality Bristol Shubunkin exhibiting blue over much of the body and splashes of black and red.

left A London Shubunkin. This one has poor coloration with very little blue.

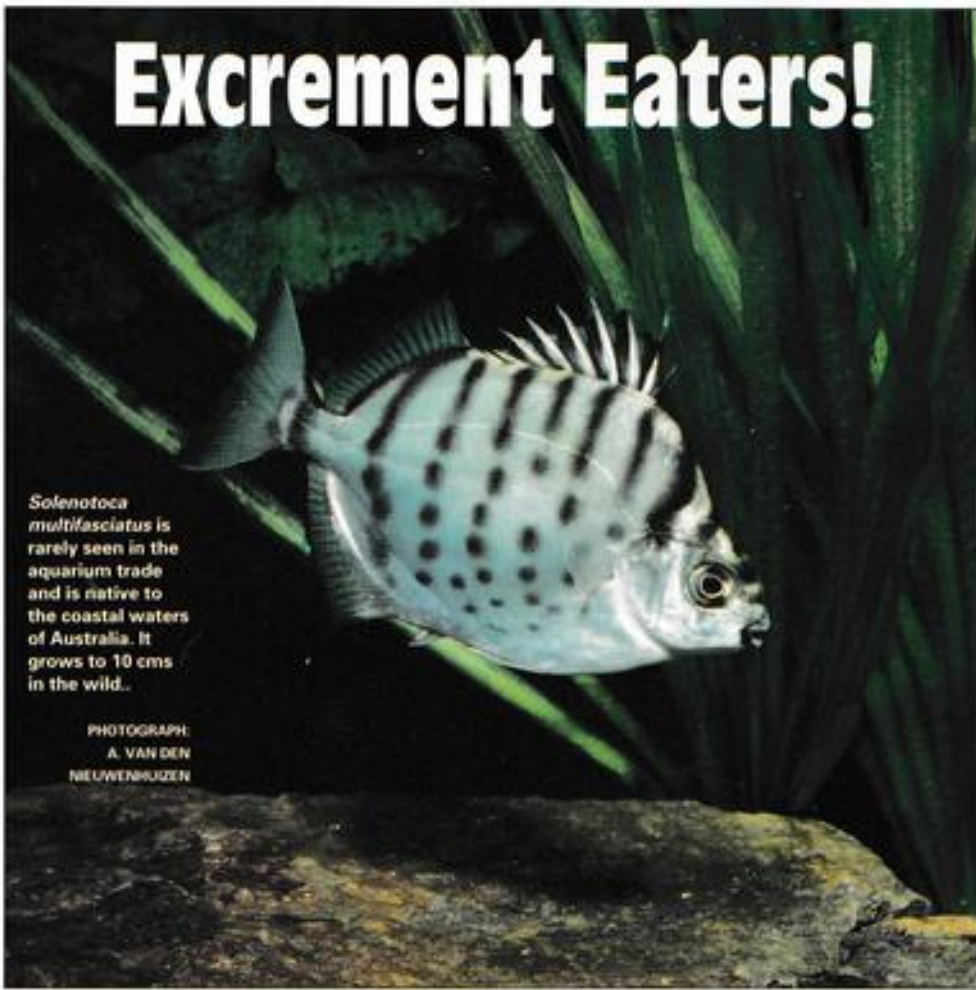
PETER CAPON takes a topical look at Scats:

PHOTOGRAPHS: MAX GIBBS UNLESS OTHERWISE STATED

TROPICAL

SCATOPHAGUS

Excrement Eaters!



Solenotoca multifasciatus is rarely seen in the aquarium trade and is native to the coastal waters of Australia. It grows to 10 cms in the wild.

PHOTOGRAPH:
A. VAN DEN
NEUWENHUIZEN

The genus *Scatophagus* was erected by Cuvier and Valenciennes in 1831 in the *Scatophagidae* family which is represented in the aquarium by this genus and the genus *Solenotoca*. The name *Scatophagus* literally means eater of excrement which the fish probably earned because of its keen interest in anything thrown over-board from ships. The Scat's are omnivorous with a leaning towards vegetable matter.

In the aquarium they can be a nuisance because they readily consume the plants starting with the most expensive first. In the wild they are opportunist feeders consuming whatever foods are available.

Scats as a family have disc shaped bodies which are strongly

compressed and are covered with very small scales on both the body and the head.

Scatophagus argus argus

S. argus argus is commonly called the Scat; other names that it occasionally goes under are Argus fish and Hundred eyed fish. The latter name refers to the rows of black spots or irregular marks that adorn its flanks. The ground colour of the adult fish is a greenish or yellowish silver with the already mentioned black spots. The fish can grow to

SCATOPHAGUS – Excrement Eaters!

30 cms in the wild but is unlikely to reach this length in the aquarium.

There are some varieties that have red spots interspersed with the black spots. These fish have in the past been referred to as *Scatophagus rubrifrons* but it is probable that these are not a true species but merely a local race.

In the 1950s it was common to see what were called Tiger Scats. These were rarely larger than five or six cms, darker in the body than normal Scats, with chocolate brown bars in the upper part of the body and red between. The red coloration extended to about half way down the body. I kept these Tiger Scats but they only lived in a freshwater aquarium for about a year before they passed away and they rarely grew to any extent. With hindsight their demise was probably due to poor water conditions as their life cycle requires varying amounts of salt in the water at different stages of their life.

The Tiger Scat is rarely seen today. Perhaps it was only collected from a particular locality and possibly that area has been over-fished or is no longer available to the collectors.

• (Eorrea's Note: This fish is now thought to be *Scatophagus argus atro-maculatus*)

Scats have not, to my knowledge, been bred in the aquarium which is not surprising as wild spawnings take place off-shore or in saltwater bays. The eggs and fry are pelagic. The young fish after spending a period feeding on the plankton at the surface of the sea make their way into estuaries and often venture into freshwater. This fish goes through a larval stage known as the Tholichthys stage when bony plates cover the head and extend backwards just onto the body. As the fry grow the plates regress and disappear. It is interesting to note that the fry of the marine Chaetodontidae also have a Tholichthys stage in their development.

After feeding in brackish or freshwater the maturing fish seek the sea again, migrating when they reach a size of from six to eight cms. They complete their growth in the sea eventually breeding and starting another cycle of sea to freshwater and back to sea water again.

This migration explains reports that claim that Scats do not require salt in their water. In point of fact small specimens can live quite happily in freshwater but as they mature the salt content of their water needs to be raised until the mature fish is living in pure sea water. It is not clear whether the mature fish again seek out freshwater after spawning but it seems unlikely as all the fish that are imported in almost freshwater are immature specimens.

The Scat was first introduced to European aquarists in 1906. For its size it is relatively peaceful but it should be borne in mind that small fish will be regarded as just food by the Scat. Its unsteady swimming motion is natural and not a sign of disease. Scats are

right *Scatophagus argus argus* is commonly called the Scat and can grow to 30 cms in the wild but is unlikely to reach this length in the aquarium.

prone to pH shock so great care is needed when moving them or changing their water.

An unwell Scat usually turns very dark and unless the conditions are rapidly adjusted will refuse to eat and waste away.

Another species, *S. ornatus*, is occasionally mentioned in the literature but it is likely that this is just a variety of *S. argus*.

Scatophagus tetracanthus

This species was first described by Lacepede in 1802 and was originally classified in the *Chaetodon* genus. Cuvier and Valenciennes renamed it *Scatophagus fasciatus* but for reasons of priority in naming it is now properly called *S. tetracanthus*.

This Scat is found in the coastal waters of East Africa especially around Madagascar. It is larger than the common Scat growing in the wild to 40 cms.

The body is decorated with dark brown bars, the first running through the eye and the last across the caudal peduncle. This fish also has very small scales and goes through the Tholichthys stage.

Its requirements are similar to *S. argus argus* with the addition of salt to the water as the fish matures. It prefers a temperature in the low to middle 70s Fahrenheit.

Solenotoca multifasciatus

This species is rarely seen in the aquarium trade. It has seven irregular bars on the upper half of the body, the first being between the eyes and running from the nape of the neck. Some specimens have the bars broken into a series of dots. The ventral flanks show scattered round black dots. This fish is native to the coastal waters of Australia and grows in the wild to 10 cms.



General

The Scats make ideal subjects for the larger aquarium being ready feeders and hardy. The need for vegetable matter can be a problem where the aquarist is also keen on growing plants for almost any plant will be devoured. The addition of lettuce to the fishes diet will go some way to protecting the tougher plants but soft vegetation will be completely consumed.

In addition the Scat does not seem to be able to differentiate between edible plant and those that will harm it. Scats have been known to consume Java fern which is toxic and succumb to its effects.

The drawbacks to these fish are the need for the increase in amount of sea salt content of the water with advancing maturity and the tendency to suffer pH shock. If just two specimens are kept together bullying and eventual loss of the weaker specimen will occur. It is, therefore, suggested that either a solitary fish is kept or a small shoal.

All in all these are interesting aquarium subjects that can get to know its owner and become quite a pet.



above The Tiger Scat is now thought to be *Scatophagus argus atramaculatus*. It is rarely seen today, perhaps because it was only collected from a particular locality and possibly that area has been overfished or is no longer available to the collectors.



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DAVE GARRETT spotlights a group of fish which behave like birds of prey:

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HAWKFISH



Harriers of the Sea

The Hawkfish belong to the Cirrhitidae, a family of fish that take their name from the small tuft-like growths of fine hairs known as cirrhi, arising from the ends of their dorsal fin spines. These cirrhi are present on all of the thirty plus species of Hawkfish although the reason for their presence does not appear to have been scientifically proven. Most species originate from the Indo-Pacific, Hawaii, or the Red Sea.

Aquarium and feeding behaviour

The aquarium behaviour of Hawkfish makes for a contrast to the constant activity of many marine species. They mimic their natural behaviour by spending little time swimming, preferring to spend a great deal of time perched on any convenient rocky outcrop or coral branch. The rays of their pectoral fins are elongated and thickened and are used to grip the surface of whatever they are perched upon.

Hawkfish are predators of small prey such as small fish and crustaceans, and planktonic animals. They are poor swimmers with no hope of pursuing prey, instead they swoop down from their perches onto any suitable passing prey. The combination of patterns and coloration of the fish, along with the corals chosen for perches, makes for a splendidly camouflaged position from which to ambush their prey.

Hawkfish certainly win no points for style when it comes to swimming and their laboured efforts can look quite comical. However, despite the lack of swimming skill and a preference to ambush their prey when in

above The Long Nosed Hawkfish (*Oxycirrhites typus*) is a quirky and interesting fish which makes a worthwhile addition to any suitable aquarium. The elongated body, elongated snout and criss-cross markings of the fish ensure that it is unlike any other Hawkfish seen within the hobby.

PHOTOGRAPH: M.P. & C. REDNOIR

HAWKFISH – Harriers of the Sea

the wild, they quickly adapt to aquarium feeding and learn that food is on tap without them having to hunt. Despite being very poor swimmers they readily join in the feeding frenzy with a general thrashing about motion that nevertheless ensures they consume their fair share at feeding times. They willingly take most of the array of frozen marine foods that are readily available and should be offered small meat based fare such as brine, mysis, fish eggs and small tiny pieces of mussel, they will also take flake food.

Compatibility

Some of the Hawkfish can reach an appreciable size with many species reaching 10 inches or more. Being predators this obviously makes them unsuitable for captivity, therefore such species are rarely seen for sale. There are a number of very attractive species that remain a much more manageable size thus making excellent additions to a fish only tank, or a reef tank. Even so, still bear in mind that a larger species will regard small fish, and in particular small shrimps (e.g., Cleaner or Dancing Shrimps), as fair game and will promptly dispatch them. In turn the smaller Hawkfish have little protection against large predators so be wary as to the size of tank mates or the predator may become the prey. Despite being predators they are generally well behaved, docile fish that do not show aggressive tendencies against any other livestock — providing it is not meal sized!

Breeding

The Hawkfish lay demersal eggs but breeding in captivity, certainly at the hobbyist level, is unknown. They are difficult to sex and the best

option would be to specifically order a mated pair as such pairs are regularly seen in their natural habitat. A mated pair will live closely and peaceably together in an aquarium.

Suitable species

• SPOTTED HAWKFISH (*Cirrhilichthys aprinus*)

This species can also be found in the literature as *C. fasciatus* and *C. axiphalus* but I believe the name above is the latest nomenclature. An Indo-pacific species that attains a length of four to five inches in the wild but rarely exceeds three inches in captivity. Not as expensive as some of the Hawkfish covered here, but then again it is not as vividly coloured either. Peaceful, easy to keep and easy to feed.

• ARC-EYE HAWKFISH (*Paracirrhites arcatus*)

A species that can be found in the Indian Ocean, Philippines and Hawaii. Can reach a size of six inches in the wild but will not reach much more than four inches in captivity. The species is very attractive, being a basic pale pink with a white flash high on the body that extends towards the caudal fin. The Arc-Eye, not surprisingly, has a yellow and red arc shaped mark above its eye. It also has yellow marks in front of its pectoral fin. Again a peaceful, undemanding species but if you are considering a reasonably sized specimen bear in mind it's taste for small crustaceans and fish.

• SCARLET HAWKFISH (*Neocirrhites armatus*)

The brilliant red coloration of this species makes it highly sought after and expensive. It is a truly beautiful species and its generally trouble free maintenance, peaceful nature and small aquarium size (rarely much above two and a half inches) all add to its attractiveness, especially for the reef aquarist. The species is found in Central and Western Pacific where it reaches a size of three inches.



left Spotted Hawkfish (*Cirrhilichthys aprinus*) is an Indo-Pacific species that attains a length of four to five inches in the wild, but rarely exceeds three inches in captivity.

above right Scarlet Hawkfish (*Neocirrhites armatus*). The brilliant red coloration of this species makes it highly sought after and expensive. It is a truly beautiful species and its generally trouble free maintenance, peaceful nature and small aquarium size (rarely much above two and a half inches) all add to its attractiveness, especially for the reef aquarist.

right Arc-Eye Hawkfish (*Paracirrhites arcatus*) is a species that can be found in the Indian Ocean, Philippines and Hawaii. It can reach a size of six inches in the wild but will not achieve much more than four inches in captivity.

• **LONG NOSED HAWKFISH** (*Ogcoelestes typos*)

The common name tells you what you are getting, what it cannot tell you is what a quirky and interesting addition this fish makes to any suitable aquarium. The elongated body, elongated snout and criss-cross markings of the fish ensure that it is unlike any other Hawkfish seen within the hobby. The species is found in the Philippines, Indian Ocean and Hawaii, often being found in deep water perched amongst the branches of black coral, thus ideally camouflaged for ambushing small prey. A length of five to six inches may be attained in its natural habitat whilst it will be restricted to four inches in captivity.

Seen perched motionless in a dealer's tank, it may look pretty run of the mill but I know from personal experience that once it has settled down in your tank it will come alive at feeding time. I kept one with a pretty boisterous collection of Damselfish, Chromis, Clowns, a Regal tang and a Bicolour Blenny, and it competed with ease.

As soon as food went anywhere near the tank it would thrash about to achieve some reasonable swimming speed and zoom unerringly in on its fair share. No points for style but full marks for entertainment and results.

The snout like mouth means it will be not be a threat to small fish and crustaceans but it is still a predator and will therefore require suitable sized meat based foods.

The fish may seem a perfect choice for a mixed fish-only community or a reef tank but a word of caution is necessary. The Long Nose is generally considered to be more sensitive to water quality than other Hawkfish hence I would not recommend it for a beginner.

Conclusions

Hawkfish have never been particularly popular fish, this may be linked to the fact that they are a small Family of fishes and consequently there are not many species suitable for the hobby. They do, however, offer an attractive, unusual, trouble free, peaceful addition to many marine tanks, in particular reef aquariums Do not overlook them too readily.



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TROPICAL

GORDON DAVIS shares his experiences of keeping and breeding these ever popular Catfish:

PHOTOGRAPHS: MAX GIBBS UNLESS OTHERWISE STATED

Experiences with S



For many years I have had a fascination with *Synodontis* catfish, the main attraction being their diverse colours, markings, and habits, and as I found out over the years, despite their sometimes higher prices you certainly get your moneys worth because they live to quite old ages.

Over a period of about 30 years I have lost count of how many *Synodontis* species and numbers I have kept, and in all fairness sometimes not done them justice. Some years ago, however, I treated myself to a 7 x 2 x 2 foot aquarium, despite many years of fishkeeping this great

expanse of aquarium gave me a much appreciated new outlook.

My *Synodontis* catfish collection at the time lived in one of my four foot aquariums: two x *Synodontis budpetti*, two x *Synodontis nigrita*, two x *Synodontis nigriventris*. They were soon promoted to the seven foot aquarium. They must have thought they were in heaven! The tank had its own home made filter, powered by a pond pump, which kept the water sparkling clear water.

Intricate shaped bogwood covered in Java Moss and Java fern gave them hiding places, and provided the occasional vegetable snack. In

left *Synodontis greshoffi* is a beautiful *Synodontis* which grows to about 11 inches in captivity.

PHOTOGRAPH: A. VANDEN NIEUWENHUIZEN

below *Synodontis angelicus* is a real beauty but is quite expensive. They are often very territorial and can cause lots of trouble in a community aquarium.

Synodontis Catfish

In addition to this a good supply of various foods, earthworms, shrimp, prawns, and an assortment of flake and pellet foods ensured a good balanced diet.

Set-up attractive and well balanced

A variety of aquatic and floating plants, several species of other fish in the mid and upper levels made the set up attractive and well balanced.

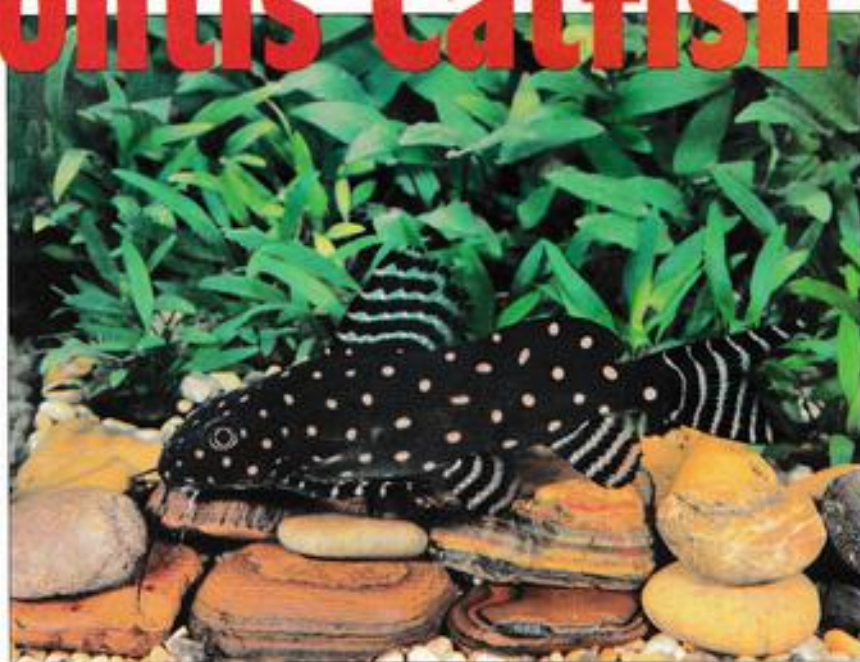
What you must understand is that sometimes I have this problem, if something is free, cheap or unwanted I seem to attract it like a magnet. This being my only excuse for the madness that followed. Several months later the seven foot aquarium had collected inmates like fleeing refugees. "Oh, take them to Gordon's, he's got room," seemed to be the order of the day.

After a silly six month spell I calmed down and concentrated on catfish. Fish numbers grew, especially *Synodontis*. Indeed, their numbers grew along with my fascination for them. Species collected were *Synodontis notatus*, *S. greshoffi*, *S. decurva*, *S. waterloti*, *S. epiplatys*, *S. robertsi*, *S. ornamentalis*, *S. constructus*, to name but a few. The list of fish continued, with half a dozen adult *Hoplosternum thoracatum* constantly building bubble nests in the floating Indian Fern plants. Butterfly fish scooting across the surface, a Black Ghost Knife fish intimidating everyone except a large Giraffe catfish who he used as a mobile cave to shelter under, a number of oddball Characins, some Pakistani and Clown Loaches, and many unidentified species added to the resulting mayhem.

Before I came to my senses the *Synodontis* did the unthinkable — they spawned — big time! Although I dived for the video camera initially and caught the dancing and courtship of several species at the same time the mass of eggs and sperm produced soon had the camera back in the bag and the bucket, siphon tube and hose pipes at the ready.

I can only estimate that many thousands of eggs were dispersed into the water, some seemed to stick to the plants and bogwood while others seemed to drift along and were pulled into the filter system, initially all the fish were having a "field day", *Synodontis omelette* being the order of the day.

The eggs seemed to just keep coming, I started netting them out as the filter material was now completely blocked and the water was now taking an alternative route, the pump pre filter became clogged and



everything stopped, I pulled the plug, threw all the plants, bogwood and filter material on to the lawn and put in air stones in the aquarium because by this time the water was like "rice pudding" and the fish were gasping and looking rather sorry for themselves. Reaching this disastrous stage took only ten minutes!

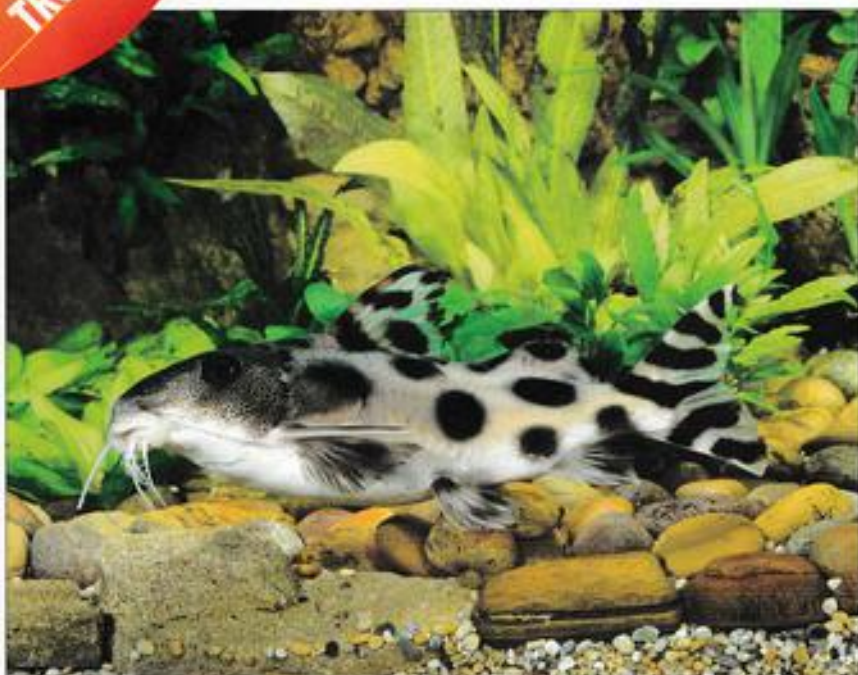
Now panicking just a bit, I performed a slow one third water change to reduce the contamination. Later that evening although I had kept the lighting off to reduce further stress, and the filter was up and running again with reduced, makeshift filter material, the water was looking healthier, even if the fish were still pale and looking as if they had a bad hangover!

Pre-spawning dancing

On reflection, and looking at the video, I am sure the *Synodontis erupterus*, *Synodontis nigrita* and *Synodontis bugetii* were the culprits, appearing to be the ones that were doing all the pre-spawning dancing. Some of the other species actually hid out of the way, indeed some of the *Synodontis* species were rarely out in daylight. I would even go as far as to say that some of the catfish were not seen from the day I put them in until the day I took them out! *Synodontis constructus*, *S. ornamentalis* and *S. waterloti*, being the most nocturnal, this shyness factor appears to be an individual catfish characteristic rather than a species tendency.

It took the best part of a week for the aquarium and fish to make a visible recovery, the *Hoplosternums* oblivious to all the commotion built yet another bubble nest and filled it with eggs. The original filter mate-

SYNODONTIS CATFISH



rial and plants were not salvageable and finally ended up a sloppy, smelly mess in the dustbin. Plants taken from my other aquariums soon made it look more inviting, the fish settled down, although the *Synodontis* had a loss of appetite for over a week.

I decided that it would be a good idea to thin the *Synodontis* numbers down to avoid a repeat performance. I think if I had not caught them in the act the first time, the resulting contamination would probably have killed all the fish.

As for breeding *Synodontis*, they appear to spawn en masse, each female producing thousands of eggs, the males in response produce appropriate amounts of sperm to fertilise them, obviously the amount of fish spawning in my aquarium over balanced the system. Having said that, eggs produced by one female alone would be a "mission impossible" task to provide adequate growing space for many hundreds of fry.

For years after, the thinned out

above My two *Synodontis decorus* I think were perhaps some of my favourites. Their colours, markings and magnificent fins are quite unique.

right *Synodontis erupterus* was probably one of the three species which spawned so prolifically that day.



Synodontis species coexisted happily with each other and other tank members, frequently putting on a courtship display but without any after results.

Finally, some of the *Synodontis* species are best left to themselves. *Synodontis schell*, in my experience, is a bit of a bad tempered individual. *Synodontis opeifcus* is a real beauty but quite expensive. I have not owned one but "I know a man who has". He claimed his individual was very territorial and caused lots of trouble. My two *Synodontis decorus* I think were perhaps some of my favourites, their colours, markings, and magnificent fins are quite unique.

If you are considering an aquarium with *Synodontis* catfish you will need a large tank, a good filter system, plenty of fast growing sturdy plants, and a good pile of bogwood arranged to give them security. This will give your fish the best conditions. The water temperature should be set at 75-78°F and small but often water changes need to be performed. Don't overfeed,

keep them hungry and they will be more active looking for food. I fed mine at irregular intervals. Sometimes up to three days with no food causes no harm and keeps them on their "toes".

Or should that be "pectorals"?

Why not give *Synodontis* catfish a try? You won't be disappointed.



Bob & Val Davies's

FROGS & FRIENDS



HERP FACT FILE: GECKOS (Part One)

The family *Gekkonidae* consists of around 820 species — the exact number is uncertain. They are further divided into 90 different genera. Twenty genera are named after the structure of the digits because they exhibit such variety, e.g., *Cyrtodactylus* = curved-fingered; *Diplodactylus* = doubled-fingered; *Gymnodactylus* = naked-fingered; *Phalloactylus* = leaf-fingered; *Rhacodactylus* = web-fingered. Another sub-division is the "lidded geckos" (family *Eublepharis*) including the well-known Leopard gecko (*Eublepharis macularius*); 20 species that possess moveable eyelids — in the rest the eyelids have fused and become transparent to provide a protective spectacle.

Diurnal geckos (around 25 per cent of all species) have a round pupil, crepuscular/ nocturnal species have a "slit" pupil which widens as the light fails; in some species the slit pupils have up to four apertures which permit vision even when the pupil is shut. The best known diurnal species are the Day geckos (*Phelsuma*).

Geckos are the most numerous lizards and the most adaptable;

they have colonised a large variety of niches on every continent and many islands. The start of sea voyages aided their movement — having arrived in a new, suitable habitat they could often adapt to an unoccupied niche. Since sperm retention is common — several clutches can be laid from one mating — even a gravid female could begin to populate an island. In addition five species are known to be parthenogenic and can produce young without males.

HABITATS

Over time geckos have adapted to a wide variety of habitats: arid deserts, rain-forests, mountains, cliffs, beaches, even human habitations. They can be found living under or on tree bark, in crevices, holes in trees, under rocks, in self-dug burrows or those dug by other animals.

FEET

Geckos are well-known for their ability to cling (and move) on vertical or over-

hanging surfaces — even glass presents no problems. A multitude of extremely fine bristles arranged in pads (lamellae) on the feet produce this ability — the bristles are so small an electron-microscope is necessary to see them. In some species similar bristles occur under the tail and on the belly giving extra purchase and anchorage.

Although bristles may be present they tend to serve a secondary function only in certain species. Claws are also used for gripping and climbing — in some cases they are retractile; bristle pads tend to be used on smooth surfaces, claws on rough surfaces. Claws and bristles are disengaged in a similar manner; by curling up the toes. Where applicable hatchlings possess these bristles (covered with skin) even when in the egg. The skin is sloughed soon after hatching enabling the babies to climb almost immediately.

Terrestrial species lack the bristles — claws are used for purchase during movement and often for digging. Other adaptations to the feet include fringed "combs" or spiny scales on the digits to aid movement on loose sand. At least three species have webbed feet for support and digging.

To be continued



Unidentified
Goniosaurus species
thought to be from
China.

PHOTOGRAPH
BOB & VAL DAVIES

CAMOUFLAGE



The Matamoras turtle occasionally abandons ambush techniques and herds fish into the shallows. PHOTOGRAPH: BOB & VAL DAVIES

Camouflage is a common feature in many animal groups. In numerous species it serves a dual function: it can prevent detection by would-be prey or protect against predators. In common with other groups, reptiles and amphibians inhabit a variety of habitats and numerous examples of cryptic coloration exist.

The simplest method of camouflage is to match the colour of the surroundings; various shades of green and brown are common but a single uniform colour tends to be rare. In practice the background coloration is broken by stripes, spots, lines, blotches, patches or bands. These break up the outline of the body — longitudinal lines can make the body look longer and slimmer — a trick known to fashion designers. A lighter belly to provide counter shading is also often seen particularly in aquatic or semi-aquatic species — this makes use of the effect of light from above.

In many cases camouflage is effective where only some of the markings, for instance crossbands, match the background — this serves to break up the outline of the body. Other fascinating examples exist: markings that resemble lichen and moss, dead leaves, pebbles, tree bark, even bird droppings. As with many camouflaged fish the eyes which might be a "give away" are often concealed by a dark line which extends through and either side of them.

Coloration is not the only means of camouflage. Body shape is often an additional protection. Long, slender bodies as seen in certain arboreal snakes may have evolved to aid progression among branches but they also assist in concealment. To disrupt the outline certain frogs and lizards have lappets or fringes along the sides of the body. These are particularly effective on branches when the animal presses itself down flat. Combined with cryptic markings excellent concealment is provided. A flattened body is used by the Horned toad lizards (*Ptychocheilus*) to prevent detection — body flattening is used by some lizards to absorb sunlight but may have the added advantage of aiding concealment.

One creature that uses coloration and cryptic shape to great advantage is the Matamoras turtle (*Chelaps fimbriatus*) of South America. Its colour matches the dead leaves in the water. The shell has three ridges of pyramid-like shields giving an uneven shape. The head and neck are flattened and possess ragged cutaneous flaps, chin barbels and numerous tubercles. The head does not retract; it is folded sideways — a narrow snout adds to the bizarre shape and functions as a snorkel enabling the animal to obtain air from the surface without too much movement. Further disguise is provided by a coating of algae which often grows on the shell.

Relatively few turtles can catch fast-moving prey and many rely on more sedentary items such as molluscs, insect larvae or worms — many species eat substantial amounts of vegetation. The Matamoras is an ambush predator par excellence. It crawls rather than swims but much of its time is spent immobile, resembling dead organic matter awaiting unsuspecting prey to approach. It has also been suggested that the fringe-like flaps along the neck also help to lure fish and one study claims that they are rich in nerve endings used to detect the approach of other creatures. At the opportune moment the neck shoots out, the huge mouth opens and like a vacuum cleaner sucks in the prey.

SPINY-TAILED MONITORS



Baby spiny-tailed Monitor — being relatively small for Monitors their popularity seems to be on the increase. PHOTOGRAPH: BOB & VAL DAVIES

Monitors (genus *Varanus*) are not the most popular lizards among British hobbyists but have a greater following in the USA. The eventual large size of many species makes it difficult to house them, although young specimens, particularly of the Nile monitor (*V. niloticus*) are occasionally offered for sale — some captive-bred specimens were on sale at the I.M.S. Reptile Fair, Walsall, in September. The most common Varanid in the trade is Bosc's monitor (*V. exanthematicus*) which is imported in substantial numbers for the pet trade — they tend to be purchased as baby specimens by the uninitiated but can soon become too large for their owner. As monitors go Bosc's is a relatively small species, reaching a total length of 48 inches (120cm) but some others can reach a substantial size with a powerful tail, claws and bite to match.

V. niloticus can grow to 78 inches (2m). Having seen the parents of the babies mentioned above we were not tempted. They had been imported as young adult specimens and were anything but tame. Approaching their vivariums produced lunging and tail lashing against the glass. Temperament is often uncertain — specimens bought as babies frequently become tame — we have seen *V. exanthematicus* which were "silly tame", used to being "cuddled" and others which lunged savagely at anything or anyone who approached the vivarium. Cleaning their quarters was fraught with danger requiring thick gloves and a pillowcase to bag them up — hardly pet animals!

Other monitors are occasionally on sale; generally wild-caught specimens which may be described as "captive-farmed". In many cases a question mark hangs over this term. As mentioned Varanids of various types are more popular in the USA — the latest to enter the hobby is the Spiny-tailed monitor (*V. crociferus*), a relatively small Australian species, usually around 30 inches (75cm). Two forms, a "red" and "yellow", would seem to occur (these are probably subspecies) but the two have evidently been interbred in the States.

Larger monitors are not usually very sociable creatures but *V. aculeatus* evidently exist in hierarchical groups that contain an alpha male and an alpha female. This can pose problems when attempting to set up a group if they are from different sources (unless they are very young specimens). Captive breeding occurred in Europe some 20 or so years ago and at least one breeding has taken place in Britain; substantial numbers are being bred in the USA. Basic requirements are an insect diet, full spectrum light and high temperatures 27°C (80°F) at the cool end up to 58°C (100°F) at the warm end. Hiding places are important as in the wild when they have warmed up by basking they hide in crevices — if disturbed they can inflate the body and cover themselves with the spiny tail — this no doubt makes a useful weapon.

Although not large lizards we were interested to see a small group of baby specimens recently that a friend had purchased. They are certainly engaging creatures as babies and so far are hard tame. They feed well on dusted insects but will take thawed pink mice although too many of these can cause obesity.



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THE PONDKEEPER

This month **JOHN DAWES** takes us through the practical steps you need to take at this time of year to ensure your fish survive the winter. PHOTOGRAPHS: JOHN DAWES UNLESS OTHERWISE STATED

Q10 AND THE POND IN WINTER



Picture the scene ... it's one of those absolutely brilliant, crisp, sunny winter mornings. There isn't a cloud in the sky. The thick blanket of snow that fell during the night rests like pristine white cotton on the lawn. The shrubs lie hidden under soft, white, rounded, snowman-like mounds and the trees look as if they've been plucked from the perfect Christmas card. The pond is safely tucked away somewhere under the same downy layer that covers the lawn. All is well with the world. Or is it?

Well, as far as the pond is concerned, that depends. If a good autumn maintenance programme followed an equally good summer one, then the chances are that the pond and its inhabitants will be in pretty good shape. If, for whatever reason, maintenance has not been up to scratch over the previous months, then the innocent, pure-white layer of snow could be hiding a far-from-happy situation.

Consequences of cold temperatures

The metabolism of all the organisms that live in and around a pond (both plants and animals) varies in tune with ambient temperatures. As these rise, as in spring and summer (and, on a shorter timescale, between night and day), so do meta-

left This pond looks like it has had little in the way of autumn maintenance. This will put any fish in it at risk during winter.

PHOTOGRAPH: DAVE BEVAN

bolic rates, but not in a random manner.

There is a "factor" — referred to as Q10 — which indicates the rise and fall in metabolic activity over a temperature difference of 10°C. For example, physical processes such as, say, gas diffusion, have a Q10 value or factor of 1.5. This means that, for every rise of 10°C, the rate of diffusion increases 1.5 times. Equally, of course, it drops 1.5 times per 10°C temperature drop. When it comes to metabolic (as opposed to physical) processes — including enzyme activity rates — the Q10 value is usually between two and three.

Herein lies the main explanation why fish and other forms of life slow down dramatically as we pass from autumn to winter. It's the Q10 effect, i.e., the consequences of dropping temperatures on everything from diffusion of gases across membranes, to breakdown of foods, to release of energy, to speed of muscle contractions, to heart rate ... to ... all of which slow down by between 1.5 to three times with every 10°C temperature drop.

By the time the pond water temperature and, as a result of being cold-blooded (or poikilothermic), the whole body temperature of a pondfish drops to around 5°C, all activity is reduced to "ticking over" mode. It may rise above this during the day, but the increase is short-lived and will plummet, along with the temperature, as night-time falls. Total cessation of all metabolic activity is, however, prevented by another interesting series of events that leads to ice formation on the water surface. This, in turn, helps keep the underlying layers of water liquid and warmer ... unless the pond is extremely shallow and the temperatures particularly severe.

It may sound contradictory to say that ice formation actually helps keep water warmer ... but it's absolutely true. What happens is that, as the water temperature begins to drop below 4°C at the air/water interface, the top water molecules become somewhat more "organised" and their overall structure "less compressed" or "more open". Such water molecules are less dense, i.e., lighter, than their relatively warmer counterparts below. As a result, they float and, as they become even colder, develop a progressively more organised, more open, less dense structure. Eventually, as the temperature approaches 0°C, this light, open structure freezes, forming a solid layer on top of the water that actually protects the underlying water column against the effects of the cold air above.

Were a fish or other organism to become trapped in such an ice-layer (as could happen in very shallow ponds during prolonged harsh winter weather), then these creatures would either die (which is very likely), or go into virtual suspended animation (which is less likely) until temperatures rise sufficiently to allow their

metabolism to begin ticking over again. Hardy plants are, however, more likely to survive ice entombment of this kind, partly owing to the more rigid and open structure of some of their tissues.

Implications for pond maintenance

The deeper a pond, the greater (obviously!) the distance between its uppermost, "freezable" layers and its warmer bottom. Therefore, one of the best ways of helping fish and

other creatures survive the rigours of winter is by providing, at least, one sizable area that is a minimum of 18 inches (45cm) deep. Please note that this depth is taken, not from the top edge of the pond, but from the surface of the water.

Goldfish and other similarly-sized, or smaller, hardy fish should find such a depth adequate, although something deeper would definitely be preferable. However, for larger fish, such as Koi, this depth is far from satisfactory, once the fish begin to put on some size.

The reason I refer to water depth first in the list of winter precautions is that, without a sufficiently deep area, winter pond maintenance tasks, even when carried out diligently, can still result in fish losses, particularly during early spring.

Let's assume, therefore, that a pond is sufficiently deep. What next?

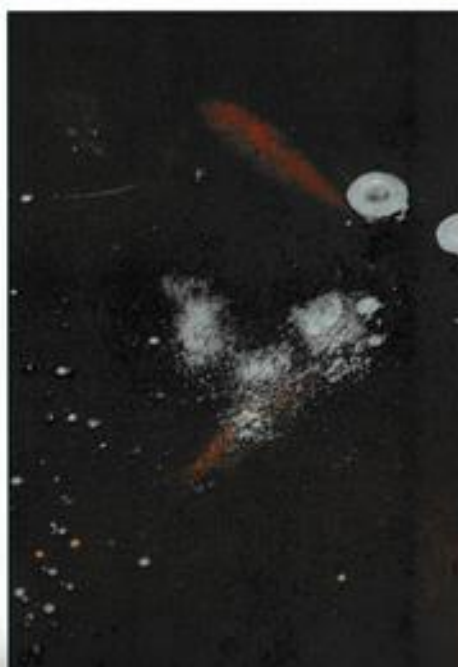
Well, it's not so much a question of embarking on a schedule of winter maintenance tasks once the first frosts or snows arrive. As I mentioned earlier (and, in some considerable detail, in my September autumn maintenance article), it's more a question of continuing with a maintenance programme that has been observed and developed throughout the season.

If this has been done properly, there shouldn't be any build-up of waterlogged leaves lying at the bottom of the pond. These would/should have been removed on an ongoing basis throughout autumn. If they haven't, don't wait for the really cold weather to set in before removing them. However, since leaf removal from the pond bottom will inevitably involve disturbance, whether you use a long-handled net or a pond vacuum, this job needs to be done while the fish are still active, i.e., before they go into their deepest rest period.

Once they are in a dormant state, fish should not be fed at all. Leading up to it, though, easily digestible (preferably sinking) foods may be provided, but only in quantities that will be consumed within a few minutes ... and early on in the day, thus affording them with a fair chance of digesting the food and not running the risk of leaving any "potentially-rottable" residues in their gut when night comes. Remember the Q10 factor!

Also in keeping with the Q10 factor "rules", under no circumstances should a

▶ *Continued on page 28*



above Despite appearances, the conduits of this fountain (photographed at Swallow Aquatics, in Rayleigh, Essex), are protected against damage from freezing temperatures by having a trickle of water flowing through them throughout winter.

left Trapped gases: a serious health threat.

THE PONDKEEPER

◀ Continued from page 27

complete pond overhaul or major clean-out be attempted during the winter months. Although the lack of apparent activity in a pond at this time of year may look tempting enough to embark on an overhaul "while things are quiet", just think what this would mean for the fish.

Being chased out of their slumber, to be deposited into warmer, temporary quarters while the clean-out is being carried out, only to be put back (however gently) into a raw pond, having — in the process — used up valuable energy reserves which can't be replaced owing to the low temperatures, is hardly conducive to successful winter survival! The stresses that such well-intended, but misguided, action generates is often sufficient to kill fish, not immediately ... but eventually, once temperatures begin to rise in spring.

Moving away from the fish, to the plants, these should have been tidied up a long time ago. However, if time caught up with you during winter, move the tenderer marginal plants under cover or into deeper water now



Never create a hole by striking the ice. If you want to get some idea of just how stressful such action can be for fish, just bang two hard objects together underwater next time you go swimming.

PHOTOGRAPH: DAVE BEVAN

... always keeping disruption to the fish down to an absolute minimum. Bog and waterside plants, especially the more delicate types, should have also received some protection by means of a good mulch or, failing this, layers of sacking, sometime ago ... but "later" is still better than "never".

If the early part of winter is relatively mild, it is also still possible to divide some of the hardier types of plants. However, if this can't be done sufficiently early, it's better to wait until early spring, especially if you need to cause major disruption in order to lift large deep-water marginals or lilies.

Pumps, filters and holes

A well managed pond can tolerate being covered in snow or ice for considerable periods, say, several days. It is nevertheless always a good idea to sweep excess persistent snow away from the surface after this time, thus letting a little light into the water. It is also a good idea to maintain an ice-free hole open at all times, even in adequately maintained set-ups. The reason for the hole is not so much to let oxygen in and carbon dioxide out, but to provide an escape route for toxic gases released from rotting vegetation or accumulated debris.

The easiest way of maintaining such a permanent ice-free area is by means of a pond heater, while, at the same time, keeping the pond pump running. However, a word of caution: if you don't use a heater and the weather is very cold ... and if you allow pumped water to return to the pond by splashing on the surface of the ice, the end result will be a drop in water temperature within the pond itself. One way of overcoming this is by raising the pump off the bottom of the pond (by resting it on a few bricks), thus leaving the warmest bottom layer relatively undisturbed, and positioning the return flow below the water surface. This is particularly recommended if you are planning to leave your pond filter in operation throughout the winter.

Other, less permanent, ways of creating a hole safely include pouring hot water on the ice, or floating weighted polystyrene boxes or plastic bottles into which warm water (not hot water, which will melt plastic) can be poured in the morning to thaw out sufficient ice to allow the box or bottle to be removed. Even "squeezeable" objects like rubber balls (of the heavier types — beachballs won't do) can be used. The only thing that must be avoided is creating a hole by striking the ice. If you



Boiling water can be used to melt pond ice either poured directly on the ice or into a metal container like this one. Plastic containers may melt if water this hot is poured into them.

PHOTOGRAPH: DAVE BEVAN

want to get some idea of just how stressful such action can be for fish, just bang two hard objects together underwater next time you go swimming.

If you opt for switching off your pump and filter over the colder months, both should be overhauled in the spring, and time then allowed for the filter to re-establish its biological capacity in step with a gradually increasing fish feeding programme.

There are other steps that can be carried out as part of a winter maintenance programme, from the creation of a "shelter" for fish (in autumn) by means of a stiff piece of dark plastic supported on bricks, to installing a heater in the settlement chamber of large external filters that are kept running (at a reduced rate) throughout the winter. Such steps will, obviously, help and are well worth considering if your pond set-up makes them feasible or desirable.

However, if you can't do everything, concentrate on the crucial steps like controlling the feeding as the weather cools down, stopping all feeding as temperatures begin to approach the 5°C mark, making sure that an escape route is provided for toxic gases and keeping disruption of the fish down to a minimum. This, of course, assumes that you've provided your fish with the best possible chance of winter survival by keeping your pond in tip-top condition at all times. And, of course, speak to experienced pondkeepers. They are always willing to pass on their own tips for success and alert you to potential pitfalls.

See you in spring ... with a pondful of healthy fish!

News Desk ... News Desk

On the brink of extinction ... new arrivals at The London Aquarium

The London Aquarium has 15 new arrivals in the Temperate Waters Zone in the shape of creatures called Nautilus. The only display of its kind in Britain. Nautilus are often referred to as 'living fossils' since they have remained relatively unchanged since before the age of the dinosaurs, millions of years ago.

Living in waters off the Philippine Islands the Nautilus



Nautilus sp.
PHOTOGRAPH M.P. & C. PEDNOR

species featured in the London Aquarium is on the brink of extinction. The high demand for its beautiful shell for the souvenir trade has led to extreme over-fishing. Closely related to the Octopus, Squid and Cuttlefish, the Nautilus is the last of the shelled cephalopods and now only six species remain.

The Octopus and Squid only live for a few years while Nautilus can reach ages of 15 and 20 years. Nautilus have a very low rate of reproduction and only reach reproductive maturity in late adolescence which puts them at particular risk of extinction if population levels fall below a certain level.

The London Aquarium aims to educate visitors on the importance of not buying Nautilus shells and other marine curios as souvenirs, to help ensure that the Nautilus does not vanish from the earth's waters forever. Visitors can see the endangered Nautilus in the Temperate Waters Zone of the London Aquarium in County Hall. Tel: 020 7967 8000.

BRITISH AQUARIST FESTIVAL

A full report on BAF will be in next month's A&P, however, here are the main details of the Champion of Champions competition which A&P sponsors. The tropical section was once again well supported with 34 entries benched. First place went to Mr and Mrs Mogford, whilst Tony Tyson had to settle for second place this year. Third went to Mr and Mrs Jones. The coldwater competition was won by Mr B. Case with a beautiful Common

Goldfish which he purchased from a local shop when he first started keeping fish. Second went to A. Barton and third D. Roberts.

BAF is also the conclusion of the F.N.A.S.'s show league and this year Halton ran away with it finishing on 498 points. Oldham came second with 267, and Sutton were third with 255.

below The winning fish, a beautiful *Tilapia buttikoferi*.
PHOTOGRAPH DEREK LANBERT

below A&P Editor congratulating Anne and Ivan Mogford on winning Champion of Champions.

PHOTOGRAPH DAVID FORD



New Training Centre opens its doors

The new Sera Partners training and distribution centre was officially opened on Friday, October 15. In a grand opening ceremony officiated by Tony Verrinder, the owner of Aquazoo, and main distributor of Sera, Mr Josef Ravnak, who had flown from Germany to mark the momentous occasion.

Aquazoo will run two-day training courses from the centre for aquatic retailers. This system of giving specialist retailers the opportunity to be trained to a high standard has been very successful in Germany and it is hoped this success will be emulated in the UK.

FISHTALES BY TOKES & SCHOFIELD



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Poison arrow frog, *Dendrobates azureus*.
 PHOTOGRAPH: M.P. & C. PEDONIR

Q I am currently setting up a terrarium to keep Poison arrow frogs, either *Dendrobates auratus* or *Dendrobates tinctorius*. I would like to plant the tank with live plants but I do not want to use standard garden compost. Would it be all right to use aquarium or pond planting compost and aquarium liquid plant foods? These obviously do not harm fish so I assume they will not harm amphibians.

If they are not suitable could you advise me on some alternatives. Also do I need full spectrum lighting for the frogs or will supplements do just as well?

Mr Hills, Worthing.

A Using aquarium or pond planting compost will be perfectly safe for your frogs, however, it is probably not a good idea

to use aquarium plant foods. These may be too strong when in an undiluted form. You would be better advised to use John Innes No. 1 or sterilised meadow loam (available from most garden centres). These has sufficient plant nutrients in them for the plants and is safe for your frogs. Once your vivarium is up and running you need not worry about fertilising the plants as the frogs will produce enough waste matter to do the job.

As far as full spectrum lighting is concerned you need to find a lamp with two per cent UVB. There are several different brands on the market with this sort of spectrum. Supplements will also be needed and for these you need to look for one which is a very fine powder. Some brands are rather coarse and will fall off micro-crickets before the frogs have a chance to eat them.

Q Having enjoyed the pleasures of a small pre-formed pool I have now set my sights on a more ambitious project in the way of an L-shaped formal water feature. I am at the moment excavating the large amount of soil which needs to be removed. The depth will range from 35 to 48 inches. I intend putting two inches of sand as a base for the liner and will line the sides with carpet which I am at the moment collecting from friends.

The long edge will form an extension of existing decking which I have already constructed. The remaining edges will carry wooden cappings. The whole shape of the feature is formed by concrete blocks.

I would, therefore, appreciate any advice on the type of liner best suited for this project and whether it is possible to have a liner welded to shape, thus saving on wastage. I would also seek advice as to the most appropriate pump and filter system. I am quite interested in the spider filter but as you are aware one gets so much conflicting advice on the performance of pond hardware.

John Tunney,
 Sutton Coldfield.

A A pond of this shape would be better constructed from blocks,

brickwork and concrete rather than a liner. This is actually a lot easier than it sounds and will produce a much better and longer lasting pond in the end. This will mean changing your construction methods a little and installing a concrete base as well. Full instructions on how to do this will be found in any good pond book and you would be wise to purchase one before you go any further with this project. A good basic book on this subject is John Dawes's Book of Water Gardens but there are plenty of others on the market.

Deciding which is the most appropriate pump and filter system for any particular pond is always very difficult. Generally speaking it is best to stick to one manufacturer's products if you are fairly inexperienced and try to find a fully integrated package suitable for your needs. For this type of formal pool with fish in it you will require a filter system which has elements of biological, chemical and mechanical filtration.

You should look for one with a UV included in the package or available from the same company and with a pump sufficient to turn over the total water volume every two hours. It would be wrong of us to suggest any particular brand as there are several different companies which offer excellent systems which will match up to these requirements.



This page is 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.

Bob & Val Davies's

A to Z OF REPTILES & AMPHIBIANS

E ELAPHE

Elaphe is a genus of colubrid snakes containing some 30 species many of them commonly referred to as "ratsnakes" although this can be confusing since members of other genera such as *Ptyas* (Asia) and *Spilotes* (tropical America) are also given this name. To cause more confusion some North American species go under the names of cornsnake (E.g. *gambeli*), chickensnake (E. *obsoleta*) and foxsnake (E. *vulpina*). As the common name implies rodents are the preferred food (not just rats) but certain species will readily eat small birds, lizards and in one case frogs and fish.

The eight North American species (and their various subspecies) are probably the best known in the hobby — older books may include a much larger number in the genus but recent taxonomic changes removed several species to the genera *Senticolis* and *Bogertophis* — this latter includes the popular Trans-Pecos ratsnake which is now *B. subocularis*. European species are not generally known as rat snakes; only one, the Ladder snake (E. *zosteris*) is truly European, the others, Leopard snakes (E. *stilesi*), Aesculapian snakes (E. *longissima*), the Four-lined snake (E. *quadrorifasciata*) actually extend into Asia.

Although the various North American species have long been popular among keepers, of the 20-odd Asian species several have now become established in the hobby and some are highly desirable.

These include: Eastern trinket snake (E. *cantoni*), The stinking goddess (E. *corinata*), Assam green trinket snake (E. *fronata*), Common trinket snake (E. *helena*), Transcaucasian (Russian) ratsnake (E. *hohensackeri*), Red-headed ratsnake (E. *muellendorfi*), Taiwan beauty (E. *radletti*), Japanese ratsnake (E. *climacophora*), Steppes ratsnake (E. *dione*), Mandarin ratsnake (E. *mandarina*), Chinese garter snake (E. *ryufodorsata*).

It is possible that the taxonomy of European and Asian ratsnakes will be revised with further changes. E. *ryufodorsata* probably should not be in *Elaphe* — it is a fish and frog eater and is highly aquatic.

Generally speaking *Elaphe* species make

good vivarium subjects. A few tend to have an aggressive nature; in fact most wild-caught adults will 'have a go' although some will become tame with time. It is better to obtain captive-bred babies as they mostly adjust well to vivarium life and become handleable. All species are egglayers except E. *ryufodorsata* — another reason for not calling it a ratsnake. Care for all species is fairly similar — a dry vivarium with an air temperature of 27-30°C (80-86°F) during the day and 18-21°C (65-70°F) overnight. Most will require winter cooling but duration and temperature (including the overnight temperature) may vary according to species and it is advisable to research the individual species.

Coloration is variable in many species, some specimens may be more attractive than others and certain adults change their colour and pattern from the juvenile form. A number of (mainly American) species, particularly cornsnakes, have been bred in various colour and pattern morphs. In addition some, again mainly American species, can intergrade where their ranges overlap and the progeny may not look exactly like the adult form of either parent.

Most of the American species should be easily available as they have been bred by hobbyists for many years. Some Asian species may be elusive but a few are bred on a regular basis and are often advertised in society newsletters or on sale at reptile shows. E. *mandarina* is probably the most attractive and commands high prices. European species seem to have waned in popularity over the years and cannot legally be brought over, however captive-bred specimens may occasionally be advertised.



above Japanese ratsnake (E. *climacophora*). An Asian species which may well be taken out of the genus eventually.



left Yellow ratsnake (E. *obsoleta*) *quadrorifasciata* from the USA. The ground colour is subject to considerable variation.

PHOTOGRAPHS: BOB & VAL DAVIES

A Seasonal Message

Towards the end of September a lady called for advice on her tortoise. It had been sold to her as an "Afghanistan garden tortoise". It was actually a Horsfield's tortoise (*Agrotornis horsfieldi*). It was still outside (as the seller had advised) and hadn't fed for some time. Its diet during the warm weather had been mainly lettuce (as advised). It was underweight, underweight and she was worried about hibernation (it would probably have succumbed). The poor creature has now been brought indoors under full-spectrum light, has a varied diet with supplements and a correct temperature regime and is "a different animal".

Tortoses have greatly increased in popularity over the last couple of years and no doubt some will be bought as Christmas presents. Tortoise care is complex and varies according to species, unfortunately correct advice is not always forthcoming. At the risk of sounding repetitive and boring we would like to issue our usual seasonal message concerning the purchase of animals as presents without the necessary equipment and knowledge or without thinking of all other implications. In the case of Tortoses the Tortoise Trust produce a number of books and videos on the care of various species. Two videos deal with hibernation — a thorny problem for some keepers. Many people, especially children, prefer to see something on video rather than read about it. The Tortoise Trust can be contacted at BM Tortoise, London, WC1N 3XX. Membership is not necessary to purchase books and videos.

The national press has reported RSPCA attempts to clear a pond of dumped Red-eared turtles and a tale of an "alligator" (possibly a man) dumped at the door of a wildlife centre — an amnesty evidently produced at least one other specimen. On television a zookeeper (in the USA) nearly lost his life when a python constricted him. At a recent show Nile monitors were on sale to anyone willing to buy them — did buyers realise the eventual size? So, think before you buy — the "cute" pet could become an unwanted monster.

A Happy Christmas and
Successful New Year to
Everyone



FACT FILE

Photograph: Aneid Van Den Nieuwenhuizen

Common Name: Guppy

Scientific Name: *Poecilia reticulata*

Family: Poeciliidae

Origins: Originally Barbados, Brazil, the Guianas, Trinidad and Venezuela. This species has now, however, been introduced throughout the tropics for mosquito control.

Size: Males 2 inches; Females 2.5 inches

Diet: Omnivore

Temperature: 64 to 82°F

Aquarium Type: Small fish community

Reproduction: Livebearer

Planner



JANUARY 2000

Sat	1	New Year's Day
Sun	2	
Mon	3	Bank Holiday
Tue	4	GLOUCESTERSHIRE FISHKEEPING CLUB MEETING Contact Caroline on 01453 824810
Wed	5	
Thur	6	
Fri	7	
Sat	8	
Sun	9	
Mon	10	
Tue	11	
Wed	12	
Thur	13	
Fri	14	
Sat	15	GOLDFISH SOCIETY OF GREAT BRITAIN MEETING Contact R. Sbirick on 0181-550 1252
Sun	16	
Mon	17	
Tue	18	
Wed	19	
Thur	20	
Fri	21	
Sat	22	
Sun	23	
Mon	24	
Tue	25	
Wed	26	
Thur	27	
Fri	28	
Sat	29	YAAS - Yorkshire Association of Aquarist Societies AGM
Sun	30	GREATER MANCHESTER CICHLID SOCIETY Millennium Cichlid Auction. Contact Carl, 01706 333363
Mon	31	

MAJOR DATES IN 2000

August 19/20, Yorkshire Aquarist Festival (YAAS), Doncaster Exhibition Centre

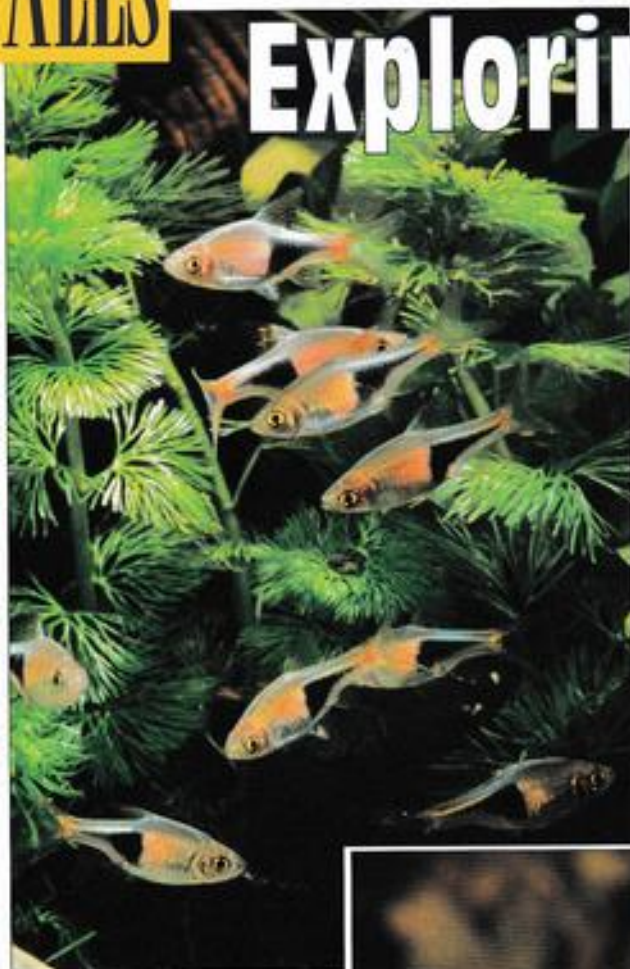
October 20/22, Supreme Festival of Fishkeeping (FBAS), to be held at Bracklesham Bay, near Chichester, Sussex

FEDERATION CONTACTS: AofA, Chris Ralph, 01703 560318; FBAS, Paul Corbett, 01983 721246; FNAS, Army Chadwick, 0161-652 6207; FSAS, Hugh Bowie, 0131-539 2790; USA, John Reid, 01738 634689; YAAS, Terry Nelson, 01724 289736

An expedition in search of tropical fishes described by
Wing-Commander ALFRED H. MARSACK, MBE, FZS:

PHOTOGRAPHS: A. VAN DEN NIEUWENHUIZEN UNLESS OTHERWISE STATED

Exploring the Jun



above Harlequin Rasboras, *Rasbora heteromorpha*, are comparatively widely distributed. Two distinct varieties were found, the first, which I can best describe as being of the normal colour known to aquarists, and the second rather rarer, was suffused all over with an enhanced redness, a deeper flush of red on the forepart of the underbelly, and bright reddish orange eyes.

PHOTOGRAPH: M.F. & C. REDNOR

right The breeding of *Rasbora heteromorpha* has been a joy and thrill experienced by very few aquarists and it is hoped that these suggestions will be of some help to those enthusiasts who would like to attempt the reproduction of this species.



It was not until April of last year (1948) that I was able partially to satisfy a ten-year-old almost fanatical urge to explore the streams of Malaya in search of fish and aquatic plants. In previous years I had applied my net elsewhere, with the enthusiasm expected of an amateur chronically afflicted with what uncharitable folk would readily term a horrible disease in which the poor sufferer dreams and thinks of little else but tiny fish.

The streams of Egypt, India, Ceylon, Hong Kong and China as well as the waters of the Gulf of Aden had all provided their thrills on previous leaves but had only increased my insatiable desire to discover what Malayan streams had to offer.

It was my intention during this expedition to take the pH and temperature of all streams where particularly interesting specimens of fish were found, together with any other characteristics which might be of value to aquarists. I had previously consulted Dr. Tweedie, Curator of the Raffles Museum in Singapore and he very kindly gave me the free run of his laboratory

Jungle Streams of Malaya

and museum records, which proved to be invaluable. His encouragement gave further impetus to my plans. Through thinking out aloud in the lounge of Raffles Hotel one morning I found that I was not the only person with interests in jungles and streams, and had very soon clinched an admirable arrangement whereby two enthusiastic twin sisters skilled in painting would accompany me.

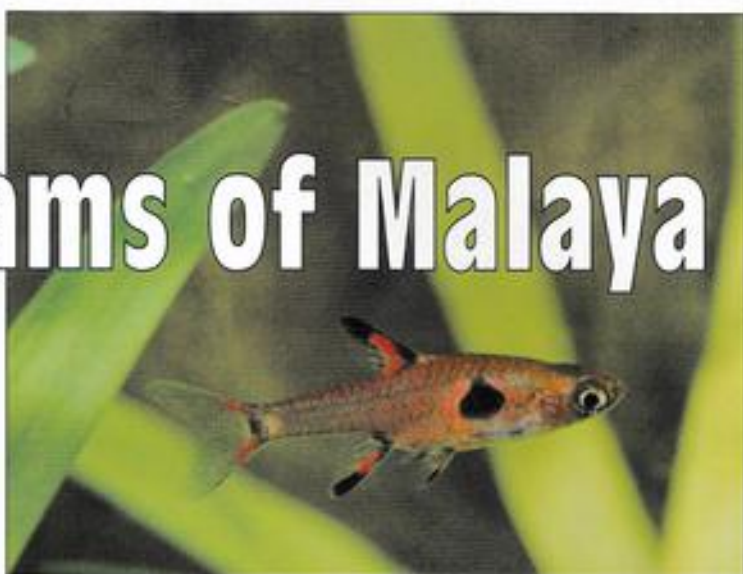
An extremely heavy thunderstorm marked the beginning of the expedition, rain fell in sheets and our spirits were rather dampened as we had to reduce the speed of the car to ten miles an hour. But Malayan weather is well known and one can be certain of a few reasonable breaks of sunshine throughout the day. Our plan was to make brief preliminary examinations of any likely streams we passed on the outward journey, and when homeward bound some days later, to collect specimens of fish which we had noted. This would obviate having to leave them unduly long in the large cans in the rather poorly ventilated boot of the car.

In all, some 50 streams in the interior of Johore State and on the East Coast were examined and 31 species of fish collected, among them no less than 14 species of *Rasbora*. The East Coast of Malaya was particularly rich in streams and by far the most successful "nettings" were either just inside the jungle fringes or in shady stretches in the plain, though there were solitary exceptions in the case of those fish which seem to prefer strong sunlight and warm shallow water.

A list of fish and plants brought back for examination included the following:

Rasbora heteromorpha, maculata, trilineata, taeniata, sumatrana, leptasoma, lateristriata, elegans, einthovenii, dorsocellata, cephalotaenia, sp. (unknown: black spotted anall), *argyrotaenia*, var *veisseni*; *Barbus hexazona, everetti, schauinslandi, bisotatus, portipentazona*.

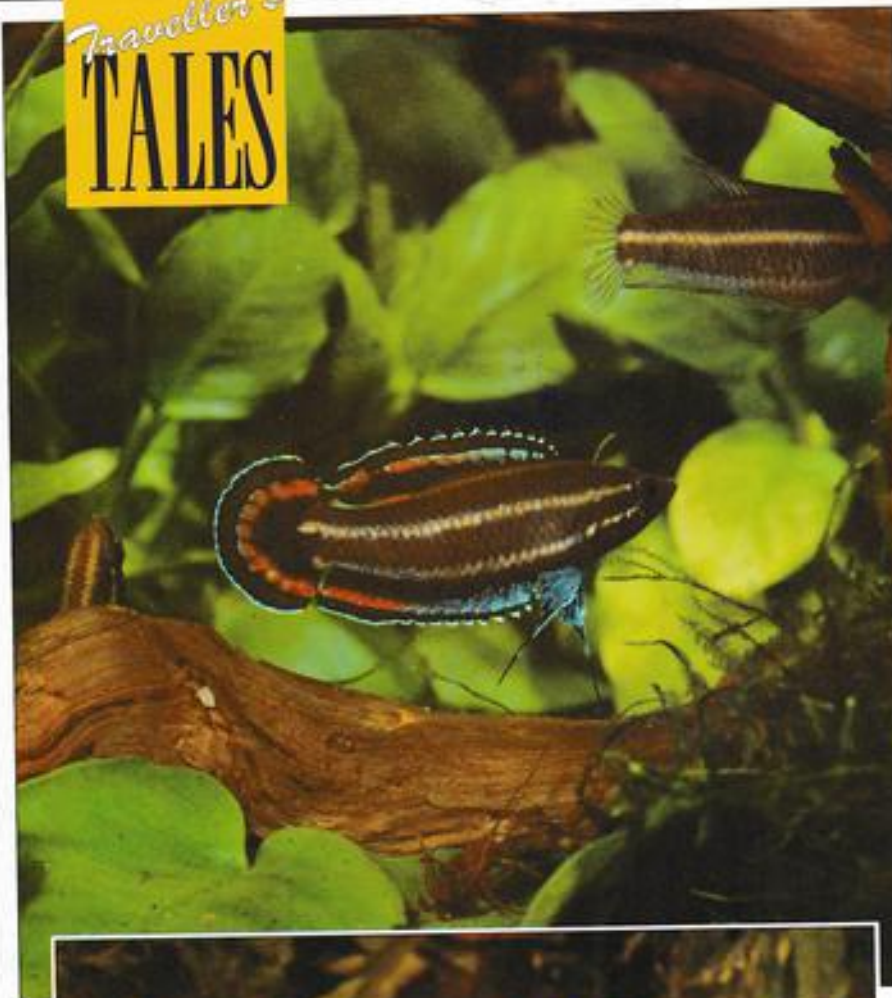
Osteochelilus vittatus; *Hemirhamphodon popotognathus*; *Dermogenys pusillus*; *Laciscephalus pulcher*; *Acanthophractus kuhlii*; *Betta taeniata*; *Parosphromenus deissneri*; *Sphaerichthys osphromenoides*; *Nandus nebulosa*; *Panchax panchax*; *Betta brederi*;



above *Rasbora maculata* were found in fairly deep and slow moving streams. This beautiful little fish has a preference for sunny localities and was found on occasions in semi-stagnant backwaters.

below To collect *Parosphromenus deissneri* a second expedition was undertaken and resulted in the capture of this relatively rare fish between two high jungle areas in a stretch of deep slow flowing river.





Trichopsis vittatus.

Plants: *Biliria*, *Sagittaria sinensis* (and seeds), *Cryptocoryne ciliata*, *C. purpuracea*, *C. cordata*, *C. griffithii*.

With space restrictions, expanded notes are confined to those fish which are better known, and perhaps more easily available to aquarists in the United Kingdom, together with some notes on two others which are likely to be of scientific interest.

Rasbora heteromorpha

This fish was comparatively widely distributed and we came across two distinct varieties, the first, which I can best describe as being of the normal colour known to aquarists,

left Apart from the dorsal and anal fins which are elongated and come to points, in overall shape *Parosphromenus deissneri* are not unlike a small female fighting fish. Anal and dorsal fins are fringed with a dark blue. The tail has the same blue edging but when courting, a very frequent pastime, it flushes with a vivid crimson, the flush continually appearing and disappearing with the frequency of the light of a glow-worm.



left *Luciocephalus pulcher* is certainly the villain of the piece. He can be found in most Malayan streams where the stillness of the water enables him to take up a stationary position in the vicinity of unsuspecting smaller fish. The best description of this fish is that of a harmless looking bit of stick with an unbelievable turn of speed when required!

and the second, rather rarer, was suffused all over with an enhanced redness, a deeper flush of red on the forepart of the underbelly, and bright reddish orange eyes. Both varieties appeared to favour moderately flowing shaded streams of clear water, with reddish sandstone pebble beds, and overhanging plants from the bank. Water temperature ranged between 77° and 84°F and pH from 5.3 to 5.9; iron content between 0.3 and 2.5 parts per million.

With the exception of odd patches of *Blixia* and a type of hairgrass there were few water plants in the centre of the streams, but in the slow moving backwaters were massive clumps of *Cryptocoryne oiliata* and *parviflora*, in many cases forming a tangled network of roots almost a foot in depth. It was as the result of brushing upwards with the net in these clumps that we found our first *R. heteromorpha* fry, thus pointing to the possibility that for spawning as well as for the subsequent protection of their fry, these fish choose the dense growth of wide leafed *Cryptocorynes*. It was also interesting to note that almost without exception, mature *R. heteromorpha* appear to confine themselves to swimming in trios about six inches beneath the surface of the water. From evidence gathered in the form of this fish in all sizes it would suggest that breeding goes on throughout the year; this is rather to be expected in a country which through its proximity to the Equator experiences no seasonal changes of climate.

The breeding of this delightful fish has been a joy and thrill experienced by very few aquarists and it is hoped that my suggestions will be of some help to those enthusiasts who would like to attempt the reproduction of this species. First of all it would be necessary to select a well-matched trio of two males and a female, correct pH, 5.3 to 5.9 (inducing the acid condition through rotting leaves rather than by chemical means), temperature between 77° and 84°F, a fairly long aquarium with a densely

planted end of wide leafed *Cryptocoryne*, running in a slope if possible from the bottom of the tank to the top, and shaded. A gentle flow of water running from a pump siphon system on to the top of the *Cryptocoryne* clump would be a distinct advantage, as also a small iron content to the water.

Rasbora maculata

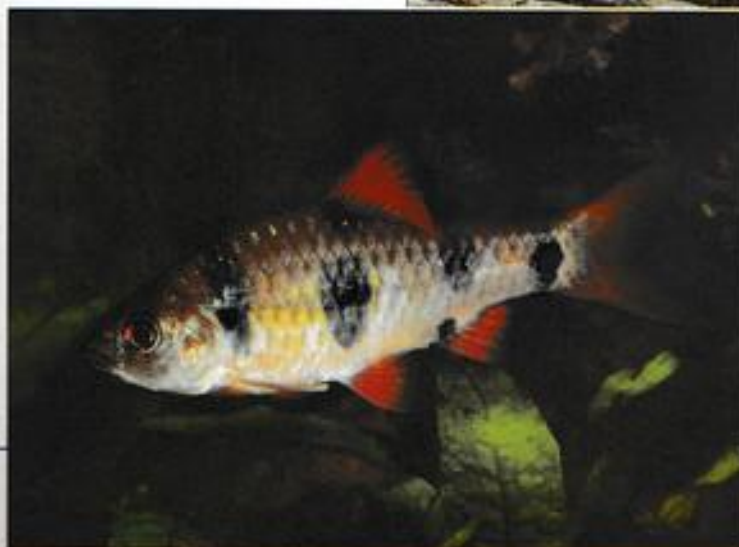
Found in fairly deep and slow moving streams, this beautiful little fish has a preference for sunny localities and was found on occasions in semi-stagnant backwaters. When located they are comparatively easily

netted as they have no turn of speed and seem to congregate in their fours and fives a few inches below the surface of the water — individual fish rarely venturing far away from the remainder of the group.

Like *R. heteromorpha*, two distinct varieties were netted in adjacent streams, one very much deeper in colour and almost an eighth of an inch larger than the other, with a slightly increased depth of body and intensity of markings. Some minute fry of *R. maculata* were found in very shallow greenish water and lifted out in cupped hands, the mesh of the net being too large for them. They were congregating within the



above Whilst *Cryptocoryne oiliata* is happy growing underwater here it can be seen growing and flowering in a rotting tree trunk. This photograph was taken in the Johor Bahru area of Malaysia.



left Clown Barbs, *Barbus everetti*, were also collected on this trip but they look more like this fish than the captive bred ones we see for sale in aquarium shops today.

shelter of a gelatinous type of *Nitella* in water of a temperature of nearly 94°F. Mature fish seem to prefer a temperature of between 80° and 85°F.

Barbus hexazona

The most elusive fish netted and by no means common. It was found in only two localities living in rather strange conditions when compared with the remainder of the

right *Barbus hexazona* was the most elusive fish netted and by no means common. It was found in only two localities living in extremely shallow semi-stagnant water, darting very swiftly in and out of a maze of swamp rush roots which made netting almost impossible.

below Coolie Loaches, *Pangio kuhlii*, are still popular aquarium fish today but have had their genus name changed since Wing-Commander Alfred H. Marsack collected them in Malaysia.

BOTH PHOTOGRAPHS: MAX GIBBS



fish collected. In both cases it was seen in extremely shallow semi-stagnant water, darting very swiftly in and out of a maze of swamp rush roots which made netting almost impossible. The temperatures were 96°F and the narrow stretches of water completely without shade.

Its distinctive colouring, a pleasant over-cast of green relieved by minute golden dots, reflected the strong sunlight to an extent which almost obscured its characteristic dark bars. Of the ten fish netted only four survived the journey back to civilisation, giving the impression that it is not as hardy as most other members of its genus.

Parosphromenus deissneri

The capture of this relatively rare fish was certainly one of the most exciting moments

of the expedition. Dr. Tweedie of Raffles Museum had given useful clues in regard to likely localities and the fact that it was not discovered on the first trip provided a welcomed excuse to make a further expedition a week or so later. His took us to a point in the interior of Johore State which was subsequently the scene of a massacre of British planters by Chinese bandits.

Between two high jungle areas we located a stretch of deep and slow flowing river fringed with shallow edges of fine rushes at the base of which was a heavy deposit of reddish mud, mixed with decaying rush stems and vegetable matter. Within an hour we had netted no less than 15 of these little treasures with the long name, as well, incidentally as three Malayan airship fish (*Sphaerichthys osphromenoides*) all of them in the shallow edges of the river.



The *P. deissneri* stood the journey back to Singapore very well, and once in the homely surroundings of a small aquarium it was possible to study them at leisure. Of a light olive brown hue, 1.25 inches in length, they have two pinkish orange lateral stripes. Apart from the dorsal and anal fins which are elongated and come to points, in overall shape they are not unlike a small female fighting fish. Anal and dorsal fins are fringed with a dark blue. The tail has the same blue edging but when courting, a very frequent pastime, it flushes with a vivid crimson, the flush

continually appearing and disappearing with the frequency of the light of a glow-worm. They are fairly slow in their movements and spend long periods near the roots of plants, quite stationary, at an angle of roughly 30 degrees.

This fish is regarded as the smallest known of the order of air breathers. By its almost negligible gill movement this would certainly appear to be so, but from my own observations as well as those of one aquarist in America who has a pair, there is a strong doubt as to whether it does in fact take air from the surface of the water.

It is a very delightful little fish and was first known to science as far back as 1870 when it was discovered in Bangkok. It appeared for the first time in Malaya in 1934. Apparently it has never been bred in captivity. This may well be due to the fact that its mouth is minute and without a plentiful supply of very small mosquito larvae and correspondingly small *Daphnia* it would be difficult to bring it to that condition which is a prerequisite of its desire to reproduce its species.

Luciocephalus pulcher

This is certainly the villain of the piece. He can be found in most Malayan streams where the stillness of the water enables him to take up a stationary position in the vicinity of unsuspecting smaller fish. Nature has been very generous in the way of cloaking and shaping him in an innocent and inconspicuous garb of brown and green. According to specimens collected one would judge the full size to be nearly five inches, with few if any distinguishing features to warn his prey as to whether he is going or coming. In fact the best description is that of a harmless looking bit of stick with an unbelievable turn of speed when required.

On first examination, when one has discovered from the small crafty eyes which end of the "stick" contains the head, there appears to be no mouth, the streamlining and camouflaging is so perfect. With the aid of a fingernail however, the mouth can be opened. It is enormous and seems to unfold with a system which I can only liken to a

series of transparent hinges and bellows, to form a tunnel quite three times the size of its innocent looking head in repose. Apparently they thrive fairly well in captivity and to those aquarists who can spare the odd live fish for his diet, he would be well worth an aquarium to himself, since here anyway is miniature underwater camouflage at its best and in its most vicious form.

Editor's Note: This article first appeared in *The Aquarist*, August 1949 issue, and although one or two of the scientific names have been changed now, the information about the fish collected and habitats they live in is just as valid today as it was then. Indeed it was partly through this article that the key to success in breeding *Harlequins* was found.



above right The Thread-jaw Halfbeak, *Hemirhamphodon pogonognathus*, is a beautiful but delicate livebearer found on this expedition.

right Croaking gouramis, *Trichopsis vittatus*, were another of the little anabantids collected on this trip. They make beautiful members of a small fish community aquarium provided that plenty of plant cover is included in the set-up.

BOTH PHOTOGRAPHS: MAX GBBS



Fish Profiles



PHOTOGRAPH: M.P. & C. PEDROIR

Serpae Tetra (*Hyphessobrycon callistus*)

By Iggy Tavares, PhD

Serpae tetras, are colourful, lively tetras that are always on the go. They chase each other around nipping each others fins without doing any permanent damage. They grow to just over 1.5 inches (4 cm) and have quite a deep compressed body. Their colour ranges from pale red to darker red with a vertical black bar usually running just behind the gill cover. The caudal fin is blood red while the red pelvic and anal fins are edged in white. The dorsal fin is mainly black with a red base and some white edging. It is difficult to distinguish males and females from the size of their anal and pelvic fins which are usually similar especially in younger fish. However, mature females tend to be plumper than males and can grow a little larger as well. Longer finned varieties are available occasionally.

The Serpae tetra belongs to the *H. callistus* complex which consists of a large group of similar looking tetras some of which are *H. callistus*, *H. minor*, *H. basemontii*, *H. baraldschultzi*, *H. rosaceus* and *H. serpaie*. It is difficult to distinguish between these different species just by looking at the fish and often requires scientific examination by an expert to be certain. Nevertheless, whatever the actual species in your local shop, Serpae tetras are a gorgeous fish. They have a wide distribution in the Amazon river in South America, ranging from the Madeira and Guapore regions to upper Paraguay.

A shoal of six or more Serpae tetras make a nice addition to a well planted community tank containing other similar sized fish. If kept in a shoal, their fin nipping is usually restricted to their own kind. However to be on the safe side it probably better to avoid the smaller tetras such as Neons and Cardinals as companions in the same tank. Serpae tetras prefer soft water but do well even in hard water. These tetras greedily eat all offered foods.

Serpae tetras can be bred in a small tank. Soft water, such as rain water, is necessary for the eggs to hatch. A nice clump of Java moss could act as the spawning medium. The male and a plump female after introduction should spawn within a day or so, usually in the morning. Serpae tetras are ravenous egg eaters and should be removed as soon as they finish spawning. The eggs hatch in about 24 hours and then use up their yolk sac before becoming free swimming on the third to fifth day after which feeding can commence. Small foods such as infusoria should be fed for a few days and then newly hatched Brine shrimp, Microworm and powdered fry food. Surprisingly, the young Serpae tetras start to show colour as early as four weeks.

SERPAE TETRA CV

FAMILY: Characidae
SPECIES: *Hyphessobrycon callistus*
ORIGINS: Amazon river in Madeira and Guapore regions and upper Paraguay
AQUARIUM TYPE: Community
FEEDING POSITION: Surface and mid-water
SIZE: 4 cm
TEMPERATURE: 72-80°F
DIET: Flake, granular, frozen and live foods



PHOTOGRAPH: A. VAN DEN NIEUWENHUIZEN

Bronze Corydoras (*Corydoras aeneus*)

By Iggy Tavares, PhD

The Bronze corydoras, *Corydoras aeneus*, also called Aeneus catfish, has a club shaped body. The most discernible feature is the metallic green head and flanks while the belly is pinkish in colour. The gill covers are also metallic green and the black eye is rimmed in green. This catfish has a double row of overlapping bony plates on each plate on each flank. Another protection are sharply spiked dorsal, anal and pelvic fins. The downward facing mouth has three pairs of barbels. Males and females when young look very similar, the sexes becoming discernible only in mature adults, especially as the female fills out with eggs. The Bronze corydoras possesses a secondary intestinal respiratory organ, which explains why occasionally they suddenly dart up to the surface for a gulp of air. Another interesting feature is that the eyes are moveable and it often appears to blink.

This armoured catfish has a wide distribution in Brazil, Venezuela, Trinidad and Guyana where they are found in slow flowing streams. Here in the soft warm waters it is found in shoals foraging at night.

The Bronze corydoras ideally should be kept in a shoal of four to six in a community set-up with other small fish such as tetras. However the armour plating affords the Bronze corydoras plenty of protection, even when kept with some of the smaller dwarf cichlids. When in a shoal it comes into its own, is much more active and is out and about even in the daytime. Because the Bronze corydoras only takes food from the bottom, sinking pellets or granular food should be provided. These they will greedily take as well as all kinds of small worms.

The Bronze corydoras is a group spawner. A group of mature Bronze corydoras, consisting of two females and five males, should be placed in a separate mature aquarium where the temperature is 80°F to start with. Following heavy live food feeding for two weeks, during which time the females should fill out with eggs, the water temperature is dropped to 65°F by adding cold water which should trigger spawning. Over 200 amber coloured eggs are deposited usually on the aquarium glass or other smooth surfaces. The adults should be removed to another tank. The eggs hatch in about two days and are free swimming in another three days, after which feeding with Microworms, newly hatched Brine Shrimp and a fine powdered fry food can be commenced. Like the parents the young are also bottom feeders.

This is an interesting catfish often kept singly to act as a scavenger in a community tank set-up. They should, however, be kept as a small shoal to get the best out of them, which might even encourage them to spawn.

BRONZE CORYDORAS CV

FAMILY: Callichthyidae
SCIENTIFIC NAME: *Corydoras aeneus*
ORIGINS: Brazil, Trinidad, Venezuela and Guyana
AQUARIUM TYPE: Community
FEEDING POSITION: Bottom only
SIZE: 7 cm
TEMPERATURE: 72-84°F
DIET: Tablets, granular foods and worms



PHOTOGRAPH: DEREK LAMBERT

Cortes Swordtail (*Xiphophorus cortezi*)

By Derek Lambert

The Cortes Swordtail is a very attractive wild Swordtail rarely seen in the trade but very popular amongst hobbyists who specialise in wild type livebearers. It grows to about 6cm and has a bluish body with a dark zig-zag stripe running along the full length of its body. Each scale above this stripe is dark edged creating a net-like pattern. In mature males the longitudinal line fades and a number of dark vertical bars develop along the flanks. A thin upward curving sword also grows out and eventually reaches approximately one third of the body length. Depending upon the individual, bright yellow or black patches may also develop over the body.

In the wild they are found in fast flowing rivers and streams with rocky substrates. They are rarely found living amongst plants except for gravid females waiting to give birth, and young fry who shelter here until they are strong enough to move out into open water. Adults will usually be found where the current is strongest and where there are plenty of boulders. Predominantly insectivores, they will search for food in clumps of plants and algae, eating any small animals they find living there.

In captivity, they are a peaceful species which will live happily in a community of similar sized fish. Males will occasionally spar with each other but no harm is usually done and they never become aggressive with other fish.

They prefer a temperature between 70-76°F but will tolerate higher for short periods. In the wild they are found in very hard alkaline water. They will adapt to neutral water conditions but rarely do well in soft acidic conditions. The aquarium should contain some plant cover and good filtration. They eat all foods including flake and frozen foods but for best results must have some live food in their diet.

Broods are born every 28 to 32 days and the fry will hide under plants on the aquarium bottom. After 24 to 48 hours they start to spend more time out in the open and are likely to be eaten by other fish in the aquarium. It is, therefore, best to move them to a separate tank for rearing.

CORTES SWORDTAIL CV

FAMILY: Poeciliidae
SPECIES: *Xiphophorus cortezi*
ORIGINS: Mexico
AQUARIUM TYPE: Community
FEEDING POSITION: Mid-water
SIZE: 6 cm
TEMPERATURE: 70-76°F
DIET: Flaked foods and live foods



PHOTOGRAPH: DEREK LAMBERT

Spotted Copella (*Copella nattereri*)

By Derek Lambert

The Spotted Copella is a relatively rare fish in the hobby despite being first collected in 1908. They are usually imported as "Splashing tetras" and normally make up only a small percentage of the wild import.

It is a very attractive fish when mature with a red spotted body, pink flushed fins and a dark black spot in the dorsal fin. It grows to about 5cm and mature males have longer and more pointed fins. The top lobe of the caudal fin is particularly elongated in males.

In the wild they are found in the Amazon basin where they live in smaller streams and pools. They are warmth lovers and require a temperature of between 76-84°F to thrive. The water in these habitats is very soft and acidic and these are the water conditions they prefer in captivity, although they can tolerate neutral to slightly alkaline water if they are changed over slowly.

Their aquarium should be well planted and have plenty of places for them to retire into. They are generally not very shy but are un-moved by fast moving fish or much larger companions. They eat all types of small live foods, as well as good quality flake foods and other commercial diets, providing these are small enough to fit in the mouth.

Captive breeding is rare, although it has been accomplished. Despite often being referred to as "Splashing tetras" they do not lay their eggs above water but on a broad plant leaf below the water's surface. The male then guards the eggs and newly hatched fry until they become free swimming after which he will eat them. The free swimming fry are very small and require infusoria or a liquid fry food for at least a week before moving on to other foods.

SPOTTED COPELLA CV

FAMILY: Lebiasinidae
SPECIES: *Copella nattereri*
ORIGINS: Amazon basin
AQUARIUM TYPE: Small fish softwater community
FEEDING POSITION: Mid-water
SIZE: 5 cm
TEMPERATURE: 76-84°F
DIET: Small live foods and good quality flake food

"How much food and how often do you need to feed the fish in captivity?" is one of the most pertinent and important questions asked by Fishkeepers. After the essential water quality and aquarium conditions are provided for the fish, including the correct water temperature, the next concern is how to feed the captive animal. Or rather, this important matter of correct and sufficient nutrition needs to be addressed before you purchase any fish or bring home a wild-caught specimen from the seashore.

Normal advice

"A pinch of food twice a day will suffice." This might be the advice given to you about a solitary Goldfish, but it can be quickly discovered to be inadequate. "How large a pinch? Do I have to feed it more when it grows?" Therefore, the reply may continue "Feed it as much as it can consume in one go, but not too much, or else the food will be left to rot on the floor of the tank." This is about as good as the general explanation gets. Species of fish are so variable in their food requirements that advisors are understandably a shade reluctant to commit themselves.

Another reason is; they do not know the answer. Unless, you have kept that particular fish over a long period of time it is hard to judge precisely how much food they will consume. Like a Salmon taking a fly after it has stopped feeding on its final spawning run up river, some fish seem habitually inclined to attack anything that resembles food. This does not mean they are hungry. All the fish may chase the food particle around the tank and then deposit it in some rock cranny where it can remain rotting, hidden from the aquarist.

How much?

A small rock pool fish like the Blenny may consume between three and 10 per cent of its body weight every day, when fed a wet food like a piece of mussel without its shell. This can only be a very rough guide as there are many variables, e.g. in lower water temperatures the metabolism and digestion speed of the fish will be slower. Dry food contains as much nutrition as about a quarter of the bulk of wet foods like mussels, cockles, white fish and the frozen sea food available from a aquarium retailers.



Andy Houston's SHORE WATCH

Opportunists (or generalists)

Opportunistic feeders, fish and invertebrates that naturally consume a wide range of different foods such as worms, mussel flesh, small crabs, prawns and scavenge on organic matter, are the easiest to satisfy in captivity. The Comb-toothed blennies (family: Blenniidae) are an example of fishes with an almost insatiable curiosity. This makes them particularly entertaining in captivity. They live between the tides and in the shallow sea where there are barnacles to bite off rocks, lots of different prey like crabs to search for in the crannies, as well as worms buried in the sand.

Crabs are often given the human trait of being greedy. They seem to need more than 10 per cent of their weight in food every day to maintain their long-term survival. They will eat anything they are fast enough to catch or crack open with their powerful claws. The smaller crabs are useful scavengers but the large ones can wreak destruction on delicate invertebrates.

Macrophagous

Macrophagous is a bit of a mouthful; it means feeding on relatively large items of food or prey. In the animal kingdom the first example that comes to mind is the snake, especially the Anaconda and large constrictors of the jungle, that eat a large monkey or other animal and then lay around and digest it for a few days. In the world of aquarium fish, there are no extreme examples that I know of, but there are certain stealth predators that go without a meal for a few days before ambushing another fish in the aquarium.

The Cottidae (Bullheads) and the Scorpaenidae (Scorpionfish) families of fishes use stealth. The predator lies in ambush on the seabed or floor of the aquarium and waits for an unsuspecting prawn or small fish to swim by. Suddenly it will rush out from its place of concealment and swallow its unfortunate victim. Lionfish are popular tropical marine exhibits,

but often have to be kept on their own because of their penchant for swallowing the smaller inhabitants of the aquarium. All these ambush hunters can be tempted by anything moving in their field of vision. If they do not like the food they will spit it out.

Microphagous

Microphagous means eating copious quantities of small items of food frequently. Feeding is sometimes necessary five times a day and these fish seem to be on a continual quest for food. The most difficult fish are specialist feeders on a single item of live prey. Seahorses and Pipefishes are usually too difficult for anyone other than the really dedicated enthusiast. In the wild they feed exclusively on living animals, minute crustaceans and larvae. Occasionally, they can be tricked into sucking in dead food in a current, but on a long-term basis, they need a continual supply of live food.

Mysids, a small prawn-like animal, can be collected from estuaries and bought from specialist marine aquarium retailers, but the supply is not always consistent, depending on the vagaries of the climate and collecting conditions. It is then that the supply of the minimum three per cent of their body weight of live food every day seems almost impossible. Live brine shrimp, *Artemia*, is a useful standby, but seems to be inadequate as the sole food for these attractive fish.

Web Links:

For foodstuffs from the British shore go to: <http://ourworld.comuserve.com/homepages/BMLSS/feeding.htm>

Tropical aquarists should be wary of introducing wild foods because of the possibility of introducing pathogens (disease-causing organisms).

TIP 1

Vary the feeding regime in a marine aquarium to ensure all the animals get enough to eat.

TIP 2

Vary the diet, brine shrimp, mussels, prawns, etc., to ensure all the fish and other animals in the aquarium get adequate nutrients.

TIP 3

Growing juvenile fishes require a larger intake of food than adults compared to the size of their bodies.

Left Butterflyfish like this Copper-band from the tropical Pacific and Red Sea can be very finicky about their food requirements in captivity. They will eat the coral polyps and other small items and are not recommended for the beginner.

PHOTOGRAPH: LINDA LEWIS

ROY OSMINT exposes some of the deadly deceivers of the aquatic world:

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

Deadly Deceiver

In a deep, dark, sluggish Amazon stream heavily overhung by a canopy of dense vegetation, a collection of fallen leaves slowly drift, suspended in the water's gentle current. Before long most will join a multitude of other such leaves decaying on the bottom and themselves contribute to the soft acid conditions of this tropical underwater environment.

One particular leaf commences to slowly drift away from the others out towards the centre of the stream and into the oncoming path of a small shoal of *Hypbessobrycon herbertaxelrodi*. The leaf, like all the others, hangs in the water at a slightly oblique angle, balanced in this position by the weight of its protruding stalk.

Everything about this situation appears perfectly natural. The fishes are totally unperturbed by the sight of the leaf now directly ahead of them. Why should they be?

The only possibly uncharacteristic feature of the scene could perhaps be the fact that while all the other leaves have now drifted on down stream a little, this one seems to hold its position against

the gentle current. But even so, many factors could contribute to this!

The fact is, however, that although the fishes have absolutely no conception of it, one member of the shoal is now in mortal danger — the one swimming in a direct line towards the seemingly innocuous leaf.

The truth of the matter is that the leaf is far from innocuous. In fact it is not a leaf at all!

The very closest examination would reveal a pair of almost invisible pectoral fins making the finest corrective movements as the leaf-like creature delicately and imperceptibly manoeuvres into optimum striking position.

The downward angled leaf stalk is in reality a short barbel extending from the lower lip of a sharply protrusible mouth. The overall body shape and coloration a perfect camouflage!

As the predator and prey come into close proximity the leaf carries out a final, extremely subtle, positional adjustment bringing

itself perfectly in line with the still blissfully unaware oncoming fish.

At the crucial moment the leaf suddenly adjusts its previously oblique angle to assume a horizontal plane. In the same instant it surges forward towards the prey in a strange sort of whirling action.

Cleverly deceived

Before the victim has time to realise that it has been cleverly deceived, a flexible mouth shoots forward creating a large funnel-like trumpet which exerts considerable suction power. For the luckless fish there is no escape! At great speed it is drawn inextricably forward straight into the unforgiving jaws of the voracious leaf.

This will not be the last time today that this violent scene will be enacted. For although the *Hyphessobrycon herbertaxelrodi* has for the time being bridged a hunger gap, the leaf has an enormous appetite and will soon be needing to lure other unsuspecting victims to their death using precisely the same tactics.

The South American Leaf Fish (*Monocirrhus polyacanthus*) is a remarkable creature in many respects. But undoubtedly its most outstanding characteristics are firstly those of camouflage — for it is truly an absolute master of disguise. And secondly its carnivorous nature — it really is a predator extraordinaire!

Its overall body configuration is leaf-like in the extreme. Markings and coloration complement the shape perfectly and, as we have seen, present a total impersonation package capable of fooling a prey fish at the very closest range, even in open water.

Body markings are extremely interesting. On the flanks from the eye to the tail runs a dark horizontal stripe which, in many cases, is likely to be a darkish brown on a golden brown background. Three other less pronounced and shorter stripes also radiate from the eye in varying directions. These markings in total are designed to resemble the delicate veins of a leaf.

When describing the Leaf Fish's general golden brown coloration I specifically make reference to the fact that this is what it is likely to be in many cases! This is important, because in reality it can change both quickly and dramatically depending upon the tint and texture of the background.

In some circumstances, for example, the fish will be seen as an overall light yellowish brown, in others a marbled greenish grey, in still others chocolate or very dark brown and many shades between. The change from one distinct hue to another can occur in just a matter of a few minutes.

In many respects it is difficult to see clearly where the Leaf Fish's fins start and finish, so comprehensive is the camouflage effect. Certain of them have a pigment that coincides with overall body coloration while others remain generally colourless.

As a freshwater predator few other species are able to match its reputation. This is a creature that almost exclusively feeds on other live fishes, duping them in the manner previously described. It is a wonderfully successful system. It has to be! The Leaf Fish is capable of consuming daily quantities equivalent to its own body weight.

Monocirrhus polyacanthus is not the only so-called Leaf Fish, there are in fact two others. But it is the one that unquestionably most appropriately fits this description. The other contenders to the title being the African Leaf Fish (*Polycentropsis abbreviata*) and another South American form (*Polycentrus schomburgkii*).

But whereas *Monocirrhus* presents in the water an almost perfect representation of a drifting leaf, the other pair, at least from a human perspective, are far less convincing in this respect possessing only a passing leaf-like resemblance.

Although our subject was originally described to science by Heckel in the year of 1840 it did not make another significant appearance for a



far left The South American Leaf Fish (*Monocirrhus polyacanthus*) has an overall body configuration leaf-like in the extreme. Markings and coloration complement the shape perfectly and is a total impersonation package capable of fooling a prey fish at the very closest range, even in open water.

PHOTOGRAPH: DAVE ALLISON

above The aquarium should preferably be planted with a good number of broad leaved plants. Amazon Swords like this *Echinodorus cordifolius* are ideal. These will be used by Leaf Fish to shelter beneath and behind.

further eighty or so years. At which time an American enthusiast and collector saw a sudden strange movement in an accumulation of underwater leaves he was examining. Closer investigation revealed a number of specimens of *Monocirrhus polyacanthus*.

In the aquarium

Most of us are fascinated by the unusual — and in fishkeeping terms they don't come much more unusual than the Leaf Fish.

It should be borne in mind, however, that this is by no means an easy aquarium subject and should consequently only be considered by those who are fully aware of the creature's requirements and are willing and able to provide the appropriate conditions and circumstances. Fascination alone is not enough!

DEADLY DECEIVER

First of all this fish is not necessarily easy to obtain. Clearly it is not a "bread and butter" species and perhaps unlikely to be often found in the normal display tanks of your average dealer.

Probably the best course of action for those interested would be to contact an outlet that specialises in rare and unusual fishes. Even if they do not have anything in stock they should be able to obtain them for you, or set you on the right track. But do not expect them to be cheap!

The next consideration is water composition and quality. Leaf Fish are especially demanding in this respect and unless circumstances are entirely favourable they will not prosper, and probably die. They particularly dislike hard water conditions, the ideal probably being very soft, slightly acid with a pH value of about 8.0. Temperature should be between 23°C and 25°C.

Water quality must be first class and to achieve this the aquarium should be very well filtered, preferably utilising an external power unit that is capable of turning over all the water on a frequent cycle. This must also be supported by regular manual partial water changes.

The final area of potential difficulty is that of diet. As we know, these creatures are consumers of large quantities of live food in the form of small fishes. Can you fulfil this basic requirement and are you prepared to do so? This is not a species for the squeamish!

Basic instincts

I believe that in some instances Leaf Fish can eventually be induced to take certain other edibles such as garden worms and various meat particles etc. But this should not be interpreted to suggest that the need for live fishes will be eliminated. On the contrary, to deprive them of their natural diet and their unique means of winning it, is to deny them their basic instincts and inclinations.

For almost any species the moment of introduction to the aquarium and subsequent acclimatisation is an extremely important period and should always be carried out as sympathetically as possible. In the case

of Leaf Fish it is quite literally critical. Get it wrong and chances are they will not survive.

The tank in which Leaf Fish are intended to be housed must be properly matured before any stock is introduced. By this I do not mean a few days, or even weeks — but many months. During this time other species requiring similar conditions can occupy the aquarium.

Despite everything previously stated about the habits of these fishes, they are not in themselves especially aggressive, in fact if anything, they are rather shy and retiring. This might, on the face of it, appear somewhat contradictory. But the fact of the matter is, these are carnivores of suitably sized live fishes. They are not pugilistic — there is a difference. Any fish too large to be eaten will be perfectly safe.

Do not forget, many species considered of mild temperament will eagerly swallow smaller fishes if given the chance. It is just that Leaf Fish have to do so to survive. The old fishkeeping motto "if it fits in the mouth it is likely to be regarded as food" almost always holds true.

The aquarium should preferably be planted with a good number of broad leafed plants, Amazon Swords are ideal. These will be used by Leaf Fish to shelter beneath and behind. As I said these are generally rather timid creatures. Very bright illumination should also be avoided for the same reason.

Breeding

Breeding of this species, like almost every other aspect of the fish, is likely to be difficult — though not impossible! For a start the sexes are far from easy to distinguish. In specimens of approximately the same size the stalk-like mouth appendage tends to be longer in males. In certain individual cases this can be absent completely in females.

In many instances females will also exhibit a somewhat more robust appearance, though this characteristic is really only apparent when the fish are already in breeding condition.

Leaf Fish are not great romantics! Once a pair have decided to breed there is little, if any, formal courtship. A suitable spawning site will be determined, this will often be a plant leaf, and a scrupulous cleaning



right

Nyphessobrycon herbertaxelrodi — small Tetras like these are often on the menu for Leaf Fish in the wild.

operation undertaken. When this is to the fish's satisfaction the female will fairly unceremoniously lay a batch of almost colourless eggs which are then fertilised by the male.

Although at first the eggs appear to be firmly adhered to the underside of the leaf, in fact each is attached by an extremely fine thread arranged in a spring-like coil. This becomes apparent over the three or four days hatching period when the eggs drop and can be seen suspended by their tiny cords.

Upon hatching, the fry are relatively large by comparison to many species. Daphnia, Mosquito Larvae and other similar live foods are eagerly taken and will promote healthy development among the young Leaf Fish until eventually they graduate to small fishes. A good intermediate live food, when available, can be found in the Freshwater Shrimp.

For all the reasons previously explained Leaf Fish are suitable only for the aquarist seeking something really different and who is fully prepared long term for what is involved. Remember, a tub of standard fish food will not do here! Adult specimens will require a constant supply of live Guppy-size fish which are likely to be consumed at a rate of three or four in a feeding session.

Leaf Fish are truly remarkable creatures in many respects. To the fishkeeper so inclined, these deadly deceivers can provide an enduring source of fascination.

right The South American Leaf Fish (*Monocirrhus polyacanthus*) is a remarkable creature in many respects. But undoubtedly it's most outstanding characteristics are firstly those of camouflage — for it is truly an absolute master of disguise.

PHOTOGRAPH: MAX GIBBS



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IGGY TAVARES PhD switches continents to try his hand at spawning *Herotilapia multispinosa*, The Rainbow Cichlid:

PHOTOGRAPHS: IGGY TAVARES UNLESS OTHERWISE STATED

TROPICAL

Chasing Rainbows



left Adult pair, male upper fish. There are several colour variations of this species and this one lacks the bright red eye of iggy's fish.

PHOTOGRAPH:
MAX GBBS

I spent many years enjoying the colourful commotion of Malawi cichlids. Having observed, bred and photographed many of these African cichlids, I decided that it was time to go change continents and try some Americans. On one outing to Fishworld, Elephant and Castle, London, I came across a tankful of mature Rainbow cichlids.

A look through the reference books on hand, told me that the Rainbow cichlid is in fact *Herotilapia multispinosa*, first described by Gunther in 1866. It is one of the smaller, less aggressive Central American cichlids and hence would be suitable for the three foot tank I had waiting. I stood watching the behaviour of the dozen or so Rainbows in the tank. One male had staked out a corner of the tank near some boulders and was showing interest in the females in the tank. A smaller female, who looked as if she might be gravid, several times followed the male to his corner. In this corner there was another larger female which was also responding to the male's attention. I knew that the larger female would be more able to stand up to the male when they were separated from the

school, and hence purchased this pair.

Rainbows are found in Honduras and Costa Rica but not apparently in Panama. They are herbivores and have evolved specialised teeth with which they are able to scrape algae of surfaces. These specialised teeth have resulted in Rainbows being placed in their own genus, *Herotilapia*, rather than the common "Cichlasoma". In the wild, during the dry season, Rainbows are found in small ponds and backwaters. Here, as the temperature soars, the plant life increases and the fluffy green algae is eaten by the Rainbows. These cichlids also breed in the ponds.

There are many colour variants of Rainbows, ranging from red to yellow. Also some look-alike species are sold under the same name. The pair I bought were full grown with the male at 14cm total length and the female at 13cm total length. They were of the yellow variety with a yellow back, a large black spot in their mid-section and usually showed an incomplete black longitudinal stripe along their middle. The male had slightly longer dorsal and anal fins than the female, which together with

CHASING RAINBOWS

the caudal fin were yellow. The dorsal fin had a marginal blue band and the pelvic fins were also pale blue out of the breeding period. A striking feature of my pair was the red rimmed black eyes making them a very attractive pair of cichlids.

Aquarium care

The Rainbows were housed in a three foot aquarium together with a pair of Jewel cichlids (7.5cm TL) and a half dozen young *Cichlasoma peacock* (3 to 5 cm TL). The aquarium had an under gravel filter with a power head, several large smooth pebbles and plastic plants. My normal hard London tap water (20°DH) kept at around 27°C was used. About 30 to 40 per cent of the water was changed every two weeks. Although the Rainbows appeared to accept their new home easily enough, they initially refused to accept any food, which consisted of various cichlid pellets as well as a good quality flake and live earthworms. These were greedily eaten by the other cichlids especially when the live earthworms were offered two or three times a week. Two weeks later I was able to coax the rainbows into eating by offering them frozen Bloodworm. A few weeks later they were taking all the food offered including earthworms, duckweed and some lettuce. Because of their herbivorous nature, I started supplementing their feed with a vegetable foodstick, which the Rainbows seemed to particularly enjoy.

Behaviour

The Rainbows were basically docile and never troubled any of the other smaller cichlids. In fact the smaller jewels were more pugnacious, even keeping out the Rainbows from their small corner of territory at opposite ends of the tank. The Rainbows only became a little aggressive to the other cichlids after spawning. Even then they did not physically harm the other cichlids, which I was therefore able to leave in the tank.

Breeding

After about six weeks of keeping, I could see that the Rainbows were coming into breeding condition. This was indicated by the belly and pelvic fins of the cichlids becoming darker in colour. I removed the Jewel cichlids to give the Rainbows access to the corners of the aquarium. The pair selected a large pebble in one corner of the aquarium which both male and female Rainbows started cleaning with their mouths. This was done with the fish in almost vertical position. Pre-spawning behaviour consisted of head shaking behaviour and some fin flaring. Sometimes the male nudged the female in the mid-section with his mouth.

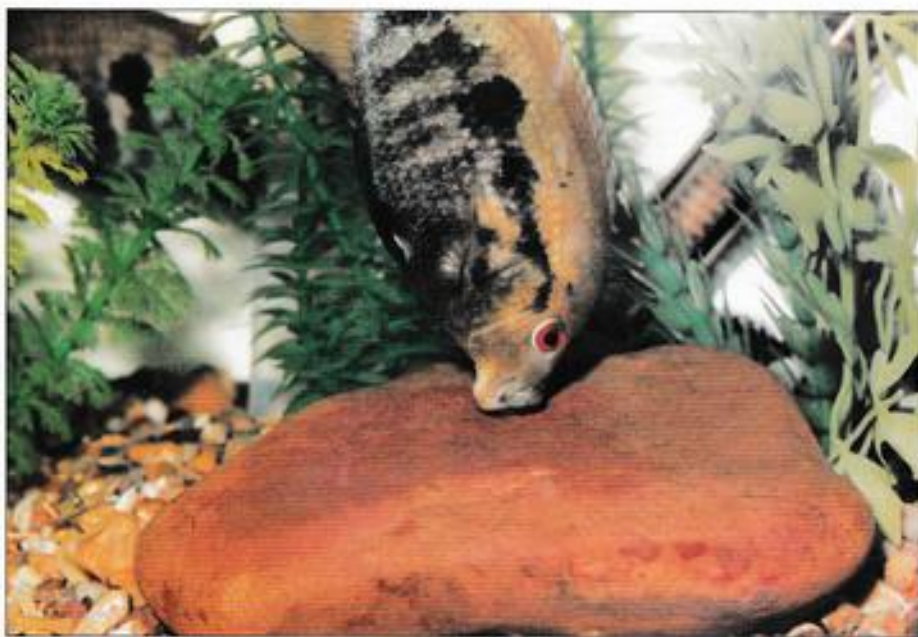
Next evening, the female started cleaning the same large pebble again with the aid of the male. She started some dummy runs over the pebble with the male in close attendance. He followed the female almost in the T-position, pecking at the area of the pebble that the female had just gone over. Finally egg laying started in earnest. The female laid a row of eggs, came off the pebble and allowed the male to fertilise the eggs. Egg laying went on for over an hour with the bulk of the eggs being laid on one pebble and some on an adjoining pebble.

Fry development

The female did almost all the egg fanning and did not abandon her eggs to feed. She only accepted food when it was put right next to her. On the second day, the male spent most of his time patrolling some distance (22cm) from the spawn site but on the third day he was closer. Both fish, especially the female, were getting a little more aggressive now. The amber coloured eggs were developing nicely and I could see them darkening in colour. Only a very small number of eggs turned white and were removed by the female. On day four, the female had enlarged the pit she had dug right next to the spawning pebble, all the way to the undergravel filter. At around midday she started to move the eggs to the pit. I decided to move some gravel to the pit to re-cover the bare filter plate and my hand was viciously attacked by the female.



right A typical Rainbow Cichlid habitat in Costa Rica. PHOTOGRAPH: DEREK LAMBERT



left The pair selected a large pebble in one corner of the aquarium which both male and female Rainbows started cleaning with their mouths. This was done with the fish in an almost vertical position.

below left Female Rainbow moving hatching eggs.



Fry care

On day seven following the spawning, the fry were free swimming. The water temperature was 27°C and the free swimming stage was reached earlier than reported in the literature. The 3mm fry shoal were now looked after equally by both parents. This consisted of picking up any strays in the mouth and spitting back into the main shoal. At least one of the parents and usually both were with the fry always patrolling and on the look out for any intruders. Any *C. pearsei* were chased out of sight. Both parents were now showing magnificent colours of yellow backs and black bellies, beautifully offset by their red rimmed eyes.

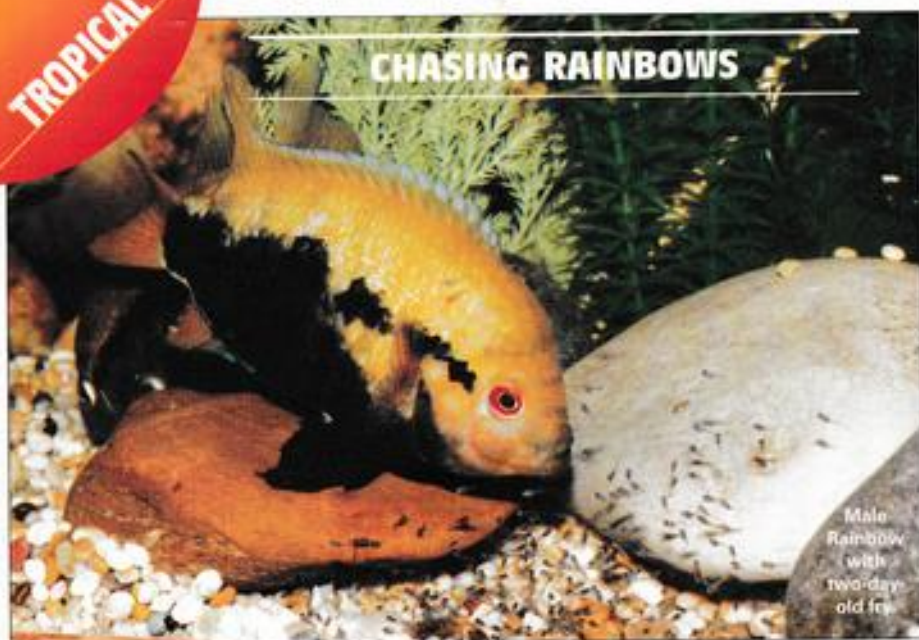
On the first free swimming day, I fed the fry with several small amounts of pre-soaked finely powdered flake delivered in the right place with the help of a pipette. From the next day this was supplemented by very tiny white worm. On this diet they grew fast so that they had doubled in size within six to seven days. The power head was put back on the uplift tube to resume its filtering function. By day three, the fry were moving further afield, some getting caught in the water currents from the power head to end up as a tiny morsel for the other fish. Fifty percent were lost in the morning and to safeguard the others, I moved the *C. pearsei* out to a separate tank. Some two weeks later I moved about 30 fry to a separate tank for growing on tank where on a mixed diet of flake and live food they continued to grow well.

Luckily the Rainbow's mouth is too small to do any damage, but the attack did make me jump. I removed the power head from the uplift pipe of the under-gravel filter to prevent any fry being sucked into the gravel. The power head was repositioned in the top corner and left running so that there would be some water circulation in the aquarium.

There was no movement from any of the eggs on the pebble prior to them being moved. However, when the female picked them up and spat them into the pit, I could then see a dark black blob with an attached tail wagging furiously. Next day the beginning of heads were apparent and the tails were still wagging incessantly. As the pit was right against the aquarium glass, I was able to observe their development easily. Many fry were some one inch below the gravel surface in the

TROPICAL

CHASING RAINBOWS



Male Rainbow with two-day-old fry

FURTHER READING

Ad Konings, *Cichlids of Central America*, 1989. Tropical Fish Hobbyist Publications Inc.

Donald Copel, *Cichlids of North & Central America*.

1993. Tropical Fish Hobbyist Publications Inc.

Fact File

Scientific Name:

Herotilapia multispinosa, Guenther, 1866.

Common Names:

Rainbow or Butterfly Cichlid.

Distribution: Central America.

Size: Male 14cm, Female 13cm TL.

Conclusion

Keeping and breeding the Rainbow cichlids has been a real pleasure for me especially as they were easy to care for. Providing them with a balanced diet induced them to spawn followed by brood care in which both parents participated in the defence of the ever so tiny fry. Malawi

cichlids do of course have interesting fry care, but females need to be isolated in a separate tank prior to fry release.

However, brood care in a community setup, with both male and female *Herotilapia multispinosa* contributing equally, is something special.

At least for the moment, I had found my Rainbow.

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Product Reviews ... Product Reviews ...

Interpet Prime 10:

INITIAL REVIEW

• This month we have selected the Interpet Prime 10 external filter for initial review.

External filters have several distinct advantages over internal units but they also have some disadvantages. The first big disadvantage is that they are far more complicated to fit together. The internals are all just basically slotted into position and the plugged in and switched on. Externals have lots of pipes and things that need fitting in position. That said this model was fairly straight forward and took almost no time to fit together and install.

The other big draw back with externals is their sheer size. Just where to hide or position the canister can be a big problem. Initially we sat the canister above the aquarium but within a couple of days the pipes had kinked reducing the water flow. By moving it down to the floor this problem was solved, although if we had reduced the hose length that might

have solved this problem and allowed us to leave the filter above the aquarium.

The size of externals may be a problem in one way but it is a real advantage in another. It means there is plenty of room for different filter media. This model came with a coarse foam disc (for large particulate matter), a Bio-media (which will be colonised by bacteria for biological filtration), Polymer wool, Carbon (which removes various toxins), and a final layer of Polymer wool to remove any fine particulate matter. You could of course change any of these for other filter media if you wanted but the standard materials supplied should work perfectly well for most aquaria.

Two really good features about this filter is the way you can monitor the flow rate by a simple to use flow indicator, and most important of all, an efficient priming system. All we had to do was fill the priming chamber with half a pint of water and switch on. It started first time, every time we tried it.

This model has a flow rate of 360 litres per hour, which is sufficient for good filtration but without blowing the poor fish around their aquarium. All in all this looks to be a very good, easy to use filter. It will be interesting to see how it performs over the coming months.

BioPlast Aquarium System:

BioPlast has traditionally been known in the UK for a relatively small range of products. CO2 fertilisers and other plant growing accessories are probably their best known products, but in fact they have a full range of products from lights, filters, heater/stats, medications right through to a whole range of systematised aquaria.

In recent years these complete aquarium systems have been rapidly taking over as the way most aquarists buy their initial set-ups. After all the one stop concept has much to appeal to the beginner who knows little or nothing about how to filter, light, and heat a tropical aquarium.

The problem with many of them, however, is they have been designed with only freshwater fish in mind. This means the filtration may not be suitable for marines, the lighting may not be suitable for reptiles or growing aquarium plants and trying to fit suitable alternatives into these aquaria can be a nightmare.

BioPlast have solved all that by producing a range of interchangeable

products which can be fitted in all their aquarium systems. This means you can mix and match the equipment to suit your individual needs whilst at the same time the basic unit will be ideal for a beginner who just wants a starter set-up.

Since the only way to find out how good these systems are is to set them up and leave them running for a while we decided to test out one of the BioPlast aquarium systems. We selected a Munich 80 with matching beech cabinet. This comes complete with all the equipment you need to set up and successfully run a tropical aquarium.

We, however, planned to include a lot of growing plants in the setup so decided to switch the standard fluorescent tubes for a BioSun plus tube. This has been specifically designed to grow plants.

The other item we switched from the standard one supplied with this system is the filter. We wanted to try out their BioSi 3 chamber filter

rather than the Bio Duetta filter which normally comes with this aquarium. Despite being larger it still fitted behind the background which is cleverly designed to hide the filter and all the equipment.

Once back at the editorial office we had to fit together the cabinet. It comes as a flat pack and takes a little time to put together. Anyone who has had experience of putting together flat packed wardrobes will find this fits together much the same way. The next job will be to set up the aquarium itself. This is going to be an Amazonian habitat tank much like the one illustrated. To do this properly we will have to have the full system up and running for several months. However, we will take you through each step of setting up such an aquarium and include a list of the plants, substrate and décor needed next month.

PHOTOGRAPH M.P. & C. PEDNOR



Manufacturers are invited to send new products to A&P for independent testing and assessment. An initial review will be published as space permits and this will be followed up approximately six months later with a full report in the magazine

Derek Lambert's Cutting Edge

PHOTOGRAPHS BY DEREK LAMBERT UNLESS OTHERWISE STATED

• The Editor's monthly look at new and rare fish which have become available to the hobby for the first time or have returned again after a long absence. Conservation issues and fish which are in need of long term captive breeding if they are to survive are also included.



In the August issue of *A&P* I mentioned a gorgeous Characin, *Nematobrycon lacortei*, which I had not seen for many years. This is a close relative of the Emperor Tetra and has similar finnage but with a blood red iris and other body colour differences, as you can see from the photographs. The one and only time I came across live specimens was in 1989 when I didn't realise just what a rare find they were at the time and didn't bother buying any for myself. Since then I have bred thousands of ordinary Emperor Tetras and would love to try my hand at this rarity, but never seen them for sale.

At the time I asked if any readers had come across them in a shop or knew of anyone breeding them. During the intervening months I heard nothing so assumed they had not made an appearance through the trade in recent times. At the British Aquarist Festival, how-

ever, Anne and Tom Canson of Workington Aquarist Society told me they had a pair they bought a year before and offered them to me if I was visiting the Scottish International Open Show the following week.

The next Sunday the fish duly arrived and I was able to find out a little more about where they had come from. Apparently Anne and Tom purchased them from North Lakes Aquatics, Robinson Street, Penrith, Cumbria, CA11 9HR (01768 891495). They thought they cost the princely sum of £2.20 each at the time.

I am glad to say my pair made it home without any problems and are now living in a 10 gallon quarantine aquarium (I quarantine all fish for a month before introducing them to an established community). Whilst here they are being fed on all the best foods in an effort to bring them into spawning condition. Hopefully I will be about to report on that in a later column.

One interesting fact I can report on straight away is the colour difference between males and females. In the common Emperor tetra males have a bright blue iris to their eyes whilst females have a green iris. This is a very distinctive characteristic which can be used to sex youngsters even before the males extended dorsal fin has fully developed.

Male *Nematobrycon lacortei*, however, have bright red irises to their eyes and all the books I have checked show only fish with this coloration. It turns out females have a green iris much the same as ordinary Emperor Tetras. They still have the distinctive mottled iridescent patches on their flanks that males do so are obviously

above left In the August issue of *A&P* I mentioned a gorgeous Characin, *Nematobrycon lacortei*, which I had not seen for many years.
PHOTOGRAPH M.P. & C. PEDGON

left *Nematobrycon palmeri*, the common Emperor Tetra can be found in many aquarium outlets and is a beautiful community fish. The middle fish of this trio is a female and has a distinctive green iris compared to the male's blue iris.
PHOTOGRAPH M.P. & C. PEDGON

the correct fish.

My next report comes from well known aquarist and live-bearer fanatic Ivan Dibble. For the past 14 years I have been highlighting the plight of Mexico's native fish in articles, both for this magazine and other publications around the world.

A few years ago things finally started to gather some momentum and several of the Universities in Mexico began projects to maintain their native species. Since most of these are underfunded Ivan decided to pitch in and see if he could help raise funds for these captive breeding programs. After a very successful international effort Ivan was able to return to Mexico this year with a substantial sum of money for the project but I will let him take up the story here:

When I went over to the project at Morelia last March I had around £1,000 to spend on it. At that time I officially handed over to them on behalf of the HALCP the following equipment:

- Five large metal fish tank stands (each would hold up to nine tanks).
- 38 new aquariums (about 25 to 30 gallons each).
- 10 large bottles of alcohol (to convert all their large spirit collection over to alcohol).
- 1 new GPS satellite location unit.
- 1 new air blower (big enough to blow air to 200 outlets 18 inches deep).
- 6 thermos containers (for fish transportation).
- 2 boxes of plastic aquarium plants.
- Fish food.
- 8 polyboxes

This means that there are now almost 70 aquariums in this unit devoted to the conservation

above right *Skiffia francesae* is probably extinct in its native Mexican habitat but a breeding colony has now been re-established at Morelia thanks to fish donated by aquarists.

right *Characodon aótax*, Black Prince, are on the edge of extinction with only one confirmed habitat known. This is a small spring and series of interconnected ponds which dry up within 500 yards.

of Goodeids plus some 20 others where conservation studies have already started on Cichlids, Catfish and Killifish. They also have many other aquaria where they raise/cultivate species for the local hobby in order to try to help subsidise themselves. All this has happened in less than a year thanks to cooperation between the University and Hobbyists worldwide and this is just the beginning!

You see, we aquarists can make a difference, so why not get your club or specialist group to come

on board and sponsor us. I know that each club or group cannot make a big contribution, as funds are tight for every one these days. But we work on the principle that lots of small figures when lumped together can amount to a goodly sum. Add to that the fact that we spend this money for the most part in Mexico where a little goes a lot further. Anyone who would like to make a donation should make cheques payable to the HALCP (MEXICO) (this stands for Hobbyist Aqua Lab Conservation Project (MEXICO), and

should be sent care of Ivan at the following address. One hundred per cent of all donations will be spent directly on the project and none is used for international travel or other expenses incurred by the fund's organisers.

For further information
Contact Ivan at, 11 Strode
Rd., Clevedon, North
Somerset, England, BS21
6QB, or by E-mail at: Ivan
Dibble<brachydibble@clara.net>



TROPICAL

STEVE PUNCHARD & GARY COWBURN continue their monthly column on Discus — King of the Aquarium Fish:

PHOTOGRAPHS: STEVE PUNCHARD UNLESS OTHERWISE STATED

The Discus Pool



The condition of water in the Amazon, which is acidic with little mineral content, means that Discus need to consume large amounts of food to satisfy their dietary requirements. Discus possess rows of teeth in the middle of their mouth known as symph, which means they can crush food if necessary. Discus are omnivores and have a varied diet which is made up primarily of aquatic insects, small freshwater shrimps and plant matter. Their main sources of nutrition are derived from *Macrobrachium* (a type of freshwater shrimp), algae, aquatic plants, fruits, berries and in certain areas, such as clearwater regions, *Ephemeridia* (Mayfly larvae). These are virtually absent in blackwater regions of the Amazon such as the Rio Negro.

Freshwater shrimps, however, are found in all regions and therefore it can be assumed that shrimps are a main stay of the diet of all wild Discus. A good substitute for this food source in captivity would be adult Brine shrimp. However, this isn't a complete diet on its own and should be fed with other types of food. Plant matter such as algae, fruit and berries can be substituted with spinach which is an excellent addition to the Discus diet and can either be added to a food mix or fed on its own.

Fruits such as bananas, apples and pears have been used successfully in food mixes, again reinforcing the belief that wild Discus eat foods other than shrimps and aquatic insects in the natural habitat.

The diet of tank bred Discus

There are many commercially available foods which can be used to recreate the natural diet of the Discus as closely as possible, such as fish flake, Diskusin, Tetra Prima and Sera Discus granules, Blood worms, Mosquito larvae, Glass worms, White worms, Earthworms and Discus beef and turkey heart mixes. Beef heart is often used, blended with fish flake, vitamins and plant matter to provide an adequate diet which can be fed on a regular basis.

The main food supply that I use for my Discus is my own beef heart mix, also known as hamburger mix. I find that this supplies all the nutrients they need for growth, colour and resistance to disease. The mix, however, must be processed and fed in such a way that it does not

DISCUS PROBLEMS

O I hope you can give me some advice on a problem I am having with Discus. I have twice attempted to introduce four young two inch Discus into my well planted 48 x 18 x 18 inch tank. On each occasion they initially settled down and fed well. The least dominant fish was then picked on until it stopped feeding and eventually died. On both occasions I ended up with a single healthy adult.

I am now going to try again, this time with a larger number of young Discus (probably eight). What I would like to know is would you advise me to remove my one remaining adult Discus before introducing the young fish or would it be better to leave the adult in the tank with the young fish. This might prevent the new Discus from bullying the individual lowest in their pecking order. If things do go wrong I do have another tank to which the adult could be removed.

Thanks for your help.

Terry Ellacott, West Glamorgan.

A This is one of the most common problems concerning growing on small Discus in furnished aquaria. There are several possible reasons why it happens but the commonest ones are as follows:

- A small shoal causing an aggressive pecking order over food. This is made worse if they are not fed enough good quality foods.
- Small Discus feel insecure and nervous in large furnished aquaria, this makes them shy and spend most of their time hiding away. Under these conditions they will stop feeding and decline.

- Insufficient water changes, low temperatures or poor husbandry.
- Poor quality fish purchased at the outset. Stunted fish in poor health will rarely recover and make good specimens, even with the best care in the world.

Looking to the future, I would suggest removing the large Discus and attempting to find a mate for it. Left by itself it will become stressed leaving it vulnerable to diseases and other health problems.

When purchasing a new group of youngsters buy larger fish and more of them. About eight sounds fine for this sized set-up. Make sure you look closely at the fish on offer and only buy from shops or breeders that have a good reputation. Broods of youngsters should be of a uniform size. If not, they have probably not been grown on in ideal conditions and may never recover.

When you introduce them to their new home it should initially be without much of the decor planned for their aquarium. Later, the environment can be built up around them with plants, bogwood, etc., added over a period of time. This way they are less likely to hide away and not feed. Keeping young Discus feeding is one of the keys to long term success.

Apart from this, make sure the water quality is maintained at the very highest level. Change a minimum of 25 per cent of the water weekly. At this time you should also check the pH. It is all too easy for the pH to creep downwards over a period of time. This will stress your fish and cause them to stop feeding. The temperature should also be kept at about 86°F for young Discus. This will help promote good growth rates.

left When introducing Discus to a furnished aquarium for the first time it is a good idea to remove most of the decor to prevent them hiding away and not feeding. Later the plants, bogwood, etc., can be built back up without causing this reaction.

PHOTOGRAPH
M.P. & C. PEDDOR

right This piece of cucumber was placed in the aquarium for the Catfish but all they were left with was the hard outer skin. The juicy centre was eaten by the Discus before the Catfish had a chance. The vegetable matter for my fish's diet is normally supplied by spinach and other vegetable foods being added to my home-made hamburger mix.



TROPICAL

THE DISCUS POOL

pollute the water and cannot be washed into the filters.

Beef hearts are my first choice because of their size and high protein levels which makes them good value for money. Turkey hearts can also be used but I find that they are too small, therefore large amounts are needed and they are tricky to prepare. I use approximately 25 beef hearts per week which are collected from a local abattoir which prepares them upon request, by removing a large amount of the fat surrounding the hearts. Once back at the shop I continue their preparation in a separate area where the hearts are cleaned and trimmed using specialised boning and extremely sharp carving knives.

The tough outside skin and fine inner skin are removed as well as any sinews and the remaining meat is cut into steaks and frozen. The following day the steaks are allowed to thaw slightly before being pushed through a heavy duty mincing machine. During mincing I add two large bags of frozen spinach cubes, 1 large tub of discus granules (this is primarily to improve colour in red and blue fish) and small amounts of vitamins intended for babies.

Because of the large amount of food required by my Discus I have had

a special plate produced which grinds the food to the correct size to suit them. For fish three inches and above I process the food through the mincer once and for smaller fish I process it twice. Any cut offs are liquidised to a soup consistency and is used to feed the tiny three- to four-week-old fry.

The hamburger mix is then placed in half inch deep baking trays and levelled off ready for freezing. The mixture is very dense and solid with little water content and is allowed to freeze overnight before it is cut into cubes for easy use. To make cubing easier allow the mixture to thaw for a few minutes when it can then be flicked out of the trays and cut into cubes of different sizes according to requirements. The cubes can then be placed into a plastic bag and returned to the freezer until it is required for feeding. This whole process takes about eight hours from start to finish every week.

A useful tip is to keep the different sized cubes in different coloured bags so that the appropriate grade can be found easily for the different sizes of fish. The cubes should be placed in the aquarium at the opposite end to the filter outlet where they soon fall to the bottom of the tank and are quickly eaten. Because of the density of this hamburger mix the food sticks together until it is eaten and only dust size particles are washed into the pre-filter, which is replaced daily.

DISCUS DIRECTORY

DISCUS: Red Rubys, Snakeskins, Blue Diamonds, Golden, Red Royal Blues, Pigeon Bloods. Starting from £6 per fish. Delivery £15. Tel: 0191-422 3579. Tel/Fax: 0191-456 8648. Mobile: 07712 2733562.

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Liz Donlan's KOI CALENDAR

December is taken up with most clubs holding their annual Christmas Dinners and whilst it may be too late to book for some of them it might be worth a phone call on the off chance that there may be the odd place left. If you are contemplating joining a club, attending a Christmas social event is a good time to go along as it may be easier to get to know members rather than at a formal meeting.

Talking of clubs, I've often heard potential members say that they've been to a meeting but everyone seems very "clickish". Unfortunately, this can often be the case but I can assure you that it's not always so. Koi keepers do strike up very strong friendships with others and will, naturally, sit next to each other at meetings or on coach trips and therefore give the impression that they're in a click. We've all been there — I know I hate walking into a room full of people I don't know and because I'm generally very shy



it's hard to make the first move. Your best bet, when attending a Koi meeting for the first time, is to seek out the Chairman or Secretary as soon as you walk in. Let them know you're a brand new member and ask if there are any other members present who live in your area — this should instantly put you in touch with one or two people and help break the ice. However, whatever kind of club you're in do remember that the more you put into a club the more you'll get out of it.

If you don't already belong to a club why not

make your New Year's resolution that of joining one. Most of the clubs are listed in this column but if there's not one in your area give me a call and I'll try and help. In the meantime, have a super Christmas and New Year and I hope Santa brings you that dream Koi you've been waiting for!

above Lincoln and June Gee's pond of The East Midlands Koi Club.

PHOTOGRAPH: LIZ DONLAN

SHOW CALENDAR

APRIL 2000
29/30 D.J.'s Koi Show, at Milton Keynes. Contact 01922 493290.

JULY 2000
30 Yorkshire Koi Society (celebrating its Silver Jubilee) at York Racecourse.

Contact Jeff Glasspole (Show Manager) on 01845 526164.

AUGUST 2000
5 International Koi Show, organised by D.J.'s Koi. Contact 01922 493290.

KOI SOCIETY MEETINGS/EVENTS

DECEMBER

3 BKKS Leicestershire Section. Christmas Dinner at the Bath Hotel, Shearby. Contact Karen Boyton on 0116 231 0797.
4 BKKS Worthing & District Section. Christmas Dinner Dance at Lancing Leisure Centre. Contact Carole Coote (Secretary) on 01903 232277.
4 Witham Valley Koi Society. Christmas Function — Medival Banquet at The Bull Hotel, Horncastle. Contact Ray Lee on 01522 872733.
5 BKKS Worthing & District Section. Monthly meeting. Contact Carole Coote (Secretary) on 01903 232277.
5 Northern Koi Club at St. James Church Hall, Salford (nr. Hope Hospital). George Money of Koi Plus talking on "Microscopes" (to be

confirmed). Contact Glynnis Morgan-Davies on 01706 218243.
12 South West Koi Club. Christmas Lunch followed by AGM at the Meeting Hall, Heathfield Drive, West Monkton. Contact John Spryng on 01934 822620.
14 East Midlands Koi Club. Christmas Dinner. Contact Richard Jones on 01283 224975.
14 BKKS Nottingham & District Section. Christmas Dinner at the Western Club, off Derby Road, Lenton, Nottingham. Contact Shirley Hind on 0115 981 0923.
18 Eastbourne & District Pondkeeping Club. Chairman's Christmas Social in the Function Room at The Lamb Inn, High Street, Old Town, Eastbourne. Contact Brian Dale on 01323 731369.
26 BKKS Leicestershire Section. Pond visit. Contact Karen Boyton on 0116 231 0797.

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 Koester, 0124 2341153.
Inland, Trevor Geary, 01247 466865.
Isle of Wight, Kevin Driscoll, 01983 296476.
Kesnet Valley, Peter Glasser, 01635 821484.
Leicestershire Koi, Karen Boyton, 0116 233 0797.
Manchester & District, Sue Ellis, 0161 480 5821.
Middlesex & Surrey Border, Jim Preston, 0181 641 2686.
Mid Staffs, Val Stokes, 01543 278358.
Northants, Peter Parker, 01908 311021.
Nottingham & District, Shirley Hind, 0115 981 0923.
Potteries & District, Tina Burgess.

01782 617526.
South East, Mick Wright, 06634 718943.
South Hants, Di Harrison, 01705 596099.
Suffolk & North Essex, Alan Carter, 01206 866011.
West Wales, Basil Evans, 01354 772190.
Worthing & District, Carole Coote, 01903 232277.
Yorkshire Section, Andrea Thornton, 01424 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 898209.
Cambridgeshire Koi Club, Graham Hagger, 01462 711129.
Devon Koi Keepers, Alison Allen, 01202 873417.

East Coast Koi Club, Alan Wright, 01502 587116.
East Midlands Koi Club, Richard Jones, 01283 224975.
Eastbourne & District Pondkeeping Club, Brian Dale, 01323 731369.
East Yorkshire Koi Society, Steve Matthews, 01964 517863, or Chis Hill, 01482 346777.
Fylde & District Koi Club, Chris Ingledew, 01772 625581.
Heart of England Koi Society, Paul Stacey, 01203 874621.
Merseyside, Spl Bennett, 01942 204948.
Midland Koi Association, Keith Hanson, 01527 545230.
North East Koi Club, Jean Hope, 0191 419 5794.
North Lines Koi Club, Ken Bush, 01472 883377.
North of England ZNA Chapter, Yvonne Munn, 0114 289 1437.
North Wales Koi Society, Keith Pury (Chairman), 01492 580303 or Dawn Davies (Memberships), 01352 762149.
Northern Koi Club (ZNA Friendship Club),

Glynnis Morgan-Davies, 01706 218243.
Norwich Koi Club, Jenny Allen, 01603 452932.
Northeshire Koi Club, Kevin Sewton, 01805 874008.
Plymouth & District Koi Keepers' Society, Sandra Crocker, 01752 210158.
South Devon Koi Club, Stan Moring, 01860 843619, or Christine Brackstone, 01860 834472.
South Essex Koi Club, Mick, 01702 342460, or Barry, 01208 565739.
South West Koi Club, John Sprout, 01934 823620.
Wessex and Southern Koi Society, Mrs Jenny Lenton, 01425 276883.
Wessex & District Koi Society, Dawn McCulloch, 0151 677 1582, or Steve Cope, 0151 327 7437.
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.

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. Copy for Koi Calendar can be sent to me: Liz Donlan, 694a Bolton Road, Pendlebury, Swinton, Manchester M27 4ET. Tel: 0161-794 8282. Fax: 0161-793 9696

DAVID TWIGG unravels the mysteries of Koi varieties:

PHOTOGRAPHS: DAVID TWIGG

Koi Varieties

Utsurimono

Working through the list of varieties brings us to the Utsurimono class. The Utsuri is a two-colour Koi having the base colour black. The second colour can be either white (Shiro), red (Hi) or yellow (Ki).

As utsuri means "reflections" in Japanese, the pattern will tend to alternate side to side black and colour and, as is usual in Koi appreciation, the pattern should be well balanced both side to side and along the length of a well proportioned body.

The head pattern (Menware) on Utsuri is similar to that of Showa; sumi (black) as a diagonal stripe or "V" shape is preferred although good ones are extremely hard to find. Sumi should wrap around the body to below the lateral line.

Being a direct descendant of the Magoi means that the utsuri

should have extremely deep black and when seen with a good snowy white coloration the Shiro Utsuri is a handsome fish indeed to have swimming in the pond. The white on the head can often be seen as an off-white, maybe dirty cream colour, but this is not ideal.

Although the Hi Utsuri is ideally red, those found in the UK tend to be more of an orange red. Once again this is a stunning fish to own, particularly when large.

The last of the utsuri group is the Ki Utsuri. This variety is seldom seen these days although when I started in the hobby 15 years ago I seem to remember that many ponds contained one.

Whilst being attractive, even imposing fish in a pond, the Utsuri can suffer from "staining" where the coloured pattern develops black spots. These marks and a poor kiwa (sharpness of edge of colour) can detract from the real beauty of these Koi.



left A classic Shiro Utsuri showing good menware and "reflections".



right A Hi Utsuri with Gin Rin (shiny gold and silver) scales.

KOI DIRECTORY

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The Pearl Gourami (TRICHOGASTER LEERI)



Pearl or Lace Gouramis are one of the most beautiful of all the labyrinth fish. The term "labyrinth" refers to the accessory respiratory organ that lies on both sides of the gill chamber. This organ is composed of folds of tissue overlaid with skin rich in blood vessels. Atmospheric air is forced into this convoluted structure where gas exchange takes place — the fish takes in oxygen while giving off carbon dioxide. This organ enables these fish to take in additional oxygen from the atmosphere, thereby allowing them to survive in water that is too low in oxygen content for most fish to live.

This species was described by science in 1852. It was, however, first introduced to the aquarium hobby in 1933 and has remained a popular aquarium fish ever since. Its natural

habitats are slow-moving streams and rivers in Borneo, Malaysia, Sumatra and Thailand. All of these habitats have heavy plant growth and high temperatures during the day. The water is often brown in colour and rather soft and acidic. The substrate is usually mud rather than gravel.

Sexing Pearl Gouramis can be difficult when they are young but by the time they reach about two and a half to three inches in body length males are usually identifiable by their longer dorsal fin. Later, as they mature

(at about four inches), their throat and lower body develops red and most rays in their anal fin elongate.

This is a peaceful fish which will live happily with most community fish. Two males may spar with each other and will want enough room to set up their own territories. For this reason it is best to keep individual pairs in aquaria of two to three feet in length. Four foot long tanks can accommodate two pairs or a group of two males and four females.

In the wild there is usually a breeding season, with the fish resting for the remainder of the year. The captive-bred strains, however, seem to have no compunction about spawning as often as conditions and feeding will allow.

The male builds a large nest among floating plants, but does not generally incorporate pieces of plants in the body of the nest. After spawning he cares for the eggs and young until the babies are free swimming. This normally takes about five days. An average brood may number several hundred but spawnings can number 2,000.

This is one of the hardest of all Gouramis and makes an ideal inmate for community aquaria.

PHOTOGRAPH BY A. VAN DEN NIEUWENHUIZEN