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PRACTICAL Fishkeeping

ALL YOUR AQUATIC ANSWERS INDOORS AND OUT

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● On sale
January 30

● Cover pic. shows marine Cardinals. Photo by Max Gibbs; The Goldfish Bowl, Oxford.



Top: Golden Tiger Barbs. See page 49.

Above: Coral Trout Cephalopholis miniatus. See page 62.

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AT 41,438 (ABC)

BRITAIN'S BEST SELLING FISHKEEPING MAGAZINE

The Dwarf Gourami is of a manageable size, reaching 2" in length. It is peaceful towards other species, although two male Dwarf Gouramis may fight. The female is top left. Pic. Max Gibbs, The Goldfish Bowl, Oxford.



Quite simple to keep, and in the right environment, not difficult to breed - IAN LUCAS writes about his happy experience of Dwarf Gouramis

Right: The bubble-nest may be 2-3" in length and up to an inch deep. Pic. Pete Trevett.



How to breed ...

The Dwarf Gourami

Since it was first imported from its native India in 1903, the Dwarf Gourami has been one of the most popular aquarium fish, and deservedly so, as it has many virtues.

The male is brightly coloured with alternate stripes of red and blue-green, with a metallic effect, and the female has a more subdued, but still pretty variation of the theme. This gourami is of a manageable size, growing to about two inches (5 cm) in length, and is peacefully disposed toward other species. Two male Dwarf Gouramis in the same tank, however, may be very aggressive toward each other.

The Dwarf Gourami is happy under a wide range of tank conditions, including temperatures from the low seventies to the low eighties Fahrenheit (25 - 30° C), pH from fairly acid to slightly alkaline, and hardness from soft to moderately hard. Similar conditions are suitable for breeding, raising the temperature by 2 or 3° Fahrenheit to stimulate the reproductive urge.

A quality flake food is a good basic diet, but occasional treats of frozen, or disease-free live foods, such as mosquito larvae, will be appreciated, and this is especially useful for fish which are to be bred.

The Dwarf Gourami, known to science as *Colisa lalia* (Hamilton-Buchanan 1822) is, like most gouramis, a member of the family *Belontiidae*, in the sub-order *Anabantoidae*.

All anabantoids are able to breathe atmospheric air from the surface of the water, which helps them survive in stagnant, overgrown backwaters.

Another adaptation exhibited by the dwarf to these conditions of low oxygen content is the construction of a nest built of bubbles and held together with pieces of floating plant, which keeps the developing eggs and larvae in the well-oxygenated surface layer. The labyrinth organ, which performs the function of breathing air is not fully developed in the newly-hatched young.

Breeding can be achieved in the community tank, but the survival rate of the fry is likely to be low, in spite of the male's courageous defence of the nest.

Breeding Dwarf Gouramis

If a tank is to be set-up specifically for breeding the Dwarf Gourami, it should be well planted. This is partly because the male incorporates plant matter into the nest; and partly to provide cover for the female.

This will allow her to escape the attentions of the male if he is more eager to reproduce than she. After spawning is completed it is advisable to remove the female as the male defends the nest so vigorously that he may injure or even kill her.

Plant growth will also help to maintain good water quality. If filtration is used, it must be very gentle so as not to disturb the nest. The plants should not be allowed to introduce snails into the breeding tank.

surface, using floating leaves to bind it together, camouflage it and bind it in place.

After (sometimes) a number of trial attempts, the male will produce a nest two or three inches across and an inch or so deep.

The male then courts the female, pursuing her around the tank and displaying. If she is not ready, it is essential that you have provided hiding places in the weeds. Otherwise she may be injured or even killed.

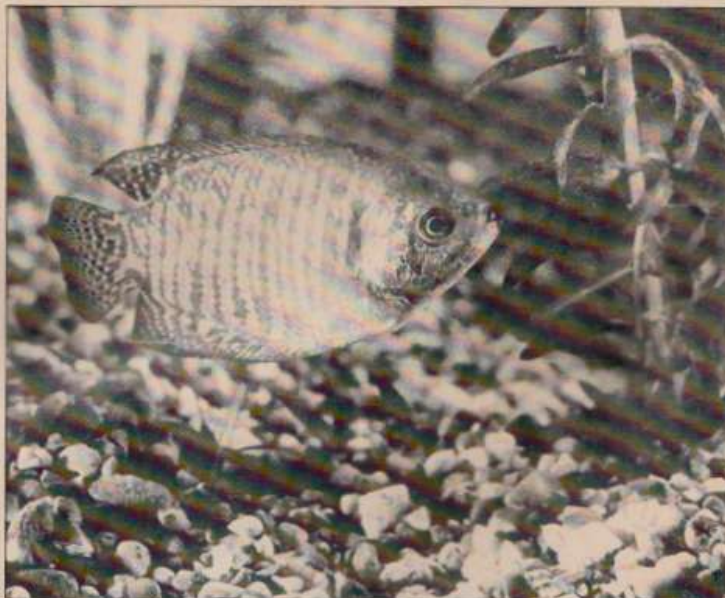
The spawning act itself is very interesting to observe, as the male embraces the female by wrapping his body around hers and rolling her over under the nest, gently squeezing to help a few eggs out each time. The male fertilises the eggs as they are laid, and guides them into the nest if necessary, as they tend to float.

The male, meanwhile, maintains the nest, adding more bubbles as necessary, retrieving any eggs, and later larval fish.

The eggs hatch after two days or so and three days later the fry become free-swimming. At this stage the father should be removed.

The young are among the smallest of freshwater fish fry, and will need infusoria as a first food. Years ago green water was recommended, as it is teeming with tiny unicellular algae.

A more modern approach is to obtain a pure culture of a single species of micro-organism, choosing the smallest species of alga or protozoan offered by the supplier. Feed carefully - if too little infusoria are fed some fry will not get enough and be stunted; too much and the infusoria will pollute the tank.



The male will maintain and guard the nest, but should be removed when the fry become free-swimming.

Live or frozen foods are used to condition the fish. The front part of the female's body becomes swollen as the eggs develop; the male will start to build little experimental nests in the community tank, and show off his finest colours and finnage.

The happy couple may now be transferred to the breeding tank, which should use similar water to the main tank - hardness, pH and so on are not critical. Increasing the temperature in the breeding tank by 2 or 3°F will stimulate spawning.

The male builds a nest by blowing bubbles at the water's

This is repeated ten to twenty times, until about one to two hundred eggs have been laid. During the pauses the female seems to float in a world of her own, drifting helplessly before recovering her senses for another embrace.

The male then takes up station under the nest and will drive away any would-be predators, regardless of size. This includes the female, who can be provided with a small clay flower pot. When she, inevitably, hides in this, she can easily be captured and removed without disturbing the nest.

As the fry grow they may be gradually weaned onto newly hatched brine shrimp nauplii, and then onto powdered flake food, or food tablets, which can be pressed against the side of the tank for the fry to nibble at, providing food over a long period. ■

If you have the opportunity, try a pair of Dwarf Gouramis, and find out for yourself why they have been one of the most popular aquarium fish for so many decades.

Classification of Aquatic



Pisces Bony fish



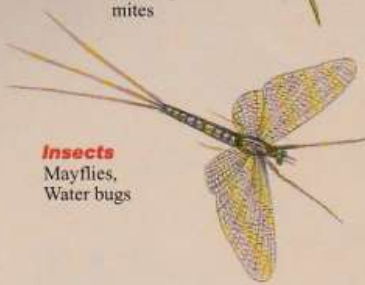
Arachnida
Water spiders,
mites



ATHROPODA
Crustacea:
Shrimps, louse, crayfish



Amphibia Newts, frogs and toads



Insects
Mayflies,
Water bugs



Annelida Worms: Tubifex



Apple snails can be 3" across or more.

An apple for the breeder?

Fish breeders often own at least one Apple Snail, *Ampularia cuprina*, which eats copious amounts of vegetable matter, and produces infusoria cultures for feeding to fry.

Housed in its own small tank, and fed lettuce leaves, its droppings produce large amounts of infusoria for feeding to fry. The snail will breed in captivity, but the eggs are laid out of water, so a special breeding tank is needed with a platform for the snail to climb out.

Snails

Freshwater snails are usually a problem rather than a rarity! The most common is *Planorbis* in coldwaters and *Planorbarius* in tropical. *Helisoma* are the little Red Ramshorns that infest tropical tanks. These originate from South America.

A small nocturnal snail that can over-run the aquarium comes from Malaya. *Melania tuberculata* is easily identified by its ice-cream cone shell.

Viviporous malleatus is a live-bearing snail from Japan. It looks like the Apple Snail, but instead of laying eggs it gives birth to perfect little snails.

Snails can make fascinating aquarium subjects. They are mostly bisexual, blue blooded, and prolific - there are a hundred or more species in British ponds alone. If you collect from the wild though, keep them away from fish as they can carry parasites.

Other Invertebrates

Use a collector's net in any natural pond or stream and many inverts will be obtained. These include many insects and their larvae such as mayflies, stoneflies and sedges or caddisflies, Waterbugs, Water Scorpions, Water Measurers, Pond Skaters, Water Beetles,

c Freshwater Animals



Mollusca
Snails, mussels



Acanthocephala
Roundworms



Platyhelminthes
Flatworms



Porifera Sponges



Ectoprocta Moss animals



Aschelminthes
Worm-like animals, rotifers

Coelenterata
Hydra



Protozoa Amoeba, paramecium

Sociable inverts

There is no British Invertebrate Society! However, the Amphibian and Reptile Club (ARC) has a Newsletter with advertisements from dealers in water animals. They also have an annual ARC and Traders Fair.

For more details contact: Snakelands, 1 Springfield, Epsstead, Godalming, Surrey, GU8 6EG - or phone their helpline 0252 702714.

Great Diving Beetles, Silver Water Beetles, Whirligig Beetles, and a host of other creatures, are all to be found in British waters with equivalent tropical varieties (but a thousand times more species) often imported by mistake in fish shipments.

The Arachnids (spiders) have water species such as *Argyroneta aquatica*, which is fascinating to watch in a small aquarium. It spins a bell-shaped web underwater, anchored to plants and fills it with air, so it has its own underwater world.

Fishkeepers are quite familiar with the small crustacea, *Daphnia* and cyclops, which can be usefully cultured as a source of food, free of the parasites found among the wild specimens. They can even be kept in a small tank and viewed with a hand magnifier as a miniature aquarium.

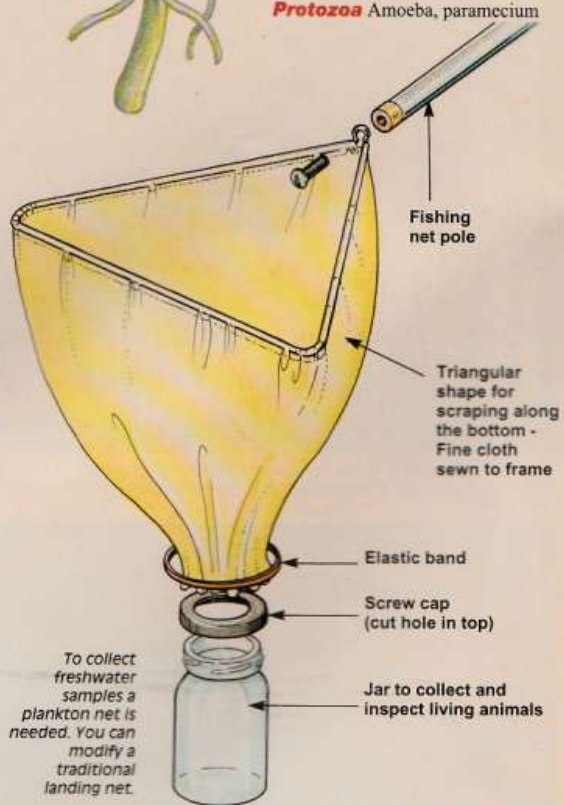
Among the worms, the most common must be *Planaria*, so often found in the freshwater aquarium as a small, white leech-like animal. It causes panic

among fishkeepers, but is actually harmless, feeding on surplus fish food (a sign of overfeeding). Leeches and hydra are sometimes seen...which are not harmless and are best avoided, even for the invert tank.

Lifting the lid of the well mature aquarium can often reveal little red mites scurrying around the surface. These too are harmless, usually from the family Hydrachnellae, especially the bright red *Hydrodroma despiciens*. Their presence indicates that a clean down is overdue!

Although few if any inverts are recommended for the community aquarium, anyone really interested in this fascinating subject can find a spare tank for a special aquarium.

For local species set it up as for goldfish, with filtration and aeration and for tropical varieties treat as a standard tropical tank with effective water filtration that maintains zero nitrites and low nitrates. Welcome to the world of Aquabiology! ■



To collect freshwater samples a plankton net is needed. You can modify a traditional landing net.

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● Most pet shops have
booklets on Land, Hermit
or Tree Crabs.

Cichlids at cross-purposes



MARY BAILEY looks at the common problem of hybrid cichlids - one that she feels should be avoided at all costs.

Imagine accidentally crossing an unusual Pseudotropheus zebra like this sport (above) and Labeotropheus fuelloborni (below), and trying to define which fry were which in the hobby...Pics. Max Gibbs, The Goldfish Bowl, Oxford.



Over the past couple of years I have had an alarming increase in the number of queries from readers who have accidentally hybridised cichlid species in their tanks.

Luckily most of these have still been at the egg/small fry stage, but occasionally I come across someone who has reared a brood to near-adulthood, unaware of the rod he is making for his own back.

More recently I have heard that a cichlid hybrid, bright orange in colour, is being sold in the trade at a quite exorbitant price, under the name "Parrot Cichlid" (which, insofar as any common name is correct, rightly belongs to the South American species *Hoplarchus psittacus*). So it

seems a good time to look at the question of hybridisation in cichlids and the problems it presents.

Hybrid cichlids - artificially produced...

Hybridisation in cichlids is, unfortunately, rather common if the fishkeeper provides the right circumstances, i.e. a female of one species without a mate, and a male (with or without appropriate female) of another, usually fairly closely related, species.

Most of the cases reported to me have involved cichlasomines or Lake Malawi mouthbrooders, with rarer reports of Tanganyikan hybrids. But it is not unknown for species from quite different genera to interbreed, one of the most bizarre I have come across being *Neolamprologus brichardi* and a *Julidochromis* species. There are also tilapia hybrids deliberately produced by fish farmers - some of these crosses produce 100% male offspring, which is advantageous as all their energy goes into growth (rather than egg production) producing a better "crop". These appear to be restricted to commercial pisciculture for food, though I have come across the occasional very odd tilapia in the hobby, which may have suspect origins.

Mercifully, I have yet to hear of hybrid *Apistogrammas* or West Africans, but this may reflect the fact that these are mainly specialist fish kept as pairs by breeders.

How does it happen?

In nature it is so unlikely as to be totally improbable that a cichlid female would be unable to find a conspecific male to mate with, so the problem does not arise. Males of other species may also be present, but these will not give the correct visual signals (shape, colour, behaviour), and are ignored in favour of the correct male.

In captivity, however, a female will ripen with eggs regardless of whether there is a suitable male present to fertilise them, and eventually she will either resorb eggs (rare), become egg-bound (also rare), or spawn.

At this stage a variety of things can happen.

- She may approach a territorial male of another species who is exhibiting behavioural signals similar to those of the correct male. This is frequently the case with mouthbrooders.
- She may be courted by a male of another species, usually a "bachelor", who recognises her as a ripe female, even if not quite the girl of his dreams.
- Or she may set up house and start spawning by herself, and find herself joined by a heterospecific male. Again this is common in mouthbrooders.
- Rather less common, but reported several times in Lake Malawi mouthbrooders, is the situation where the "top fish" in the tank's "pecking order" is a particularly dominant individual, and manages to oust

the rightful male during a spawning.

This may involve the right male being chased off completely; the males sharing the female; or the interloper fertilising only one batch of eggs. I have had an odd fish in a brood of *Labeotropheus* which had some characteristics more appropriate for *Pseudotropheus zebra*, which was the "top fish" in that particular community!

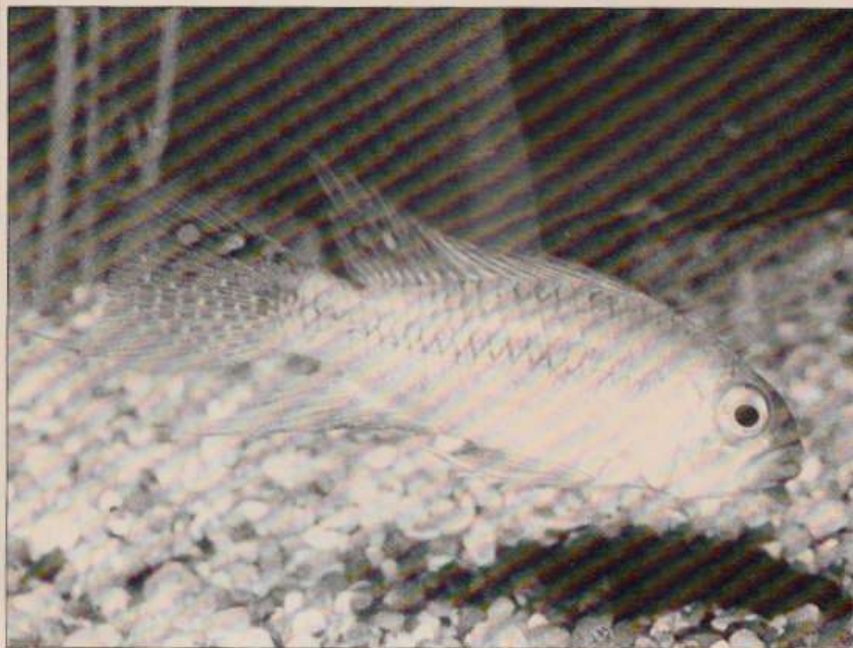
It is very difficult to avoid the last type of hybrid, as the relative dominance of members of the Mbuna community will vary from time to time, so you cannot predict if and when a male will be unable to hold his own.

By the same token, if a cross does occur, the process is unlikely to be repeated, so it is not necessary to take action to

prevent repetition - though obviously if one male is a real "wimp", failing every time, he should be replaced.

Mis-mating because of the absence of the right male is likely to be repeated, and it is important to take action to prevent repetition unless you want to be forever destroying eggs/fry (remember, many cichlids will spawn to replace a lost clutch after only a couple of weeks).

Moreover, especially with substrate spawners, there is a strong likelihood that the mismatched pair will come to regard each other as the "correct" partner - in terms of colour, shape, behaviour - and it will then be very difficult, if not impossible, to persuade them to accept a correct mate when you provide one.



"I have yet to hear of hybrid Apistogrammas... A. cacauioides has a beauty that needs no improving."

Parrot Cichlids - a warning

I have already referred, in passing, to the so-called "Parrot Cichlids". These are, I am informed, being sold at £80 a pair, and that all important phrase **a pair** suggests that some fishkeepers may be misled, as to the hobbyist, a pair can only suggest the possibility of successive generations of little mouths to feed. As this article shows, if these cichlids are hybrids, this is **not** the case.

But, before you go and berate any dealer you find selling these fish, remember that he may himself have bought them in good faith from the wholesaler. I hope too, such dealers will understand that, in drawing the hobbyist's attention to the true nature of these fish, I am not attempting to spoil their trade, but to protect this wonderful hobby from abuse.

Young fis



KIT TIP

No 1. The Bubble-Up filter

How does it work?
Air is pumped into the unit and as it rises it draws water through it. The water passes over or through the chosen media.

What extra equipment do you need?

You need an air pump and preferably an air stone, plus, of course some airline, to power the unit. There is also the need for media to go into the filter. Filter wool is almost essential to get the best from such units.

What media should I use?

Almost any media that will fit into the unit. Bubble-ups can be filled with gravel, charcoal, zeolite, sand, crushed coral, and many other specialist media. Line the top and bottom of the filter with filter wool or floss.

How do I use it?

Such filters provide efficient general filtration (and aeration) in any tank, though only smaller tanks can actually be run permanently on one. They are very useful for brood and hospital tanks; and perhaps better still used as a back-up unit, loaded with charcoal, zeolite, or peat for instance, to combat particular problems or produce special conditions in an already filtered tank.

Good features

Simple to use; cheap; efficient.

Are there any drawbacks?

The units can look bulky and ugly in a tank; air power may not be sufficient to draw water through dense or clogged media.

Underwater Safari



This Caddis has built its case from sand.

This month our series on aquatic insects and bugs looks at Caddis Larvae

If you pull a twig out of a natural, or even a garden, pond you may well find it adorned with tiny cases, each containing a larva of the Sedge or Caddis Fly, the Trichoptera, a family with over 190 different species in the UK alone. Of these around 150 make the distinctive cases of avascular material - twigs, gravel, sand, pieces of cut leaf or weed, twigs, and discarded shells.

The species in running water make their cases from heavy items to help them from being swept away.

They live for around two years in their protective case, improving and extending it as necessary. The various larvae are vegetarian, carnivorous, or omnivorous, and will eventually seal the ends of their tube to pupate, emerging as a free-swimming pupa. After a couple of weeks, they swim or climb to the surface and emerge as the moth-like "adult" sedge.

But moths have powdery scales on their wings; caddises have tiny hairs.

Picture by Pete Gathercole.



Catfish query

Tim Hall writes from Fareham, Hants - and sends us a cartoon to illustrate his problem:

I have a 30" x 12" x 12" aquarium which houses one Bullhead Catfish of 6", and one 'Golden' catfish which is 4". Can you tell me:
1) How deep my tank should be? It is presently filled at 8". 2) How can I keep the Bullhead when he gets larger - how large a tank should I buy? 3) Some more about my Golden Catfish. 4) How large each catfish will grow?
I may later transfer both cats to a pond if they grow too large. What are your views?

Your *Ictalurus* (Brown Bullhead) could reach 250cm (*Ictalurus punctatus*) or 270cm (*Ictalurus furcatus*); it's impossible to say if your 'Golden' Cat is a sport of the *Ictalurus* family or a Madtom Catfish which may not grow much larger or might reach a 30cm.

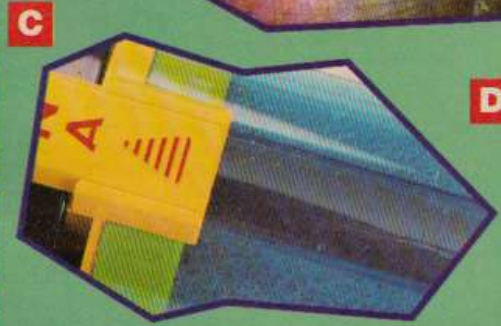
Why is your tank not filled to the top? It's important to give these fish the maximum water volume - anyway larger volumes of water are more stable. You can leave the Bullhead in the 30" tank and remove the other to a slightly smaller tank. To get the best from your Bullhead indoors you'll need at least a 4' x 12" x 12". He could be moved to a pond but beware - he'll eat small fish, and may damage others.

Quick tip

Most of us know that we shouldn't site an air pump lower than the water level if possible. But it isn't as easy to organise. You can fit a non-return valve in the airline. But cheaper and easier is to loop the air line so that part of it lies lower than the pump. Then water can't possibly back-siphon.

shkeeper

Quick tip
 Starve your fish! Every feeding regime should include one or more days of not feeding per week. This will help to prevent any problems with overloaded filters and will encourage your fish to eat algae and to turnover and clean the substrate.



TROPICAL TEASERS

Can you identify the four pictures in this month's contest?
 Two are alive; two are pieces of equipment - and that's all the help you're getting.

We've got a tasty little prize for the first five correct entries opened on February 28. Sponsors REEF AQUATICS of Lambley, Nottinghamshire have not only sponsored our 'open-to-all' phone-in contest, but have also generously offered five Hexafun Hexagonal goldfish tanks complete with undergravel filter, air pump and other equipment. Apart from being an excellent homes for one or two goldfish, this type of tank often comes in handy for spawning or hospitalising other fish.
 In this contest you must be 17 or under to enter.

A B

C D

Name

Address

.....

.....

Age.....

Floyd

by fran



■ Rare in captivity

Please could you give me some information on the Zebra Shovelnose?
G. Priestley, Essex

Meredontotus has been captured alive and has been on sale in the USA (or at least displayed). Some imports said to be the Zebra Shovelnose are actually a close relative, *Brachyplatystoma juruensis*, which grows to over five feet.

It lives in fast flowing waters which are slightly acidic and extremely soft. It feeds on fish, crustaceans and anything it can grab on the move. The one captured came from the Rio Madiera in Brazil and measured 22". DS

■ Catfish for African tank

I have decided to set up my 30" tank as an African community. Please could you advise me on which catfish would go with Congo Lumpheads and a pair of Kribbs?
William Davies, Oxford

Mochokiella paynei is a non-predatory catfish which would be ideal for your set-up.

This little catfish is closely related to *Synodontis* but differs in certain characteristics - the easiest for the fishkeeper to see are the many branched maxillary and mandibular barbels.

They grow to about 4" in total length and thrive in various water conditions and on a wide range of foods, although they particularly enjoy shredded shrimp. DS

■ Keep the water bright

Where can I get river sand? Also, could you tell me which type of catfish I can keep with Tilapia in my 60 gallon aquarium?
Mick Inman, Lancs.

Honey sand is a washed river sand which should not be confused with coral or silver sand. This is not widely available so perhaps you could collect your own from a clear stream. Only a light scattering is advised as stagnation can occur in deep beds without undergravel filtration which is choked by sand.

An ideal companion catfish for your cichlids would be *Synodontis eupterus*, the Featherfin catfish. It thrives on chopped prawns, earthworms, bloodworm, Gamma shrimp and flake.

They enjoy good water changes, keeping the water 'bright', so do not be afraid to undertake large changes. DS



Cherry Barbs can be difficult, as they are timid and tend to be loners.

Avoid in-breeding

Q I have a three foot community tank which includes some Cherry and Checker Barbs, which I would like to breed. I have a spare tank. How do I go about it?
• David Kimpton, Chester

A The Cherry Barb, *Barbus titteya* is not an easy breeder. The fish are timid and loners so finding a pair can be difficult. Look for the fuller-bodied

males, especially if they are bright red, indicating spawning behaviour. Place him in a breeding tank with the largest female available. Remember to choose from different families or you will get poor genetics. The tank should be well-planted at 79°F with medium soft water and a slightly acid pH. Remove them after spawning.

The eggs are attached to plants via a thread and hatch after 24 hours. Feed the fry on infusoria and

freshly hatched brine shrimp.

The Checker Barb, *Barbus oligolepis*, also called the Island Barb, is easier to sex: the males are larger and have much deeper colours than the female. Unlike Cherry Barbs they are best in shoals...the males display but rarely fight.

Follow the same procedure as for the Cherry Barb. The eggs hatch in 36-48 hours and some green food, such as algae, is beneficial. DS

A bit of a shock

Q At present I have an Electric Catfish which is about 8" long. It has settled in well with a couple of Plecs, a shark and a 6" Shovelnose. The tank is 48" long.

Can I keep another Electric Cat with the one I've already got?
• K. Breeze, Cornwall

A The African Electric Catfish, *Malapterus electricus* is the subject of a great amount of documentation relating to the electric organ discharge (EOD) and how the electric organs, which lie along the sides of the body length, make up electro-plates. The head is



An adult Electric Catfish is capable of dishing out a shock of up to 350 volts.

negative, the tail positive. They are capable, in adult sizes of over two feet, of sending out a massive 350 volts.

They use this shocking piece of

equipment to defend themselves and stun their prey.

I presume they can live together, although your aquarium sounds a little over-stocked. DS

Disease is infectious

Q In a mixed *Corydoras* tank, containing several species, a female *C. aeneus* has been developing what can only be described as an embolism on the last ray of her dorsal fin. This seems to occur either prior to or just after spawning. It doesn't seem to affect the fish in any way.

Now another *C. aeneus* has developed a similar embolism.

Please could you shed some light on this problem?

• J. Ward, N. Yorks.

A I have seen this disease many times but never had it formerly identified. The signs suggest that overcrowding during export or in aquaria, low temperatures or a bacterial infection triggers it off.

I believe it is infectious, so you are best to treat the whole tank with fin rot treatment. Use a gravel siphon set to draw out sediment from the substrate.

Expect a slow response to treatment.

DS

Loaches may school together

Q Could you please tell me whether my Skunk Loach would be compatible with my five young Clown Loach?

I have a mixed tank which is 78" in length.

• A. Lawrence, Norfolk

A The Skunk

Loach *Botia horae* or *sidthimunki* is

also known as the Dwarf Loach. It is a peaceful but lively fish which should be kept in shoals. However, I think the fish will school with the Clown Loach, because these fish will tolerate other species. It is better to get a trio or more if



Botia sidthimunki is a shoaling species and should be kept in groups of three or more. They may, however, school with other members of the *Botia* family, such as Clown Loach.

available.

It accepts all foods and tolerates most water types so there are no problems with this species. It prefers a loamy or even sandy base rather than gravel. There are no reports of aquarium breeding. DF

■ Use zeolite

Please could you tell me whether activated carbon will remove nitrite? I presume it will not, as in the December article, it states that it will not remove nitrates and ammonia, and nitrite is also water-soluble.

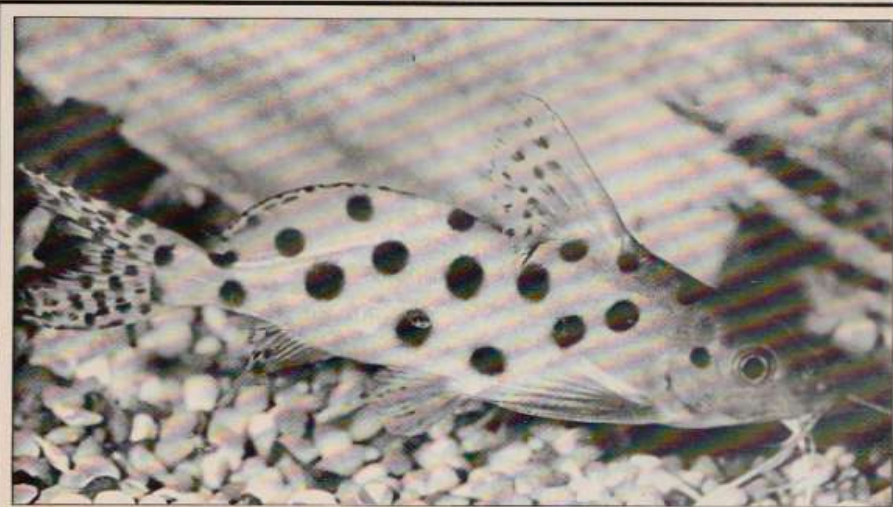
If it will not remove these substances, how are fish protected from poisoning in tanks where activated carbon is the sole source of filtration - such as temporary tanks?

What compound should be used to remove ammonia and nitrites in tanks where there is no biological filtration?

P. Brokenshire, Kingston upon Thames

Carbon will not remove nitrites, as you have correctly surmised. Instead, use zeolite in temporary tanks, as it absorbs ammonia, which as I'm sure you know forms the first part of the biological filtration process. In tanks where carbon is used exclusively, bacteria will still form on the surface of the carbon and biological filtration will take place, but of course, as carbon needs changing regularly, you would lose your entire bacteria population at one fell swoop.

While carbon cannot be recharged by the amateur, zeolite can be recharged in salt water. I'd always use vast amounts of filter wool or similar to mechanically (and biologically) filter the water before it gets to the zeolite or charcoal.



Synodontis ocellifer, like other *Synodontis*ids, is semi-nocturnal, preferring a cave to hide in.

Keep with larger fish

Q I have just bought a *Synodontis ocellifer*. Please could you tell me if I should provide caves for shelter? What should I feed it on?

• J. Smith, Hants.

A *Synodontis ocellifer*; in common with 95% of the known catfish are crepuscular or semi-nocturnal and they will take charge of the first cave or shelter that they can find.

Feed flake, prawns, frozen

Gamma shrimp and peas in a half light (room light) and you will encourage the catfish to wander out from his place of safety.

A well-fed *Synodontis* is an excellent community catfish among larger fish.

■ **May become aggressive**

I have a young Green Puffer *Tetraodon Fluviatilis*, which I keep in an 18" tank, in brackish water. Please could you give me some information on this fish, which is 1" long at the moment?
K. Martland, Merseyside

The Green Puffer is a brackish water species. It grows to about 6" and will eat snails, earthworms, meal grubs, beef heart and liver.

For crushing shells it has a strong beak, or tooth plate.

You can keep them with Mollys or Scats and any other hardy brackish species (although steer clear of Bumblebee Gobies and Glassfish). Green Puffers do become aggressive as they get bigger and you may have to separate them from other fish if they are at risk.

They breed in large tanks in the same manner as cichlids.

■ **Synchronised heating**

I have a 60" x 12" x 18" aquarium and I purchased two 200W heater/stats, as the room gets very cold at night.

I positioned one heater/stat at either end of the tank and set them both to 78°F, but only one comes on and stays on, while the other doesn't come on at all. How do I get them to come on together?
J. Finch, Dundee

The problem with two separate heater-thermostats is that one will always operate before the other because it is high impossible to adjust both to be identical where thermostatic switching is from bimetal strips.

Only a microchip circuit will be identical - like the Aquarian electronic heater/stat or the Rocon Digi-Stat.

The ideal control is one external thermostat controlling two internal heaters.

However, with modern power filters the water flow through even a five foot tank is so efficient that one high wattage heater/stat will maintain the aquarium at the set temperature.

If the room gets very cold, it is advisable to encase the back and sides of the tank with polystyrene tiles.

Another tip for good heating is where an open external filter is used, you can add the heater/stat to the filter. Turned up high this gives a warm (30°C) filter which is ideal for the nitrifying bacteria, and a cooler (24°C) aquarium. **DF**



Sturisoma spawn on vertical surfaces, such as the aquarium glass. Males are parental.

Wonderful community fish...

Q I recently purchased a *Sturisoma* catfish which is about 4" long. It is in my community tank. Please could you give me some information on this fish?
• L. Dart, Wilts.

A *Sturisoma* comes from Columbia and is often given the common name of the Giant Whiptail.

They are wonderful community catfish and the males are parental. Spawning takes place on vertical

surfaces, such as the aquarium glass. Males can be differentiated from females in breeding condition because they develop cheek bristles.

Feed them on frozen peas and shrimp with a little blanched lettuce thrown in from time to time. **DS**

Mouthbrooding Gouramis

Q Please could you give me some information on the Chocolate Gourami and how I can breed them?
• J. Smith

A The Chocolate Gourami, *Sphaerichthys osphromenoides*, is a peaceful, indeed timid fish from Malaya and Borneo. They are best kept in pairs. The male has a yellow border to the anal and caudal fins.

To breed, isolate the fish in a well-planted tank of soft, mature water made acid with peat. Feed them well on live foods, such as Brine shrimp and cultured worms plus carnivore flake. They build a nest on the floor and lay a few eggs (20-40 at the most) which the female mouthbroods for two weeks.

Feed the fry freshly hatched brine shrimp and then microworms before weaning them onto flake.

It is best to have a low water level so there is plenty of moist warm air over the surface, especially at about week four, when the fry fill their labyrinth organs. **DF**



The hatching rate of *Corydoras* eggs depends on the fertility of the male and the water conditions during spawning.

Infection due to dirty gravel

Q I am trying to breed *Corydoras*. My first attempt began when my Bronze catfish spawned in the community tank. I removed the eggs by rolling them on my fingers and placing them on the sides of a raising tank.

Only a very few of the eggs hatched. I suspect the damage was done when I removed them.

I fed the fry on powdered flake until they were half an inch long. Then I moved them to a larger tank with undergravel filtration.

After a few days, all the fry got white mouths which extended all around the head. Over the next

couple of days they all died.

Please could you tell me what this disease was?
• R. Watson, Cumbria

A The hatching rate on *Corydoras* eggs can depend greatly on the fertility of the males during spawning as well as the conditions. I use a sponge filter in my *Corydoras* fry tanks and I let them stay in these until they are a quarter of an inch or so, before releasing them back with the adults where they come on faster.

The infection you describe is bacterial and is picked up from unclean gravel and can be treated with a proprietary fin rot treatment. To clean the fry tank, stir it up vigorously and then syphon off the debris as it floats. **DS**



Planaria may be unwittingly introduced to your tank via live foods. Unlike many of the dangerous parasites which can be introduced in this way, these worms are harmless and will be devoured by Gouramis.

Lucky...this time

Q Recently I've been experimenting with various live foods, including tubifex, bloodworm and whiteworm. I've had no problems with tubifex and bloodworm, but the substrate in both of my tanks appear to be infested with small white threadworms. Have I introduced something to the tank?
• D. MacKeddie, Perth.

A The creatures you describe are *Planaria*. These are unsegmented worms of the family *Acicelomata* which includes *Trematodes* and *Cestodes*. The latter two groups are all, without exception, parasitic. The mainly non-parasitic worms are *Turbellaria* and the one found in aquaria is *Planaria*. They lay eggs which can get into the aquarium in water or on plants, but especially with live aquatic foods.

If it is possible to add them, Gouramis will eat these worms. Guppies will take them too. However the worms will outbreed their predators, so keeping the aquarium clean is the best method of removal. Scrape any off the glass and Hoover them out with lots of partial water changes. A Diatom filter is very useful for polishing the water and removing free swimmers. Cut back on feeding and scrupulously remove any surplus.

The worms are harmless and will fade away eventually. But live aquatic foods are not worth the risk ... the worms could have been parasitic ones. **DF**

Fluke epidemic

Q I have a rare strain of fluke in my aquarium and I have tried almost every cure on the market without any success.

They have reached epidemic proportions with fish dying every day. Please could you give me some information on how to eradicate this parasite?
• A. McConnell, Plymouth

A I think your problem is the treatment, not the disease. Flukes are parasites and it is in any parasite's interest to keep the carrier alive.

Most aquarium fish carry some

parasites all their lives - all wild fish carry them.

If you overdose (and mixing different remedies is as bad as overdosing) the fish develop extra mucus to protect them from the chemicals in the water. This layer also protects the body and gill flukes so the chemical does not do its work anyway.

I recommend lots of partial water changes to keep the aquarium sweet and clean. Add no chemicals for several weeks, but feed the fish on high protein foods. Then hit the parasites with any of the remedies sold for ectoparasites, at exactly the manufacturer's recommended dose. **DF**

Old age may be to blame

Q I have been keeping fish for six years. My main fascination has always been cichlids.

At the moment I am trying to breed *Kribensis* in an 18" tank where the four year old male was introduced to a female for the first time. They paired up and displayed breeding colours.

Unfortunately the female died, but the male still displayed breeding colours. A couple of months ago I introduced another female which was killed by the male two days later.

I now have a third female in the tank with him, along with a couple of dither fish. But the male has gone a smudgy grey colour and he seems to be afraid of the female, although there is no physical contact. Please could you give me some advice?
• Joseph Smith, London

A First of all, your tank is really too small for a pair of *Kribis* - 24" would be better. Secondly, you have a rather old male who has never seen a female before and it is hardly surprising that in such a small tank, this has led to trouble.

It now sounds as if the male is out of sorts - this may well be old age, or it could be a sign of poor water quality.

I would start again with the pair in a larger tank and replace the male if the problems continue. You should certainly not add a young male to the existing set-up as there is no room for the loser to escape. If you want to try a young male you should accommodate the older one elsewhere. **MB**



Placing two *Kribis* together in a tank does not mean they will breed. The tank must be large enough - at least two feet in length - and the pair must be compatible and happy.

TROPICAL ANSWERS is our FREE reader service designed to help YOU get more from your hobby

- Answering general queries are **DR DAVID FORD**, Senior Consultant to the 'Aquarian' Advisory Service, and **NICK FLETCHER**.
- Plant problems are the realm of **BERTI GESTING** of Aquatic World.
- Cichlid fans deal with **MARY BAILEY**, treasurer to the British Cichlid Association.
- Discus queries go to **STEVE DUDLEY** of Euro-Discus.
- **DAVE SANDS**, consultant to 'Aquarian', is our catfish expert.
- For all your "Oddball" queries, you can now write to **PAUL DONOVAN**.

Just tick the appropriate box below and attach the coupon to the front of your letter. Send with SAE to: Tropical Answers, Practical Fishkeeping, Bretton Court, Bretton, Peterborough, PE3 8DZ.

We regret that letters sent without an SAE will not receive a reply.

TROPICAL ANSWERS

- General queries
- Plants; Berti Gesting
- Catfish; David Sands
- Cichlids; Mary Bailey
- Discus; Steve Dudley
- Oddballs; Paul Donovan

CLEAN MASCOT

We all want our tanks to look their best, and for this to be the case, it's necessary to keep them clean, inside and out. Here's our buyers guide to the tools for the job.

But cleanliness is more than just cosmetic - there's a health angle too. A filthy substrate will clog and prove useless for undergravel filtration; when it's not part of your filter it may harbour disease causing bacteria.

Eventually a build-up of mulm can turn the substrate anaerobic, causing foul smells and fish deaths. Most gravel cleaners can be used as part of your fortnightly water changes, syphoning off the mulm.

Some other air or battery powered systems recycle the water, collecting particles in a muslin bag, and can therefore be used more often for messy fish or more regular cleaning of sensitive fish or fry.

A mouthful of tank water is most unlikely to do you any harm, but it's always a treat for inveterate suckers to use a self-starting or bulb syphon system.

Algae rarely causes health problems and often has more benefits than drawbacks, but it is unsightly. Algae scrapers and regular syphoning will limit the problem. If algae thrives in your tank look carefully at your nitrate levels and your lighting.

Algae can clog some items of equipment - many of these come with a brush suitable for removal. A clean toothbrush is equally good.

The planting forks on the end of algae scrapers also come in handy for turning over the substrate (and incidentally for easing airline from air pump pipes and the like). ■

Are you a sucker or a pumper? Does your algae scrape a living? We look at the gear to keep your mulm at bay.

Water changers



ROLF C. HAGEN ▶
Product: Syphon Starter Bulb
Price: £2.99
 Squeeze bulb to start syphon.

◀ **ALGARDE**
Product: Syphon set
Price: £5.67
 Consists of a bulb and syphon tubing.



▶ **INTERPET**
Product: Meridian Water Changer
Price: £25.95
 For use on any size tank.



◀ **Product:** Multi-Purpose Cleaner
Price: £1.91
 Self-starting syphon

CHINES

INTERPET ◀

Product: Interpet Algae Magnet Price: £4.30
Product: Interpet Double Algae Magnet Price: £7.48
 Consists of two very strong velcro-covered magnets. May scratch plastic.

Algae magnets and cleaners

ROLF C. HAGEN ▼

Product: Algae Magnet Cleaner, 1.3/4" or 4"
Price: £4.49 and £7.99
 Features a heavy duty permanent bond pad.

INTERPET ▲

Product: Aquarium Scraper
Price: £1.98
 Consists of a non-scratch algae scraper at one end and a planting fork at the other. Consists of two very strong velcro-covered magnets. May scratch plastic.

ALGARDE ◀

Product: "Flipper" Planter and Cleaner
Price: £2.40

Features a swivelling algae scraper with a choice of two cleaning surfaces at one end and a planter at the other.

Gravel cleaners



ROLF C. HAGEN ▲

Product: Aquarium Gravel Cleaner, mini or large size
Price: Mini £4.99; Large £6.49
 Mini size is suitable for tanks up to 15 gallons.

INTERPET ▲

Product: Python No-Spill Clean and Fill
Price: £26.44
 Cleans the gravel while syphoning out water during water changes. The tank can also be refilled using the same product.

ALGARDE ▼

Product: Aquarium Power Cleaner
Price: £4.43
 Attaches to an airpump. The bag is removable for easy cleaning.



◀ Gravel cleaners

INTERPET ▶

Product: Gravel Cleaner

Price: £5.92

Cleans the gravel using a syphon action during partial water changes.



ROLF C. HAGEN ▲ ▼

Product: Multi-Vac Battery Operated Aquarium Cleaner

Price: £16.49 Replacement bags £1.29

Adjustable depth (from 9-16"). Also removes algae.



TETRA ▼

Product: Tetra HydroClean, Junior and Standard

Price: Junior £6.28; Standard £8.12

The HydroClean has recently been re-designed and now features a self starting action. Use the 'Junior' for tanks under 15 gallons and the 'Standard' version for larger tanks.



Contact Addresses

Rolf C. Hagen Ltd.,
California Drive, Whitwood
Industrial Estate, Castleford,
WF10 5QH 0977 556622

Interpet Ltd.,
Vincent Lane, Dorking, Surrey
RH4 3YX 0306 881033

Algarde,
Enterprise House, Wharf Road
Industrial Estate, Pinxton,
Nottinghamshire. 0773 581481

Tetra,
Lambert Court, Chestnut Avenue,
Eastleigh, Hants 0703 620500.

▶ INTERPET

Product: Airstream Air-Operated
Vacuum Cleaner

Price: £1.98

For tanks up to 20" deep. Connect to an
air pump.

THE TOP TEN Fry Mortality Syndrome FACTORS

- 1. OVERFEEDING**
leading to water pollution
- 2. UNDERFEEDING**
starvation/under-development malformation
- 3. POOR DIET**
under-development of organs
- 4. FAILURE OF VITAL ORGANS**
fry unable to live
- 5. INCORRECT WATER DEPTH**
water pressure on fry
- 6. OVERCROWDING**
increases chances of infection and water pollution
- 7. INCORRECT WATER QUALITY**
pH variations stress developing fry
- 8. INCORRECT WATER TEMPERATURE**
too low slows metabolism; too high reduces oxygen levels
- 9. POOR FILTRATION**
high bacterial levels; water pollution
- 10. GENETIC WEAKNESS/ INBREEDING**
deformed fry

N.B. Plus many other factors or suspected factors like excess salt in brine shrimp.



The eggs of *Corydoras barbatus*.



Young fish move to the shallows for warmth and food.

Don't let FRY DIE

Following his look at natural spawning last month, DAVE SANDS of the 'Aquarian' Advisory Service considers the factors that cause fry fatalities in the aquarium.

Why do young fish automatically seek out the sanctuary of the shallows? And why is this connected with tank behaviour that makes them an easy target for hungry adult fish?

The answer lies in the spawning patterns their parents adopt. If this pattern means that they lay the eggs in a place protected from the maximum number of predators, then abandon them, leaving the resultant fry unparented, the fry will naturally adopt certain forms of behaviour.

Instinctively they seek out the shallows where the water is warmer and richer in nutrients and micro-organisms. That this area is safe from the larger aquatic predators is unlikely to be coincidence.

But in aquaria, the fry of non-parental fish are most unlikely to have shallows to swim to. They

might well be safer in plants, under stones or in bogwood crevices. Instead they swim towards the light, and in community tanks, instantly become food for the other occupants.

Last month I detailed the different forms of parental and non-parental care that fish adopt. The example above is just one of the reasons why an understanding of the natural

background can greatly improve our efforts to breed fish in unnatural aquaria.

Removing the eggs prior to hatching - or the removal of the parent fish from the tank in which they have spawned - is one sure way of protecting eggs and fry. In addition, it's always advisable to spawn or raise fish in a smaller separate aquarium in which the water level can be varied as the fish develop.

Case study: pH, feeding and *Corydoras* fry

In 1980 I collected a batch of *Corydoras barbatus* fry in Brazil in a pH of 4.8 and zero hardness. I had no trouble raising these in a pH of 7.9 with a hardness up to 100ppm. I allowed the fry to grow to a few millimetres in a small 24" tank with water only a few inches deep, then at four weeks placed them in a 24" x 24" in water six to ten inches deep. The temperatures were raised from 77°F in the spawning tank to 81° in the raising tank. The fry were fed on powdered, then crumbled flake - and the losses were undetectable. (Some fish fry may require live foods; gouramis, Fighters, characins and barbs may require minute foods if losses are to be avoided.)

Fry Mortality Syndrome

So, you have successfully hatched the eggs, and the fry are free from predators in a properly-controlled environment. What are the threats, now?

The vulnerable time for most fry seems to be between the six and eight week stage. Many fishkeepers (including myself) have seen sudden wholesale losses during this period - despite all seeming to be well.

I have several theories relating to this problem, which I've christened fry mortality syndrome (FMS). (See panel on opposite page.)

If fry losses are very great, it is likely that one or a combination of the FMS factors has come into play. It is always difficult to provide an exact diagnosis, because of the variables. For example, hollow-bellied juveniles may not have been provided with the correct diet; may not have had enough food; may have deformed organs; have been afflicted by a bacterial infection; or affected by poor filtration and/or water quality...

The best way to avoid these problems, therefore, is not to have them in the first place.

Tips on the fry aquarium

- Fill the tank in advance with fresh water, then condition it, and allow it to mature over a few days.
- Mature your sponge filter on the main aquarium for several weeks, and don't clean it before transferring it. This will ensure that it's bacterially loaded and mature before it is introduced.
- Unless the pH and hardness levels are extreme in tapwater, they should not be adjusted. Some buffers "wear off" with dramatic effects; and a pH of 7.7 will support more dissolved oxygen than one of 6.9.

Feeding

Many breeders will disagree with me when I suggest that a good flake food DOES offer balanced nutrition for fry. Providing the food is fresh, the vitamins, proteins and roughage can be relied on. Additional foods including vegetable matter, white worm and brine

shrimp should be regarded as treats.

In Nature most juvenile fish are grazing continually. It's almost impossible to replicate these circumstances in the aquarium without over-feeding and polluting the water.

Live foods will pollute less - while they remain alive.

Water

If fry have to surface for the first intake of air (as with some catfish, and all anabantoids) water depth is critical. Because of the 'box' aspect of aquaria,

will rot and encourage bacteria that will attack the fry, causing huge losses

Filters

Sponge filters are my choice ahead of box, or internal power filters, because fry cannot be drawn into them. Food sucked onto a filter sponge can still be grazed by the fry.

Could an external filter be used? Possibly - but the intake would have to be well plugged with filter floss.

Good filtration is essential, for good water quality

Case study: Raising and feeding young *Corydoras adolfoi*

Small brood tanks need the right equipment. I am currently raising *Corydoras adolfoi* fry in small 12" x 8" x 8" tanks with a sponge filter and the conveniently small new 'Aquarian' heaterstat.

Many experienced fish breeders use infusoria, microworm and young brine shrimp - and have good results.

In these tanks I'm working differently, succeeding with powdered fry food, allowing snails to break down fresh grass into waste - which sets off an automatic 'infusoria' production line.

Small snails are great at converting any excess food - and as soon as they become too big I crush them and they become food for the growing fry.



Dave is currently breeding *C. adolfoi* (right).

and the need for a bare bottom tank for easy cleaning, it is not easy to offer fry this variety of depths.

The best compromise is to offer warm shallow water close to the conditions they prefer in nature.

Regular water changes can reduce pollution from over-feeding but ensure that it is aerated and stored to disperse chlorine. Regular water changes must be made to remove (by syphoning) the excess food that

combined with a gentle water surface flow which is the essence of life for young fish whatever the species.

Knowing when to thin out, or increase the size of the growing on tank is a matter of judgement. The more space the fry have the better they will grow (though you must still make regular water changes and food will be more difficult for the fry to locate in a larger tank).

Parental fish

Most cichlids, gobies and some catfish generally attend to their eggs until they hatch - and some species go on to protect fry until the youngsters can forage for themselves. Once fry begin to wander far from the hatching site, most parents consider them capable of surviving, and often move on to hatch another brood.

If such parental fish consume eggs or fry, it is usually a sign that something is not right.

Perhaps the pair are immature or badly matched. Sometimes semi-adult fish have to practice at being parents until they get it right. Taking eggs or fry away from non-parental fish can be non-productive, as it does not stimulate and sharpen up these basic instincts. If the parents make mistakes only practice will make perfect.

That said, commercial breeders almost always remove eggs and fry from parental fish because they cannot afford to risk slow development or heavy losses. Fishkeepers by contrast can afford to be patient. ■

Five final points

To minimise the likelihood of fry mortality, follow these five basic points

- Good water quality
- Good conditions (temperature, water depth, etc.)
- Good food
- Good breeding stock
- Good nursery space

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It's the same, they tell us, for those who live near the great cathedrals or other tourist spots - they rarely visit them. Just because the Water Zoo in Peterborough's Lincoln Road is our local shop, there really was no valid reason for not including them as a Shopcall - especially after owner Roy Scott had completely refurbished the store. With the work almost complete, we decided it was time to pay an "official" visit.

The Water Zoo is now firmly on the modern path of getting everything on display, with a large dry goods area entirely separate from the extensive fish sections. Roy designed the displays himself and had them built to his designs. By creating extra space he has been able to assemble little display areas which draw attention to some of the high-tech and often lesser-known bits of kit. Everything is laid out for viewing, though sadly shop lifting problems mean that not everything can be examined without the help of a member of staff. A good and wide-ranging selection of equipment includes frozen and live food, spares, books, and specialist kit like Dennerle and Tunze.

It's nice to see the massive display unit here housing 27" Frank, the Red Tail Cat in enough space to let him swim freely. We know Frank of old - and it's lovely to see his size increase in the extra space of the 10'6" 770 gallon tank.

The shop then opens up like Dr Who's police box. A lengthy



Roy Clarke behind the counter in the main fishroom.

RIGHT ON THE DOORSTEP

We pop down to our local trop shop.

corridor culminates in a display that will soon upstage even Frank, a massive marine tank, 15' x 3'6" x 4' set to contain some 1250 gallons; even the built-in filter holds 240 gallons.

If this represents a fantasy for most fishkeepers, a quick return to reality can be found in the solid ranks of tanks in the large fish rooms. There's always a few curiosities here among the cichlids and cats; and a few other exotic species; but they're solidly backed by a regularly changing cast of bread and butter fish, enough variety for any community tank specialist.

PFK staff members tend to haunt the eight or so brackish tanks

that feed their special interest with a remarkable variety of species; beside them there is an excellent range of Mbuna and other hardwater cichlids; to the other side, tanks of nice Discus.

Local marine hobbyists rate their extensive marine section highly, and it compares well with any we've seen on our travels.

A small but interesting coldwater section is worth a visit; as will be an expanding outdoor section come the spring.

It's the cleanliness of this area that always impresses on our regular visits, even including the large plant display.

All these tanks turn over an estimated 1.6 million gallons a day through the huge filtration system. The shop as a whole now covers 4,000 square feet.

Five full-time staff provide what Roy thinks of as continuity; that is, they're likely to be around during the week and when you come back again with a problem; and remember you. This is more than useful in regard to, for instance, the shop's clearly-stated and very fair fish returns policy.

Jason Scott is a partner in the shop; time-served expertise is provided by Brian Tate, a Killifish nut, and the hugely experienced Roy Clark. Andrew Ede and Ian Carr are younger staff members who inspire confidence. And just for the record, Water Zoo staff are as smart and tidy as their shop!

The Water Zoo is open 10.30am to 6pm Monday to Thursday; Friday 10.30am to 7pm; Saturday 9am to 6pm; Sundays and Bank Holidays 10.30am to 5pm

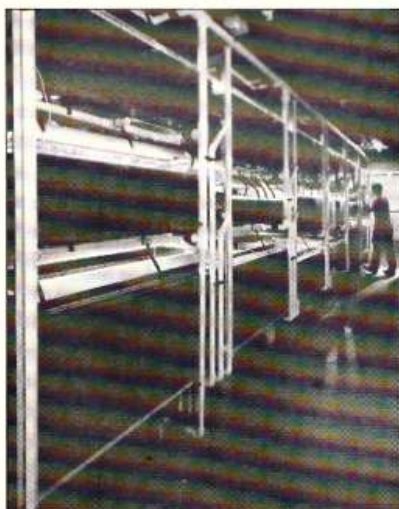
•Water Zoo, Peterborough Aquatic Centre, 439 Lincoln Road, Millfield, Peterborough. Tel: 0733 312142.

Best things about the Water Zoo:

Loads of fish choice with the reputation for healthy fish; good staff; superb layout.

Worst things about the Water Zoo:

Awkward parking; can be difficult to find first time; very popular and often busy(!)



The plumbing designed by Roy to service the tanks.



Name: Nick Dakin
Home town: Camberley Surrey
Occupation: Independent aquatic consultant
Hobbies (apart from fishkeeping)? Photography, music (playing), reading, horses, and many more...
Years of fishkeeping experience? 30 years
Favourite type of fishkeeping? Marines
Best book on fishkeeping? Any by Stephen Spotte (Apart from the one I'm currently writing)

FACTFILE

Our monthly question and answer session with a well-known fishkeeper

Favourite species? Basslets and clownfish
Least favourite species and why? Stonefish - they're ugly and dangerous.
How many tanks do you own? 14 at the last count
What was the first tank/fish you ever had? When I was four I kept a Three Spined Stickleback in an old tin watering can. Unfortunately it tried to escape up the spout and got stuck. I was very upset.
What was the first fish you ever bred? *Aulonocara nyassae* the Peacock cichlid from from lake Malawi, many years ago. Before that sticklebacks.
Worst mistake in fishkeeping? Putting a shoal of peaceful, soft-water-loving Neon Tetras in with a group of aggressive, hard alkaline water-loving Malawi cichlids. The cichlids ate all of them within two minutes and before I could get them out. Can't think what made me do it.

What's the most you've ever paid for a fish? £50 for a Flame angel (that's the only one I'll admit to, anyway)
What do you think is the most important current issue in fishkeeping? That all fishkeepers should be encouraged to become caring responsible and knowledgeable - which will demonstrate that we do not need enforced regulations from the faceless Eurocrats of the EEC.
Biggest fishkeeping gripe: Many fishkeepers are deliberately misled by rogue dealers and the odd manufacturer, purely for financial gain.
Are there any fish you wouldn't keep - and why? Some species of Butterflyfish as they don't survive in captivity for long.
Which fishkeeper do you most admire - and why? Terry Evans - he is exceptionally knowledgeable and has invested vast amounts of time

and money of his own in improving fishkeeping techniques and hardware.
Favourite fishkeeping myth? That you can set up an aquarium on Saturday, and finally stock it on the Sunday - see previous answers regarding current issues and gripes.
Biggest fishkeeping ambition? To own an enormous marine showtank (at least 1,000 gallons) fully equipped and stocked - and pay someone else to do all the maintenance.
If you were reborn as a fish, which fish would you be? A Flame Angel - inquisitive, intelligent, always on the go, and of course extremely good looking.
How would you like to be remembered in fishkeeping? (Apart from that he lived a long time) - that I helped fishkeepers in a positive and practical way to achieve their aspirations without having to endure initial disappointment.

■ Next month: Dr DAVID FORD

New Water Lily society

A British Branch of the International Water Lily Society has recently been formed, with about 75 members throughout the country. For details of membership contact: Harry Hooper, Mill Lane Nursery and Water Gardens, Mill Lane, Bradfield, Manningtree, Essex, CO11 2QP.

Experts at exhibition

'Aquarian' and Underworld products have lined up an impressive list of fishkeeping experts to guest on their joint stand in conjunction with Kingfisheries Ltd. of Beckenham at this year's Ideal Home Exhibition at Earl's Court. Each weekend will feature at least one special guest:
March 14-15 David Sands, consultant to 'Aquarian' and renowned catfish authority.
March 21-22 Dave Keeley, marine expert.
March 28 Dick Mills, author of many fishkeeping books.
March 29 Adrian Dempsey, FBAS speaker.
April 4-5 Dr. David Ford, of the 'Aquarian' Advisory Service. The stand - No.1004 - will feature five fully stocked display aquariums.
The show is open from Thursday 12 March until Sunday 5 April from 10am-8pm, with late night opening until 10pm on Thursdays.

ws...Fish in the news...Fish in

● According to the *Sun*, fishkeeper Bob Roberts from Northfields, Birmingham had his life saved by his fish tank. A rough translation of the story (which talks about **three** gallons of water in a three foot tank and **Japanese Fighting Fish**) suggests that Bob dozed off with a lighted cigarette smouldering in a waste paper basket beneath his fish tank. The basket ignited and the fish tank split with the heat, dousing the fire.
 Bob apparently lost nearly 100 guppies in the incident.

● Another *Sun* spot talks about Lanarkshire magician Stevie Starr who swallows live goldfish - then spits them out still alive. Apparently he scandalised German viewers - and the press - with his act.
Stevie's reaction? He commented "I've used the same fish for years and none has suffered. I had to retire a couple after five years because they got too big to swallow."
 (Don't write to us please, write to the *Sun*...Ed.)

● More reputable reports in *BBC Wildlife* have shown that Convict Cichlids in the wild use foster parents to bring up their broods - and in many cases the foster parents are delighted.
 Efficient parental care in their Costa Rica stream homes really needs two parents. Fish that lose a partner through illness, predation, or desertion often lead their shoal of fry in among another, despite being harassed by the parents, then rapidly retreat leaving the two shoals inextricably mixed.
 The fry must be smaller or similar size to the original shoal to be accepted. Larger fry are eaten or driven away. The fact is apparently, that during attacks by predators the smaller fry are the more heavily predated. The adoptive smaller slower-moving fry gave a new twist to the idea of strength in numbers, as they were depleted first.

● Have you got a story for *Fish in the News*? Send us your clippings, stating clearly where they come from and the date. We'll pay £3 for every one printed.

DIARY DATES

THURSDAY 13 FEBRUARY
 ■ Tetra's "Talking Fish" seminar goes to Nottingham University. The topic is **Tropical Fishkeeping**. The seminar includes a film and slide presentation. Tickets cost £3. Apply in advance to Tetra, Lambert Court, Chestnut Avenue, Eastleigh, Hants SO5 3ZQ.

SUNDAY 16 FEBRUARY
 ■ The BKKS Scottish Section is holding a meeting in Tillylickey near Stirling. Non-members welcome. Contact Archie Dick on 0786 832073 for further details.

SUNDAY 23 FEBRUARY
 ■ The Catfish Association of Great Britain Northern Area Group are holding an auction at the Boys Brigade HQ, Bryn Road, Bryn, Nr. Wigan, starting at 2pm. Booking in from 1-2pm. Contact R. Thompson on 0942 224059.

SUNDAY 8 MARCH
 ■ Birtley Aquarist Society are holding their 9th Open Show at Birtley Community Centre, Ravensworth Road, Birtley. For further information contact R. Flinn, 29 Birch Terrace, Birtley Co. Durham, DH3 1JL. Tel. 4106403.

SUNDAY 15 MARCH
 ■ Rothwell and Wakefield A. S. are holding an open show at a new venue, St Mary's Catholic School, Royds Lane, Rothwell, which is 100 yards from Blackburn Hall. More details from Kevin Swinson 0977 511464.

Practical Fishkeeping/February 1992



The answer to algae?

I was interested to see Mary Bailey reply to one of our correspondents on the Tropical Answers pages about dealing with the problem of blue/green slime algae. Her verdict was that it was impossible to get rid of.

Recently, (and here I'm continuing along-running saga well-known to those hardened enough to regularly read this column) I changed the media in the external filter of our long-suffering tropical community tank. This lives in the reception area at our Bretton Court base, and houses waifs and strays along with some half-decent fish. I removed the charged-up charcoal and added a specialist ceramic media coated for bacterial growth (or so it claimed - probably truthfully as events transpired).

Now cast your minds back to Steve Dudley's fascinating article on carbon (PFK December '91) in which he listed the things charcoal won't adsorb. (Yes that's adsorb - it refers to taking up chemicals onto its surface, not absorbing them).

Among these were phosphates, nitrates, nitrites, and ammonia. In other words, all the substances



that feed algae (and can damage fish.) With our tap water fairly safe, as far as we can discern, I decided to do without the charcoal, which would otherwise need regular and expensive changing.

Of course all these substances promote the growth of algae. Nitrates, one of the main feeders of algae, were likely to increase due to the increased bacterial action in the filter. That would deal with ammonia and nitrates, (though not of course phosphates which also feed algae).

Around the same time, whoever had been turning off the lights each night got a little careless, and the tank received an excess of light for several days.

Overnight, blue/green slime algae appeared in the tank. It rapidly formed massive sheets over the substrate, looking like someone had tipped a tin of paint into the tank. Goodness knows what it would have done to smother an air-powered

undergravel, stopping the smooth flow of water.

I stripped it out of the tank, and thoroughly syphoned the substrate, making a healthy water change. I turned over the gravel to cover any remaining patches from the light, and hoped I'd seen the last of it. It was back within days.

This time I let the problem grow to see what would happen. It simply got worse. So I evolved a battle plan. I removed one solid sheet of algae from the substrate, like lifting a carpet. I scrubbed the plastic plants with a scourer, and dosed the tank with a carefully-measured portion of algae killer. At the same time I used one of the new Interpret nitrate absorbing resin bags to remove any trace of nitrates. Finally I left the lights off for four or five days though the tank still received daylight and light from the reception area.

The result? Algae gone completely and still, as I write some months later, it hasn't returned. You can beat the slime algae.

Steve Windsor

Steve Windsor

Sea Life for a family day out

One company which has made a big splash in the leisure industry in recent years is Dorset-based Sea Life Centres.

The eight aquariums spread around the coast attracted more than 2 million visitors in 1991.

From the opening of the first Centre at Oban in 1979, the Company broke new ground in the design and layout of its Centres as well as in the advanced technology employed.

New glazing techniques facilitated multi-shaped displays providing a variety of viewing angles, and the use of moulded acrylic has enabled the Company to feature spectacular walk-through tunnels in its Centres at Blackpool, Hastings and Scarborough.

The Company has found that its visitors are both surprised and delighted by the diversity of creatures from around our own shores.

They do their bit for conservation, too, with a substantial quarantine unit at the Weymouth Centre, where distressed or injured sea creatures regain their health, and breeding programmes have been so successful that many species are routed back to the sea.

Regular talks, feeding displays and demonstrations within the Centres reinforce the commitment to enhancing public awareness of the marine environment.

There are now Sea Life Centres at Weymouth (0305 761070), Portsmouth (0705 734461), St Andrews (0334 74786), Hastings (0424 718776), Blackpool (0253 22445), Brighton (0723 376125) and Scarborough (0723 376125). A ninth Sea Life Centre will open in Rhyl in June this year (details on 0202 896289).

● Don't miss your chance to win a family day out at your local Sea Life Centre on pages 38 and 39.

New repair policy for Interdab pumps

Interdab Ltd. who manufacturer and supply DAB Nova water pumps, have announced the creation of a DAB Nova Service Centre.

The change of policy took place after research revealed some dissatisfied users. In the past warranty claims have been referred back to the shop that sold the pump. This has caused problems as the pump then took a long trip back to Interdab, and by the time any action was taken the owner was quite rightly irate and blamed Interdab.

Occasionally the retailer would exchange the pump for a new one. This did not fit in with Interdab's policy of repairing or replacing pumps. Nor did the new unit carry a further 12 months warranty.

Interdab's warranty is only effective from the date of the original purchase, not from any subsequent repair or replacement.

To remedy these problems, pumps may now be sent direct to: Interdab Ltd., DAB Nova Service Centre, The Maltings Industrial Estate, Southminster, Essex, CM0 7EQ.

Customers should pay their own carriage and include a bona fide receipt of purchase; and a Guarantee card (or tagged pump) only if the other portion of the card has been previously registered with Interdab.

If you are not sure the card has been registered, please call DAB Nova Service with your serial number to check your

registration. Pumps will be repaired, registered with a new serial number and despatched within six working days from receipt.

On many occasions a pump not still under warranty can be repaired economically, and Interdab offer a competitively priced repair service.

For details of both services contact DAB Nova Service on 0621 773081.

● As an added inducement to return warranty cards, Interdab will list all registered warranty cards returned from March to September and draw a monthly winner, who will receive a new Nova 200 Submersible Pump. Look out for the winner's name each month in *Practical Fishkeeping*.

Next month...

Remember the Moonshadow Catfish, DAVE SANDS' new discovery? Dave goes to meet the man who named it in our 'Aquarian' contest, and present his trophy; and we look at some of the runners-up.

These young Arulius Barbs have only the beginnings of the distinctive spines in the dorsal that give them their common name.



Best of the **BARBS**

This month's gallery features the Asian barbs, fish with a vegetarian tendency, and a liking for burrowing; but otherwise nearly all ideal for the novice fishkeeper. **MAX GIBBS** of the Goldfish Bowl, Oxford, supplied the pictures.

Which barbs can you choose from the vast array available? Here's a random choice of five of the most interesting - and most popular - of these carp-like tropicals.

Arulius Barb *Barbus arulius*
Also known as the Long-finned Barb due to some extensions on the dorsal fin of mature male fish, this partly vegetarian barb grows to five inches. It comes from southern India, and is unfussy about water temperatures between 73 and 79°F.

Arulius Barbs like to dig in the substrate and will nibble at

TROPICAL INSTRUCTION ■

◀ foliage in planted tanks, making them most unsuitable where an underwater garden is required.

They also demand a fair sized tank, 36" being the minimum, with plenty of swimming space.

A good diet for Arulius will include flake, live food, and blanched spinach, lettuce or cucumber.

The black bars on the body intensify as the fish grows but are always less distinct than on the Tiger or Spanner Barbs.

Arulius Barbs are not prolific compared to other barbs; but you may still be left with a brood of 100 to raise...

hardy, as well as a similar shape and colour. It can reach 5", and prefers temperatures around 74°F. This is one barb that has no barbels.

Again, include a vegetable element in the diet, and feed a variety of food, or a colour enhancing flake to get the best colours from the fish.

Keep Rosy Barbs in shoals and ideally in dull light, with a soft substrate to burrow into.

While they too, are not fussy about tank water, they do prefer neutral to acid water for breeding.



Rosy Barbs are among the most popular tropical fish - hardy and easy to breed.

Rosy Barb *Barbus conchonioides*

The Rosy Barb from northern India, is sometimes described as the tropical goldfish, as it has many of the virtues of its coldwater counterpart being tank

particularly as the scourge of Guppy's tails, and Angel's fins. Some authorities suggest that if you keep these fish in a shoal their preoccupation with their own pecking order will dissuade

Tiger Barb *Barbus tetrazona tetrazona*

The Tiger Barb is also known as the Sumatran and, unsurprisingly comes from Borneo and Sumatra.

This fish is easily bred in slightly acid water, and our picture (below) shows the result of some selective breeding to produce a semi-translucent Coral Red colour.

The fish reach 2" plus; but this small size belies their famed aggressiveness,



them from bothering other fish. Keep Tiger Barbs at around 74°F.

This barb has no barbels and is distinguished by four stripes which are usually more intense than the four shown on our pictured fish, the body of a "standard" Tiger Barb being golden brown, with

bright red pelvic fins, and a black and red dorsal.

Tinfoil Barb *Barbus schwanefeldi*

This fish is the "great mistake" often perpetrated by novice fishkeepers. Not only does this



The Tiger Barb should always be kept in shoals. This is a specially bred coral red variety.



Left: The Tinfoil is one of the more troublesome barbs - it grows fast, eats plants, and can become predatory.

Below: The Cumings Barb can be difficult to breed.



fish have potential length of more than 14", it also grows rapidly.

As it grows, it not only outgrows the normal community, but becomes nicely predatory; to keep a balanced diet it also consumes large amounts of vegetation.

Our picture (top) shows a young fish, its body colour more vivid, but without the flashes of black and white on the dorsal and other fins that the adults have.

This fish comes from Thailand, and is often the

choice of fishkeepers looking for a tough companion for other large fish, as it is hardy, and lively, adding movement to the often dull tanks of slow moving large fish.

A good jumper, so the tank should have a firmly fitting lid.

Feed plenty of vegetable matter. The tank temperature should be around 72°F - but the fish is happy down to 68°F.

Cumings Barb *Barbus cumingi*
This is a smaller barb (up to 2") from Sri Lanka. It prefers

warmer tank conditions than many of the other Barbs, up to 81°F.

It lives in forested streams in the Sri Lankan mountains which may account for the difficulties sometimes encountered in breeding the species. While not fussy about water for general living conditions, it does prefer acid water for spawning (some authorities suggest collected rain water). The fry are small and need rotifers or infusoria as first food.

Adults need a vegetable element in their diet. ■

Breeding Barbs

Not all barbs are easily bred. The giant Tinfoil Barb *Barbus schwanenfeldi*, for instance, is not thought to have been bred in captivity. There's a challenge, perhaps, for someone with a ten foot tank....

Other barbs are easier. Tiger, Rosy, Ruby and Green Barbs are some of the easiest.

The recommended method is to separate males and females in a divided tank of at least two feet in length, and condition them on either side of the divider. Feed irradiated bloodworm and brine shrimp, whiteworm, and in some cases scalded lettuce or cucumber.

The tank decor should be sparse, including only spawning mops or bushy plants like *Myriophyllum* or *cambomba* in pots; a heater, and a sponge filter.

Although most barbs are tolerant of a wide range of tank conditions and temperatures, the ideal conditions for spawning will usually be at around 79-81° F, and softening the water, if necessary to around 6° dH and a pH below 7, plus the use of a little blackwater extract, may increase the willingness of the barbs to spawn.

The fish should be introduced and conditioned either side of the barrier.

Remove the barrier in the evening when the fish are conditioned; spawning should follow within three days, the males driving the females and the eggs being deposited in the plants or spawning mops.

The fish are often voracious egg eaters, so they should be removed, after spawning and males and females separated for a rest.

Raising the fry

The eggs usually hatch within two days, with the fry hanging immobile for the next few days. Four days after the spawning the fry will move towards the surface, when they should be fed newly-hatched brineshrimp and finely powdered fry food.

If you follow a good regime of tank hygiene you will have large numbers of young fish and regular culling will be required and/or moving the fry to larger and large tanks.

Which barbs to choose

Among the easier barbs to breed are the Tiger Barb, Rosy Barb, Ruby, Cherry and Green Barbs.

DEREK LAMBERT looks at a popular livebearer which is frequently left off the retailer's stock list.

Extinct species

A third species in this genus was *Characodon garmani*, Parra's Characodon, which is thought to have become extinct in the early 1900s due to a combination of development for agriculture plus domestic and industrial pollution.

Unfortunately, Red and Black Rainbow Goodeids are also in danger of becoming extinct in the wild.

The Black Rainbow has only been collected in the outflow of El Ojo de Agua de Las Mujeres at El Toboso, in the State of Durango, Mexico. This limited habitat is obviously very vulnerable and gives rise to this species being listed as a threatened fish by the American Fisheries Society.

The Red Rainbow has a much wider distribution, but has seriously declined in abundance and distribution over the last 30 years and is also listed as threatened.

In 1979 the American Fisheries Society listed 251 fish of Canada, America and Mexico which warranted protection because of their rarity. In the latest list published in 1989 the number had risen to 364 but many others may also need to be listed once more information has been gathered.

For this reason 'Aquarian' have agreed to sponsor an Endangered Species Survey in Mexico which will be taking place while you are reading this article.

Forgotten



A pair of *C. lateralis* - Red Rainbow Goodeids.

The Rainbow Goodeids are a small group of fish which are extremely popular among livebearer enthusiasts. The genus comprises of only three species, of which two are readily available within the hobby although hardly ever stocked in aquarium shops.

The first species to arrive in the U.K. was *Characodon lateralis* - the Red Rainbow Goodeid or Rainbow Characodon.

This is a slender torpedo-shaped species, with both the dorsal and anal fins set well back on the body.

The male pictured (right) is about twelve months old and has reached his prime. The body is a deep blood red colour overlaid with green spangles. His belly and throat are yellow. A darker lateral stripe runs from the mouth, through the eye, to the caudal peduncle. Some specimens have large black spots or blotches on the sides. All the fins are red near the body, paling

to yellow, edged in black.

The female is green with a line of black spots along the lateral line. The number and size of these vary from individual to individual. All the fins are clear to greenish.

This is a very shy and retiring species which must have plenty of plant cover to feel secure. However, they can be kept in a community tank of similar-sized fish. A temperature of 70-75°F is ideal.

The two most important factors in breeding this species are water quality and diet. At

least a 50% water change needs to be carried out every other week or a very good filtration system employed, with smaller partial water changes.

If possible their diet should consist of predominantly live food with the occasional addition of some green vegetable matter such as peas or spinach.

Breeding

For breeding, two young pairs should be placed in a large well-planted tank and fed on as much live food as possible.

Where can you get Rainbow Goodeids?

Fortunately, both the Rainbow Goodeids which still exist are well-established within Viviparous (the British livebearers society) and regularly turn up in auctions held by this organisation. The next one is to be held on **Sunday March 15** at **Heron Cross Sports and Social Club, Grove Rd., Heron Cross, Stoke-on-Trent** and starts at about 1pm. Non-members are welcome at these events.

For further details about this organisation please contact Viviparous's Public Relations Officer: **Angela Moore, 43 Lamb Lane, Monk Bretton, Barnsley, South Yorkshire.**

Rainbows

The gestation period is, on average, eight weeks and the fry are large at birth.

The brood record for live fry from a single isolated female is only 27, so this is not a particularly prolific species.

When the fry are born the adults may leave them alone and you will have established your breeding colony.

Sometimes, particularly with older females, the fry will be attacked and killed. If this happens, save as many of the babies as you can and place them in a small tank for rearing. After about a month they should be large and strong enough to be returned to the breeding tank. Once the adult fish are used to having small babies with them they leave even the new-born ones alone.

The Black Prince

The next species to be imported to the U.K. was *Characodon audax* - The **Black Rainbow Goodeid**, **Black Prince** or **Bold Characodon**. This is a slender,

torpedo-shaped species similar to the Red Rainbow Goodeid with both dorsal and anal fins set well back on the body.

The male pictured is a young fish approximately five months old. The body is greyish in colour, paling to creamy pink on the belly. The sides are overlaid with iridescent silver scales and the gill plate (*Operculum*) is a shining sky blue. The fins are jet black near the body becoming clear near the edges. The female lacks the silver scales and black fins of the male and is very similar to the female Red Rainbow Goodeid.

Unlike its red cousin this species is a bold fish, spending most of its time swimming around at the front of the aquarium once it has become used to its home.

If too many fish are housed in the same tank then fights often develop which may lead to the death of some of the protagonists. Similar behaviour has been noted when this species is fed too little or poor quality food.

Breeding

Aquarium maintenance should be the same as for the other species in this genus, although breeding them as a colony is more difficult.

Often it is best to remove the pregnant female to a small tank on her own for the last few weeks of pregnancy so that the babies have the best chance of survival possible.

The female can then be given a few days on her own to recuperate before being returned to the main tank.

The fry grow well on a mixed

More about Goodeids

Mexican Goodeid Fishes of the Genus Characodon with Description of a New Species by M.L. Smith and R.R. Miller 1986

Fishes of North America: Endangered, Threatened or of Special Concern: 1989

Jack E Williams et. al.

Viviparous magazine volumes 2 and 15

diet of live and flake food with some vegetable matter for roughage. They are sexable at two months old, however, it is nearly four months before the males are sexually mature. ■



Above right: This male is about a year old and in his prime.

Right: A male *C. audax*. The Black Prince.

A "natural" reef system (see next page) encourages the growth of macro-algae - and arguably looks more attractive.



Good practice makes *PERFECT*

Over the last few months LES HOLLIDAY has observed the coral reefs of the world, asking what we, as good fishkeepers, can do to preserve them. Now he brings the topic much closer to home as he reminds us that only good aquarium practices - the best systems and filtration - are acceptable, if we wish to keep reef fish.

Practical Fishkeeping/February 1992

There is growing concern that marine fishkeepers take seriously their responsibility to preserve the coral reefs.

If we are really going to do our bit, it's not enough to simply insist that the coral reefs should be exploited in an environmentally friendly fashion. Ideally we should also question our own actions and decide whether we are doing our best to ensure that the living creatures we obtain from coral reefs are maintained and cared for in the best possible aquarium conditions.

It's a good time to review the marine fishkeeping scene. There have been tremendous changes and innovations over the past year or so.

At one time Germany was the source of many of the new developments. More recently there has been something of an international flavour to the equipment on our retailers shelves and in the bright ideas

appearing to improve our hobby.

Our own manufacturers have not been left behind, and have been joined by the Americans.

Notable among these is Albert Thiel with his innovative range of **Aqua Tech** products now readily available over here.

There have been many major developments in all areas of marine aquarium technology; and perhaps more important, a much greater understanding has emerged of such important considerations as what really constitutes good water quality management, adequate lighting and the proper nutritional requirements of both fish and invertebrates.

The first essential - high quality water

In creating any form of marine aquarium the level of water quality you are able to maintain ultimately determines the quality of life for the subjects you can keep.

This means that the level of your ability and the adequacy of your system in controlling water quality determines what you are able to keep, whether it be a simple fish-only system, mixed fish and invert system or reef aquarium.

If we are looking for the highest possible standards, and this must be the ultimate aim. What options are currently available to improve our aquarium management skills, and which of the recent technological improvements are able to assist us?

Of course, the efficient filtration of the aquarium water to remove unwanted and harmful gases, chemicals and compounds must be the primary consideration. Once living things are introduced into the aquarium the water quality naturally begins to deteriorate. There are three major methods of filtration, mechanical, biological and chemical, to overcome this deterioration and most marine aquarium systems usually employ all three. ▶

◀ **MECHANICAL FILTRATION**

Mechanical filtration in its simplest form is a means of trapping and removing suspended organic matter from the aquarium and preventing chemical and biological filters from clogging.

Spun nylon floss and dacron are commonly used as a filter medium and normally these materials are installed as a pre-filter in canister type chemical and biological filters or as a barrier to prevent large debris entering a filter compartment or trickle filter bed.

This form of filtration does not necessarily improve water quality but only removes the debris from the water column and out of sight into the filter medium.



"Open plastic designs" of media are increasingly popular as they trap less debris.

If the filter loaded with this organic detritus is allowed to remain within the aquarium system the trapped material can quickly decay and produce all manner of toxic by-products, lowering the dissolved oxygen levels, and severely hampering the efficiency of the chemical or biological filter with which it is coupled. Mechanical filters do however provide an essential service in trapping unwanted organic detritus, and make it easy



A "clinical" system may have a bare substrate - but it still looks good.

to remove this material from the aquarium **before** it can decay and affect water quality.

As it is vital that the filter medium is regularly cleaned or replaced, a simple but effective improvement most of us can easily introduce is to regularly clean the mechanical filter.

By regularly, I mean as soon as visible signs of clogging appear and certainly not less than once a week. For those without a mechanical filter currently installed it is also well worth considering using a supplementary small canister filter filled with mechanical filter medium to perform the task.

BIOLOGICAL FILTRATION

The biological filter is the heart of the aquarium's water cleaning processes and the most important component of your filtration system. Here the water is cleansed by harnessing the biochemical action of living bacteria to break down the toxic substances ammonia and nitrite, by-products of metabolism and protein decay,

into less harmful compounds.

This is an essential process as very small quantities of these substances are highly toxic and often lethal to a wide range of fish and invertebrates.

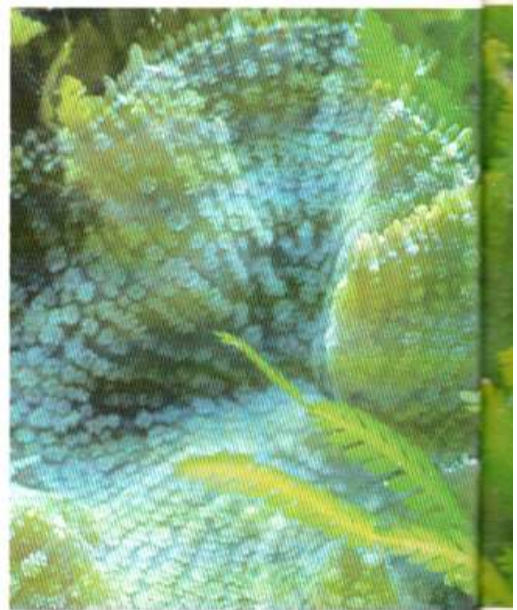
The biological process relies upon a constant supply of oxygen, as the bacteria involved in the breakdown process are termed aerobic, that is they require oxygen to thrive, and will die if insufficient of this dissolved gas is present.

Clean system or green system?

The latest thinking in reef aquariums divides into two camps, the clinical system where the aquarium is kept scrupulously clean to avoid the danger of settled organic matter and muck decomposing and affecting water chemistry - and the so-called natural system where various forms of macro algae such as caulerpas are encouraged to grow and biologically filter out the nitrates and phosphates formed from decomposition - they are absorbed as a nutrient through the leaves.

Owners of clinical systems often dispense with any form of fine substrate material to allow easy cleaning. A mechanical filter can be a boon to these clinical system devotees, often used as a vacuum cleaner to pick up material agitated into the water column by a flow of water from a pump or by hand.

Mechanical filters can also be considered essential as a prefilter to immersed biological filters employing media which is easily clogged such as Double Layer Spirals (DLS) systems; or those using highly porous materials such as Siporax which is severely impaired by clogging.



Right: *Caulerpa mexicana* in a "green system."

Totally immersed filters require a constant flow of well oxygenated water to function effectively, and the latest advances in biological filtration have gone a step further, and often employ above water trickle-fed systems which rely on atmospheric oxygen.

This can improve the efficiency of the filter bed by over 60% for a given volume of filter medium.

There is a further outstanding advantage trickle filters have over immersed systems. As the water trickles from the aquarium down through the filter medium into the 'dry' section of the filter tower, a large proportion of the ammonia held in solution is liberated naturally into the atmosphere as a gas.

It is also possible to enhance this process. Further gains are possible if the tower is ventilated by an air pump or fan. It has been discovered that ammonia can often be removed more effectively by this means, than by bacterial action.

You can understand why trickle filters have proven to be far superior to any other form of biological filtration currently available.

Bolt-on bonanza

Last year was the year of the 'bolt-on' trickle filter in this country.

For the first time a wide range of very effective and well-

designed self-contained trickle filter systems became available. These filters are designed to be used with conventional aquariums as opposed to earlier integral filter/aquarium systems which were sold as a single package.

The bolt-on systems sit below the tank and use the simplest of plumbing arrangements which do not require holes to be drilled through the glass of the aquarium, or need lots of modifications to tank hoods or other existing equipment.

A bolt-on filter is easy to use and an admirable choice when setting up a brand-new aquarium; but really comes into its own when used to convert an existing conventionally filtered aquarium to trickle filtration. The existing filtration can be left in place in such a situation or progressively phased out as the trickle system matures.

Converting an aquarium in this manner avoids all stress to the aquarium inmates due to the sea-sawing water chemistry which may occur when a filter system is disrupted, modified or replaced.

Many of the more advanced trickle systems have provision for built in protein skimming, chemical filtration and ozone sterilization, plus the more standard anaerobic nitrate and immersed biological aerobic filtration.

All of this paraphernalia usually is very difficult to contain within

Casebook - a comparison of filter media

I am using all of the main media types in my own three tanks. My 45 gallon (204 ltrs) Minireef is fitted with a totally immersed filtration system based upon two DLS filters for the aerobic filtration and a further DLS filter used anaerobically for nitrate filtration.

This system is mainly for invertebrates and works very well provided I wash the DLS filter rolls clean of accumulated dirt regularly in salt water.

It is possible with two filters to clean each in rotation to avoid disruption in filtration efficiency, and I schedule this on a monthly cycle.

My 35 gallon (160 ltr) Hockney system is fish-only and is filtered by undergravel reverse flow, an immersed slow flow aerobic filter, and a small trickle filter, both of which are filled with Siporax. These filters have a pretty large biological load to contend with, especially after feeding, but I find I can maintain sufficiently high quality water to be able to keep delicate fish such as dwarf angelfishes and butterflyfish.

My third tank was commercially built to my own design and is a 35 gallon (160 ltrs) tank with trickle filter system housed below. For filter media I am turning to the now-available Thiel Aqua Tech, Super Techs, a spikey plastic ball design of which I have received very good reports. I cannot comment from experience as I have not had sufficient time to test this product in my own system - but watch this space!



A 'bolt-on' system - the *Amiracle* wet-and-dry filter.

conventional filtration systems, and aquariums can soon look quite Heath Robinson affairs. It often seems easier to avoid updating and improving the conventional type of set-up because of such limitations, but trickle filters are so versatile in this department that a programme of improvements to build up the system can easily be made without any such hassles.

Moving over to trickle filtration may seem a dramatic and expensive step, but there is no better way of improving the total quality of your aquarium's environment.

There is always the alternative of building your own trickle filter system but there are many critical design requirements which really need to be fulfilled if the finished article is to function correctly.

The fine books by Albert Thiel

such as *Small Reef Aquarium Basics* are essential reading for would-be do-it-yourselfers as all of the design parameters are explained in detail.

Biological filter media

Whatever the type of filtration the filter media to be used is an important consideration. All manner of designs and materials are available for the purpose - from plastic hair curlers to gas blown ceramic tubes.

Design considerations have tended to change over the last couple of years away from the denser materials which can easily trap dirt to more open plastic designs which ensure good water circulation while conforming to the basic design requirement that





Left: A booming population of Fireworms is often the result of overfeeding.

Below: Red algae can be caused by a poor feeding regime.



the material provides a large surface area where bacteria can settle; and that it makes best use of space in the filter chamber.

The Swiss-roll form of the double layer spiral (DLS) design and fine aggregate materials tends to have been replaced, especially in trickle filters, by plastic perforated ball designs and plastic wheels. Some are ingeniously designed to not only allow free movement of water through the medium but also to ensure even water distribution.

A great deal of experimentation has also taken place with trickle filters in testing various flow rates over the media, and the ability of bacteria to adhere to the various media surfaces according to flow rate.

The results of these experiments tend to favour plastic filter materials with polished surfaces to prevent too heavy build up of bacteria, which can be counter-productive as the bacteria overgrow each other, and kill the lower layers.

A relatively-slow flow rate through the filter is usually advised with this type of media, with perhaps the whole of the aquarium water passing through the filter three times per hour to avoid wash-off of the bacterial colonies.

CHEMICAL FILTRATION

There is little doubt that the biggest advances in aquarium filtration have occurred in chemical filtration. At one time only activated charcoal was

available but now there is a whole range of compounds and resins designed to selectively remove the various impurities from water.

The introduction of polymeric adsorbents has been particularly welcomed as these polymer-based materials have more efficient adsorbent characteristics than the best activated charcoal.

It is important when considering various chemical filtration methods, to distinguish between those used for filtering water from the tap to use in the aquarium; and those used to filter the saline water within a marine system. Some chemical treatments such as ion-exchange resins are quickly exhausted in marine conditions as they take up the sodium salts, calcium and other compounds comprising sea water mixes.

Most of us rely on tapwater initially to make up our salt solution, and for replacing water lost through evaporation. As we know, tap water can be very variable in quality dependent on your location and perhaps even

on the time of year. Common impurities can include chlorine, nitrates, phosphates and sometimes small quantities of pesticides and heavy metals.

The levels may not be harmful to us, but can be above those acceptable for the marine system.

Fortunately removal is relatively straightforward, using chemical filtrants such as activated carbon, de-ionising resins or combinations of these with reverse osmosis or submicron mechanical filtration.

It is surprising how much water is used to replace evaporation and to accommodate water changes and it is well worth investing in some form of

chemical filtration for this purpose especially if you live in a bad area for water quality.

Chemical filtrants for use within the aquarium system have improved immeasurably, and now it is possible to filter out a number of impurities which were impossible to irradiate a few years ago without major water changes.

Products are available to selectively remove chlorine, nitrate and more recently phosphate; while there are others which are broad-spectrum such as the polymeric adsorbents.

The nitrate and phosphate irradiating products are granules which rapidly remove these harmful compounds, and unlike activated charcoal will not leach back the impurities when fully saturated.

It is worth noting that activated charcoal together with other chemical filtrants which act as adsorbents, that is function by chemically-attracting the molecules of compounds dissolved in the water, are equally efficient at extracting trace elements and beneficial substances such as iodine.

These need to be replenished

Casebook - How much air?

When installing a skimmer the main considerations are that the air pump should be sufficiently powerful for efficient operation and the size of the skimmer is appropriate for the type of aquarium system. Even the smallest skimmer needs a pretty powerful pump, one capable of producing a strong foaming action. I tend to go for overkill knowing that I can always reduce the flow of the pump, but it is impossible to increase the flow beyond its limit.

I find the powerful, silent running and dependable German Hoffman range of pumps the best and I usually have a pump dedicated solely to the skimmer.

and next month I will be looking through the range of commercially available additives for this purpose and for other benefits.

PROTEIN SKIMMERS

Protein skimmers are nothing new, but recently they have come back into popularity, mainly because there is now a greater understanding of how to design them correctly but also because now it is possible to banish what is an ugly piece of equipment from the aquarium itself. Skimmers can, I suppose, be regarded as a form of mechanical filtration, and they can be invaluable in removing protein and other organic matter held in suspension in the aquarium. Just witness for yourself the gunge which appears in the skimmer catchment cup shortly after

cleaning the inside of the glass of adhering algae for example.

A major feature of the skimmer is that it is self-regulating, that is, the greater the organic load, the more frothing that occurs the more froth the greater the efficiency.

A protein skimmer or foam fractionator, as this simple appliance is now called, can therefore be regarded as a further indispensable item for our aquarium environmental quality improvement plan.

Size does matter

Sizing the skimmer is difficult but the bigger the better is a good rule. The hang-on commercially retailed skimmers all tend to be too small, mainly because they are designed to minimise the eyesore they present as they sit in the aquarium.

The trickle filter offers an advantage here, here, usually



New resins may remove the old enemies phosphate and nitrate.

having ample room; for a correctly-sized skimmer all tucked away.

As a guide to the size required I would recommend a skimmer of diameter of three inches (or 3" square) at least 12" long, for a 30 gallon aquarium with an average biological loading. I'd go for a counter current design. The newer venturi skimmers now available are more efficient and much more compact than columnar types, and are worth considering

where there's a lack of space.

Of equal importance to design is maintenance. Protein skimmers require daily attention, or similar problems to those experienced with neglected mechanical filters can occur.

Decaying effluent in the skimmer catchment cup can easily more than reverse the beneficial action of the skimmer.

A good powerful stream of bubbles also needs to be maintained and airstones should be replaced quite regularly - at least every two or three months.

I find wooden airstones superior to other materials producing very fine bubbles which are excellent for the purpose. Perhaps the most common reason for a skimmer losing efficiency is the failure to maintain the optimum water level in the reservoir where the skimmer is installed, and here again day-to-day attention is required. ■

A TROUBLE-SHOOTERS GUIDE TO AQUARIUM ENVIRONMENT PROBLEMS

Symptom	Cause	Remedy
Rampant red algae	High nutrients/ low Redox potential. Usual cause is a high bio load due to overfeeding/overstocking and/ or poor water management	Cut down on feeding, feed more live foods, cut down stock numbers especially fish that are gross feeders (groupers, tangs). Try to apply better attention to tank hygiene, water changes, maintenance of mechanical filter and protein skimmer, try chemical filtrants for nitrates/phosphates
Rampant thread and slime algae	In reef aquaria A sign of nutrient build-up (usually phosphates). This occurs slowly over a period, then suddenly algae growth increases dramatically In fish systems Associated with high bio load, but acceptable redox potential levels. Again, slow build up of nutrients, nitrates/phosphates are the cause	In reef aquaria If nitrate readings lower than 5ppm, treat for phosphate. Try chemical filtrants for phosphate/nitrate In fish systems Cut feeding down, feed more live foods, apply more attention to tank hygiene. Try chemical filtrant for phosphates/nitrates
Large numbers of Fire Worms	These worms are carnivorous and feed on leftover uneaten protein foods and dead animals. Large numbers signify gross overfeeding	Fire Worms are not harmful to other living creatures in the aquarium. Numbers will reduce when feeding is cut down
Oily film or algal slime on water surface	Usually a symptom of overfeeding or feeding with oily food and mainly protein	Cut down feeding of oily foods. Direct outflow of pumps towards surface; use airstone to break film up, and employ a protein skimmer
Low pH reading (below 7.6)	Usually due to organic acids from decomposing organic matter or overfeeding/overcrowding	Cut down on feeding and stock numbers. Do water changes and regularly use pH buffer.
High nitrite reading (above 1.0 ppm)	In new aquaria Usually a sign that the filtration system is not fully mature; or too rapid stocking. Possibly due to decomposing dead organism. In mature aquaria Overfeeding/overstocking or too rapid increase in stocking	In new aquaria Slow down stocking, feed minimally, and do a 20% water change. In mature aquaria Cut down feeding, feed more live food, improve tank hygiene. Stock only one animal at a time leaving at least a month before adding more. Do not overstock.

GROUPERS, or Rock Cod, are members of the Sea Bass or Serranidae family. There are 400 species which are widely distributed throughout subtropical and tropical waters.

Size between the species varies enormously, from moderately-sized specimens to some real giants, weighing in at 1000 pounds or more.

Due to this diversity, misidentification is rife. Juveniles often bear no similarity to adults, males and females may differ from one another and there are even considerable colour variations within a single genus, depending on its exact distribution. This has led to some species being classified under several names.

All Groupers, whether large or small, share several overriding characteristics. They all have a large body, the first dorsal fin is heavily spined and the relatively small eyes are

placed high on the head. And of course, they all have a huge mouth which extends to a position beyond the eye.

Groupers, like certain other marine fish, possess the ability to change colour to some degree, if the circumstances arise. They come in many colour forms and cover a broad range of complex patterns, including spots, blotches and stripes.

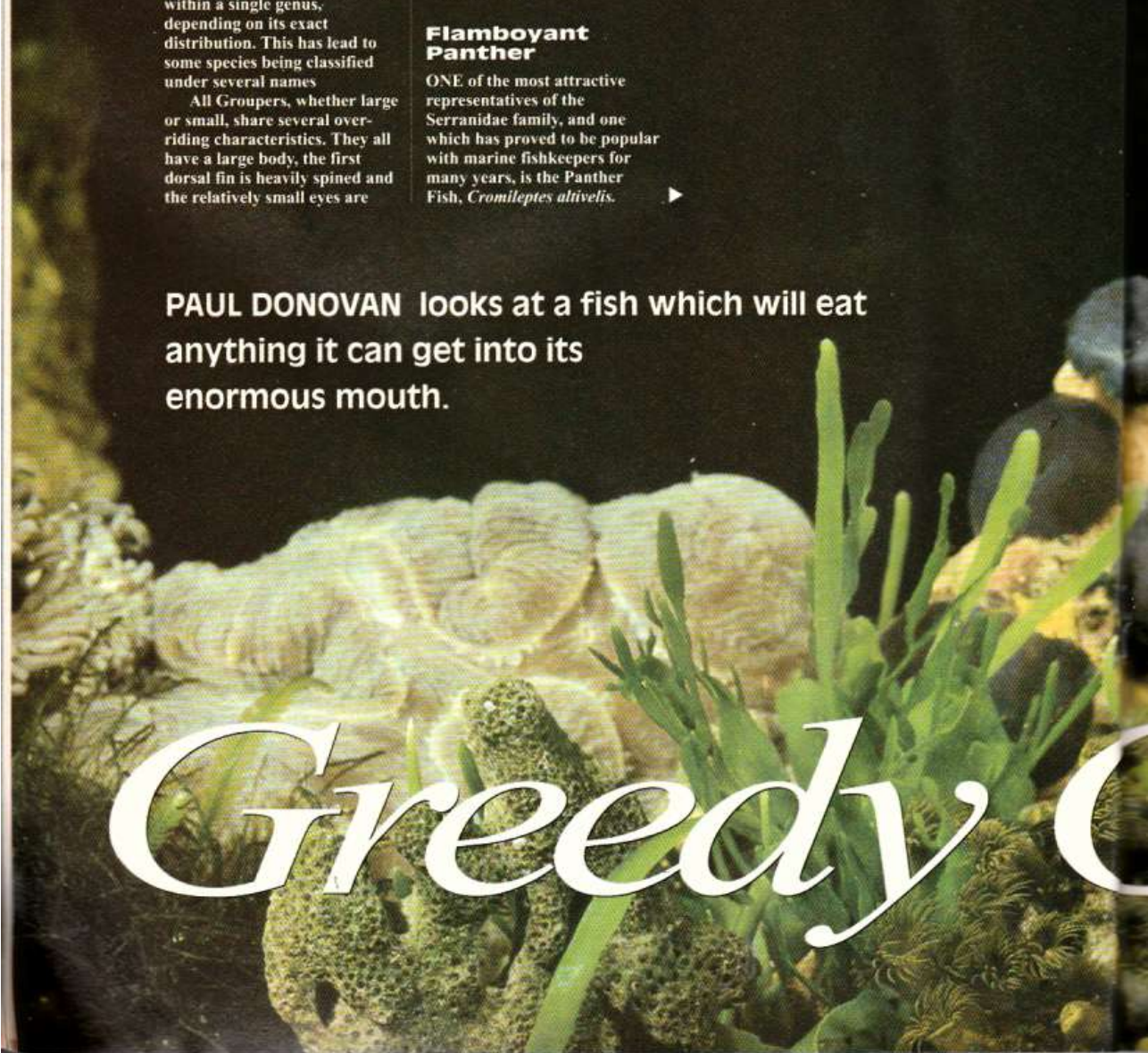
If you are one of those fishkeepers who strive for the more unusual and larger representatives to grace your aquarium, then Groupers will fit the bill admirably.

Flamboyant Panther

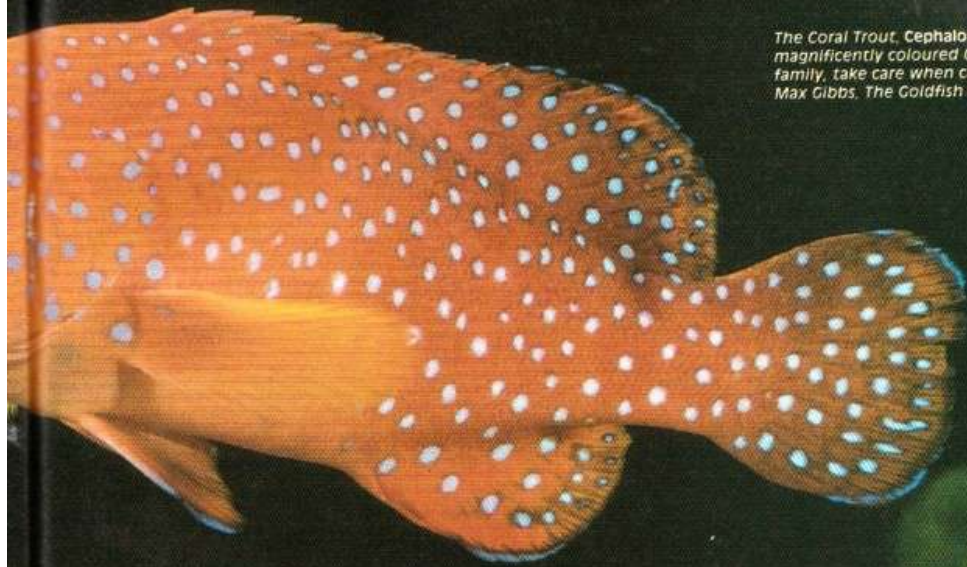
ONE of the most attractive representatives of the Serranidae family, and one which has proved to be popular with marine fishkeepers for many years, is the Panther Fish, *Cromileptes altivelis*. ▶

PAUL DONOVAN looks at a fish which will eat anything it can get into its enormous mouth.

Greedy



The Coral Trout, *Cephalopholis miniatus*, is a magnificently coloured Grouper. As with others in this family, take care when choosing its tank-mates. Pic. by Max Gibbs, The Goldfish Bowl, Oxford.

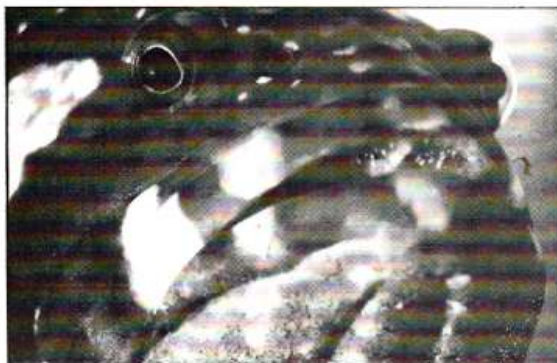


*Grouper*s

◀ Its finnage is flamboyant and flowing (eat your heart out, Russell Grant) and the greyish white body is covered with black spots. Its distribution covers the Indo-West Pacific where it attains a length of 60-65cm. Although it reaches this comparatively large size in the wild, in captivity it appears to remain a manageable length. I kept one of these fish for five years in a 300 gallon tank and through that period it seemed to reach a point, at 35-40cm, where growth stopped, despite feeding voraciously. It also became exceedingly tame and would take food from my fingers.

Large fish, huge mouths

AT THE other end of the scale is the Queensland Grouper, *Epinephelus lanceolatus*, which is also available to the fishkeeper, although unless you can provide very large accommodation, you may be as well to avoid it. This species can reach up to 240cm and weigh in at half a ton. They seldom reach this in captivity, but even some of the small specimens have large, bulky bodies. *E. lanceolatus* is an attractive fish of green brown colouration with lighter spots and is distributed through the South Pacific where it inhabits relatively deep waters. It holds up during the day in its lair, waiting for any unsuspecting fish to pass by, when they will be engulfed in its huge mouth. There are accounts of divers being stalked by this fish and unconfirmed reports of them actually being swallowed. Although these are unconfirmed, it is not beyond the bounds of possibility that a very large Grouper could swallow a man.



The Queensland Grouper, *Epinephelus lanceolatus* grows to well over two metres in the wild and has a mouth in proportion to its size.



The Blue and Yellow Grouper, *Epinephelus flavocaeruleus*, is one of more active members of the family. It reaches almost 75cm in length.

A range of Groupers are caught as game fish and while the flesh may be eaten, it can cause a nasty side effect if consumed during the breeding season, when ciguatera poisoning may occur.

Other species

THERE are a number of other Groupers suitable for the home aquarium.

- Blue and Yellow Grouper *Epinephelus flavocaeruleus*

This Grouper comes from the Indo-West Pacific and reaches a length of almost 75cm. It is a uniform pale blue with yellow finnage and is one of the more active of the family.

- Blue Spotted or Argus Grouper *Cephalopholis argus*

A comparatively smaller Indo-Pacific Grouper at 50cm in length which is often seen in captivity. Its general colouration is green with dark circles which

are pale blue in their centres.

- Six-stripe Soapfish *Grammistes sexlineatus*

This distinct Grouper has a jet black body adorned with six white horizontal stripes. It originates from the Indo-West Pacific where it grows to no more than 30cm, making it ideally suited to the aquarium. However, it does possess the ability to secrete a toxin into the water which will kill other fish including itself, when stressed.

Aquarium conditions

THERE are certain criteria which should be taken into consideration before you attempt to keep Groupers.

The most obvious of these is living quarters. The tank should be a minimum of four feet in length.

All Groupers are hardy fish and can tolerate conditions which you would not normally wish to see in a marine aquarium.

However, some degree of consistency must be maintained and I recommend the following parameters which should cover the family as a whole:

- Temperature: 24-26 C.
- pH: 8.8
- sg: 1.020-1.023
- Nitrite: 0-0.1ppm
- Nitrate: 10-20ppm

Swallowed whole

FEEDING is one problem seldom experienced with Groupers. Provided the food is dropped in front of the lair,

which the Grouper will establish, it will quickly be snapped up. They will not, however, pick up food which has come to rest on the filter bed, as other fish might. With respect to diet, basically anything they can swallow in one go, they will do. Many of the frozen type foods are too small for larger specimens and one of the easiest ways of getting around this problem is by a visit to your local fishmonger, where you can lay your hands on some spratt-sized fish. Or use strips of fish-complete with head, fins and bones.

More than a mouthful...

IT GOES without saying that if you keep a Grouper in a tank with any fish smaller than its mouth, it will devour them. If you decide to keep such large fish in captivity, you must reside yourself to the fact that unless you can provide suitably large living quarters, which could be stocked with similarly sized species, such as Moray Eels, Lionfish or small Sharks, then they must be housed alone.

A further point to remember is that Groupers are territorial and will not tolerate other Groupers within their defined territory.

Although they make good aquarium exhibits, Groupers do tend to become the dominant fish in a tank, irrespective of which other species are kept with them. ■



New shells for old

ANDY HORTON focuses on one of the most popular of native marines, the humble Hermit Crab.



Continual fights and squabbles are the result of keeping several Hermit Crabs in the same aquarium. This can be explained by the need of this crustacean to protect its soft abdomen, which is not armoured with a hard carapace like the true Brachyuran crabs. Instead, the larvae adopts a univalve (snail-like) mollusc shell, which it carries around on its back throughout its adult life. Fights occur when the crabs dispute the available shells.



Early Stages

Like all of the decapod (ten-legged) crustaceans, Hermit Crabs mate, with the female carrying the eggs attached the underneath of the coiled abdomen for several months (times vary), when they are said to be 'in berry'. In the Common Hermit Crab, *Pagurus bernhardus*, the eggs hatch into



Pagurus bernhadus, dispossessed of its home in a whelk shell. Note the coil of the abdomen which fits into the gasteropod shell and also the egg mass.

Gasteropod Shells

Pick up a gasteropod mollusc trundling across the floor of a rock pool in an uncharacteristic manner, and you are quite likely to spot the two claws just protruding from the aperture. Juvenile Hermit Crabs are common on rocky shores, where there is a plentiful supply of the required shells.

It is fun to discover exactly what species of mollusc is used. Typically, in Sussex they will be found occupying the shells of the Grey Topshell, *Gibbula cineraria* and the Common Notted Dogwhelk, *Hinia reticulata*. When they are a little larger they seek out Periwinkle shells, *Littorina littorea* and most specimens will be found in the black shell of this abundant mollusc.

A few months later, they will be found inhabiting the larger shells of the Dogwhelk, *Nucella lapillus*, before the survivors eventually move into the more

commodious shelter of the a Whelk shell, *Buccinum undatum*. This is the largest gasteropod that is commonly found in British seas. Fully grown Hermit Crabs are more common offshore.

Taxonomy

DECAPODA

Caridae: prawns and shrimps.

Astacidae: true lobsters and crayfish.

Palinura: lobster-like crustaceans with small claws.

Anomura: Hermit crabs, Porcelain crabs, burrowing prawns etc.

Brachyura: true crabs.

However, there are many other suitable shells. In Sussex they will be found in the empty Flat Winkle, the Sting Winkle, *Ocenebra* and even in the unsuitable Slipper Limpet shells, *Crepidula fornicata*. Other molluscs will be used where present.

Anomura

Hermit Crabs belong to the taxon of decapod Crustacea called the Anomura, which evolved at an earlier date than the Brachyura. The main distinguishing feature is that the fifth pair of legs is much reduced in size, so that in the related Porcelain Crabs, *Porcellanidae* they appear to have only eight legs.

Other anomurans found on British shores include at least two species of Squat Lobsters, and at least three species of burrowing prawn-like animals known as the *Thassinidea*.

Feeding

Anomurans can be grouped together because they all present similar problems of animal husbandry. Although the popularity of the Hermit Crab exceeds all other native species, they are by no means easy to keep, and an average life span of only five months makes them one of the least successful species.

larvae in the first two months of the year, and are released to take their chances among the plankton. At this hazardous stage, they will undergo moults like all crustaceans.

The first stages are called the zoea and later when they develop the claws (chela), they are termed megalopa, before they settle on the benthos, and search around for a gasteropod shell to inhabit. Hermit Crabs are widespread on different demersal habitats, and the choice of shell depends on what is available. Pheasant shells, *Tricolia pullus* and Little Notted Dogwhelk shells, *Hinia incrassata* are a popular early choice on mid-Sussex shores. These shells are only about 10 mm, and as the Hermit Crabs continue to moult and grow like other crabs, they need to embark on a constant quest for new and larger shells to inhabit.

In most cases these will be dead specimens, or vacant shells, but squabbles occur frequently, both in the wild and in aquaria. A Hermit Crab dispossessed by a more aggressive crab of the same species, is vulnerable to attack by its many enemies.

Right: *Pagurus bernhadus* with commensal anemone *Calliactis parasitica*. The Hermit Crab is inducing the lower anemone to detach itself using its two claws.



Left: *Galathea squamifera* is a common offshore species of Squat Lobster.

Far left: The Hairy Porcelain Crab, *Porcellana platycheles* will fit comfortably atop a fifty pence piece.



Left: The Long Clawed Porcelain Crab, *Pisidia longirostris* is best observed with a magnifying glass.

Below: *Pagurus prideaux* with sea anemone *Adamsia carcinopados*.

There is no simple answer to the problem. However, one factor that needs to be addressed immediately is how to provide them with sufficient nourishment. Most anomurans feed on debris, algae, and small organic particles, which they scrape off rocks and from the sand. Larger species are scavengers and will tackle larger

items. Appendages are often covered with hairs and setae which are used for extracting living plankton from the surrounding water. The upshot of this is that they may starve to death in a spotlessly clean tank. Also, food is often pinched by more aggressive fish and crabs, if they do not actually prey on the anomuran itself.

Common Hermit Crab

Seven species of Hermit Crabs are currently part of the British marine fauna. Only one, *P. bernhardus* is very common, and even abundant in some areas, found the length of the British coast and further afield. Claws are bright orange when adult,

with a paler body. In juveniles the orange claws and legs are banded with white.

Young specimens will be found on most shores during Summer until late autumn. Adults are more likely in the second half of the year, and in deeper water. Small Hermit Crabs are collected in shrimping nets over the sandy shallows.

Common Hermit Crabs are greedy scavengers on pieces of mussel, which should be supplemented with other foods,

Commensal Animals

Hermit Crabs live together with other animals in a commensal arrangement, sometimes with mutual benefits accruing. The most spectacular is the presence of the sea anemone *Calliactis parasitica*, which inhabits the exterior whelk shell in some populations of crabs found in the south-west. The anemone is the active party in the relationship with the Common Hermit Crab, *P. bernhardus*.

Inside the whelk shell at the spiral end, a ragworm, *Nereis fucata*, may permanently reside,



poking its head out and scavenging food cut up by the crab's mandibles. Sessile attaching animals and algae may settle or already be living on the external shell including various hydroids, acorn barnacles, sponges, slipper limpets, bryozoans, keelworms, and tubeworms. One hydroid, *Hydractinia echinata*, is only found on shells occupied by Hermit Crabs.

Other Hermit Crabs

The Hermit Crab, *Pagurus prideauxi*, is coloured deep red and possesses numerous fine hairs for capturing plankton. However, its most interesting feature is the presence of a commensal Cloak Anemone, *Adamsia carcinopados*, which wraps itself around the shell and grows so that this particular crab does not need to change shells. It is occasionally found on Scottish shores. It has a poor record in captivity, and is a species for the experienced fishkeeper.

Hermit Crabs are asymmetrical, with one major claw larger than the other. In most species this will be on the right hand side nearest the apex. (This will appear on the left in photographs). However, the only other British species that could be found at low tide in certain locations in the south-west of Britain is the interesting *Diogenes pugilator*, with the claw on the left. The body of this Hermit Crab is red lined with blue, and it can be found in disused Tower shells, *Turritella*

communis. The scientific name is particularly apt. It fares badly in aquaria.

Other British Hermit Crabs which inhabit deep water are, **small:** *Anapagurus hyndmanni* and *Anapagurus chiroacanthus*; **medium sized:** *Pagurus cuanensis*; or **large:** *Pagurus pubescens*.



Diogenes pugilator is an unusual Hermit Crab with the major fighting claw on the left. (This appears right on the photograph).

Squat Lobsters

Squat Lobsters are similar to Hermit Crabs, symmetrical, with an abdomen only weakly armoured. They need to hide in holes or under stones. The common shore species is *Galanthea squamifera*, which is brown or green. It is common to epidemic numbers on rocky shores, sometimes

found in millions.

In the north-east *Galanthea intermedia* is found. This species has orange and white banded legs.

Other species are found in deep water and Scottish lochs. All are short lived in aquaria, usually expiring at the moult. Success will involve providing them with plenty of food. They will filter feed. They are easy to capture, but shoot backwards rapidly when disturbed.

Porcelain Crabs

Two species of Porcelain crabs are very common on the underside of boulders on rocky shores. They are both very small, with claws of equal size.

The Hairy Porcelain Crab, *Porcellana platycheles*, will fit comfortably on a fifty pence coin. The Long-clawed Porcelain Crab, *Pisidia longicornis*, is even smaller, and most specimens would fit on a penny.

In aquaria they will hide, but are fascinating to watch under a magnifying glass. They will survive best in dirty tanks.

Glossary

Mollusca: phylum of soft bodied animals, mostly with hard external shell. It includes familiar animals like the Periwinkle, Cockles and Mussels, and also the intelligent Octopus and Squids.

Gasteropoda: a large class of snail-like molluscs including the Garden Snail, Periwinkles, Topshells, all with coiled shells, and also shell-less sea-slugs (nudibranchs) and the conical Limpet, *Patella* spp.

Burrowing Anomurans (Thassinioidea)

Systematists (taxonomists) in the past were unclear where to classify these crustaceans which burrow in sand or mud. This is because they are a walking animal which resembles a prawn in superficial appearance. The pink-orange species *Axius sutchinus* is occasionally found on the lower shore in Sussex. This species looks like a miniature lobster. It will require an aquaria on its own. It is a snapping crustacean with the larger of two claws making a sound like breaking glass.

In sandy shallows in sheltered areas of eelgrass beds, small depressions in the sand are indicative of the burrows of a sandy coloured prawn-like species - *Upogebia deltaura*. ■

Casebook - keeping Hermit Crabs

I have kept the Hermit Crab, *P. bernhardus* successfully for 18 months, with scrupulous care, and tracked down the most likely reasons for their demise.

They are:

- 1) Poor water quality. This means a deficiency in the mineral salts, especially calcium, that are dissolved in the water, and taken up by the anomuran at the ecdysis stage of the moult. The best policy is to change 25% of the water every month.
- 2) Incorrect nutrition. The correct and sufficient protein diet is necessary for the formation of their cuticle and the chitin component of the armoured claws and other parts. Filter-feeding is important, even in scavenging species.
- 3) Predation by other inhabitants.
- 4) Too high temperatures. Ideally temperatures should be in their natural range, and always below 22°C. This has been proved by experiment rather than theory.
- 5) Incorrect salinity. It should be maintained at 3.4%, and certainly not be diluted below 3.0%. S.G. should be 1.027 at 15°C and 1.026 at 20°C (hydrometer calibrated at 24°C).

I would be interested to hear of the shells occupied by Hermit crabs on other coasts of Britain. Please write to: Andy Horton, British Marine Life Study Society, 14 Corbyn Crescent, Shoreham-by-Sea, Sussex. BN43 6PQ.



Breed Bitterling

PAUL SZYMANSKI advocates a natural breeding system for the Bitterling which has brought him great success



A male and female Bitterling inspect a spawning site.

You might suppose that a fish that lays its eggs actually inside a living shellfish would be rare, exotic and hard to breed. In fact it is a common European coldwater fish, the Bitterling.

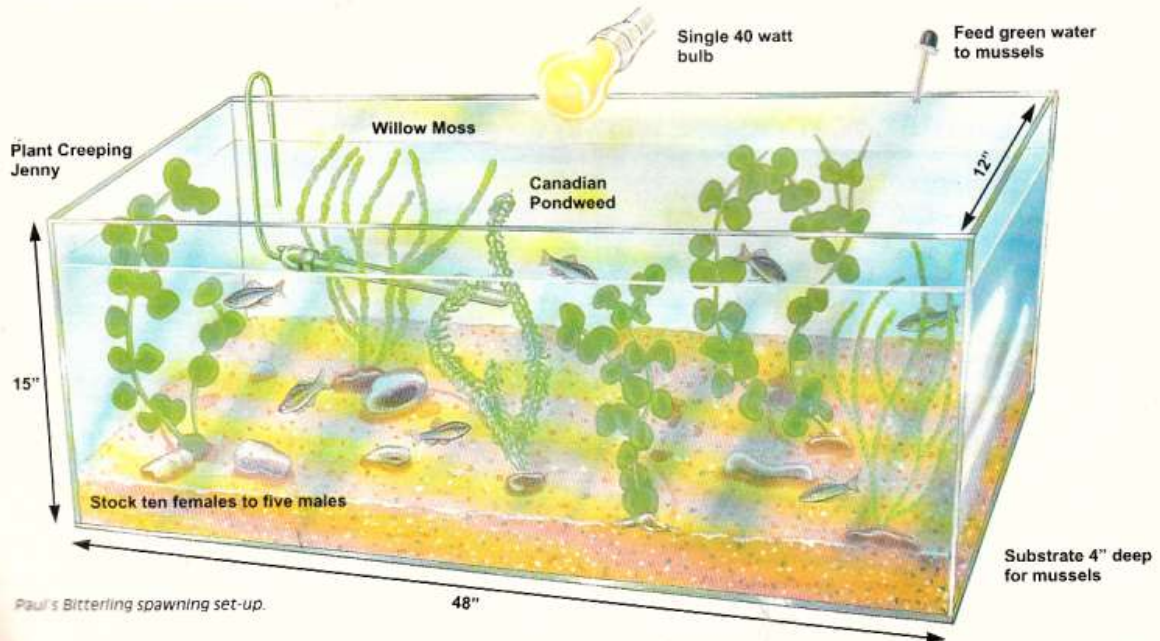
To add to the fish's charms, the male is exceptionally colourful for a coldwater fish.

Its back is grey-green or grey-blue, the sides silvery with blue and pinkish purple iridescent streaks, and the fins red or pink.

In the breeding season, he develops a multi-coloured iridescence and his fins become still brighter.

Spawning Bitterling the natural way

I have spawned Bitterling under both natural and artificial



Paul's Bitterling spawning set-up.

...rling step-by-step



The female places her ovipositor in the mussel.

conditions - nature's way being rather more difficult.

A long warm summer can help, though. If the temperature is constantly warm, around 68°F, and lasts late into the coldwater season, the broods are larger.

I have also found it useful to keep the Swan mussels (which are vital for these fish to breed) and the fish apart until late in the season, when success has been more likely.

Why is the Swan mussel essential? When these fish spawn, the female places her ovipositor in the inlet valve of the mussel to release her eggs, which are then fertilised by the male and hatch fully-formed from the mussel, in much the same way as livebearers would release their young.

Giving nature a helping hand

I have always preferred to keep my aquarium as natural as possible, keeping the coldwater fish and plants in a coldwater environment, and the tropicals as near to their natural habitat as I can make it.

For breeding the Bitterling, however, I felt that changing nature's way was justified. No harm came to either fish or mussel because no excess of temperature or conditions was ever used.

I believe that with the method I'm going to describe, Bitterling would breed indefinitely. I only tested the system for a short time, because with 100% success, my tanks were getting overcrowded with fry. ■

Step one - water

Start with water at pH 7.2. In nature, 68°F is the most favourable temperature for breeding, so place a heater in the tank set at that temperature.

Step two - the tank

A large tank is preferable as Bitterling like to have plenty of room; in my case, I used a tank size 48" x 12" x 15".

Step three - substrate

Lay down a gravel substrate to a depth of at least 4" for the mussels to burrow into, so that they can settle with just their breathing and feeding apparatus above the surface.

Step four - feeding mussels

Introduce the mussels and maintain these by feeding with cabbage water and small amounts of disease-free green water.

Step five - lighting

Bitterling dislike too much light, so I used just one 40w bulb in the 48" tank. A 25w or 15w bulb could be used in smaller tanks.

Step six - plants

Introduce plants such as Creeping Jenny, Elodea and Willow Moss which will do well at low light and temperature levels.

Step seven - stocking ratio

Stock with two to three year old fish. Introduce roughly ten females to five males. Any more males and they will spend too much time fighting, instead of mating.

At my first attempt they went straight to the six mussels. This was a wonderful sight.

Step eight - fry tank

Set up a smaller tank with a matching pH and temperature. An 18" x 12" x 12" is sufficient. One week after the fish have spawned remove the mussels to this tank.

Take care to keep them submerged. I used a large jar full of tank water for this task.

Step nine - fry

Around twenty five days later, you should see the first fry; and over a period of one month, the others will hatch. The young Bitterling should be quite comfortable in this tank, measuring 18" x 12" x 12".

Step ten - fry feeding

Feed the young Bitterling in initially on infusoria, moving them onto microworms. Gradually they'll move onto a mixture of fry food or crushed flake, microworm, and other food items. The fry should reach .5" in four months.

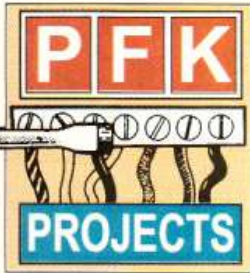
Step eleven - growing on

Hardening-off the fry is essential.

If the ambient temperature is near 68°F, the tank need not be heated, and can be raised from then on as normal coldwater fish.

If the tank is heated, gradually reduce the heat down to ambient temperatures.

The fry will grow faster, if kept in a heated tank, but may make weaker adults, less able to survive in normal coldwater conditions.

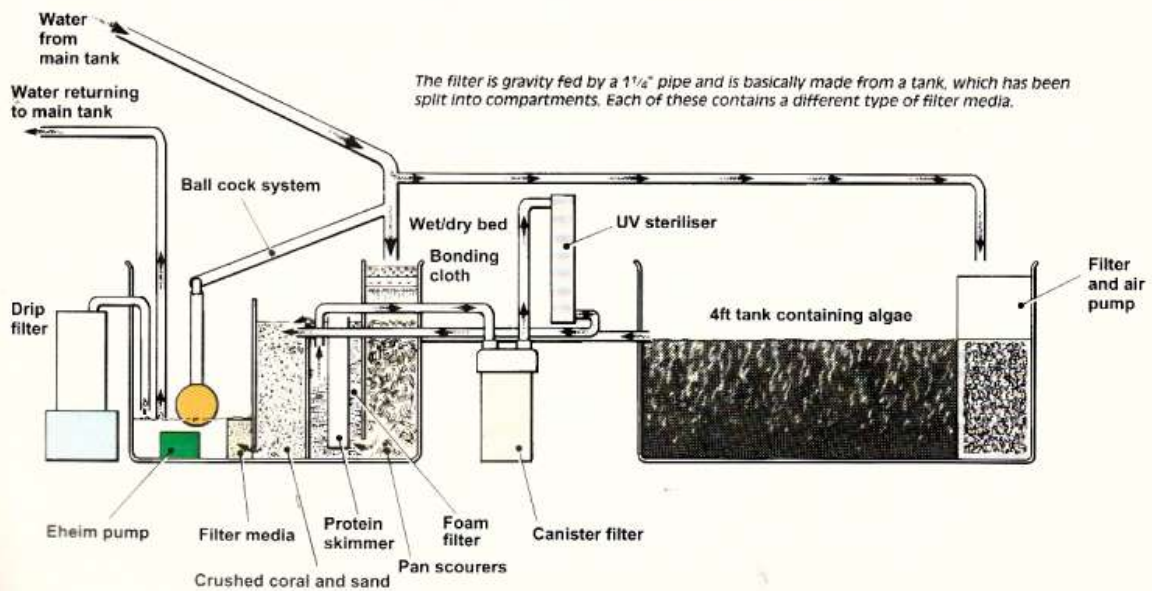


A ballc

CHRIS WHEATLEY shows KAREN YOUNGS his filter-under-the-floorboards.



Above: The complete trickle filter system is housed in the cellar, along with all the electrics. There are no problems with rising temperatures in the event of very hot weather because the cellar helps to keep the water cool.



Rock filter

Chris Wheatley had read about the benefits of trickle filters and decided it was about time he installed one on his much-cherished, bow-fronted marine tank, which forms the centrepiece of his living room.

The tank contains a healthy stock of fish, including a Regal Tang, a Queen Angel, a Mandarin and a pair of Common Clowns, along with a nice selection of inverts and living rock.

Understandably, he was reluctant to have the tank drilled, as it would need to be dismantled. So he decided to house a trickle filter system in his cellar.

To begin with, Chris tried gravity feeding the water into the cellar through the filter media and pumping it straight back into the main tank. But problems occurred with water levels. Eventually he came up with the idea of a trickle-filter which utilised a ball-cock system.

How it works

The filter is gravity fed by a 1 1/4" pipe and is basically made from a tank, which has been split into compartments. Each of these contains a different type of filter media.

The water travels from the main tank upstairs, down and through a wet and dry trickle bed into a compartment filled with pan scourers. The next chamber contains foam and a protein skimmer and the water travels from here into a third compartment containing crushed coral and sand, before being pumped back into the main tank. The protein skimmer needed to be cut down by 2" to fit into the system.

The ball-cock system is housed in this final compartment. It works with the aid of a plastic arm, which Chris screwed onto a plastic tap, so that as it rises the arm lifts and stops the flow of

water to the tank. This way, if there is a power cut, the ball-cock will rise and prevent the tank from emptying upstairs.

A bypass is fitted into the chamber containing the protein skimmer so that water can be taken to feed a separate tank, which Chris uses to cultivate algae, such as *Caulerpa* or as a quarantine tank, if required. It's passed through a Fluval 203 canister filter which runs a UV steriliser, through another trickle filter system and into the four-foot tank. From here it travels along a pipe and into the crushed coral compartment where it returns to the tank as before.

Chris has a water purifier from

which he has removed the carbon filter and replaced it with siporax and coral gravel. This forms a drip filter which removes nitrate from the water. It feeds water into the end compartment, before the water returns to the tank.

As an added precaution Chris drilled an 1/8" hole in the outlet pipe, so that if the water level drops the pipe will suck in air and the water flow will be cut off.

The entire trickle filter system cost Chris a little over £420 - this includes the UV unit, protein skimmer, tanks, pump and canister filter.

All the electrics are housed in the cellar, so all Chris has in his



Above and left: The aquarium has been set up for three years and contains some well-established inverts, so Chris didn't fancy the idea of having the tank dismantled and drilled to incorporate a standard trickle filter.

living room is the aquarium itself, with no unsightly wires or equipment. He finds no problems with rising temperatures either, because the water cools as it travels through the cellar.

Before he added the filter, eighteen months ago, Chris had experienced problems with brown algae in his aquarium. This disappeared soon after the filter was up and running and he has rarely had to service the tank since. A small water change of 10-15% once a month suffices, with the conditions remaining perfect throughout. ■

More on phosphate

I read with interest the article on Phosphates in the December issue. This has, to a lesser extent, occurred in our research reef set-up.

The invertebrates affected are Feather Duster worms, which lose their heads and die; Green and Brown Polyp colonies do not fully expand; Cleaner Shrimps are not able to moult and death ensues. PH levels are fine. No other side effects described in the article are evident.

I suspect tapwater as the contamination point in this area.

The following extracts are taken from detailed notes which were made during the research:

21 October 1990:

Trickle filter modified; now driven and prefiltered by Fluval 103 power filter. Flow rate approx. 350 lph.

22 November 1990:

Green and Brown zoanthsids responding to modification. Now fully expanded and in perfect health.

30 November 1990:

Many desirable macro algae growing well. Reduction in hair algae noted.

8 June 1991:

Boiled rainwater (9 pints per week) replacing tapwater to make up loss through evaporation. Controlled growth of hair algae achieved. Greatly reduced algae deposits on glass. *Gonipora lobata* bubble coral, hammer head coral and tooth coral fully expanded and in perfect health, as are all our invertebrates.

From our observations it is quite clear that replacing tapwater with boiled rainwater to replace evaporated water has produced spectacular results, as has converting the trickle filter to take a power filter.

Trickle filtration increases evaporation and in our case some thirty six pints per month of boiled rainwater is required. A 12% monthly water change is diluted by 33% rainwater and we can assume that phosphate levels are also diluted to acceptable levels.

In areas of high industrial pollution it may be advisable to use distilled water or the more mechanical means, such as reverse osmosis, to replace evaporated water.

• Leon Taylor, Aquarium Systems Ltd.



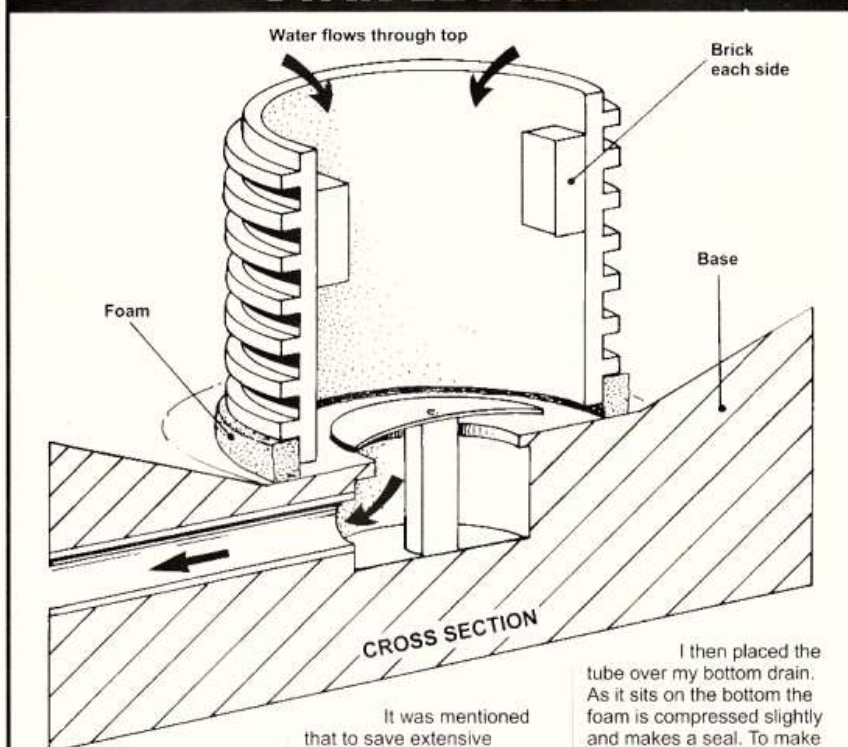
Club in London

I have been fishkeeping for five years and I am concerned about the lack of a fishkeeping society in the London area (North London especially). I am sure there must be many fishkeepers living in this area who would be delighted to join such a club if there was one available.

Therefore, I would like to set up a fishkeeping society in this area and I'd be pleased to hear from anyone who would like to join. The address to write to is 28 Grafton Road, London, NW5 3DU.

• Joel Kafetz, London

STAR LETTER



■ **Michael Wood of Croydon, wins a years' subscription to PFK for this pond tip.**

I saw the December PFK Coldwater Answers 'Keep Temperatures Stable' letter, which was about using bottom drains in cold weather and the removal of the warmer water to the filter.

It was mentioned that to save extensive alterations to existing ponds with bottom drains, only a second pump could be used.

I have only a bottom drain in my pond. I found a discarded round plastic manhole extension tube in a skip and decided to use it in my pond. The tube is 22" in diameter and ribbed on the outside. It can be cut to length if purchased new. Around the base I fitted foam rubber and tied it on with string.

I then placed the tube over my bottom drain. As it sits on the bottom the foam is compressed slightly and makes a seal. To make the tube sink I screwed two hard bricks to each side. The tube is lowered by the use of string with one person each side.

This tube then stops the water from being sucked from the floor of the pond and water is taken from further up. I must admit that I have never measured the temperature of the bottom water, but the system seems to work.

Artificial colours

After seeing the appalling dyed Glassfish in shops and reading the many complaints raised by people about them, I thought I should bring another fish to the attention of your readers.

While visiting a local aquarium shop I noticed a tank labelled 'Electric Blue Botia' in which there were a number of *Botia modesta* which, I was informed by the assistant, had been colour fed. The colour on what is normally a beautiful fish had become a revolting chalky, patchy blue colour which left me feeling appalled and disgusted that any shop could even contemplate stocking these fish.

I have four *Botia modesta* all approximately 4-5" in length which are a lovely grey-blue colour with deep blood-red fins and tail, so why is it that dealers feel the need to do this to a fish which has such beauty in its natural form?

• Lee Furness, Tyne & Wear



Botia modesta - pretty enough in blue-grey?

Getting the right start

I read with some interest the letter from S. Levy (Talkback Dec 1991), regarding his home-made undergravel filter.

I clearly remember my first 18" x 12" x 12" tank, which I started as a sixteen year old in 1969. I purchased a system almost identical to this for my little set-up from my local aquatic supplier. I cannot after all these years remember the manufacturer's name, but such a system was certainly commercially available in the late sixties. From what I remember it worked well.

Other teenage activities meant that fishkeeping was at that stage a phase through which I passed within a year or so, not returning to the hobby until the summer of 1989.

While walking my dogs in a derelict nunnery which is often used by tipplers, I was delighted to find a discarded four foot tank, in perfect condition.

This was duly retrieved and finally set up after an appropriate amount of research from the local library, as a mixed community of tropical fish.

The fact regarding research brings me to the point at which I must compliment PFK on the series of articles run for newcomers to the

hobby over the last year or so.

I know that many more experienced fishkeepers probably skip these pages, perhaps wondering why such sections are always included.

However the importance of the right start cannot be over-emphasised, and is not, I am afraid, always correctly correctly emphasised by every retailer.

The interest of major manufacturers involved in our hobby is clearly largely a case of volume sales. This interest with its continual flow of new and interesting products is of benefit to all fishkeepers and long may it continue.

The "right start" on my re-introduction to the hobby, has led to an increasing number of tanks with a wide variety of fish and an Angelfish breeding programme which goes a long way to covering the costs of the hobby.

For most of us I'm sure the major fascination of the hobby is the fact that there are few definitives. Much is still a matter of experimentation with both fish and equipment, with fishkeepers experiencing varied results with their own projects.

• David Burchett, East Sussex
Ed's note: A new beginners series starts in our March edition

Another Clown

I read with interest the letter from William McDowall in December's Talkback.

I too had a Clown Loach which often used to lay upside down in his flowerpot or on his side.

He was very gentle and the only time he would show any aggression was on the occasions when I put cubes of fish into the tank for him. He would let off a loud clicking noise to warn off all the other fish - except a Red

Finned Black Shark, who was his greatest buddy. The loach would always allow him to share his fish.

He was fifteen years old when I lost him and 9" in length. It was a very sad day for us all when he died.

I now have five young ones which are coming on very nicely.

I hope Mr McDowall will have many more years of enjoyment from his Clown Loach.

• A.W. Lawrence, Norfolk

Bermuda is purely for beginners

Can I refer to your review of some of our company's products under your *What's New?* column in the January edition of *Practical Fishkeeping*. While welcoming any form of editorial and not wishing to get involved in arguing against your appraisal, I do feel that you miss the point totally when considering our 'Bermuda' aquaria.

The main thing to be said is that the Bermuda is NOT meant to be serious at all, a pure novelty product designed to stimulate interest at the novice (children's) end of the market, a product offering a unique design which we hope will convert mothers and fathers, through regular marketing, to purchase one for their child.

From this very simple and economical beginning i.e. no filtration, no lighting, easy to clean etc., we hope to develop the child's interest in fishkeeping who will, over the years we hope, move through the more advanced stages of the hobby and more than likely subscribe to your publication for ideas.

Therefore, your last statement on the Bermuda, *will find its way into the hands of novice fishkeepers*, is precisely what we want to happen.

• Ian S. Grant, Sales and Marketing Manager, Tahiti Aquariums ▶



Is domestic lighting cheaper to run than aquatic units?

The charge is just the same....

In a recent **Talkback** letter in *Practical Fishkeeping* some information appeared that we find potentially misleading in connection with the costs of running fluorescent lighting. To put the record straight here are some details.

Electricity companies (in this

case we consulted Seeboard) charge their domestic customers only for the "real power" consumed by a fluorescent lighting unit.

This "real power" consumed by a fluorescent unit consists of - the power consumed by the lamp, plus the power lost in the control

gear circuit, measured in watts.

For example: In a 40W switch start fluorescent lighting circuit-

Lamp consumes 40 Watts of power
Circuit consumes 10 Watts of power (on average)
Total consumption 50 Watts

Therefore if you run the above unit to light an aquarium for 15 hours a day: Total power consumption will be 750 Watts and if you pay 7.3p per kilowatt hour the cost will be 5.5p per day.

The fitting of a power factor correction capacitor to the circuit will not reduce the power consumed as measured by your domestic electricity meter, as was suggested last month, and you will be paying the same to run a fluorescent unit with or without a power factor correcting capacitor.

The reason for this is that the electricity companies do not charge for the reactive current in the inductive circuits, but only for the resistive current (although they make provision for both the reactive and inductive current in their cabling network).

As a guide, the table below shows total circuit wattage (the power you pay for) for some commonly-used fluorescent lamp units.

Fluorescent lighting unit (Luminaire)

*Total circuit Watts

15 Watt lamp	24 Watts
20 Watt lamp	30 Watts
30 Watt lamp	38 Watts
40 Watt lamp	50 Watts
65 Watt lamp	78 Watts

• For standard 240 Volt 50Hz switch start circuits

• R.H. Southall, Product Development Manager, Jerrard Bros Plc.

A lesson learned

There follows a cautionary tale on how an attempt to improve my pH nearly killed my fish and plants.

A major problem arose when I tried to lower the pH in my tanks from 7.9 to somewhere nearer 7.

In early September I put half a litre of aquarium peat in each filter and the pH dropped to about 7.5, but all the new leaves on some of my plants grew dwarfed and deformed and the older leaves yellowed and died. So I doubled the fertilisers, but the algae (hitherto kept at bay) saw its chance, and I soon had black beard algae, *spirogyra*, a short green furry covering on leaves 2-6" below the surface and a blue-green

slime on leaves at the surface.

I put the correct dosage of 'Aquarian' No.4 Algicide into both tanks and learned a lesson - try drastic remedies one tank at a time. A week later, the Loaches, Plecs, Angels and Anabantids were in acute distress, hanging just below the water surface and not feeding. All the small Tetras and Rasboras were unaffected.

I did a 40% water change and put the aeration on permanently, switching from optimum conditions for plant growth to what were hopefully the best conditions for expensive Plec survival.

I rang the Catfish Association of Great Britain three days later, as the Plecs were still distressed and they were very helpful. I did



Plecs in pH distress?

another 40% water change and hoped that all the tankmates, both animal and vegetable, would forgive me. The peat idea hasn't worked for me, for a while the Kingston pH has beaten me.

In retrospect, I had destroyed what must have been a very fine balance between the requirements

of the fish for oxygen and those of the plants for slow filtration and water turnover rate with minimum surface turbulence (in order to avoid driving off the CO₂). It has taken daily attention for the last six weeks to restore this balance.

• P. Brokenshire, Kingston upon Thames

Marine Answers

■ Not usually aggressive

I recently purchased three Dancing Shrimps. The assistant put them all into a plastic bag for the journey home.

Upon my arrival home I found that the two males had dismembered the female's legs and had killed her.

This type of behaviour was not mentioned in any of the books I have. In fact they say that these shrimps prefer to live in groups. I find this hard to believe as they seem to be rather aggressive towards each other and also to the Cleaner Shrimps in the tank. Timothy Bubbs, Herts.

I was very surprised to hear about your bad experiences with Dancing Shrimps. I have never found them to be aggressive in any respect and believe them to be an ideal beginner's choice.

It is true that they do live in groups in the wild and can safely be kept in a similar fashion in the aquarium.

When you bought your shrimps, are you sure that the female did not die in the bag and the males were not just feeding on the body? Unless you actually saw them kill the female, I would find this very unlikely.

As long as your aquarium is large enough for all the shrimps to co-exist in a little bit of territory, there should be no problem at all.

■ Keep a steady salinity

I have been keeping marines for four months, using a wet and dry trickle filter system. I cannot grow Caulerpa. Do you have any tips?

My lighting consists of an Actinic, two Tritons and a Powerglo. My tank is three and a half foot. All my readings are perfect, so it doesn't make sense.

I have read that phosphates may help. Do you have any advice? Nigel Musgrove, Northants.

Macro algae, such as Caulerpa require excellent water quality and a steady salinity to thrive, plus good lighting.

Evaporated water should be replaced regularly - little and often and not in large quantities. Salinities of the changed water should match exactly.

Don't worry about extra fertilizers or nutrients. In my opinion they are generally more of a hindrance than a help.

Are my inverts safe with my fish?

Q I intend to set up a 50" x 20" x 15" tank. Filtration will be by undergravel method with two powerheads and a protein skimmer. I also intend to use a canister filter with carbon. How often should I change the carbon in this filter?

Would it be beneficial to add a trickle filter? My choice of fish would be an Anemone fish, Firefish, Long-Nosed Hawkfish and a *Centropyge loriculus*. Will these species be safe with crustacea and are they alright for beginners?

On the invert side, how do you determine the amount of inverts kept in an aquarium? Many books have photographs of beautiful aquaria with inverts apparently squeezed in all over. I intend to avoid hard corals, but are there any other especially difficult or endangered species I should avoid?

• Dr. Philip Young, Devon



The Long-Nosed Hawkfish should not present too many problems for the newcomer to marines.

A Good quality activated carbon (Eheim Ehflpur) should be changed every two months.

An added trickle filter would certainly be beneficial, but should not be seen as an aid to increase stocking levels.

The fish outlined are all suitable

and not particularly difficult. Sessile invertebrates should be given plenty of room as most expand and contract and also grow. You are correct in avoiding hard corals at this stage. Stay mainly with soft and leather corals. Mushroom polyps and clams would also be fine.

LETTER OF THE MONTH

Joseph Smith of London wins an Interpet test kit for his letter of the month.



In their natural environment, Clownfish automatically strike up symbiotic relationships with anemones. In the confines of an aquarium, they may be reluctant to enter an anemone at first and may not do so for many months. Pic. by Andreas Spreinat.

Q About three months ago I bought a pair of tankbred Common Clownfish. A week later I introduced a *Radianthus* anemone and a couple of days later I added a *Stoichactis* anemone.

But the Clownfish will not enter them. The larger one seems to nip the smaller one, but although it swims towards the anemones, it will not enter it.

Please could you explain this reluctance?

A Sometimes Clownfish are very reluctant to enter an anemone and there doesn't appear to be any reason for this apparently strange behaviour.

I can only suggest that you be patient as in the end, most Clownfish do eventually enter anemones, but it probably will take some time - maybe even months.

In the meantime, keep an eye on your fish and make sure the smaller one does not get too bullied.

The right diet

Q Please could you give me some information on feeding Mandarins? Mine is in a mixed fish/invert tank and although it is healthy, I've never seen it eat anything. Is it possible to breed them?

Please could you tell me how long Sea Slugs will live in captivity?

• G. White, Barnsley



Mandarins are not the easiest of fish to keep. They require a diet of microscopic live foods, along with rotifers and brine shrimp. Pic. by Alex Kerstitch.

A Mandarins eat microscopic live foods as well as brineshrimp and rotifers. They can be kept in pairs and may even spawn, scattering their eggs into the current, although none have been raised to date.

Sea Slugs are difficult to keep for any length of time, and they usually die through lack of the correct diet. I would steer clear of them.

Go for the smallest

Q I would like to keep a Flame Angel, but I have heard they are difficult to keep. I have a four foot Minireef set-up which includes a protein skimmer, internal spiral filter, external Eheim filter and two trickle filters - one above and below the tank. Please could you give me some advice on keeping Flame Angels?
• Glen Howe, Herts.

A I have always found Flame Angels one of the easiest of the *Centropyges* (Dwarf Angels) to keep. The secrets of success are a good varied diet, including some algae, along with excellent water conditions. It should be housed in a fairly quiet mixed fish/invert system. Always buy the smallest (youngest) specimen available, as these adapt much more quickly to aquarium life. Make sure it is feeding well in the dealer's tank. They dislike being bullied or pestered by other fish. Plenty of rockwork should be available to retreat into.

TIP OF THE MONTH

An Interpet test kit goes to T. Woolgar, from Kent for this top tip.



If you experience continual problems with inverts and have ruled out all the usual causes, try testing your tapwater for copper.

When keeping marines, nothing should be left to chance. I could not understand why I was having so little success with invertebrates. Great care had been taken with filtration, lighting, tank size and stocking, but still things went wrong. Until I decided to test the tapwater for copper. The result was an amazingly high level. This was totally unexpected, but serves as a useful reminder to all marine fishkeepers, especially those with invertebrates.



NICK DAKIN
is your expert on the saltwater scene

You must include a stamped, addressed envelope and attach the Marine Answers coupon, below, when you write in with your query or your tip to:
Marine Answers, Practical Fishkeeping, Bretton Court, Bretton, Peterborough, PE3 8DZ.

We regret that queries sent without a stamped, addressed envelope will not receive a reply.

■ **DON'T FORGET** - the Star Letter and Tip of the Month in every Marine Answers wins an Interpet Test Kit.

Use the address above for tips and letters.

MARINE ANSWERS

Nick Dakin

What is living in my rock?

Q I have a three foot marine tank which I've been running for about a year. It consists of fish, inverts, tufa and living rock. One piece of living rock in my tank is puzzling me. It has several long, thin transparent tentacles which stretch to about 9" long across the bottom of the tank, picking up odd bits of

food and fish waste before drawing them back into the living rock. Please could you tell me what these are?
• P.B. Love, Suffolk

A Believe it or not, the creature you describe is a Comb Jellyfish. It is quite common within the

invertebrate aquarium and is totally harmless. It spends much of the time out of sight in rockwork and corals and when hungry it extends its tentacles in search of food. These are sticky, so any small morsels are captured and drawn back in to be eaten. It's a fascinating sight to watch and is certainly a creature to encourage.

Too close to the spines

Q I have a 44 gallon marine tank with undergravel filtration, a protein skimmer and an external Marathon filter containing carbon. The tank has



The Marine Catfish, Plotosus lineatus, naturally swims among the spines of sea urchins when juvenile. Occasionally they come a little too close.

a UV steriliser. I test the water regularly and all are fine. My stock includes a Tomato Clown, a Regal and an Achilles Tang, a Copperband and two marine Catfish. About a week ago I purchased a long spined black urchin which settled in well. I had the Achilles Tang for a month and it only used to eat very small amounts of brine shrimp - frozen, it wouldn't eat any live. It was very thin. Eventually it rejected food completely and died. Three days later one of the Catfish seemed to be hanging at the surface, breathing very rapidly and in obvious distress. Three hours later it was dead, with its gills open very wide. There was no apparent sign of disease.

Could it have been poisoned in some way by the urchin, as the catfish sometimes swim among its spines? Or do you think it may be connected with the death of the Tang?
• D.E. Sharp, Liverpool

A I think the deaths of the Tang and the catfish are unconnected. Although it is difficult to pinpoint any specific reason, the Tang appears to have adjusted very poorly to aquarium life and seems to have wasted away. I would suggest that the sudden demise of the catfish was due to being stung by the urchin. Marine Catfish do naturally swim among the spines of urchins when juvenile but it seems that within the confines of the aquarium, it came a little too close.

This month NICK FLETCHER devotes his Practical Pond column to some new items on the pondkeeping market - and suggests another he'd like to see....

Practical Pond *New for*

Face it, February is an unremarkable time for Koi keepers. I used to regard my pond as a dog-breeder might view a kennel - merely as living quarters for the animals in his charge. Increasingly, I see the pond as an organism in its own right, in which the fish play an admittedly large part.

After all, a properly-managed biological filter lives and breathes. Fountains, venturis and waterfalls lend movement to the water, and what plants I choose to include will interact, during the warmer months, with the higher life-forms.

Now, though, the giant sleeps. The filter flow has been reduced, remaining just sufficient to prevent ice formation. The fish are semi-dormant, aquatic plants have largely died down, and I have long-since removed last year's unruly tangle of growth from the bog garden.

February is a time for thinking - sometimes laterally - planning, and sifting what knowledge I



Come the early Spring, most ponds are clear . . .

have acquired over the years, so that when the spring awakening takes place, I shall be prepared.

Clear water - and the UV

Clear water is the current preoccupation, and one which has made the manufacturers of

pond hardware quite a lot of cash over the past couple of seasons.

The battle against the harmless, but unsightly 'pea soup' has brought ultra-violet units into general use, especially among Koi keepers - whose fish preclude the sort of naturally-balanced, planted pond of years gone by.

UV, of course, started life in the aquarium side of the hobby as a bacterial and protozoan controller for marine fishkeepers. When it first made the quantum leap to outdoor ponds it was viewed with suspicion as a possible killer of filter bacteria, and was claimed to lower the natural resistance of Koi and



. . . but by June they can be green and murky.

A murky Summer problem

Murky water is a summer phenomenon...go outside now, look at your pond and I guarantee it will be crystal-clear. It amuses me when people come up to me in late autumn, with that self-satisfied look, and say: "I can see to the bottom of my pool" - as though they had done something clever.

The truth is, soupy water is caused by two things, single-celled algae and suspended solids. And what causes solids to go into suspension? The movement of fish. Little wonder that in winter, with the fish conserving their energy, none of this stirring up takes place. Have a look at your pool on one of those unseasonably warm days we get before spring proper, and I'll wager you'll notice some loss of clarity. You can't blame your UV for that, so the fault must lie in your filter.

One thing I make a point of at this time of year is going round my pool with a dip-net, taking out muck from the bottom. If I had a vacuum, I'd use that. There is no better way of ensuring, when your filter begins to come on stream in spring, that it is not overloaded in dealing with decaying plant matter.

'92



Case study - the UV in Europe

Now that UV units for ponds are big business, it's getting so that rival manufacturers are cutting one another's throats to compete for a share of the home market. The sensible ones are looking to export their product farther afield. When one company sought approval abroad for their current model of UV Clarifier (having already paid great attention to its safety features), they thought it would be a formality.

But preliminary submissions to German and Dutch standards offices soon revealed that all existing 'water jacket' or 'enclosed' designs, using the familiar double-ended germicidal UV lamps, would be unacceptable in Europe. The problem lay in potential risks to the user during lamp replacement.

The solution was to hand in an enclosed design with a new type of germicidal lamp, the TUV PL-S 'long life' manufactured by Philips Lighting. This features one-ended electrical contact and built-in starter.

The company have incorporated this new lamp into all their UV systems, and say that it gives them a unique safety status for both home and export markets.

Further protection is provided by an internal safety switch which isolates the lamp when the hood is removed during lamp replacement.

Here is a classic example of necessity being the mother of invention - the benefits of the new system go far beyond safety considerations, for the electrics are simpler and more compact, and this is reflected in reduced cost. A 9W unit will treat 2000 gallons, as opposed to the 1000-1500 gallons claimed for current 8W models, and if you enlarge your pool, all the new UVCs can be upgraded with a so-called 'Lamp-add' kit. There is another cost-saver, in that the Philips TUV PL-S loses power far more slowly than a conventional lamp. As in those adverts for long-life batteries, it will still be going strong after a year, whereas six months is the effective lifespan of the old style 8W tube.

The new lamp is claimed to emit over three times more light per unit length than a double-ended 8W lamp, which accounts for the viability of a more compact design of UV unit.

But contact time decides how efficient a UV will be. To compensate for the shorter tube, it's been necessary to increase the cross-section of the contact chamber from 65mm to 105mm square. A spin-off from this is increased turbulence, which is another decider of performance.

The new models will be ready for the 1992 season...one can only wonder whether they would ever have 'seen the light', had it not been for safety-conscious officials across the Channel. See contacts below for details.

other fish to common ailments.

That myth didn't take long to die: I believe that many people were subconsciously confusing UV with ozonisers which can, indeed, be dangerous to both fish and fishkeeper unless sensibly used.

Being the soft-hearted individuals we are, once we were convinced UV was safe and beneficial to our fish, we left it at that. But I was always a bit uneasy that the prototypes of



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commercial UV sterilisers didn't carry a health warning - directed, not at our Koi, but towards ourselves.

There seemed something inherently dangerous about a mains-fed piece of equipment, in use 24 hours a day, in which there was an interaction - however well-guarded between water and electricity. More so because UV tends to be an 'add-on' to established ponds. In other words, we take to heart all the safety advice about installing a circuit-breaker with our pumps, and burying the cable, and insulating our junction boxes, and then along comes something which

promises an instant improvement to the clarity of our water. The urge to buy the first one off the shelf, and get it kicked in ASAP, may override commonsense - hence the huge postbag I get from hobbyists who are in some way dissatisfied with their investment.

Affordable bottom drain

Another useful item in our obsessive battle against green water would be an affordable bottom drain... not, I hasten to add, as a vehicle enabling us to

flush hundreds of gallons daily to waste, but as a means of feeding bottom water to a settlement or swirl chamber. One reason Koi-keeping got the early reputation of being a 'snob' hobby was the high price of the hardware.

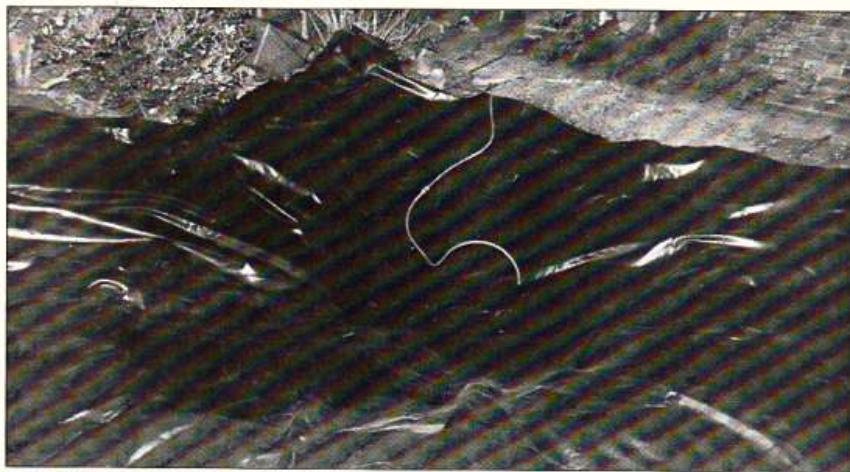
I recall Peter Waddington, in his first In-filtration catalogue of ten years ago, saying that all it needed was mass demand for his products, and he would be able to afford the necessary injection-moulding equipment that would put his bottom drains on supermarket shelves for a tenner!

In those heady days, Golborne was the centre of a very small universe and Pete could sell all he could make, regardless of the price.

Not so now. The first indication of the spread in popularity of Koi-keeping was the rash of external filters, of varying efficiency and pedigree, being knocked up in garden

Left: The new bottom drain from Bob Pateman.

Below: Blue Photographic Koi bucket also from Bob Pateman.



A box-weld liner would avoid this scene.

sheds and flogged to those whose buzz-word was 'biological'. Healthy competition was no bad thing, and we, the hobbyists, reaped the benefits.

Now, on the same tack, we have a bottom drain that won't dredge our bank balance to danger level. Not quite Pete Waddington's predicted tenner, but the Pond Safety Drain by Bob Pateman Enterprises is going in the right direction at just £32.

Made of heavy-duty black PVC, the drain wins no prizes for beauty - in fact, when I first saw one I laughed aloud, because it reminded me so much of those little space creatures that used to advertise instant mashed potato!

The drain consists of the

traditional 'mushroom cover' (450mm diameter - about 18 inches) over a sump, from which a pipe coupling leads either to waste or to a filter, of which more later. The necessary gap between the cover and the flange is achieved by PVC spacer blocks. This drain is for liner pools only, the idea being that the liner is trapped between trough and sealing flanges with a gasket of mastic, then tightened into place with screws. It sounds precarious, but that's the principle with all such drains - providing you position the liner snugly into the excavation, so that it doesn't pull away as you begin filling the pond, and you allow the mastic time to cure, all should be well.



The Pateman Cyclone water filter.

A design point I like about the Bob Pateman drain is that the outlet pipe is a smooth, unobstructed fit to the sump, minimising the likelihood of any debris getting trapped.

From the same manufacturer comes the Cyclone water filter, hardly an innovative design as Bob himself knows, having worked with such units for many years in an industrial setting, so the main consideration is price.

This vortex-chamber type solids separator starts at £114 for

the 3ft tall, 2ft diameter model, going up to £303 for a monster standing 5ft 8in tall and with a 3ft 6in diameter.

The principle is that water enters constantly by means of a tangential inlet, via a bottom drain, and exits higher up the cylindrical body of the filter, free of suspended solids. These have been collected in the inverted cone shape at the bottom of the device, in the base of which is a pipe that can be connected to a tap, pump or a gate-valve. This is a principle of filtration that has a lot going for it in these times of water-saving consciousness. Team it with an efficient UV unit and biological chambers holding one or more of the new generation media such as open-cell foam, matting or Siporax, and perhaps truly clear water will be within everyone's grasp.

What I do find ironic, though, is that while biological chambers may now be built smaller than ever before and still remain effective, the pre-filter (or settlement) units are going in the opposite direction. Vortex filters may work a treat, but they are not easy to install unobtrusively - there is further scope here for a laterally-thinking design genius to make his fortune. Details in the contacts box. ■

CONTACTS

■ New U/V details from **Cyprio Ltd., on 0778 344502.**

■ Details of bottom drain and vortex stockists from **Bob Pateman 0277 623027**

Box-welds off the shelf?

Still on the subject of mass-production for the Koi market, why is it that box-welded pool liners are not more readily available 'off the shelf'? At the moment you can order them specially, and they cost a few pounds more than the equivalent flat liner, but I suspect that there would be a huge demand for standardised 'drop-ins'.

After all, if you are an indoor fishkeeper, you buy your tanks ready made - 30' x 15" x 12", 36' x 18' x 12" and so on...you don't buy the glass and assemble them yourselves, unless you want an unusual shape or something to house a 4ft Redtail Cat!

The benefits of being able to go into any aquatic shop and come out with a square or rectangular box-welded liner are potentially great. The customer gets a pond without all the horrendous creases in the corners that slow down water circulation and provide a bolt-hole for parasites. There is none of that guessing of the pond volume, so often proved wrong when the time comes to administer medication.

The dealer benefits, too, because if he is smart he will be able to offer filter, UV and pump packages tailored precisely to the various liner pools he sells...along with all the necessary pipework, couplings, filter media and so on.

Ah, but what about the joys of deciding the precise dimensions of your pool? Will not such standardisation be alien to the creative instincts of the pondkeeper? Perhaps, in some cases, it will.

But if I were starting a new pond from scratch I would welcome this small infringement to my liberty, in return for the sheer convenience of such a system.

And I would far rather dig a hole 8ft x 10ft x 4ft deep and pop in a purpose-welded liner than lug home one of those awful pre-formed pools with curves, and shelves, and a naff name - then try and excavate something approximating to its complex contours, with all the subsequent hassle of levelling and back-filling. Does anyone out there agree?

PRACTICAL Fishkeeping

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COMPETITION

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AQUATICS

WIN AN H39 HEXAGONAL TANK FROM REEF AQUATICS OF NOTTINGHAM

Reef Aquatics of Lambley, Nottingham are giving a superb Hexagonal white island aquarium worth over £1000 to the lucky winner of this month's competition. Suitable for tropical fish, marines, and inverts, the system includes water resistant hood; correct lighting tubes with reflectors; light control unit; centrifugal pump; spiral filter; combined heater/thermostat; nitrate filter and protein skimmer.

The whole unit forms an integrated fishkeeping system that will make a superb talking point in any room.

This month's competition begins on January 28. To enter, all you have to do is to study the three questions below, the answers to all of them can be found in the Reef Aquatics mail order advertisement on page 115 in this issue.

■ When you think you have the correct answers, dial our competition hotline on 0898 600067

■ The recorded message will read out the questions in the order they appear below, and the choice of answers (a,b, or c). All you have to do is say clearly "Yes" to the answer you think is correct in each case.

■ If you answer all three questions correctly you will be asked to leave your name and address. Please state whether

you would be willing to receive details of any further promotions, including the Reef Aquatics catalogue.

■ Keep the competition handy by you when you 'phone.

■ Calls cost 36p per minute cheap rate; 48p per minute all other times

■ The names and addresses of all the correct entrants will go into a draw after the closing date which is February 28. The first name drawn will win the Hexagonal tank.

■ REEF AQUATICS,
FLORALANDS GARDEN
CENTRE, CATFOOT LANE,
off MAPPERLEY PLAINS
ROAD, LAMBLEY,
NOTTINGHAM NG4 4QC.
Tel: 0602 676100

1. Which well known brand of filter is on special offer in February?

- a. Fluval
- b. Eheim
- c. Visijet

2. What price is the Sea Test master Kit?

- a. £45.25
- b. £38.70
- c. £35.50

3. How many types of plastic plant are available?

- a. 6
- b. 15
- c. 12



The H39 system tank.



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Coldwater Answers

■ Careers with fish

Is there a course for anyone interested in a career with ornamental coldwater fish or in trout and salmon farming? Gail Mackay, Northampton

Sparshott College, Sparshott, Near Winchester, Hants, specialises in the Ornamental Industry and fish farming, varying from one to three year courses.

The Institute of Aquaculture, University of Stirling, Scotland, also provides degree courses.

The Institute of Fisheries Management, 22 Rushworth Avenue, West Bridgford, Nottingham NG2 7LF, run training courses, leading to a certificate or Diploma in fisheries management. **BB**

■ Check your water

In September I built a pond 18' x 11' x 30" using a liner. It holds 1600 gallons of water. It has oxygenating plants. Large sandstone blocks form the edge of the pond.

Eleven 2" Orfe were added to the pond after two days, together with a couple of goldfish. The following day three 4" Koi, two Shubunkins and an Israeli Carp were added.

Within three days the Golden Orfe had all died, followed a week later by the Israeli Carp and the Shubunkins. The goldfish and Koi later succumbed.

The fish showed no signs of disease although they did appear to be very lethargic. Do you have any ideas? D. Mactavish, N. Yorkshire

You do not mention whether your pond is filtered. It is most likely that your problems arise from poor water quality and I would strongly recommend the addition of a filtration unit to break down the harmful by-products excreted in the form of ammonia by fish.

Both ammonia and nitrite are extremely toxic to fish and can lead to rapid death. Test kits are available to monitor ammonia and nitrite and this should be done regularly.

Tetra have recently launched a dissolved oxygen test kit, which is another item worth keeping in stock. In the colder winter months, oxygen dissolves readily in water, but as the temperature increases in the summer, oxygen decreases. It is essential that there is sufficient aeration in the pond during the summer, especially if there are plants in the pool, or the water has become green due to an algal bloom. **BB**

Will my fish grow?

Q I have a two foot tank containing a 3" goldfish, two 2" Moors, a Fantail, which is 2" and three Koi Carp, one of 3" and the others 2" in length.

They have been in the tank since September. Are they likely to grow any bigger?

• Margaret Sweeney, Strathelyde

A Your tank is actually just about right. Including your Koi, you have, by my reckoning 16" in a tank with a surface area of 288 square inches - or one inch of fish per 18 square inches of surface. Recommended maximum is 10" per inch of fish.

So don't panic...this is fine. In my



Fish kept in an overcrowded aquarium will become stunted. If released into a pond, at a later date, they will grow slowly compared to other goldfish. Pic. by Pete Trevett.

experience, there is hardly a coldwater tank in the land which complies with this calculation. So long as you maintain your aquarium well with regular water changes, you should be fine.

The goldfish will almost certainly not put on more growth as they are being stunted. Even if you later transfer them to a pond, you will

find that they grow much slower than is normal.

Koi are supposed to have a growth hormone that limits their size to within the limits of their accommodation - but that is not my experience. Two whoppers in my pond started off in a tank and soon outgrew it. The cheap and nasty Koi grow the quickest, I find. **NF**



Fancy goldfish tend to suffer from swimbladder problems because their body-shape compresses the organ, preventing it from working properly. Pic Noreen Tan.

Upside-down goldfish

Q My Lionhead, which I purchased over a year ago, has been sleeping head down in one of the tank corners at night. This problem has become increasingly worse and he now spends long periods of the day on his back. When I disturb him, he turns round with a bit of an effort and swims quite normally. He is eating well. What is wrong and how can I cure it?

• Robert Pierce, Jersey

A Your Lionhead appears to be suffering from

swimbladder disease. The swimbladder is a sac-like organ lying close to the spine of the fish. It holds gas and regulates its position in the water, but in some fancy varieties of goldfish, the body shape is so distorted that the swimbladder is compressed and cannot function properly.

Sometimes this problem is temporary and rights itself, but equally it can be incurable.

Some authorities recommend raising the water temperature and I have seen a sling device which kept a sick fish upright until it regained its equilibrium - but I am not convinced. **NF**

Which central heating pump?

Q My pond is part-raised and holds approximately 1200 gallons of water. It is run by a 770 Amphibious pump, but I am in the process of fitting a central heating pump. What do you recommend?

• C. Heald, Droylsden

A Grundfos is the most commonly used brand of central heating pump. Aim for one which will turn your pond volume over once every two hours, i.e. 1500 gph (allowing for loss of pumping power through friction in piping and at head). The stainless steel model is less subject to corrosion, but does not have the option of a variable speed, which can prove useful in winter.

All central heating pumps should be sited in a dry, well-ventilated chamber as far below pond surface level as possible. As your pond is part-raised, your pump could actually be installed at ground level, but a sunken chamber covered in decking would be neater. Be sure to install isolating valves either side of the connections, for swift removal and replacement of the pump if things go wrong. **NF**

Lower the protein

Q Can goldfish breed out of season? My two Black Moors (so recently purchased that they are still in the quarantine tank) are showing all the signs of courtship with the presumed male chasing and nuzzling the female.

He swims beneath her and pushes her towards the surface. She seems to tolerate this but doesn't reciprocate.

I'm feeding them quite a lot of protein (prawn, chicken; white fish). Could this have been a stimulus?

In a few days they are due to move into the main aquarium which currently houses a Calico Ryukin. Should I put the male in first to give the female a break in the quarantine tank alone?

• Carol Anne Davis, Edinburgh

that your central heating, plus possibly very good lighting, coupled with a diet that is tailor-made to building body tissue is what has prompted your male Moor to behave as he does. I would not give such a high-protein diet - you will notice that the protein content of coldwater fish flake is lower than for tropicals - they simply cannot digest it as efficiently.

The behaviour could equally be mild aggression, either between fish of the same sex or between a pair, the presumed female of which is unready for the male's attentions. Your solution of putting the suspected male into the community tank first, is the



Moors, like other coldwater fish, require lower protein levels than tropical fish.

right decision. It will also give you the opportunity to see how he behaves towards the Calico. NF

A Any change in environment, temperature or water quality can trigger the spawning impulse. I would venture

A rapid grower

Q I have recently purchased a *Myxocyprinus asiaticus* which I have in a three foot tank which is slightly heated to 68-70°F. Please could you give me some information on this fish?

A Also known as the Chinese Sailfin or the Topsail Sucker, *Myxocyprinus asiaticus* is a member of the carp family. It is peaceful, entirely vegetarian, and there is just one snag. If you heat the water, as you are doing, it will grow - rapidly - to 24" or more. In a three foot tank, this will cause you problems, so you may need to expand your glassy horizons substantially. NF

A I'm afraid your suggested stocking of native and ornamental fish is ill-advised. Collected fish almost always carry some sort of infection or parasite which, in a confined aquarium, emerges and devastates the less hardy fancy goldfish.

A tank holding Sticklebacks and Gudgeon might be interesting, however. The Gudgeon's lifestyle is similar to that of the *Corydoras* catfish, in that it is a bottom-dweller, living on small invertebrates. Sticklebacks behave much like Cichlids during the breeding season, with the males defending the nest from predators. The same is true of Bullheads, *Cottus gobio*, which I believe can still be found in cleaner parts of the Thames. NF

Don't mix them

Q I am intending to set up a coldwater community tank. I have collected some Stickleback eggs which have recently hatched, along with a Gudgeon from the Thames.

I would like to keep a pair of Sticklebacks and a pair of Gudgeons along with some Minnows, two Moors and either two Calicos or Orandas.

Please could you tell me if this set-up will work?
• William Davies, Oxford



Gudgeon are a bottom-dwelling species with a lifestyle similar to *Corydoras* catfish.

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Everything you want KOI

We continue our series for lovers of Koi - and newcomers to the hobby - destined to cover every aspect of the most popular pond fish. This month, anatomy, by ALEXANDER ARROWSMITH

What makes Koi tick?

Carp are bony fish (as opposed to the cartilaginous skates, sharks and rays).

Ask a child to draw a fish, and he or she will probably come up with something shaped more or less like a Koi; for carp are designed, not for a specific environment, but to take full advantage of a variety of habitats - hence their almost global success story.

They are not, for example, laterally compressed like Angelfish, elongated like loach or finned like a predatory fish, (which has most of its propulsive power towards the rear of the body, for sudden but unsustainable bursts of speed).

The fleshy, protrusible mouth of a Koi has two pairs of barbules or 'whiskers' on the top lip, one

much larger than the other. These are equipped with highly sensitive taste receptors, useful when the fish is grubbing around for food on the bottom of a lake or pond, when eyesight is of limited use.

Fins

The fins of a fish, and a Koi is no exception, perform the same function as those on an aeroplane, with the addition of propulsion. The **caudal**, or tail fin, moves the fish forward through the water and also acts as a rudder, to change direction. The somewhat long **dorsal**, or back fin, has three or four hard rays on its leading edge, with up to 22 soft rays behind, and its function is to keep the fish upright; the single **anal** fin

performs the same function (3H, 5S rays). Paired **pelvic**, or **ventral** fins steer the fish in the water (2H, 9S), and probably the most finely-tuned fins of all are the paired **pectoral** fins, behind

and below the gill covers (1H, 16S).

Fanning of these can move the fish slowly forwards or backwards.

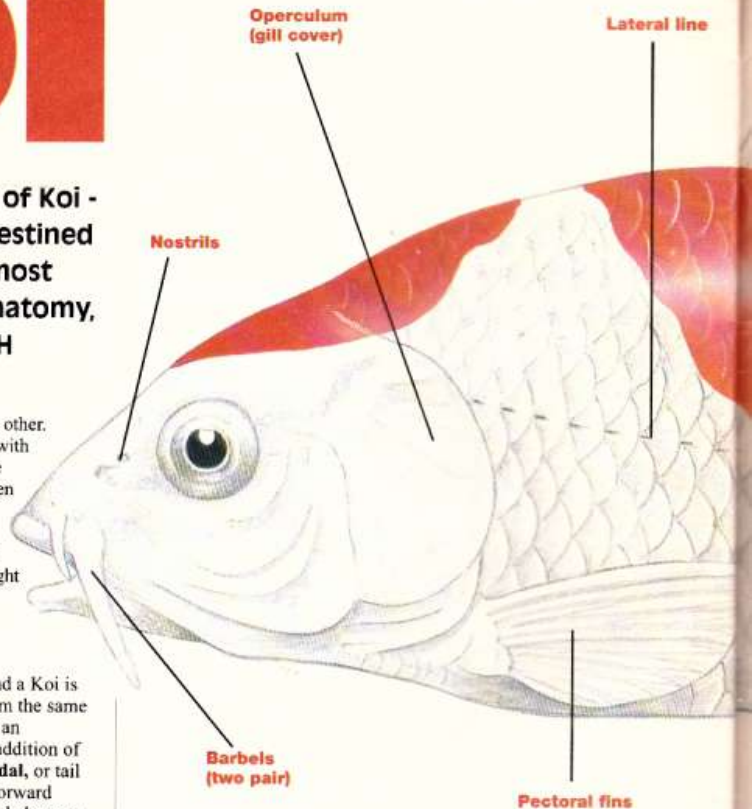
Skin and scales

The Koi's body is protected by three (in the case of Doitsu fish, only two) layers of defence: protective **mucus**, **scales** and **skin**. Where scales are not present, the skin is usually more leathery, to compensate.

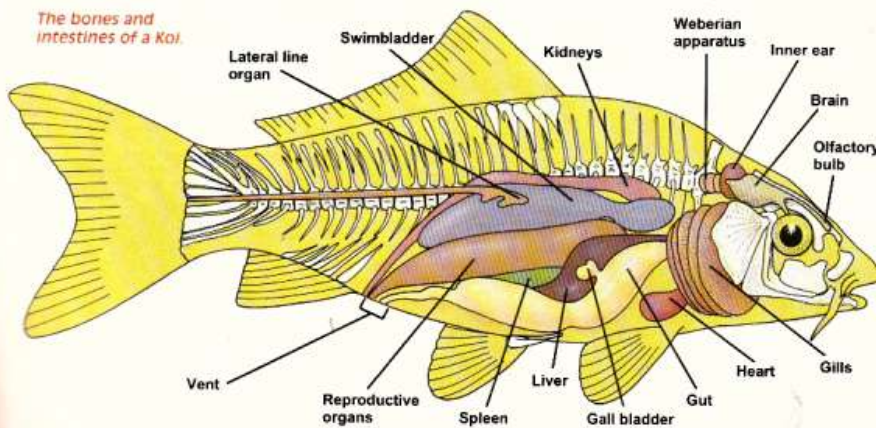
Mucus and scales can both be replaced if rubbed off or damaged, but in the meantime the fish is at greater risk from water-borne infection.

Eyes and senses

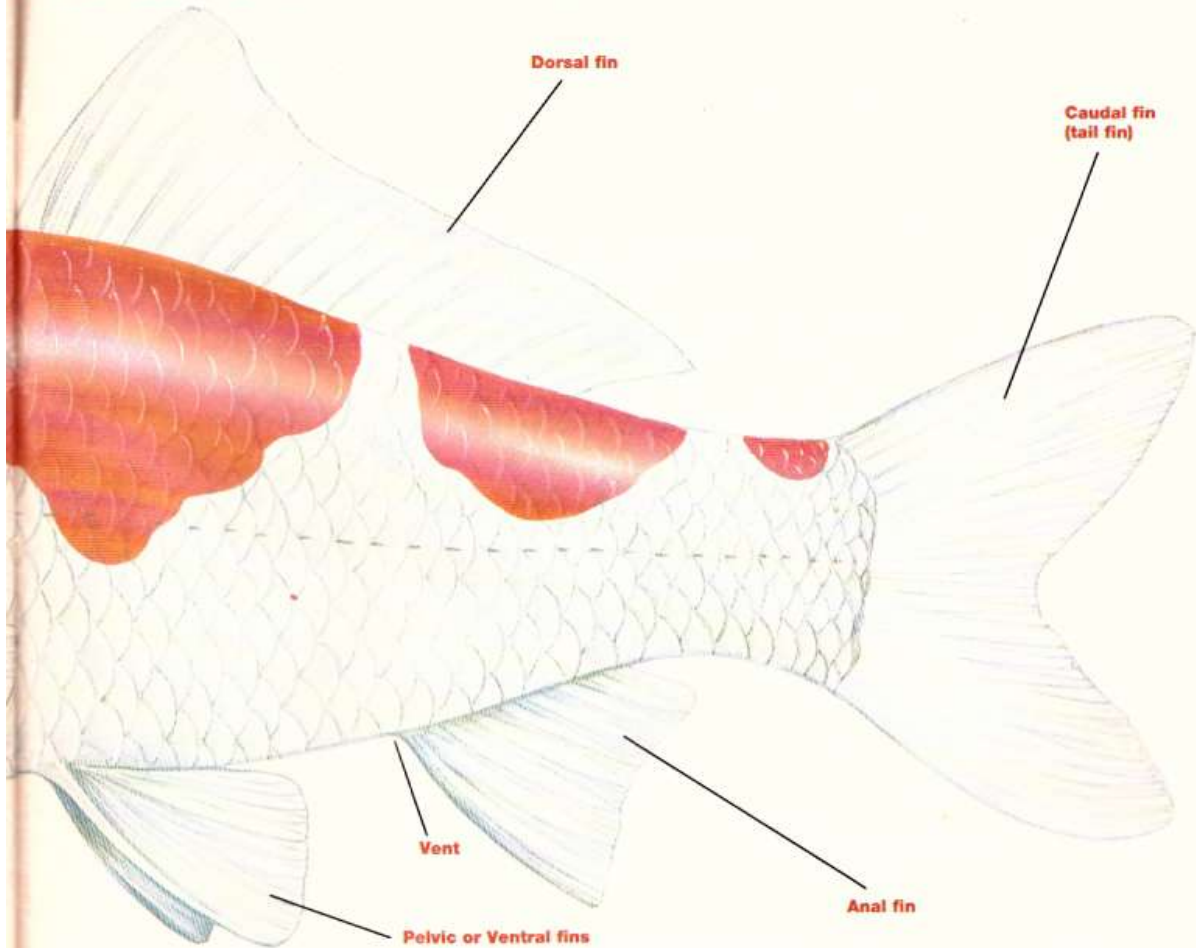
Koi are provided with sophisticated sensory apparatus to assist in their search for food



The bones and intestines of a Koi.



...ted to know about...



and evade predators.

Eyesight is good, and these fish possess all-round colour vision. The **sense of smell** is well-developed, too. Nostrils are paired, and joined by tubes in the bottom of which is a high surface area of olfactory cells. Water enters the forward nostril, passes over these cells and exits via the rear nostril, during which time the minutest traces of dissolved substances are picked up and conveyed to the front region of the brain via olfactory lobes.

The **lateral line** is common to all bony fishes, communicating the animal's position in the water relative to other Koi and to inanimate objects: it also senses changes in water movement.

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As in the ear, there is interaction between the water and a series of **sensory cells**. These are located in canals within the skin, contact this time being made via pores in a series of scales running from gill cover to tail.

Respiration

The **gills** are the Koi's equivalent of our lungs, providing a gaseous exchange via a network of fine blood vessels, or capillaries.

The gill filaments, protected by the gill cover or operculum, are provided with a steady stream of water caused by a pressure difference as the fish opens and closes its mouth. The huge surface area of capillaries,

connected to the heart and serviced by a network of veins and arteries, takes up dissolved oxygen from the water and releases carbon dioxide.

Internal organs

There are no teeth in the jaws of Koi, but further down the throat are bony **pharyngeals** which can crush snail shells or the chitinous armour of aquatic insects.

Koi do not have a stomach, only a short **oesophagus** connecting to the intestine, where food is broken down by enzymes and the nutrients are absorbed.

The very large **liver** stores sugars which are released to replenish energy.

The **kidneys** of Koi can be

regarded as simple filters, situated high in the body cavity either side of the flexible backbone. Waste products pass via a capillary network into a series of ducts which merge into the ureter, from where they are voided into the water. The kidneys also regulate the fluid content of the fish's body.

The **swimbladder** is an organ that regulates the Koi's buoyancy, enabling it to rise or fall in the water and maintain any position in between. Situated just below the kidneys, it is connected by a small duct to the gut. To maintain the gas within the swimbladder, the Koi gulps surface air which is then conveyed to the organ through this narrow passage. ■

THE

MARINE FORUM



Dave Keeley is
Underworld's expert.

■ Angel in Distress

Q Help, I bought a Rock Beauty dwarf angel, *Holocentrus tricolor*, last week, and I cannot get it to feed. I have tried all the obvious foods - frozen mysis, brine shrimp, bloodworm, cockleshell, mussel meat, Flake Food, freeze dried krill etc. The fish wants to feed, he shows interest in all that I introduce, but he just will not swallow any. Any ideas?

B. Thin, Rockwell

A If you read Butterfly & Angelfishes, the diets of each of the described species are described in some detail. By analysing the stomach contents of captured fish, it is possible to determine their eating habits. Many of the Angel species are found with sponges in their stomachs, including *Pomacanthus*, *Holocentrus*, *Pogonites* and *Euxiphyps*. These species rely on sponges for part of their diet, to a greater or lesser extent, and your fish feeds almost exclusively on sponges in the wild.

Until recently, feeding these species was a major problem, but now Ocean Nutrition of California have introduced as part of their frozen food range their Angel Formula, which actually contains 10% frozen sponges. This is a real breakthrough in feeding technology, a great step forward in helping to keep alive fish which previously had little chance of survival.

Ocean Nutrition in fact have a range of 'Formula Foods' for different types of fish, tailored for individual species' needs. They have only recently been introduced into the U.K., and you may have to search around to find a stockist, but the advantages of the Formula Foods so outweigh conventional single constituent packs, that I am convinced that once your fish have experienced the new diet, they would not let you revert back.

■ On Heat

Q In January's Underworld Marine Forum, you answered a query concerning heating a marine tank,

■ Decorating Tips

Q Dave, I swear I'll kill you if you feature me as your Wally of the month, but my question is so simple I think you might. Forgetting technology and all the advanced queries, how do I decorate my marine tank? I want a fish only tank, initially anyway, but I want it to look full and interesting. Tufa Rock is both boring and displaces too much water, as do other rocks. I refuse to use real coral for obvious reasons, and just as obviously Live Rock is not suitable for my tank. Any suggestions will be welcome.

B. Rush, Trimdon

A You need not worry. I have no plans to feature Wally just yet. And since yours is a quite common and sensible query, you would not qualify anyway. Decorating an invertebrate

tank is a lot easier than a fish only tank, as long as sufficient funds are available. Both Living Rock and larger individual invertebrates serve both as inmates and as decoration. But because of its expense, many aquarists cannot afford to fill a tank with living rock, and many use Hobby's 'dead living rock,' or Grotto Rock, to pad out the real stuff. The Grotto Rock looks perfectly natural, to the extent that many inverts will actually colonise it. And there is no reason why you should not use it in your fish only tank - it is perfectly safe, it is non-toxic, it looks good, it comes in interesting shapes and hues, and is very porous, so does not displace much water. I normally do not recommend Grolux in marine tanks, but I have to admit that the red light does bring out the best in Grotto Rock. And at about a quarter the price of the real thing, it is very popular in these

hard times. It was not available for around two years owing to production problems, but you should have no problem in locating it now.

If you had asked me this question six months ago, the answer would have stopped there. But now I should mention as well ReefForms, the new Aquarium Systems range of artificial corals and sponges. All together there are 24 different corals, all either in their natural 'live' colours or in bleached white, plus three sponges. I have seen tanks decorated entirely using ReefForms, and they look unbelievably realistic - they certainly fool the fish. I am currently experimenting with setting up a tank with a background of Grotto Rock, with just three or four pieces of ReefForms intermingled in strategic places. I will try and publish a photo in a future Marine Forum.

and you recommended using Visitherm heater/stats because of their reliability, but you left a lot of questions unanswered, for me anyway. What temperature should I keep my marine tank at? How do I set the temperature in the first place? How do I check if the temperature is OK? How do I know what wattage to choose initially?

R. Burns, Heaton.

A Temperature is easy - 75°F or 24°C. Nearly all the coral seas are this temperature, and nearly all the marine fish and invertebrates you are likely to encounter will thrive in this range. It amazes me the number of beginners who set their thermostat 2° or 3° higher - it is not necessary, and is wasteful.

Compared to the old days when setting temperatures was time-consuming and somewhat of a lottery, the Visitherm is designed for very quick and easy adjustment, with a large visible scale, marked in both fahrenheit and centigrade, so setting the temperature is now no longer a task - I was reading one of my articles the other day,

written around 10 years ago, where I allowed 24 hours for getting the temperature right - fortunately, this is now history.

Another advantage with Visitherms is that they are all preset, in the factory, submersed in water, and consequently they are more accurate than most thermometers available.

Certainly in my experience I never rely on stick-on digital thermometers, which by their very positioning, stuck on the outside of the tank, can not be expected to give a true reading of the water temperature. By all means use a digital thermometer as an easy visible indicator of problems, but always have access to a mercury thermometer for accuracy.

As for knowing what wattage to choose, this does depend very much on the room temperature. As a general rule of thumb, I use 50w Visitherms for every 6 or 7 gallons of water in an average living room. Thus, if I was setting up a tank 36 x 18 x 15, holding 35 gallons, I would buy 2 x 150w heaters if the tank was situated in a living room, maybe 2 x 200w heaters in a hall or bedroom.

PRODUCT INFORMATION

If you would like further information on any of the products featured in Underworld Marine Forum, please complete the enclosed form and send with a S.A.E. to:

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