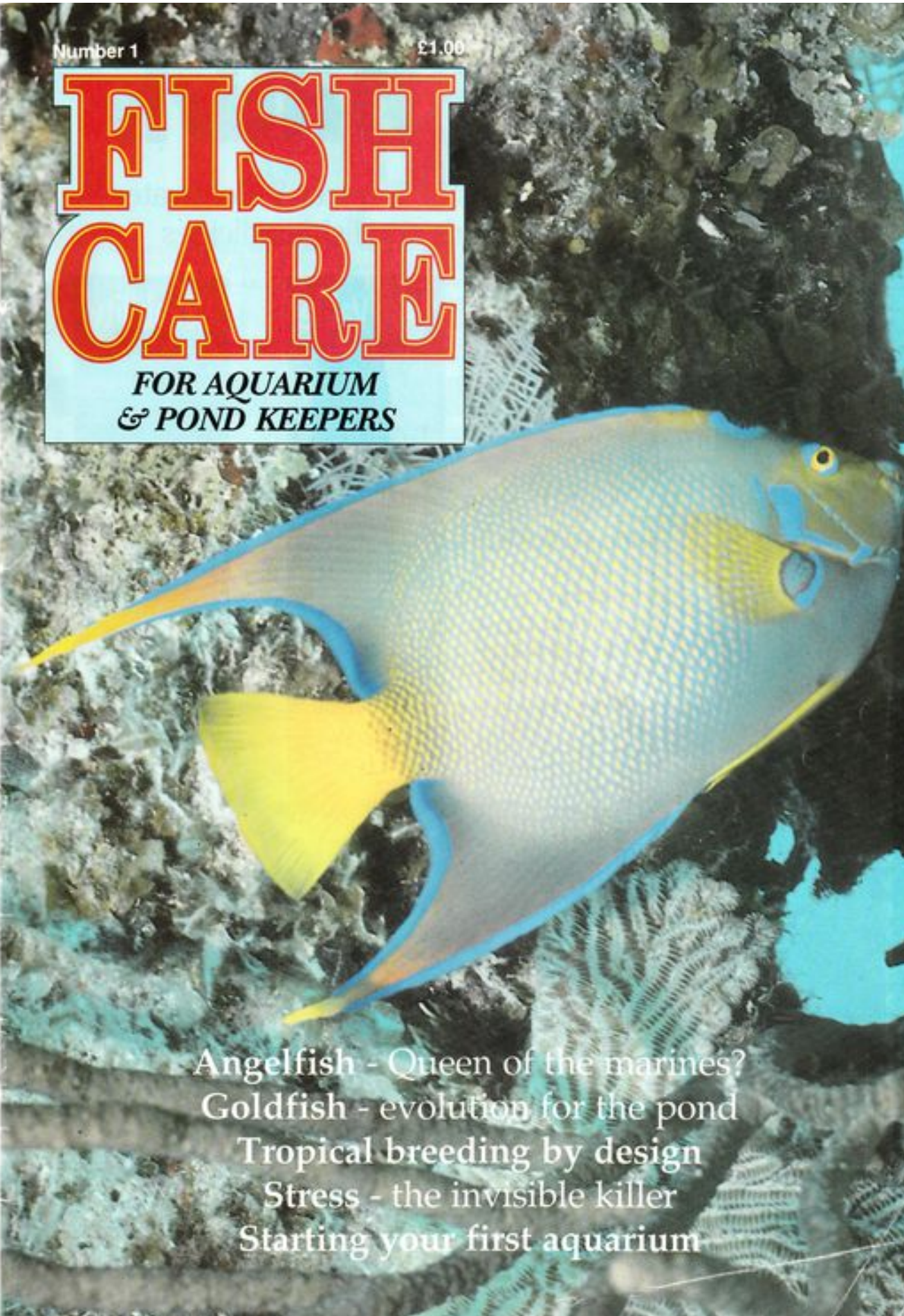


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FISH CARE

WINTER 1987

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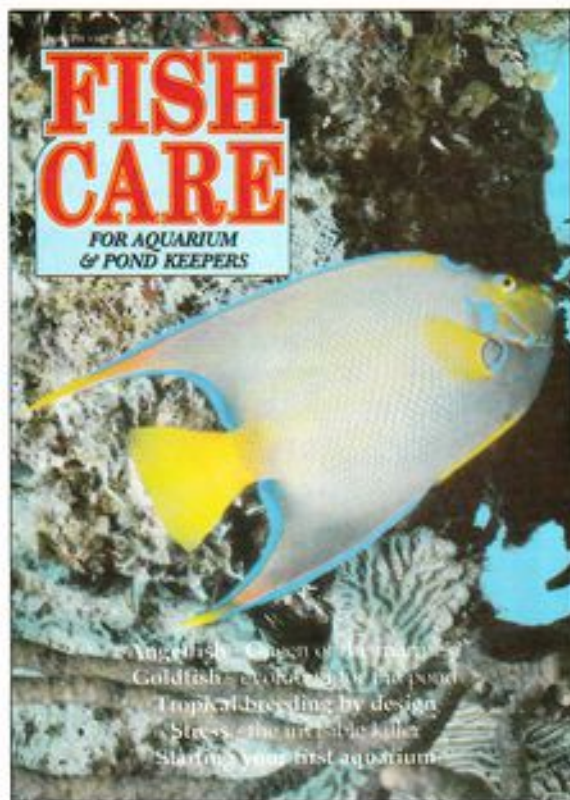
Above: *Lamprologus brichardi* with young fry. Breeding by design, page 11.

Photo: Dick Mills

Left: *Flame angel*. The Royal Family, page 24. Photo: Max Gibbs

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FISH CARE



FISH CARE THE FIRST ISSUE

Welcome to the first issue of *Fish Care*, a completely new magazine devoted to encouraging the fascinating hobby of fishkeeping.

Our aim is to help and encourage fishkeepers at all levels - from the browser who likes what he sees but doesn't know where to begin, to the enthusiast who has been breeding unusual species for many years.

Readers' comments are welcome. All letters will be considered for publication and, wherever possible, a solution will be found to any problems you may have. We also want to know about the activities and forthcoming

events of fishkeeping clubs and societies and we will endeavour to publish them all,

but please send us the details as far in advance as possible. All correspondence should be

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WINTER 1987

addressed to the editor at the Swanage address on page 3.

The Spring 1988 issue of *Fish Care* will be out in March/April, available at the best aquarists' shops and garden centres. But, if you want to be sure of your copy, use the subscription form on this page. And join the *Fish Care* Club (see page 19) - it's free, and members get their *Fish Care* subscriptions free of postage costs.

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SETTING UP AN AQUARIUM

Gina Sandford gets you started



It can be difficult to know where to start. One approach would be to walk into an aquarium shop, knowing only that you would like a tank and some fish. Usually there is a helpful assistant on hand who will guide you through the pitfalls of planning the tank, stocking it and, above all, maintenance. However, you may have just picked up this magazine and still be thinking about it. If so, I can help you to decide on your next move. But remember that this is only a guide - each of the stages should be explored in greater depth before you make your final decision.

Consider first the type of fish you wish to keep - coldwater, tropical freshwater, or tropical marine. For the beginner I recommend either coldwater or tropical freshwater. Tropical marines are more eye-catching with their vibrant colours, but they call for a degree of skill that comes with experience.

Of the coldwater and tropical fish, it is far easier to keep a tank of tropical fish in peak condition than their coldwater cousins. This is mainly because of the conveniently small size of the average tropical, and also their eating habits. Carp - from which the coldwater goldfish and koi are derived - are vegetarian, detritus feeders and so they dig in the sand or gravel and stir it up. Also, being vegetarians, they are relatively inefficient and have to eat a great deal - they thus

produce a great deal of manure, which can quickly pollute a tank.

Whichever type of freshwater system you choose, the basic needs are the same. Decide on the site for your aquarium. It should be out of direct sunlight, away from direct heat sources such as radiators, and in a position where you can sit and enjoy your handiwork. Having taken note of the maximum size tank you can accommodate, check the floorboards and any furniture involved to make sure they can take the weight - water is incredibly heavy stuff and, once you have positioned your tank, it will be very difficult to move. Your dealer will be pleased to advise on the sizes of tanks, stands, and cabinets available, and can even arrange to have a tank and stand made to measure for little extra cost. Many tanks now

come complete with sliding lids to accommodate lighting. However, if you choose a tank that doesn't you will need to buy a hood.

Lighting is essential, and by personal preference I use strip lights. To achieve the plant growth shown in the photographs use at least three over a 15 inch wide aquarium, or four over an 18 inch wide tank. These should be of different colours; for example Northlight, Warm White, Colour 84, etc. Only use a Gro-lux if you want to enhance the red of the fish in the aquarium, because this light on its own does very little to encourage plant growth.

Ideally, these lights should be on time switches so that they come on in sequence, peak at mid-day, and go off in sequence - giving an overall exposure of

GETTING STARTED

approximately 12 hours to imitate intense, tropical daylight. It is intensity and not duration that is important for good growth of tropical plants.

Most tanks come complete with a condensation tray, which keeps moisture off the light fittings. This tray should be kept scrupulously clean because algal growth and salt deposits reduce the light reaching the aquarium, greatly affecting plant growth.

The substrate in the tank should be fine gravel that does not compact. This allows plant roots to spread easily, and the water must be able to flow through the gravel to prevent it from turning sour. The average depth of the substrate should be about 50mm.

Wash rocks and bogwood in hot water, and then sit them on the base glass of the aquarium so that they won't be dislodged by the digging activities of some fish. Do not add any detergent to the water when washing the rocks and wood. Take care also to choose wood that doesn't have unnatural straight edges. The same goes for the rocks - pick all the same sort and, if there are visible strata, arrange them so that all lines run in the same direction.

Arrange plants individually, placing them so that they enhance the rockwork or wood. This is a time consuming and rather fiddly job but it pays dividends. A suitable planting interval is generally the span of the leaves, and if rows are staggered the overall effect when viewed from the front is a wall of greenery. This rule of thumb is fine for the cuttings such as *gibbula*, but the larger plants such as Amazon sword need a little more space. As this latter plant grows it will shade the substrate, so one or two shade-loving *cryptocorynes* can be used. Remember, your tank is an underwater garden. Treat the plants as you would those in your garden - give them the conditions they need and they will thrive.

Add the water to the aquarium carefully. Pour it in from a jug or, better still, siphon it in from a bucket. Place a piece of paper or polythene over the substrate so that the gravel is not displaced. The water temperature should be 72-76°F (21-23°C) and this can be maintained using a heater and thermostat placed out of sight behind the plants and attached at an angle of about 45° to the back glass of the aquarium by suckers. The heating element should be lower

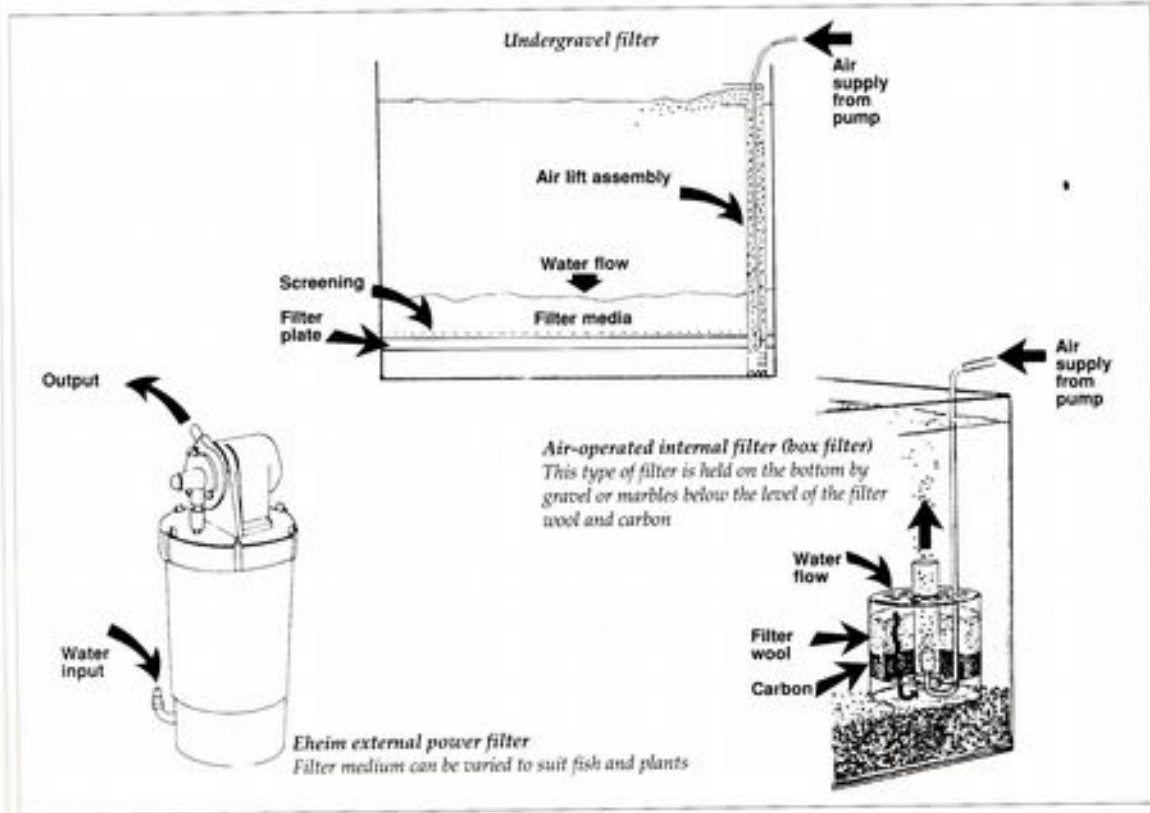
than the thermostat but under no circumstances bury the heater beneath the gravel or expose it to the air with the power on.

It is also important to maintain the water quality and this is done by filtration. There are three types of filtration system - box filters, undergravel filters, and power filters (see illustrations below). Each has its use. The box filter is ideal for small breeding tanks and quarantine tanks.

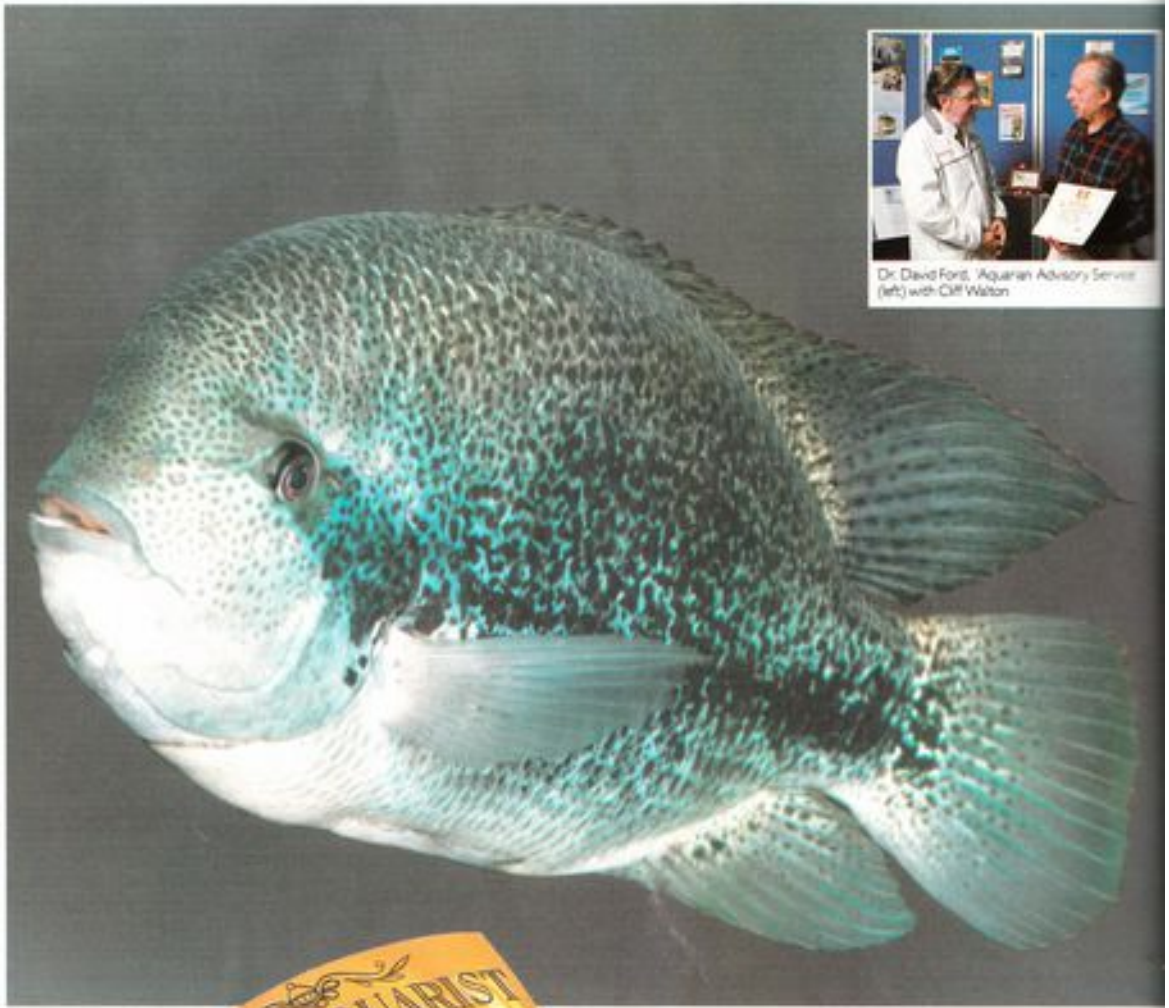
The undergravel filter comes into its own in a marine invertebrate system, although it can be used in a freshwater system. It needs an air pump and works by drawing water through the gravel and returning it through an uplift tube. A constant flow of aerated water allows the aerobic bacteria in the gravel to break down the waste products - it is therefore important that the air supply should never be switched off.

The third method of filtration is one that I use, the external power filter and, by preference, an Eheim. This is a very effective method, giving not only mechanical and biological filtration but also

Continued on page 10



PLAY IT AC



Dr. David Fort, Aquarian Advisory Service (left) with Cliff Walton



AIN, RAM'

"In all the shows, in all the places, in all the world, he had to walk into this one!"

When Cliff Walton walked off with 'Best in Show' at the 1987 British Aquarist Festival' you could excuse the occasional wry comment from his fellow top aquarists.

Only a few months ago Rambo, Cliff's magnificent Dichlid, *Cichlasoma hertwegi*, won 'Best in Show' at the 'Aquarian' Fishkeeping Exhibition at Sandown Park.

Cliff, of Bracknell A.S., reared Rambo from a couple of inches long and has from the start supplemented Rambo's diet with 'Aquarian' Flaked Fish Food.

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open the seal on 'Aquarian' you can smell the freshness – and judging by Rambo's reaction he certainly appreciates the difference."

So if you would like to follow in the footsteps of top aquarists like Cliff Walton or if you just want to ensure that your fish are getting the very best complete balanced diet, buy Britain's leading flaked fish food – 'Aquarian'.



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GETTING STARTED

water movement at the surface from the spray bar, thus doing away with the need for an air pump. It is expensive but, when considered alongside the cost of fish and plants, I believe it is a worthwhile investment.

The size of filter needed depends on the volume of water it has to turn over - it should in theory turn over the water twice an hour, eg for a 30 gallon tank a flow rate of 60 gallons per hour. But, to achieve this, it is a good idea to buy a pump with a nominal flow rate capable of circulating the water three or four times per hour to allow for the resistance of the filter and gravel - remember that this resistance increases all the time as the filter does its job.

It is a little daunting to see the flow of water from the filter when it is working, but the fish and plants seem to benefit from this water movement. There is no general rule governing how often the filter medium should be changed. My best advice is to watch the water flow and, as this starts to slow, change the medium. It is not always necessary to replace the carbon, just wash it in the bag (in cool water so that you do not kill the working bacteria) and reuse it. The filter

wool traps most of the debris and this can be thrown away. If you are keeping larger fish it may be advisable to use small ceramic pipes, eg Elbfimech, in the base of the filter. These can be washed and reused as necessary.

None of these filtration methods do away with the need for water changes. This is vital piece of tank maintenance. Every 10 to 14 days siphon off 15-20% of the tank water - making sure that you take the siphon across the surface of the gravel and into any nooks and crannies to remove any decaying plant matter, uneaten food, and fish excreta. Replace with tap water of about the same temperature that has been allowed to stand for around 12 hours to disperse the chlorine that is detrimental to the fish. By changing the water rather than topping up the tank after water has evaporated you are removing some of the waste products and excess salts that build up in the aquarium.

Having put the aquarium together it takes some time for the system to mature. Leave it running for a least a week, preferably two, before you introduce three or four hardy fish. During this time the plants will have started into growth

and the filtration system will have begun to build up the bacteria needed to cope with the fish. It is important not to overload the system at this early stage.

Most of all, it is important to have patience and not to expect instant results. The aquaria pictured here have been set up for anything between 6 and 18 months. Never be afraid to ask for advice, one part of fishkeeping that is free. There will be some disappointments and set-backs in the early days, but part of the joy of fishkeeping is in the learning.

Page 6: Fully-furnished tropical aquarium in the author's home

Below: Artificial foliage (by Aqua Plants) offers variety without green fingers



Breeding by design

Dick Mills' advice on controlling what comes naturally



The most common reason for starting an aquarium is to have a living, decorative picture to brighten a dark alcove - a picture that often becomes a bigger attraction than the television set in the opposite corner. It is also common for this first venture into fishkeeping to be based upon a community collection of fish rather than a specialised group.

As the months go by, the new fishkeeper realises that developments are taking place within the aquarium: plants become established, the whole underwater scene looks less man-made, and the fish display their natural colours. Soon, another phenomenon occurs - there are more fish than there were before, the possibility of breeding fish is raised, and the interest enters an even more exciting phase. The owner may begin to pride himself upon his skill, but the credit should go to the fish and their natural urge to procreate.

Closer inspection generally reveals that these additional fish are the progeny of one particular group - the livebearing species such as guppies, swordtails, platys, and mollies. These colourful species are extremely prolific, the females sometimes being gravid (pregnant) when bought. So, if you give a true pair of mature fish (one male and one female) adequate space and the best of food and aquarium conditions, they will spawn.

Pair of Lamprologus brichardi with young fry. Spawning took place under a large rock, despite the flowerpot cage provided

There follows the excitement of watching the youngsters fall from the body of the female, ready to swim and lead their own independent lives. But within these few apparently simple parameters there are some difficulties to overcome. Some fish are easier to breed than others - and some are difficult to stop.

Sexing livebearers isn't difficult. The male's anal fin is a rod-like shape, quite different from the female's fan. However, although they are second to none in their readiness to breed, livebearers are indiscriminate in their choice of partners. Males will spawn with any female of the same species, regardless of colour or variety. This soon leads to a diminishing of quality within the mixed aquarium stock as the colour varieties interbreed. Summing up, livebearers are easy to sex, easy to breed, but quality is very difficult to maintain.

It is better to specialise in one colour strain, or one cultivated variety, to maintain the type of fish you started out with. You must also be ever vigilant in selecting the best fish as breeding stock, discarding poor quality youngsters and keeping males away from females.

Egg-laying fish are not quite so

prolific, needing to be brought into condition before spawning occurs. Sexing egg-laying types is slightly more difficult (sometimes the fish themselves get confused) but a general guide is that males are more brightly coloured, slimmer, and often have more elongated fins. Females usually fill out with eggs prior to spawning and this can be seen quite easily, especially if you look at the fish from above.

Unlike livebearing fish, the young from egg-layers are not born ready-swimming but require time to hatch from the fertilised egg and absorb the nutritious yolk sac before they are capable of self-support. Fortunately for the fishkeeper, inter-breeding is highly unlikely. On balance, egg-layers present a bit more of a challenge but, as a bonus, reproduce in several different ways.

As in most animal forms, fish eggs must be fertilised and this is achieved in two main ways: livebearers' eggs may be carried and fertilised within the female's body, where they develop independent of the mother's food supply until the free-swimming young are released at birth. Most popular livebearers use this procedure and are known as ovoviviparous: other species of livebearers may be viviparous where the internally-develop-

Continued on page 12

TROPICALS

ing young receive nourishment via a direct connection, known as the trophotaenia, from the female. Incidentally, females in the first group can store sperm and consequently produce a number of broods without further mating with a male; females of the second group cannot do this.

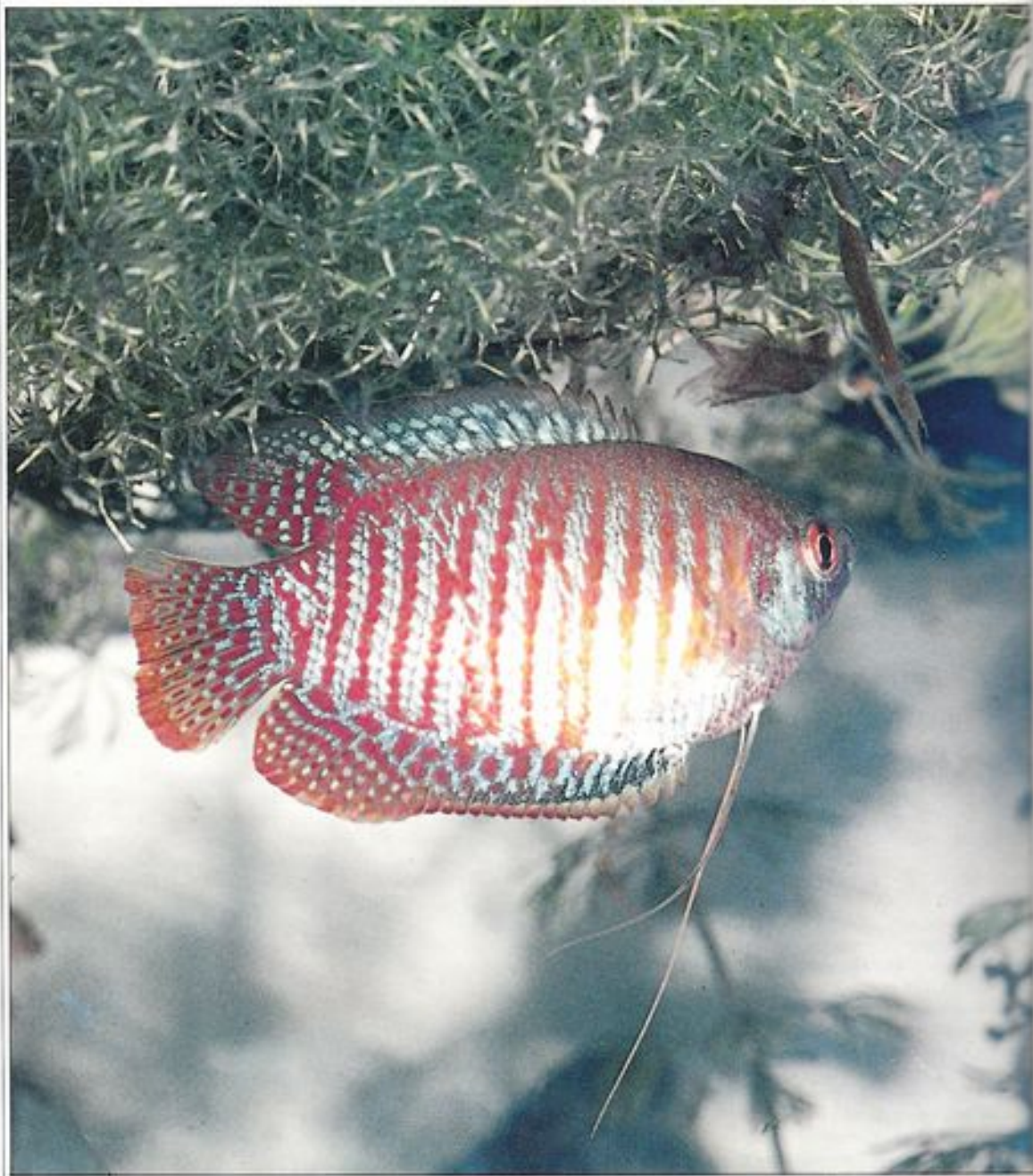
Egg-laying females require the stimula-

tion of courtship or a spawning drive from males to trigger off a release of unfertilised eggs. These are fertilised externally by the male, either instantaneously at the peak of the spawning chase or more deliberately in more sophisticated spawning actions - the details of which are fascinating, and knowledge of them essential for successful breeding.

At its simplest, as practiced by the majority of egg-laying fish - barbs, characins, danios, rasboras, etc - two fish (or even a shoal) come together, eggs are released and simultaneously fertilised.

Continued on page 14

Male dwarf gourami (colisa lalia)



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TROPICALS

and no further action is taken by the parents - except perhaps, in the close confines of an aquarium, to eat the eggs.

A gradual increase in parental care is shown in other spawning methods, dependent sometimes on conditions prevailing in their natural environment. For instance, killifish from tropical streams that dry out in the summer heat will bury their fertilised eggs in the mud to await the onset of the next wet season, which will not only fill up the stream again but also trigger off hatching of the eggs. Fish from the group containing the Siamese fighting fish (*Betta splendens*) try a different idea, blowing a nest of bubbles at the water surface under which the fertilised eggs are placed and guarded until hatched.

Further up the evolutionary scale, cichlids such as the popular angelfish (*Pterophyllum scalare*) form fairly estab-



lished pairs and stake out a territory. Within this a spawning site is cleaned, and the eggs are deposited by the female and subsequently fertilised by the male; they are then guarded, periodically cleaned, and moved to another pre-cleaned site, until hatched. A variation on this theme amongst smaller species of cichlids (eg *apistogramma*, *pelvicachromis*) is to deposit their eggs inside a cave or thoughtfully-provided, up-turned flowerpot. Female mouthbrooding fishes (some African cichlids) incubate the fertilised eggs in their mouths to protect them from predators, and the young fish seek sanctuary within their mother's mouth for some weeks after 'birth' if danger threatens.

Of these diverse groups the livebearers, bubble-nesters, egg-depositors, and mouthbrooders need the least human involvement. Action must be taken to combat egg eating among egg-scatterers, while the egg-laden substrate (usually a peat layer) of egg-burying species may need some storage time before hatching is activated by re-immersion in water.

If enough attention is given to choosing a suitable pair of fish and providing the right conditions and the correct amount (and size) of food for the young, there is no reason why the fish usually found in aquarists' shops cannot be bred in an aquarium. But, when boasting of your achievements to your friends, please give the fish some credit too.

Left: Angelfish cleaning site
Below: Bubble-nest breeding Siamese fighting fish (Betta splendens) - male has the colour and extended fins



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COLOURFUL CARP

Hilda Allen introduces the fish that the Japanese have made their own

As more people turn to the pleasures of water gardening and visit aquatic suppliers or specialist garden centres, they will inevitably catch their first glimpse of the magnificent, coloured Japanese carp known simply as koi. It usually proves to be an unforgettable experience when seeing these graceful fish, in a myriad of colours, glide through the water as if to demonstrate their beauty.



TAISHO SANKE

Clearly showing the red and black with the desired sharp edges to the patterns on a white body.



KOHAKU

A white and red fish produced in a wide range of patterns but, in this *Doitsu* variety, enhanced by the metallic scales showing as silver on the white body and as gold on the red pattern.

KOI



TANCHO KOHAKU

A perfect example of the single red marking on the head of a fully-scaled fish.



HARIWAKE OHGON

A mixture of both gold and silver, and shown here with scaling of the *Doitsu* type.



SHOWA SANKE

Considered to be a basically black fish with red and white markings. The black of the body must extend into the pectoral fins and sometimes onto the nose.



ASAGI

This blue, fully-scaled fish has a reticulated appearance by the pale edges of each scale. Varying amounts of red occur along the body and in the fins.



SHUSUI

A *Doitsu* mirror-scaled version of the *asagi*, retaining the red characteristic.



SHIRO BEKKO

A white fish with any arrangement of black markings and, as with all patterned Koi, the more balanced the markings so the better the fish is judged.

Continued

COLOURFUL CARP

Continued from page 17

Carp (*Cyprinus carpio*) are believed to have originated in the Caspian area. But, as man journeyed ever further, so these freshwater pond fish were spread to other countries having a suitable (temperate) climate. Regarded in Europe as a valuable source of food, carp were also used for this purpose through Asia and China long before they eventually arrived in Japan.

Recognised for their characteristics and strength, and admired in the private ponds of noblemen, carp became the national fish of Japan. They were raised in the open waters and rice paddies in northern areas, where carp breeding developed into a useful sideline for peasant farmers seeking to supplement their income and meagre diet. In the Niigata Prefecture, many farmers made indoor ponds to continue their interest through the deep snow of winter.

Because of their friendly nature, carp were often looked upon as family pets and so it was natural that, when any unusual mutations of colour were noticed, such fish escaped the fate of their fellows and were kept for breeding.

As more variations were found, their owners began to hold summer competitions to decide on the merits or otherwise of individual fish and, thus, coloured carp were established. As a result of continued selective breeding the white and red patterned koi named *kohaku* first appeared, in the year 1870.

In 1904, a gift of young German scaleless and mirror-scaled carp were sent to Japan from the Royal Museum in Munich. Only four female scaleless and one male mirror carp survived the long sea voyage to be cross-bred with the coloured Japanese carp, producing varieties based on scale type. Today, the Japanese word *Doitsu*, meaning German, is used as a prefix to describe scaleless or mirror-scaled koi.

With an increase in the variations of colours, patterns, and scalings, the keeping of koi gradually spread to other areas of Japan until, in 1914, the showing of these beautiful fish from Niigata attracted large crowds to the Grand Exhibition in Tokyo. In appreciation of the farmers' efforts, the carp were awarded the title of *nishikigoi* - *nishiki* being taken from a silken, brocaded fabric and *goi*, when added to another

word, or koi by itself, can be translated as carp. Note that it is quite wrong and an unnecessary repetition of words to refer to the fish as 'koi carp'.

Genetically, all koi are of the same species although they are now available in a number of pedigree lines as well as a magnitude of lesser mixed types. It isn't practicable to describe all the named koi in this introductory article, but a short list may shed a little light on some of the more easily obtainable varieties.

The metallic golden koi, known as *ohgon* was produced in 1946 after 25 years endeavour by Mr Sawata Aoki of Niigata, and continues to play an important part in the development of further varieties. The koi known as *hariusake ohgon* has a body clearly divided into patterns of both gold and silver, and the *kajaku ohgon* is named after the peacock to signify its rich mixture of brilliant shining colours. Koi having scale variations other than the normal, fully-scaled type are referred to as *Doitsu ohgon*, *Doitsu kohaku*, etc.

There are many names for the different red patterns on the white body of *kohaku*, but one of the most favoured is *tancho kohaku*, having a single, large, red spot on its head and symbolic of the Japanese bird, the crane.

Taisho sanke is a tri-colour koi - the basic colour being white, with red and black patterns (*taisho* era 1912-1926). *Shouzu sanke* is a black-bodied koi with red and white markings produced in the modern era of *shouzu* (1926 to today); the black must extend into the pectoral fins.

Shusui are *Doitsu* koi produced by crossing the German mirror carp with the Japanese fully-scaled *asagi*. The back should be blue with large mirror scales in neat rows on an otherwise mainly scaleless fish. Silver scales sometimes appear and - with red showing along the body, the cheeks, and into the pectoral fins - these koi are considered very attractive.

Bekko means tortoiseshell and, though such patterned koi originated from *taisho sanke*, they differ by having only two colours remaining. These can be *shiro bekko*, a white fish with black markings, and *aku bekko*, a red fish with black markings. When the colours are reversed the koi are classified as *utsuri*, meaning reflection as in a mirror, giving rise to names such as: *shiro utsuri*, a black fish with white markings; *hi utsuri*, a black fish with red markings; and *ki utsuri*, a black fish with yellow markings.

In more recent years, many varieties of koi have been produced with the added

beauty of gold or silver scales from *ohgon*, and either the words *kin rin* (gold scale) or *gin rin* (silver scale) are used in front of the basic name, ie *kin rin kohaku*, *gin rin sanke*, etc.

Koi are unquestionably the unique product of Japan and the highest tribute must be paid to the early farmers - followed by commercial breeders - who, by selective line and cross-breeding, stabilised the colours and patterns to create these living jewels.

The endless varieties with strange-sounding names are confusing for beginners, but are less important than learning the koi's needs and the rudiments of how to successfully keep them. Most people have heard of the sensational sums paid for high-quality specimen koi, but rest assured that the vast majority of the thousands of British koi-keepers buy and keep koi on an unremarkable budget.

Koi are often seriously stressed before purchase - subsequent losses may be attributable to conditions of travel, water changes, or rapid fluctuations in temperature - so health is the main criterion when selecting koi. Body shapes may vary according to size and sex but, when viewed from above, the fish should have a smooth, flowing outline. Any with obvious damage, listless appearance, sunken eyes, or fins held close to the body are to be avoided. Some may have difficulty in breathing or maintaining an even balance, and patches in the natural mucous coating can all be indications of sickness. It is wise to also look for external parasites such as fish-lice, anchor-worm, and white spot.

I believe that common sense is the major prerequisite for successful fishkeeping. No-one should assume new purchases are free from trouble, and the onus is on the buyer to choose carefully - and then to strictly observe the golden rule of quarantining new stock.

Koi have the potential to grow into very large fish, given a suitable environment - fish over two feet long are common in Britain today. In my opinion they should not be introduced into shallow ponds, and no-one should buy a large koi to add to a small pond in which it could never have attained its size. Such fish rarely thrive - much better to have spent the money on making a more practical pond before buying medium-sized (6-10 inches) koi.

Established in suitable ponds, koi grow well, breed, and their owners become completely captivated by these friendly Japanese carp - as I have learned over more than 20 years.

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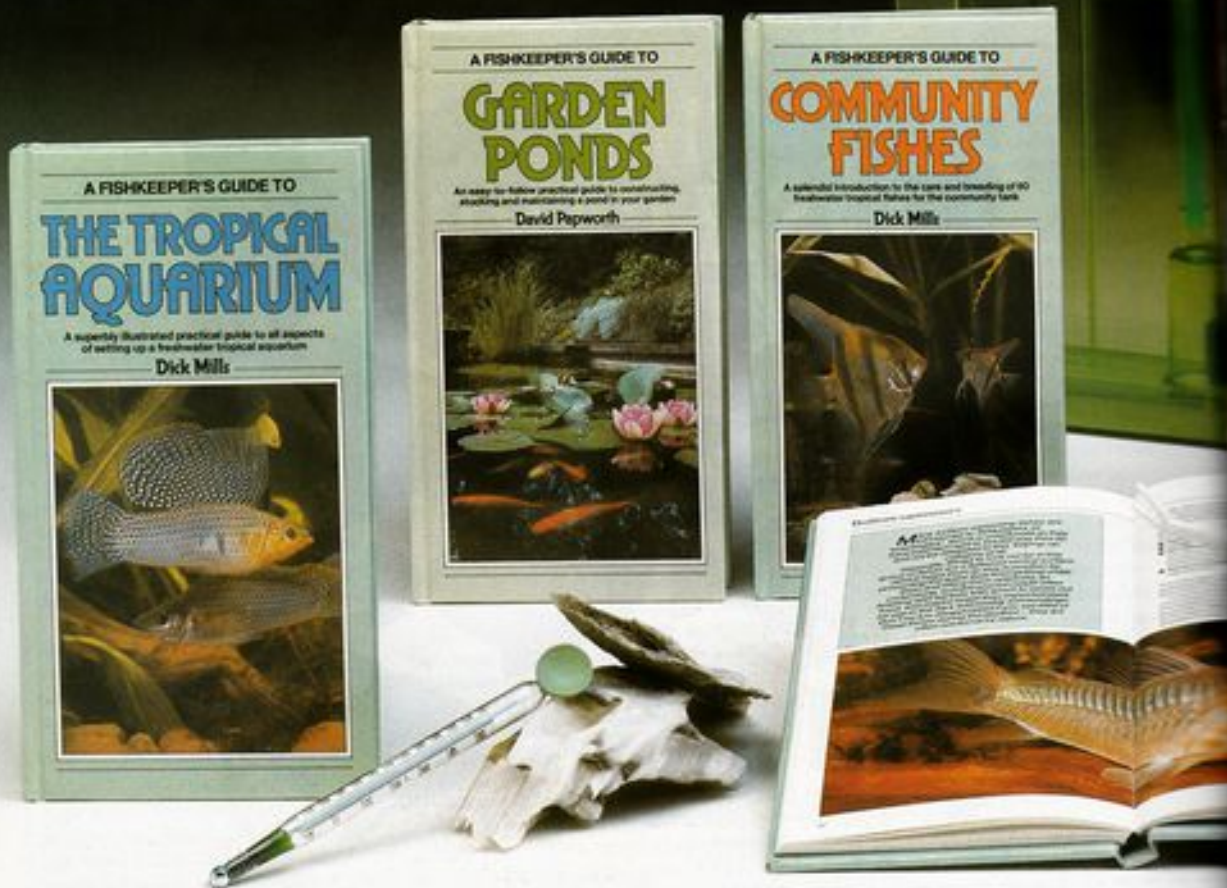
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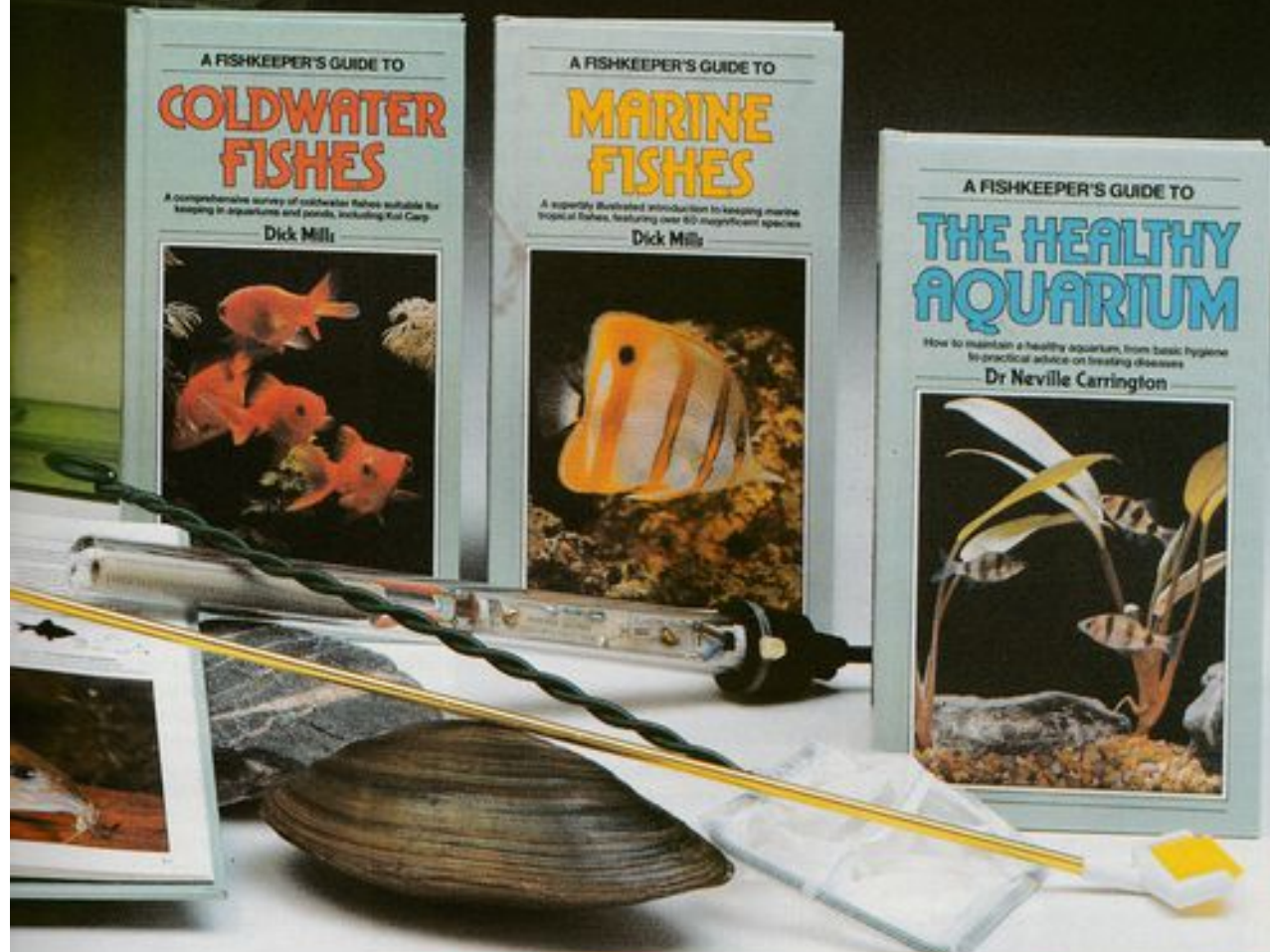
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ALL'S WELL THAT GROWS WELL

Barry James
believes soft furnishings should come first

Tropical aquaria are uniquely different - they should be regarded primarily as attractive articles of furniture in which the keeper attempts to create a facsimile of a small section through a tropical stream or pool. The art of doing this in a natural and realistic way is called aquascaping.

Aquarists use natural products such as gravel, rocks, bogwood, and driftwood as well as artifacts specially manufactured for the purpose such as Simlawood and Simlarock. These are known as hard furnishings. Living aquatic plants are the soft furnishings. In this article I shall deal with the essential points that should enable a beginner to achieve vigorous plant growth.

In order to find out how to grow plants successfully, aquarists went to the tropics and studied the factors that influence aquatic plants in their own environment. The idea was that, having assessed how plants grow in the wild, it should be possible to duplicate the system in aquaria. This they did and to a remarkable degree. But why should they have gone to all this trouble? Why should the fishkeeper consider the plants' needs first?

Apart from providing grace and beauty, plants perform many important functions that are essential to the well-being of the fish. The waste products of the fish's metabolism are consumed by



Newcomers to fishkeeping are, naturally, attracted by the colour and movement of the fish. Seldom do they consider the environment in which they will be housed. This is not surprising - their previous experience of keeping living creatures was probably with small mammals and birds, where the principal concerns are feeding the occupants and cleaning their cages.

bacteria, which in turn convert the organic matter to nitrates and phosphates that the plants absorb as fertilisers, taking them in not only via the roots but also by direct absorption through their leaves. Thus plants act as natural filters.

Plant thickets act as shelters for nervous fish, giving them a greater sense of security and thereby improving their colour. Floating plants also provide shade, spawning sites, and a refuge for the fry. In addition, many fish need some plant food as an essential part of their diet; plants produce many essential vitamins. But, probably, one of the most vital roles played by living plants is that they inhibit the growth of algal organisms - algae would otherwise turn the water into pea soup, discolour the glass, or form ugly, tangled masses of stems known as blanket weed.

Aquatic plants used in aquaria were, and some still are, collected from all parts of the tropics and sub-tropics. Nowadays, however, many of them are cultivated, either in the open in tropical countries

Above, left: Cryptocoryne pontederifolia

Below: Water hyacinths



PLANTS

such as Singapore or under glass in more northern climes such as Europe or North America. There are hundreds of species with a variety of leaf shape, height of growth, and colour. But their growing needs are much the same - only temperature, degree of illumination, and certain electrical and chemical properties of the water vary somewhat from species to species. The broad needs are:

- ✓ A suitable substrate (soil) to grow in.
- ✓ Water that has the right electrical and chemical properties and is clear of suspended debris.
- ✓ The correct temperature range.
- ✓ The correct supply of nutrients (fertilizers).
- ✓ Lighting of the correct colour (spectral analysis), intensity (Wattage), and duration.

Most aquarium shops stock a variety of gravels. These should be of particle size from $1/16$ th to $1/4$ inch, and should ideally be free of lime contamination. You will need approximately 14 lb per square foot for adequate coverage. All moist, tropical countries have one predominant soil type known as Laterite - a clay containing an abundance of iron, and sold in this country as Everite. This

material in powder form is mixed with the first half an inch of gravel. The rest of the gravel is washed and placed over the top to a depth of 2-3 inches.

For plant roots to thrive, a heating pad of the Ultratherm type should be placed under the aquarium. This will encourage root growth and also help to circulate fertiliser throughout the tank. The water should be around neutral pH and low in calcium salts that would otherwise make it hard. The mains supply can be softened by mixing with rainwater, or small water-softening units are available to connect to your air pump or filter. A good filter will ensure water clarity, and temperature is easily controlled by modern thermostats. Aim for a temperature of 75°-80°F - this will also suit the majority of fish species.

Plant nutrients are of two types - basic and trace element. Basic fertilisers such as Everplant M contain NPK (nitrogen, phosphorus, and potassium). They are normally in tablet form and administered monthly. Trace element fertilisers contain all those elements that, although only needed in minute quantities, are essential for healthy growth. Everplant D is a typical product, in liquid form and administered daily.

Very keen plantsmen often use

suspended lighting systems using mercury vapour or metal haloid lamps, but these are somewhat expensive.

Instead, most beginners use fluorescent lamps housed in a reflecting metal canopy that can hold two lamps. The Smoothline hood made by John Allen is a suitable model, and includes a compartment to house the starter units that power all fluorescent lamps.

Lighting should be at the rate of 20 Watts per square foot of surface area. One Grolux or Aquaglow lamp plus one Truelight or Sunglow tube will give excellent illumination as well as high-lighting the colours of the fish. Lights should be switched on for 10 hours per day - too short a period will lead to poor plant growth, but too long a period could encourage an infestation of algae.

Finally, when buying plants be sure to get fresh, healthy specimens from a reputable dealer. Don't be tempted by highly-coloured, somewhat stiff specimens - they are almost certainly house plants and will have only a limited life underwater. And if your plants have a limited life, so might your fish.

Barry James (below, at work) is Managing Director of Everglades Aquatic Nurseries, Baunton, Gloucester.



The Royal Family

Gordon Kay in praise of the angels

It is little wonder that angelfish have such grandiose popular names. When you view any display of coralfish, angels are always the first to catch your eye with their fantastic colouration and patterns and majestic demeanour. Sooner or later, you will want to acquire one.

Marine Angels are not, by and large, impossible - but nor could they be called

easy. A little understanding of them is essential to avoid sleepless nights. So in this article we will look at a few of the more popular species and their needs.

The scientific name for the whole family is *pomacanthidae*. There are some 74 species, each falling within one of the seven genera that make up the family.

Coral beauty (*centropyge bispinosus*)

Many species live in rather shallow water, just deep enough to find protection from the tidal surge (usually, this means between 10 and 40 feet of water), although *centropyge* species - known as dwarf angels - are rarely found at less than 60 feet or so.

Most angels need shelter to some

Continued on page 26



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MARINES

degree and generally inhabit areas with plenty of rocks, caves, and coral crevices, rarely being seen over open stretches of featureless sand. They are somewhat territorial and spend most of their time roaming around their patch looking for food, which is mainly sponges, tunicates, anemones, corals, and algae. All feeding activities end at dusk, however, when the fish retreat into their own little crevice, entering into a state of torpor. Many of them also exhibit night-time colouration.

The queen angelfish (*holocentrus ciliaris*) gets its name from its crown - the blue-ringed, black spot on the forehead, which distinguishes this species from its cousin, the blue angel (*holocentrus bermudensis*). The wonderful specimen seen on the cover of this magazine is an adult - but queens are usually sold in the juvenile form, when it is very difficult to tell a queen from a blue. The young fish has five vertical, blue bars, three on the body and two bordering the eye. The body is an olive colour, with yellow on the underside toward the head. As the fish matures, the bars increase and then fade until *ciliaris* looks like the one in our photograph - usually at about five or six inches.

The queen angelfish comes from the tropical Atlantic around Florida, the Bahamas, and the Gulf of Mexico. It

grows to around 18 inches in the wild, although nothing like this in captivity. This species is one of the hardiest of all in the aquarium, accepting most types of food - which should regularly be enriched with vitamins.

Hailing from the other side of the World, the Koran angelfish (*pomacanthus semicircularis*) is also one of the hardiest and most popular of all the angels. Its popular name is derived from the fact that many people see a similarity between the markings around the tail and the Koran - the holy writings of the Muslims.

Being widespread throughout the Indo-Pacific region - from South Africa through to Fiji - the Koran grows to around 12 inches long and is another which changes dramatically from juvenile to adult. Unfortunately, all angels in the genus *pomacanthus* have juvenile forms which are so similar that even the experts have difficulty telling them apart.

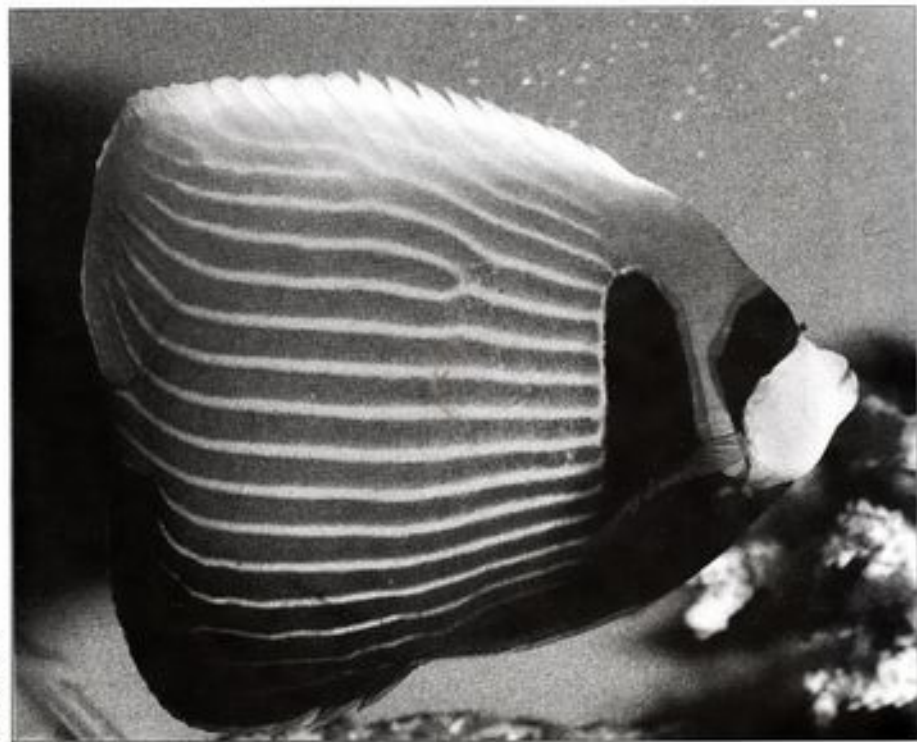
The Koran is generally sold at around 2 1/2 inches long, when it is dark blue with light blue edging on the fins. It has five bold, vertical, semicircular, white stripes, the curve being more pronounced toward the tail. Between each of these stripes runs a fine blue one, and there is a white stripe on the tail. The adult is green

with blue-tipped scales and light blue edging on all fins - lovely. The Koran makes a superb aquarium fish, easy to keep and rather long-lived.

From the same part of the globe comes another *pomacanthus* species with a grand name - the emperor angelfish (*pomacanthus imperator*). This fish also grows to around 12 inches long and, again, looks very different as a juvenile, although young emperors at least differ considerably from the young of other *pomacanthus* species in that the white markings form a definite ring near the tail. Describing the adult *imperator* is not easy - the best way is to look at the photo below.

Once established, emperors are as tough as old boots and will eat for as long as you are prepared to throw food to them. I know of at least two that are over five aquarium years old.

My favourite angels are the dwarfs - and there can be none more lovely than the flame angel (*centropyge loriculus*), which is found only around Hawaii. The flame reaches a length of around four inches and is unusual in that it is one of the few red coralfish. It sports six black bars along its flank and a dark purple colour to the rear of the dorsal and anal fins. Unfortunately, because *loriculus* lives at extreme depths in an area that is about as far away from here as you can



Emperor angelfish
(*pomacanthus
imperator*)
is a beautiful creature - and
yet tough as old boots

Origin of the species

Pam Whittington traces the proud ancestry of the humble goldfish

While sitting peacefully by a pond on a warm, sunny day, watching coloured goldfish lazily swimming around, have you ever wondered about the origins of these fish? Do you perhaps think that they have been netted out of some foreign pond or river and then transported to the local pet shop, as so many of the tropical varieties are? If so, you are in for a surprise.

The name "goldfish" is used to cover the whole range of these fancy, coldwater breeds from the simple, single-tailed, common goldfish through to the complicated, double-tailed bubble-eye. And, indeed, all the fancy varieties have evolved from one species of carp - *carassius auratus*.

The species originated in China some 1600 years ago, occurring naturally in a river. But it is not until 960 AD that there is any proof of domestication of the "red scaled fish". From the 11th century onwards they became popular as pets and the Chinese had special bowls made to keep them in, decorated with paintings inside and out. These large bowls were made of pottery, so the fish could only be seen from above; it was not until the hobby became popular over here that aquaria came into being.

The first record of goldfish in England is around 1730 when a few were brought from the Orient by a ship of the East India Company. They were given to the Sheriff of Surrey who put them into a pond, where they seemed to have settled very happily - not many years later, they were being given away as pets. One recipient was Horace Walpole, who in turn presented some to the French Court. From this small beginning the goldfish spread its progeny around Europe and had reached the Americas by the middle of the 19th century.

While the West was being introduced to the basic goldfish, the fish breeders of the East were turning their attention to the more exotic. The Chinese had found that odd variations would occasionally occur - mutations of eyes, scales, colouration, and body shape - and went on to isolate, crossbreed, and interbreed them. These man-made fish are now well known, the most common being the Moor, pearlscale, lionhead, fantail, oranda, and shubunkin. Owing to the severity of our winters, only the shubunkin is suitable for all-year-round life in an outdoor pond.

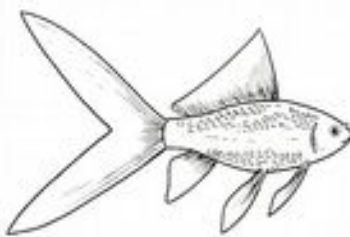
The shubunkin appeared in Japan around the turn of this century, a multi-



COMMON GOLDFISH AND
LONDON SHUBUNKIN



BRISTOL SHUBUNKIN



COMET

coloured version of the common goldfish in the nacreous scale group, but we had to wait until the early 1920s before it reached England and here it was named the London shubunkin. Meanwhile, American aquarists had been breeding with this new Japanese fish and were producing it with a much longer tail. These were imported into the UK in great quantities and breeders in the Bristol area developed it even further, giving it a long, gracefully-flowing tail. In 1934 it was adopted by the Bristol Aquarist Society into their standards and became known as the Bristol shubunkin. The Goldfish Society of Great Britain also recognise this variety along with the London shubunkin, common goldfish,

and comet, and have laid down standards for them on the show bench.

The comet is also suitable for the outdoor pond. Again evolved from *carassius auratus* via the Japanese fish imported by America, it was developed at the turn of the century. The comet is long and slender with a tail fin equal in length to its body and can be found in metallic orange, silver, or yellow as well as the nacreous blue patterned variety.

The London and Bristol shubunkin and the comet are the hardiest of the goldfish species. They will withstand a water temperature range from freezing to 80°F and, provided they are properly looked after, will live for up to 25 years. This length of life often surprises tropical fish keepers whose fish will live only a fraction of that time but it must be realised that, while tropical fish are burning themselves out by living 365 days a year in warm water, coldwater fish have a very different lifestyle. They virtually only 'live' for eight months of the year because, from November to February, they are dormant out in the pond. Once the water temperature falls below 45°F they should not be given food as their organs cease to function and food cannot be digested. As the water starts to warm up again in March so they will come out of their winter hibernation and once more start feeding in readiness for spawning.

All these many varieties of the goldfish will easily interbreed and, unless strictly culled out, you could end up with a pond full of uncoloured carp - being man-made fish they will gradually revert to the wild.

There are several methods of controlled spawning and rearing of the young fish, which will be discussed in our next issue. Future articles will also cover other exotic varieties of fancy coldwater fish including suggestions as to the best way to keep them in an aquarium. But, indoor or out, be proud that keeping goldfish is not only a rewarding hobby - it's a centuries-old tradition.

COLDWATER



The Goldfish Society

If you keep or breed fancy goldfish, would you like to know more about them? Are you interested in showing your fish in competition with other fishkeepers? Would you like to talk about genetics, colouration, line breeding? Are you worried about disease, culling, inbreeding, feeding, filtration?

Whether you have a tank in the lounge, a pond in the garden, or a fishhouse in the back yard, whatever your problem or query you will most likely find the answer within the Goldfish Society of Great Britain. The GSGB are a friendly bunch, always willing to give advice to fellow members. They meet five times per year in London, publish a Bulletin Newsletter, and hold a Convention and Open Show with a fish auction every October.

To find out more write to Roger Saltrick, Membership Secretary,
GSGB, 38 Herent Drive, Clayhall, Ilford, Essex IG5 0HE.

STRESS

Peter W Scott explores the trauma suffered by fish before you take control

Stress is a very popular term with the tabloids and pseudo-medical fraternity, but not so popular with the scientific community. There is little doubt that it is an important factor in many cases but, because it is so difficult to measure, referring to stress is considered to be a cop out by many people.

Even defining stress is difficult, except in the most general terms. A series of changes take place that enable the creature to make the most effective

Livebearers are very prone to bacterial skin infections after stress, which is why so many dealers keep them in salt

possible fight-or-flight response - hormones increase heart rate, respiratory rate, and blood glucose level (like eating a Mars bar). An unfortunate side effect of these changes is that they also depress the fish's immunity and leave it open to disease.

Long-term stress changes are the most



HEALTH

serious because the body uses up its reserves; the fish becomes dark and thin and doesn't want to eat. Stressors (causes of stress) are cumulative - they act through the same pathways so that minor problems build up to become major ones.

In the United States Professor Sniieszko, one of the World's leading fish pathologists, described a host-pathogen-environment triad that leads to disease (see diagram). This means that disease is the result when a susceptible host is exposed to a virulent pathogen (infection) and certain environmental conditions. Often it is the environment that makes the host susceptible by causing stress to the point at which the fish loses its natural protection.

Fish are subject to various stressors in the journey from their country of origin to the aquarist's tank. There are two sources of ornamental fish: wild caught or farmed (over 90% of freshwater fish coming into Britain are now farmed). Wild caught fish are often carrying a number of parasite larvae in various internal organs or under their skin. And farmed fish may be carrying any or all of the organisms which go hand-in-hand with intensification, such as protozoa or skin and gill flukes.

All fish carry a few parasites just as almost all humans do. These live in perfect harmony with the host for most of the time, but when defences are low the parasites can break from the constraints that the host would otherwise exert on them.

Prior to shipping, fish are often held in somewhat overcrowded conditions (dictated by economics). They are normally starved before shipping, often for just 48 hours. But, depending on the source, wild caught fish may not be fed at all until they arrive in the UK. It is essential to starve fish before transporting them any significant distance - food increases the fish's oxygen demand and their faeces contaminate the water, which also reduces the oxygen level. Unfortunately, even a short period of starvation is a stress, and it acts with the overcrowding to begin the cascade of stress factors that can cause problems.

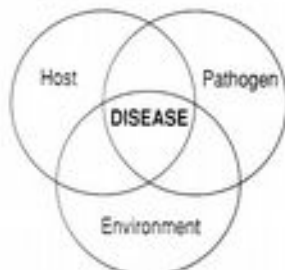
Fish are then bagged in a relatively small amount of water (it is not the fish that are expensive to ship, but the water in which they live). The bags are packed in polystyrene boxes to maintain the temperature, transported to the airport, cased around, weighed, rubber-stamped, etc, and finally loaded into the hold of the aircraft.

Airlines certainly try to make the trip

as comfortable as possible, although it is not unheard of for fish to be stacked in unheated sections of the hold or for the power in the hold to be turned off. The temperature fluctuations and associated stress can cause many deaths during the flight or very soon after arrival.

On arrival the fish are collected and then must be cleared, which can take several hours, before being loaded into a truck and taken to the wholesale premises. Here they are unpacked and stocked into single-species tanks of water prepared for them, often with a little salt to ease their metabolic problems (like a drip being given to a person in shock).

A large percentage of the fish coming



out of the transport bags will have bacteria in their blood, because they will have been exposed to a high concentration of bacteria growing in the water during transport (this is called a bacteraemia). A major part of the wholesalers' job is to ease the stress suffered by the fish. Considerable attention is given to help the fish clean up the bacteria within their system and to settle them down enough to begin feeding (to avoid the bacteraemia becoming septicaemia, where the bacteria are actually multiplying in the blood). Suitable antiparasitic or antibacterial treatments and special, flaked food containing antibiotics may also be used.

When the fish are healthy and settled they are sold to retailers, and this should involve only minimal stress since the transport period is much shorter and the amount of handling much less.

The wholesalers association Ornamental Fish International (OFI) have a code of practice that all members must follow, developed by their members to improve the health of fish on sale. Transport bags can be stocked up to a maximum rate of 500g per litre of water and members must also quarantine fish for five days, or longer if necessary. Other regulations govern the numbers of tanks, total fish in stock at any one time, disinfection procedures, etc. It is only by this type of professional approach that the fish and

the consumer will be properly served.

An area of the aquarist business that is less well regulated is the consolidation of fish - some large wholesalers pass on a few boxes of fish unopened to a small dealer, or an agent may put together a bulk shipment for many dealers who all collect from the airport.

Some of the retailers who buy these fish are very good at the settling down and quarantine procedure. Others are less good, selling fish virtually straight from the box and thus, in the guise of letting the aquarist have a discount, let him also take the risk of having problems. There is a reasonable, partially-convincing argument in defence of this practice with marines, which are generally going to specialist fishkeepers who can give the fish individual attention. But, unfortunately, consolidators may have little influence on their suppliers and so less care may be taken at source.

A good dealer will watch the fish delivered to his shop, treating when necessary and often putting up small signs along the lines of: "Sorry, these fish are not for sale, they are being treated". This type of honest dealing is good for everyone and should be encouraged. The less scrupulous may treat and not tell, or may not treat at all. It is important to remember that we are dealing with living, sentient creatures, and not brightly-coloured toys simply to be replaced when they break.

As a belt-and-braces man, I strongly advise koi keepers and those with specialist tanks such as marine systems to arrange their own quarantine tank. This should be designed such that ornaments present for shelter can easily be removed to catch the fish for treatment or transfer to the final tank or pond.

With the best will in the world, nobody can absolutely guarantee that fish are free of disease. Carriers may show up in the dealer's tank, but an extra period for safety will be better than losing many thousands of marines (or thousands of koi).

Routine treatments with proprietary antibacterial and antiparasitic preparations are worthwhile during quarantine. These are not usually 100% effective but generally they don't need to be - all one needs to do is let the fish establish and maintain a balance, helping them to control infections through the difficult post-arrival period.

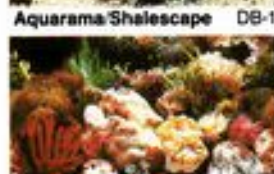
Peter W Scott is in practice at Aquatic Veterinary Services, a division of the International Zoo Veterinary Group.



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