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AQUARIST AND PONDKEEPER

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COVER STORY

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Staffordshire Waterlife

As more and more people take up Koi-keeping, scenes like the one depicted on our front cover are gradually drifting within the reach of every dedicated enthusiast. Majestic Koi specimens, although still as expensive as they have ever been, are nevertheless no longer the rarities they once used to be, while the huge influx of small, colourful, robust, inexpensive Koi in recent years has given rise to a corresponding flood of new hobbyists. Improved technology, along with wider dissemination of advice and literature, are among the other factors which have contributed (despite the current S.V.C. scare) to the impressive growth in Koi-keeping which is being experienced worldwide.

S.V.C. — WE NEED THE FACTS

Mention Koi these days and virtually everyone raises the problem of S.V.C. (Spring Viraemia of Carp).

Yes, it has been a bad year for S.V.C. but, if some of the scare-mongering headlines we've seen in past months were really true, then one could be excused for believing that every single Koi in the UK has had a brush with this deadly virus.

Let there be no doubt — S.V.C. is serious — *deadly* serious. If you are 'hit', like some people, unfortunately, have been — you've got problems ... and how! Under such circumstances you'd, quite naturally, be hard pushed to believe that anything other than draconian methods will provide a solution.

Don't let's, however, make the fatal mistake of believing that S.V.C. has affected *all* imports of Koi and Carp. It hasn't. In fact, shipments from certain countries such as Japan have, reportedly, been totally clean. (S.V.C. is apparently unknown over there). Equally, adequate quarantine, along with other simple sensible measures, can prevent the spread of the disease to healthy stocks (see, for instance our Koi '88 preview in *Out and About*).

We, at *A & P*, wouldn't dream of closing our eyes, or minds, to the problem, pretending that it doesn't exist. However, neither do we want to rush into print with poorly-documented reports and half-baked anecdotes. What we want is a responsible, objective, well-informed, comprehensive review of the situation which will help us all to see the problem in its true perspective.

Yet, in order to do this, we need help. We need our readers, be they hobbyists, retailers, wholesalers, importers, researchers ... or whatever, to give us any relevant information they may have at their disposal. Only then will we be able to tackle the issue as responsibly as is our normal practice.

Easier said than done, though. While we have already received much-appreciated data from certain sources, in many other cases, documented evidence (understandably, to a certain extent) is proving extremely hard to come by. If you wish to retain your anonymity when you write in, then we will, of course, fully respect that and will not publish any details you request us to withhold. We do, however, need to know your identity, if only to contact you to seek amplification/clarification of any points you may raise. The important thing, though, is to send something in to allow us to compile our report.

You will find reference to S.V.C. in three separate items this month: *Naturalist's Notebook*, *Coldwater Jottings* and *Out and About*. That should leave no-one in any doubt as to how important we consider the subject to be.

Now, having got that off my chest, let me turn, briefly, to much brighter matters concerning Koi.

As soon as you picked up this issue of *A & P*, you can't have failed to have noticed that it is a bumper one. It is our traditional August Koi issue featuring a really super, colourful, self-contained *Supplement* on these living jewels (yes, there *is* life outside the realms of S.V.C.). Top articles from top writers make this latest *Koi Supplement* an absolute must.

If you are *not* a Koi buff, though, just glance down the impressive contents list on this page — you are bound to find something to suit your taste ... whatever that might be.

Read on ...



John Dawes
(Editor)



**SPECIAL BAF
ADMISSION OFFER
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KEEPING A BRACKISH AQUARIUM

If, like Patric Baird, you want a change, why not set up a brackish aquarium? It will add a new dimension to your fishkeeping.

Almost two years ago, I felt the urge to widen my horizons with regard to keeping tropical fish. At that time I had a four-foot tropical aquarium which, although very successful and decorative, had very little scope for development and improvement. As a very keen aquarist, I enjoy the challenge of setting up, stocking and maintaining a tank. However, now that my tank was fully stocked and running very well, all I could do was feed my fish, change some water every so often and ensure all was well with the electrical equipment.

While watching the fish gave me a great deal of pleasure, I was starting to feel less like a participant, and more like an observer. I therefore decided that it was time to set up another tank. I wanted it to be as different as possible from my existing one, and preferably, something which I had never tried before. Eventually I decided that it was a choice between marines, Rift Lake Cichlids or brackish water fish.

I had a very brief encounter with the first two some years ago, but found some of the fish to be very expensive, or poor quality and virtually unobtainable. I attribute this to the fact that I am unfortunate enough to live in "The land that fishkeeping forgos" — Northern Ireland.

Anyway, I decided that brackish fish it would be. I knew next to nothing about what this largely ignored section of fishkeeping involved, although I had a fair idea which fish were suitable, having many times attempted to buy them, only to be told "Not suitable for your tank — they're brackish". It didn't take long to realise that very little information is available on this subject. I managed to obtain what I believe to be the only book, namely 'Brackish Aquariums' by Michael W. Gos, published by TFH Inc, in the KW series.

Now confident, and armed with a basic knowledge on the subject, I took the first steps into what turned out to be the very rewarding and fascinating world of brackish fishkeeping.

Among the Rainbowfish, *Telmatherina ladigesii*, the Celebes Rainbow is probably the best suited for brackish conditions.

knowledge on the subject, I took the first steps into what turned out to be the very rewarding and fascinating world of brackish fishkeeping.

SETTING UP

I decided to use a 30in x 15in x 12in (75 x 37 x 30cm) all-glass tank. As with marines, an all-glass aquarium is best, owing to the corrosive properties of brackish water upon a metal-framed tank. Plastic or glass condensation trays are vital also, in order to protect the lighting equipment from salt deposits, and to prevent evaporation which leads to fluctuations of salinity. No special equipment is required in setting up a brackish aquarium; therefore, anyone who may decide to convert an existing freshwater set-up may do so at very little extra cost.

Filtration — I decided upon a combination of undergravel and power filtration. Brackish water fish tend to prefer clean, well-aerated and turbulent water, so an Algarde 23in undergravel and Rena 225 power filter were installed. A Rena 101 air pump is adequate, but for a larger tank, a stronger pump would be needed. Substrate is largely a matter of taste. However, living as I do in an area supplied with very soft water, I found it necessary to use limestone chippings and coral sand, separated by a Gravel Tidy. Generally speaking, hard and

alkaline water is a must for brackish fishes. By using limestone gravel, coral sand and/or Calcium Plus as a substrate, one can usually achieve the necessary alkaline pH and a carbonate hardness of above 10 degrees DH. Those already supplied with hard water may use ordinary Dorset pea gravel or similar.

Heating — An ordinary aquarium heater/star is ideal, although it is a good idea to maintain a relatively high temperature of around 78-80°F (25.5-26.5°C).

Lighting — Depending on whether or not one wishes to attempt growing plants, the bare minimum of light will suffice. I employ a 20W Grolox in my tank, although the addition of a 20W Northlight, or similar, would certainly be of benefit to the plants.

Assuming one has followed the usual guidelines for setting up a normal tropical freshwater aquarium, combined with the above pointers, the tank is now ready to be filled with water and for decoration. I find it a good idea to furnish the tank with rocks, etc before filling, therefore allowing for the inevitable displacement of water.

Again, how you decorate the tank is up to you. My own preference is for the 'Marine' look. This involves furnishing the tank with bleached or coloured coral skeletons, shells, tufa rock and a coral sand/limestone substrate. A light blue background also adds to the 'Coral Reef' effect. Alternatively, some may favour the more natural 'Mangrove Swamp' look; decoration, in this case, would include cleaned and cured driftwood, rocks, pebbles and plenty of salt-tolerant plants. Bogwood may only be used if properly varnished — otherwise, it would have the undesirable effect of acidifying the water. Caves are much appreciated by many fish, and should be included wherever possible.

Whichever type of decor one chooses, it should be remembered that, while coral is Despite a tendency to nip fins, the Green Puffer (*Tetraodon fluviatilis*) is a useful candidate for the brackish aquarium.

Along with the Scot, the Mono (*Monoactylus argenteus*) is one of the most popular brackish water species available.



of benefit to the water chemistry and pleasing to the eye, it is not a normal part of the brackish fish's environment and may be dangerous to some unwary tank inhabitant.

When the tank is filled with water, it is time to take the most important step towards becoming a brackish fishkeeper — adding the salt. If you can, try and work out the capacity of the tank by filling it with, say, a two-gallon bucket. Alternatively, use the formula:

Height of tank x length x width (in inches) divided by 277.

Remember to allow for displacement by gravel, rocks and equipment. On average, the reduction is 10-15%.

Once you have calculated the water capacity, add salt at the rate of two teaspoonsful per gallon (4.5l). A pre-packed Marine salt mix is probably best, although quite expensive. I used fine grade sea-salt from a health food shop, which costs 28p per lb. Judging by the health of my fish, I think it to be perfectly acceptable. On no account use table salt or cooking salt, as some contain an anti-caking agent which can be harmful to fish.

After adding the salt, let the tank run for about a week. This ensures that everything settles down and that the temperature has a chance to stabilise.

It is now time to add the fish. Before doing this, however, it is important to acquaint oneself with the necessary procedures for acclimatisation. It is quite possible that some of the fish you buy will be swimming around in completely fresh-water as the dealer may not be aware that those particular fish are brackish.

Therefore, with all new fish, float the bag — unopened — for about twenty minutes in your tank. After this time, carefully open the bag and turn down the edges, so creating a pocket of air around the bag enabling it to float with the top of the bag above the water surface. Every five minutes or so, add about an egg-cupful of tank water to the bag, occasionally removing a little so that it doesn't overflow. This will gradually raise the specific gravity, or salinity, of the water in the bag to that of the aquarium. After about six of these additions, gently release the fish into the tank. Assuming the fish is brackish-water-tolerant, it should settle down quickly into its new surroundings.

SUITABLE FISH SPECIES

There are quite a number of species which will live and breed quite happily in a brackish aquarium. Depending on availability in one's locality, a varied community can soon be established. Many dealers have at least one brackish tank and some may order specific species on request.

All the following species are suitable occupants for the brackish aquarium. Generally speaking, they are all extremely hardy fishes. This is because in nature, they tend to inhabit mangrove swamps, river estuaries and coastal areas, which are often subject to large and sudden fluctuations of salinity according to changing tides. As the fish swim around looking for food, they must be able to survive these frequent

transitions between fresh and brackish water, or sometimes totally marine conditions, for short periods.

MONOS

These very beautiful fish belonging to the family Monodactylidae are among the best known brackish water fish. *Monodactylus argenteus*, commonly called the Malayan Angelfish or Mono, is quite readily available and is quite a bit cheaper than the less common *Monodactylus sebae*. As adults, they are better suited to totally marine conditions. I have found juveniles to be fairly aggressive towards each other. Therefore, it may be a good idea to keep only single specimens, or a small shoal of four or more. They are not fussy eaters, and will consume just about everything in front of them.

SCATS

Members of the family Scatophagidae are also common and hardy, the Green Scat (*Scatophagus argus*) being the most well-known. It is very important to purchase full-bellied specimens as emaciated-looking fish refuse to eat and eventually die. Once established, however, they have hearty appetites and can grow to 10in (25.5cm) in captivity. These fish frequent sewage outlets in their natural estuarine habitats of Asia, which indicates their tolerance of poor water conditions and scavenging tendencies.

PUFFERFISH

Pufferfish are musts for any brackish community. Their unusual shape, markings and habits make them interesting and attractive inmates, as does their hardness and fondness for troublesome snails. Of the two most common species available — The Green Pufferfish (*Tetraodon lineatus*) and the Figure-eight Pufferfish (*Tetraodon palembangensis*), I have found the latter to be the less shy and less likely to nip the fins of other tank inmates. Pufferfish will not, as a rule, accept dried food. Most types of live and frozen food are consumed readily, however, and these fish will gorge themselves just to the point of bursting, given the chance.

RAINBOWFISH

Of the many species available, probably the most suitable for the brackish aquarium are the Celebes Rainbow (*Telmatherina ladgeni*), the Madagascar Rainbow (*Bodonia geayi*) and the Red New Guinea Rainbow (*Glossogobius aureus*). All these fish are colourful, hardy and peaceful. Perfect inhabitants, in fact.

GOBIES

Most people are familiar with the Bumblebee Goby (*Brachygnathus viviparus/nana*), although those who have tried to keep them in non-brackish conditions will almost certainly not have had much success. However, as additions to the brackish community, they will flourish. They tend to be very territorial towards each other, although a small group can be kept, if plenty of hiding places are provided. They will not generally eat flake food, but live Tubifex is eaten readily. Another Goby suitable for inclusion



THE "MARINE LOOK" BRACKISH AQUARIUM

TOP VIEW



KEY

- Tall Corals
- ⊕ Sea Fans
- ⊗ Large Rocks (Tufa, limestone, grotto, ceramics etc)
- Small Rocks, Corals or Shells
- ⊕ Plants (Bunched *Elodea*, *Sagittaria* etc)
- ⊙ Undergravel filter upfit tube

Suggested layout for a "Marine look" brackish aquarium



Chanda ranga, the Indian Glassfish, is widely available and does well in a brackish community.

is the brightly coloured Peacock Goby (*Tetraodon ocellicauda*). Again, this small New Guinea fish prefers live food.

LIVEBEARERS

Of all livebearers, perhaps the most suitable for inclusion in the brackish aquarium are the Mollies. The Black Molly (*Poecilia sphenops*) and the Sailfin Molly (*Poecilia latipinna*) are available as many different colour strains. They will reproduce readily, providing the other tank occupants with live food — assuming gravid females are not transferred to a separate tank prior to giving birth. Mollies will eat all foods and will benefit from a little fresh green matter, such as peas or lettuce, included in their diet.

Platies, Guppies and Swordtails have thrived in my own tank, although it may be a good idea to take a little extra care over acclimatisation. Livebearing species of Halfbeaks make excellent brackish tank inhabitants. They are surface-dwelling fish and present a challenge to the hobbyist wishing to breed them and raise young. The Celebes Halfbeak is, perhaps, the hardest and most colourful, but, again, it must have live food.



THE "MANGROVE SWAMP LOOK" BRACKISH AQUARIUM

TOP VIEW



KEY

- Bogwood (varnished) or Driftwood
- Large Rocks (granite, limestone etc) forming caves
- Bunched Plants (Elodea, Hornwort etc)
- Java Ferns/Moss
- Small Rocks, Pebbles
- Undergravel filter upflit tube

Suggested layout for a "Mangrove Swamp look" brackish aquarium



Scats (*Scatophagus argus*) can grow to 10 inches in a properly maintained set-up.

CICHLIDS

Unfortunately, none of the South American cichlids are very tolerant of brackish water; however, of the African species, there are two examples which I have found to be suitable. The familiar 'Krib' (*Pelvicachromis pulcher*) does remarkably well in these conditions, showing much brighter colours than any Kribs which I have kept in soft, acid conditions. They do tend to be a little aggressive towards smaller fish, so be careful. A lesser-known, but very pretty cichlid also from 'The Dark Continent' is the African Butterfly Dwarf Cichlid (*P. thomasi*). Closely related to the Krib, it flourishes in slightly saline conditions.

The Chromides, India's only native cichlids, are equally suitable inhabitants. The Orange Chromide (*Etoplus maculatus*) is a small, colourful fish with a quiet temperament. The Green Chromide (*E. suranensis*), however, grows much larger and is not so well disposed towards its fellow fishes.

CATFISH

The choice of catfish for the brackish aquarium is extremely limited. In fact, only one

species is really suitable. The Shark Catfish (*Arius jordanii*) is a very striking silver-grey fish, with white-tipped black fins. It does grow quite large, however, and will consume anything which will fit in its big mouth. It also loses much of its colour, so only juveniles are really suitable for the smaller brackish tank.

I have successfully kept "Plecostomus" species in brackish conditions. The chocolate-coloured ones would appear to be the hardest, the darker ones never really settling in. If there is very little algal growth in one's tank, the "Plecostomus" must be given additional green food, if it is to survive. A slice of cucumber with a lead plant weight clamped around it will sink straight to the tank floor and will keep any Pleco amused for hours as it munches away the white fleshy part, leaving only the green rind.

Bumblebee Catfish (*Leiocassis naniensis*) will also live in brackish water, but their size and predatory habits do little to recommend them as ideal inhabitants.

OTHER SUITABLE SPECIES

There are quite a few other species that will live in a brackish aquarium. Among these are Archer Fish (*Toxotes jaculator*), Glass Fish (*Chanda wolffii* and *C. rangi*), Pipefishes (*Epiplatys* spp.) and some of the Killifishes. According to some books, Spiny Eels (*Macracanthus* and *Macroparurus* spp.) are suited to brackish aquaria. However, of the three different species which I have introduced to my tank, none have done at all well and had to be transferred to completely fresh water conditions before regaining their health.

FEEDING

As mentioned above, some species require live food to remain healthy; Tubifex worms, Daphnia and Bloodworm are usually cheap and readily available. In some cases fancy eaters will take the frozen equivalent of their favourite live food, so it is a good idea to keep some in the freezer in case of an interruption of Tubifex, etc., which often occurs where I live.

As well as live and frozen foods, I regularly feed flake and high-protein granular food (Promin). Boiled and crushed peas and boiled lettuce should be offered fairly often, as green matter is a very important part of a lot of brackish fish's dietary requirements. Basically, a varied diet will ensure healthy fish.

NECESSARY MAINTENANCE

The usual aquarium maintenance is all that is required to keep the brackish tank in good order. Every fortnight or so, it is a good idea to check the pH, remove any salt deposits from the cover glasses and lights, and clean any algae from the front glass.

Once a month, a partial water change should be performed. Replace about a third of the water with conditioned tapwater containing salt at the usual rate of two teaspoonsful per gallon (4.5 l). Therefore, if adding six gallons (27 l) of new water add twelve teaspoonsful of salt beforehand and mix well. If evaporation occurs, the tank

may be topped up with freshwater, although this will cause a slight fluctuation of salinity, it will not harm the fish.

In order to test the pH, a good marine test kit should be purchased. The pH value for a brackish aquarium should be maintained around 7.8. The presence of coral, shells or limestone in the tank should provide a sufficient buffer; if a low reading is obtained (say, below 7.5), one must add a chemical buffer, such as Seabuff, to increase the alkalinity of the water. Most test kits will contain a buffering solution with full instructions for use.

PLANTING THE BRACKISH AQUARIUM

There are very few plants which one can grow successfully in brackish water. Generally speaking, most of the common aquarium plants prefer soft and neutral water and would quickly die when placed in hard, saline water. Another problem which the plants face is that many of the fish are avid plant eaters so, perhaps, artificial plants would be the obvious choice.

My advice is simply to try keeping live plants. If they survive, all well and good. If not, try again, or change to artificial plants, or no plants at all. Among the few suitable species I have tried and had success with are Java Fern (*Microsorium pteropus*), Sagittaria species, *Elodea*, *Myriophyllum* and Hornwort (*Ceratophyllum* spp.). Java Moss (*Vesicularia dubyana*) will also survive for a short while. One may wish to experiment with different plant species and subsequently stick to those plants which survive.

WHY SET UP A BRACKISH AQUARIUM?

The reason I set up my brackish aquarium was that I was a little bit bored with basically the same set-up, same fish, same plants, same gravel — which I had kept for about twelve years. Now when I visit my local aquatic shop, I am not as limited in my choice of fish as I once was. And, as I also have my 'normal' fish, they provide an amazing contrast in their soft, greeny-brown surroundings to my brackish fish in their sparkling bluey-white world, especially as both tanks occupy different tiers on a four-foot stand.

It was very cheap and incredibly easy setting up my brackish tank — and perhaps those wishing to venture into the uncertain and often expensive world of marine fish-keeping would be better advised to progress gradually, via a brackish aquarium, rather than take a blind leap into the unknown.

I would like to see this rather obscure side of fishkeeping gain the same popularity as other specialist areas, such as Malawi or Discus. This would undoubtedly provide aficionados, such as myself, and the (hopefully) ever-growing band of brackish fish-keepers, with a larger selection of fish to choose from, more books and information on the subject, and, perhaps, cheaper fish as more enthusiasts manage to breed fish hitherto regarded as 'impossible', by those ignorant enough to think that salt belongs only in the marine tank or on the table.

Naturalist's notebook

By Eric Hardy

Spring Viraemia of Carp (S.V.C.)

Dopey, dory carp with distended stomachs, bleeding under the skin and haunting shallow water, like fish with dropsy, should be carefully sent to the Ministry diseases of fish lab at Weymouth immediately for a path test. Once again Spring Viraemia has affected some carp-waters from south to north after first appearing in the West Country, suspiciously like a continental importation.

This virus infection is a compulsory notification and is easily transmitted by hand. Maybe infected carp were imported from the continent, but S.V.C. also infects other cyprinids like orfe, and a Water Authority official told me it could have been introduced by a tourist smuggling fancy fish in the false bottom of a suitcase.

Until it appeared in April, only four other cases had previously been confirmed in Britain, the last being in 1986. With the increase of professional fishing waters in recent years, many grant-aided excavations of pools and stocking them with imported carp, there is a great risk of viraemia being spread, but the movement of carp and eggs is prohibited in declared areas.

The disease is also called erythrodermatitis and first appeared in this country in 1973. It is a complex disease not quickly confirmed. Roach and tench can be infected and claims to cure it with antibiotics, etc, must be treated with caution as they are not proven. Fish disease can also be spread by herons and other fish-eaters (see also *Coldwater Jottings* in this issue of *A & P*).

Marine magnum opus

The magnum opus for all interested in marine fish of this area, is the recently completed 3 volumes of *Fishes of Northeast Atlantic and the Mediterranean*, published by UNESCO at £37.50 per vol, through HMSO in Britain. It has diagrams and technical descriptions of 1,256 species from 218 families, plus distributional maps, far more than any other textbooks, elaborating UNESCO'S 1973

Checklist known as "Clofnam". It will be the standard reference for the next generation.

I am surprised that it doesn't include the White Marlin for British waters, despite the British Museum checking a specimen at Ulverston in Morecambe Bay in 1983. Also it has no data on the food of sea-horses, yet aquarists who keep them find they eat only very small crustaceans like sandhoppers, brine shrimp and zooplankton, mosquito larvae — and newly born mollies.

Caddis and stone fly nymphs

Turning over stones in a trickle of a stream splashing down from the limestone at Trevor Rocks near Llangollen recently, with Dr Ian Wallace of Liverpool Museum, we found a rich collection of stoneflies and caddis fly nymphs, as well as a range of waterlife like water-crickets.

Not all caddis nymphs crawl about in ornate underwater cases, hunting their prey like the aquatic stages of midges. One of the caseless caddises here, *Plectrocnemia conspersa*, is one of the greatest predators on other life in the stream. It spins a fine silken net on the wet undersurface of river stones with its catching funnels turned into the current. *Hydropsyche fulvipes* and *Eristalisia articularis* were two more caddis here. If you go around turning stones over for such things, put them back again afterwards.

There are 47 caseless caddisflies in British waters. Some don't start spinning their cases or galleries until their final moult, but their early stages don't usually last more than four weeks.

We also came upon the large nymphs of such stoneflies as *Perlida* and *Dinocras*, closely related to fossils in the nearby carboniferous limestones and looking somewhat like cockroaches with two large "tails" forking from their posteriors and two antennae at the head end. These big ones are easier to identify than the small species which need a microscope to examine their genitalia. Hairs and bristles are important identifications in these and



L. E. PERKINS

Caddis Fly nymphs are common inhabitants of streams in spring. Not all species build cases like this, though.

other aquatic insects.

We have 35 stoneflies, one of them, *Brachyptera pustata*, being known only from Britain, in Herefordshire and several sites in Scotland. It has antennae like a string of beads.

Grass carp research

Sections in the Lancaster Canal near Kendal stocked with Indian Grass Carp have been used by a Liverpool University research team to see if these vegetarians can check the growth of weed. Grass Carp have been used for this in Britain for over 20 years, but with mixed results, and some hidden failures.

The fish have to start eating it early, before growth speeds up in spring. But if they just remove the covering weed, it admits light to stimulate the submerged roots or plants to greater activity than before. The Kendal carp reduced a third of the weed last year. When the carp are removed the weed re-establishes fast.

Miscellanea

Israel is the latest entrant into alligator-farming, keeping the Mississippi Alligator, the Nile Crocodile, and *Osteolepis terapsis*, the West African Short-nosed Crocodile, at Hammat Gadar, Ramat Haydon.

Natural hybrids are rare, particularly among amphibians,

hence the interest of a Palmate X Smooth Newt hybrid from a pond in the Wye Valley Llysdinam field centre in mid-Wales recently. Salamanders sometimes hybridise too. In Virginia, US, Matthew Hardy has been studying the female Red-spotted Newt's habit of transporting male sperm in its cloaca.

Three sea snakes have been recorded in the fauna of the United Arab Emirates, near Aden: *Hydrophis ornatus*, *H. lapemis* and *Pelamis platurus*.

The Black Leopard is a well known example of melanism of unusually excessive black pigment. It is much scarcer in reptiles, but a black Common Wall Lizard was found recently in a rice field near Pavia, in Italy.

Most lizards have a defensive head posture, especially the Horned Lizard, positioning it in a threat display. Common Agama Lizards so often seen basking in the hot sunshine on walls and buildings in town streets in the Mediterranean take up this position if one approaches incautiously.

One doesn't see an angler these days dead-baiting pike with a mouse on the hook, but this was a custom in our ancestors' times. I recalled it when the remains of small mice, voles and shrews were found in the stomach of a large-mouthed Black Bass, which has an equally voracious appetite.

Pink frog rain

Young froglets, spawned in small Saharan desert pools, sink into the mud to escape the heat of the sun and, in so doing, become stained by the pink sand familiar to all visitors to Tunisia. This is believed to serve as a disguise, and they return to their natural colour when they breed.

Some Gloucestershire naturalists argue that a "rain" of pink frogs recorded there could have been blown by winds from North Africa, as has desert sand, and some desert warblers.

Most stories of "raining frogs" are due to wet weather affording young frogs the moisture to move from their ponds in the open, where normally they would use the night dew or damp ditches for their route.



THORN GACOSTA

The lake at Woods Mill.

PONDKEEPING AND CONSERVATION

In a world of fast-disappearing natural Wetland habitats, garden ponds can provide welcome havens for wildlife. **Jacqueline daCosta** of the Sussex Trust for Nature Conservation puts the situation into perspective and encourages all pondkeepers to take positive steps in helping to safeguard our aquatic heritage.

Since the last War, 50% of our wetland habitats have been destroyed or suffered serious damage due to drainage, reclamation for agriculture or "chemical enrichment" — a term that brings a shudder to any conservationist's soul!

Wetlands do not seem to have the emotive appeal of woods or downland when it comes to conservation, perhaps because a stretch of flat water looks rather boring to the untutored eye. As recently as 1978 it took a public enquiry and the active opposition of the Sussex Trust for Nature Conservation to save Amberley Wild Brooks, a superb stretch of wetland in West Sussex, from being destroyed under a proposed drainage scheme. And even today, vast stretches of the Flow country in North West Scotland, a rich nesting ground for many now rare birds such as the Golden Plover, are being drained and planted with unnecessary trees by private foresters to provide a tax haven for the super rich and investment for pension funds. So enthusiastic have we become to drain everything in sight, that wetlands have become the scarcest of all habitats.

The loss of habitat and the consequent loss of associated plants — a nationwide water lily survey was launched last year as part of the R.S.N.C.'s National Wildflower Week, so serious is their decline due to increasing water pollution, particularly by nitrates and phosphates — that the insects and amphibians that depend on them for their survival have been seriously affected.

Dragonflies and damselflies, those exquisite insects totally dependent on small lakes and ponds for their breeding sites, have suffered a 10% loss of species in the

last 25 years. And "loss of species" means extinction! No other group of animals has suffered a comparable loss. The Orange-Spotted Emerald had its stronghold on a river in Dorset until a sewage treatment plant for a new housing estate caused pollution within the permitted levels of safe water quality — this species was incredibly sensitive to pollution. A few other old haunts have failed to reveal any signs of its survival.

The Basingstoke Canal at Byfleet, Surrey, was listed as a high grade site for conservation in 1947 and, in current terms, would be of national importance. This was one of the most outstanding freshwater bodies for invertebrates in southern Britain. However, after the Second World War, the surrounding woodlands were largely destroyed to make way for new housing estates, thus destroying the hinterland of rides and glades used by the adult dragonflies. There followed the demand to spray the canal against mosquitoes and soon the site was a virtual write-off. However, a few species kept going in small numbers, but with the demise of the canal, the tree canopy started to close in and water fern (*Azolla*) and duckweeds cut out the light which supported the aquatic plants. Later, some stretches of the canal dried up as lock gates decayed. There are current efforts to restore the canal for leisure navigation, but the method of restoration will determine whether there is any future there for the dragonflies.

Amphibians are among the most vulnerable of our wild animals. Recent rapid changes in land use, especially in agriculture and forestry, and the consequent loss or break-up of their habitats, have been particularly damaging. They have little ability to

escape such changes, so even a temporary loss of habitat — the draining of a pond, the removal of an egg-laying site — can spell disaster. Add to these problems the fact that they need to spend up to six months in hibernation in a torpid state, during which any disturbance can be fatal, and it is not surprising that they have declined both in abundance and in range in our countryside.

Ponds are often the first things to suffer when a farmer decides to drain land and, so serious has the problem become, that the Great Crested Newt and the Natterjack Toad have now been put on the list of Specially Protected Species. It is illegal to kill, injure or catch them, or even attempt to do so without a licence. Even the humble Common Newt, Common Frog and Common Toad can no longer be offered for sale without a licence and the Nature Conservancy Council has issued guidelines to anyone who "really needs" to collect them or their spawn for educational purposes, to take only limited numbers from the wild and return them as soon as possible to their place of capture.

Ponds as havens

But all need not be as black and hopeless as it seems in this depressing tale of destruction and loss. More and more people are being encouraged to establish ponds in their gardens to counteract the balance of the loss of natural ponds. Surveys show that garden ponds do, in fact, play a significant part in stabilising amphibian populations.

At Woods Mill, Henfield, (the headquarters of the Sussex Trust for Nature Conservation, which owns or manages 40 reserves scattered throughout the county, only 10 of which are primarily wet sites), the problem

is being tackled in a very positive way. There are three man-made lakes and ponds on the 15-acre reserve. The two-acre lake was created in 1947. It now boasts a host of water lilies and is home to a fine selection of carp, tench and rudd as well as supporting masses of dragon and damselflies. The dipping pond is used extensively in the education programme which Woods Mill runs for groups of local schoolchildren. This pond is quite deep and therefore best for insects such as water boatmen, caddis flies and damselflies. Children are encouraged to net and identify whatever creatures they find before carefully returning them to the safety of the water.

The third pond is a garden pond established last year as part of a demonstration of a wildlife garden as an encouragement to visitors to think of creating their own miniature "nature reserves" back home. A shallow hole (6ft x 6ft) was dug and lined with plastic pond liner. Shallow ponds attract amphibians and need be no deeper than 18-24 inches (45-60cm). This depth prevents freezing and offers a safe hibernation place for frogs. Ponds as small as a sunken baby bath have been known to house happy frog populations, but to attract newts you need something a bit bigger — 12ft x 6ft is an ideal size, but any pond will help. A word of warning about pond liners. There's a wide range of materials now available but some of the cheaper ones are essentially polythene sheets which are almost certain to crack after a year or two's exposure to the ultraviolet rays of sunlight and, since as sunny a spot as possible is the most suitable for an amphibian pond, you could have a real problem on your hands.

As soon as the pond was filled with water (tapwater was used which is fine, as long as you leave it to settle before putting anything in) Canadian Pondweed and Frogbit appeared as if by magic. Both of these are good oxygenators for amphibians to lay eggs in and the Trust then added Greater Spearwort and rushes and reeds as marginals which are used by damselfly nymphs when they leave the water and turn into adults.

Within twenty four hours of filling up, Water Boatmen and a lot of minute larvae appeared. Water snails, beetles, water scorpions etc. all add to the fascination of the pool and the predatory species help to control the amphibian population. Within one week, newts had arrived and started to lay eggs and a week later, frogs discovered this new haven and moved in. Now, two years later, there is a thriving habitat which is not only attractive but also serves a serious purpose in conservation terms.

Those who wish to establish their own garden wildlife ponds may not be so lucky in spontaneously attracting amphibians, but a word with a neighbouring pondkeeper, an advert in the local paper around March or a call to your local Conservation Trust will quickly provide you with a legal source of spawn.

It isn't enough for conservation to be in the hands of professional groups only. Pondkeepers, in particular, can play a vital part in the survival of our wildlife. Inexperience and ignorance are only poor excuses



Top, the Dipping Pool at Woods Mill is attractive, full of life and highly educational.

Right, dragonflies (this specimen is emerging from its nymphal case) are common residents of the well-maintained natural pond.

Above, toads, seen here spawning, do best in ponds which do not experience regular disturbance during cold, "hibernating" months.

for inaction. The Sussex Trust runs a Conservation Corps of volunteers who help clear any existing ponds and a call to their office will always get you the information and advice you need. Other Trusts run similar schemes. The British Herpetological Society, which is based at London Zoo, publishes an advisory leaflet entitled "Garden Ponds as Amphibian Sanctuaries" which tells you all you need to know about establishing a successful domestic pond.

A few days ago, a fully grown toad appeared in the kitchen of the cottage where I was staying. I picked it up and held it for a moment before releasing it back into the



garden. Not beautiful in any conventional sense, but utterly beautiful in its own right. How tragic it would be if such creatures were to disappear for ever, and how much poorer our lives would be because of it.

Editor's Note

For further information on wildlife ponds write to us at *AC&P* and we will pass on your request to Jacqueline daCosta.

In addition, the following book carries useful information on the subject: *How to make a Wildlife Garden* by Chris Baines, published by Elm Tree Books (1985), ISBN 0-241-11448-9.

Spotlight

LUDWIGIA

Almost every aquarist grows *Ludwigia* at one time or another. Yet few take the time to look at this popular plant in sufficient detail to appreciate that not every *Ludwigia* is the same. Dick Mills recently did.

(Photograph: Bill Tomey)

Plants in the genus *Ludwigia* belong to the family Onagraceae (formerly Oenotheraceae). This family name may be more well-known to the gardeners among our readers, for it is the Evening Primrose family, containing colourful delights such as the Clarkias and Fuchsias. *Ludwigia* is, however, a marshy aquatic plant sharing this characteristic with the, as yet, uncultivated *Botanivalia*.

The genus was defined as early as 1753 by Linné, the name being chosen to honour Professor C. G. Ludwig of Leipzig (1709-1773). The genus is quite large with some 75 species (including the re-classified *Jussiaea*); of these, some 15 are suitable for submerged cultivation, although not necessarily for all of the time.

In essence then, *Ludwigia* is a bog plant that does well as an aquatic plant, provided its limitations as a completely submerged species are both realised and catered for.

For marsh, or bog plants, the actual uptake of nourishment may differ according to the physical conditions prevailing at any one time. When growing emerse, that is, with leaves above the water, the anchoring roots also play an important part in taking up nutrients; when completely submerged, the leaves take over this duty. Turning back briefly to the more horticultural-suitable relatives, *Ludwigia peruviana* is reported to be excellent cultivated out of water when it develops a bushy growth with large yellow flowers.

Distribution

The genus is found almost worldwide: most attributions are to the southern areas of North America and Central America, although species are also found in Africa, South-east Asia, Northern Australia, Europe (our Editor feels sure that species are to be found naturally in Spain), Central Asia and as an introduction into New Zealand.

Ludwigia repens Forst is an American origination, also known to hobbyists by the synonym *L. natans*. The specific name 'repens' means creeping, and refers to the

plant's natural growing method when cultivated emerse in swampy conditions; only the tips turn upwards. Growth is only totally vertical when the plant is grown completely submerged. A feature of the species is that, unlike most aquatic plants, the leaves are quite capable of literally 'standing up for themselves' when removed from the water. The shiny-surfaced leaves are arranged in opposite pairs at intervals along the central stem. When grown emerse, yellow flowers are produced in the axils of the leaf.

It may be difficult accurately to identify the exact species as there are, perhaps, three different forms found in aquarium circles: this may be due simply to the plants being imported from different geographical locations. On the other hand, to complicate matters even further, the narrow-leaf form will have variably-shaped leaves depending on whether the amount of light given conforms to the 'long-' or 'short-day' configuration, the narrower leaf resulting from short-day (less than twelve hours) illumination. Two round-leaved forms are found: the one with the familiar reddish undersides to the leaf is slightly broader than the other greener, whitish undersided form, although some red coloration may occur in even these leaves when grown above the water.

An alternative form, familiar in European aquaria after W.W.II, was a hybrid form of *Ludwigia repens* and *Ludwigia palustris* ('palustris' = bog, or swamp-loving). Also known as *L. natans* or *L. mulleri*, the leaves, although similar in size, shape and colour to the reddish round-leaved form described above, did not have the same inherent stiffness when removed from the water.

Cultivation

For furnishing the aquarium, planting in clumps is best. Under good lighting conditions, *Ludwigia* will prove to be a very colourful 'space-filler'. Usually, the normal mixture of plain gravel and accumulated aquarium detritus suits this plant well, but some extra organic materials in the form of

specially-formulated aquarium plant food can be used to produce more robust growths. Removing the growing tips when they reach the water surface will keep the plant 'in its place' and help to develop a bushier growth; the tips can be re-rooted to provide more plants.

Water conditions do not appear to be that critical, although the usual assumption that, like most plants, softer more acidic water is preferred to very hard alkaline water, might be valid. *L. repens* will happily tolerate tropical temperatures, although some reports indicate that, like *Aponogeton*, a cooler resting period over winter months may be beneficial.

As in most *Ludwigia* species, roots growing from each node on the stem make for easy re-cultivation. It is not unusual for the leaves to drop off in autumn (suggesting a rhythmic life cycle, although this effect, coupled with the leaves remaining green may well be the result of too little light) so it may be better to attempt propagation through cuttings only during the summer (stronger-growing) period.

The temptation to acclimatise other species to warm-water conditions may prove unsuccessful, not from the growing point of view, but from the aesthetic appearance of the plant. If, for example, *L. palustris* is acclimatized to, and kept in, tropical aquariums, the nodal roots along the stem will develop into rather unduly long growths under the influence of the warm water conditions coupled with bright lighting; hence this species is best suited for the coldwater aquarium where the lighting can be a little more subdued.

NOTE

If you are interested in aquatic plant cultivation, why not join the recently-formed International Society for the Study of Aquatic Plants? Full details (including application forms) available from: Mrs P. James (Secretary), Everglades Aquatic Nurseries, Baunton, Nr Cirencester, Glos. Tel: (0285) 4656.



Seaview

by Gordon Kay



A new twist to *Seaview* this month; I am writing it in Leicestershire. I have just moved to the Loughborough area and so am on the lookout for marine aquarists in the region. If anyone would care to contact me — through the magazine — maybe we could get together for a chat.

Cory Aquino on Cyanide

Following last month's page, the bulletin of the International Marinellife Alliance — *Sea Wind* — is packed this quarter with stuff about the situation in the Philippines. I don't want to milk the topic at the risk of driving you all away, but there is one item which is very encouraging. Apparently, President Aquino wrote in the maiden issue of *Dagat Balita* (newsletter of IMA, Philippines) that the conservation of the 'Life-Support systems' of the Philippines' seas is vital to her programme of government. She went on to say that her administration was committed to pursuing all efforts to stop destructive fishing methods.

Thoroughly recommended book

With the exception of a few rather short-sighted individuals, we all know the importance of reading — both when we are taking our first tentative steps into marine aquatics and as we progress to greater things. Books by the likes of Martin Moe, Frank de Graaf and Graham Lundegaard sit on my shelves ready for me to consult from time to time. A new book



Giant clams can reportedly live for "hundreds" of years.

which is well worth having is the *Encyclopaedia of Marine Aquariums* by Dick Mills.

Dick is a very 'readable' writer and this, when allied to the talents of consultants Dave Keeley and Terry Evans, proves to be the recipe for a smashing book.

The technical aspects are well covered in an enjoyable and understandable way (unlike others) engulfing all the accepted modern techniques. The second part of the book consists of a pretty comprehen-

sive fish catalogue which covers all the species more commonly encountered. This section is well laid out, with all relevant information and some stunning photographs. One touch I particularly like is the 'practical reminder' found with every turn of the page in this section. I am more than happy to have this book in my collection and you could do a lot worse than to follow suit — whatever your stage of involvement.

Saltwater kittens — progress report

And now the news I promised

on the saltwater kittens' at *Underwater World* in Stevenage. Well, the parents have been re-sold and are apparently churning up their new home, so it would seem that another spawning is on the cards. The fry, sad to say, didn't fare too well. The shop had a seven-hour power cut and only four of them survived. A home was found with another customer for these although, unfortunately, there is now only one left alive. However, the lone survivor is thriving and growing well.

On the face of it, one fish might not seem like much — but just think about it. To my knowledge, this is the first-ever captive spawning of *Plotosus anguillaris* and has to be one of the most exciting happenings for years.

Snippets return

1. At low tide on the reef, many corals are left high and dry in strong sunlight. They prevent dehydration by producing a heavy mucus coating which is washed away by the rising tide.

2. Sponges tend to be more prolific at the base of the reef where sunlight is weak. This is because algae would block their pores and restrict the flow of water through their bodies, thereby preventing them feeding.

3. Plate Corals (*Acropora* spp) which are found in protected areas of a reef, away from the worst of the turbulence, sometimes measure over two metres across!

4. The Giant Clam (*Tridacna gigas*) is reputed to weigh as much as 260 Kilos and live for hundreds of years. Nice to know there are other creatures on this earth older than me!

5. Apparently, there are over 400 species of Chromodorid Nudibranchs in the Indian and Pacific Oceans.

6. The Indo-Pacific Humpback Dolphin (*Sousa chinensis*) can enter very shallow water and has been seen feeding within a few feet of the shore. Of course, they don't get there by accident — they do it on purpose . . .!

7. Finally, how about a little feedback from you lot — or is John Dawes the only one who reads this drivel?

Until the next time.





M. Pearson

Thriving Blanket Weed colonies face and depress many pondkeepers every spring.



M. Pearson

Clear water such as this is only achieved (on a long-term basis) when some degree of environmental balance has been established.

ALGAE CONTROL

(A QUESTION OF BALANCE)

Biologist **Bill Frost** has waged war on algae . . . and won. As he explains, there are several ways of achieving the sort of balance that will give pond owners the upper hand in their annual struggle for clear water conditions.

The chilling experience is common place, a cold dawn light slowly revealing the green swampland that once was the pride and joy of a now-defeated owner. Soon, a fight, a conflict of far reaching consequence, must occur. The enemy? A microscopic organism that invades every pore and cubic millimetre of our ponds and garden pools. So, what can be done to relieve this infuriating condition?

Chemical solutions

Depending on the individual's environmental standpoint, there are two opposing solutions. The first is best suited to the person that believes, rightly of course, that a pond must be reserved purely for the purposes of relaxation. Or, in other words, a fast, "minimum-effort" cure. I refer to the use of algicides, some of the more "interesting" products derived from our chemically advanced era.

There are two main groupings of chemical product that are defined as algicides. The major group is of the low to medium strength variety. Members of this group will complete their task but require sustained, and often continuous, usage. The remaining product ranges are of high strength; some will even guarantee control for up to six months.

However, with both groupings there can be disadvantages, especially when the probability of mis-use is taken into account. The negativities arise from the ability of each algal cell to become resistant to any number of applied chemical products. When instructions are mis-read, and particularly so when only one product is used, the

potential for acquired resistance can become acute.

To reduce the danger of this happening we need controls, rules of usage to work by. My main rule states that, when using algicides, never over-stress your reliance upon one chemical product, and always follow the written instructions to the letter.

Heaven sent though algicides might be, there is an added aesthetic disadvantage. Bright blue waters may suit the surrealist but, personally, I prefer purity; purity that lasts for more than just a few passing moments, as with some algicides.

Environmental solution

Now to the other extreme; our second, less common, solution. This applies to the environmentally minded among us. Generally speaking we keep ponds and aquaria as isolated, "re-situated" ecosystems. We deliberately set out to duplicate one environment within another and expect it to thrive.

The environmental concept of algae control relies upon the theory that algae may be managed by making minor adjustments to the ecological balances. The theory is correct, but the possibility that the foster environment may be alien often receives little attention. Only with a great deal of time and effort can the theory be successful.

At risk of appearing overly critical of either method, I scientifically approve of neither, more so when I realise that more calculated solutions are also available. Extremism is best avoided.

Alternative solutions

So, if both the chemical and environmental methods are unsuited to the long term

conflict, what can be done? To answer this question best an example of an algae overpopulated pond is required. To this we will then be able to apply the theories behind the only other viable option. We will assume that our theoretical example is well established, with a number of plants, a few fish, somewhere, a frog or two, and a stable ecosystem, (I will discuss this stability later). The problem, however, is that the waters are thick with a number of different species of algae.

As a matter of fact, the ecosystem, and the local environment as a whole, is not stable at all; ecology is never quite so straightforward. Country ponds, and garden ponds to a lesser extent, continuously act to destroy themselves. A country pond will, over several hundred years, have destroyed itself a number of times. Why? I would like you to consider this question as you continue. The reason is far from complex.

Nevertheless, work, as such, must begin now on our theoretical example. The first priority that we need to think about must be to ascertain exactly what we are dealing with, and from there on in, our task is to prevent re-infestation. To do so there are a number of steps that we need to complete:

1. Remove all plants, renew their rooting pots, and place the cleansed plants in an isolated container with an algicide solution. When renewing the rooting pots, take the wise precaution of making sure that the spore-ridden rooting material is disposed of well away from the pond itself. Then rescue as many living organisms as possible; fish, snails and insects for example. These must then be stored well away from the work site and treated with an algicide.

Coldwater jottings



Stephen J. Smith
Good husbandry essential

Rumour has been rife over recent months with regard to SVC — Spring Viraemia of Carp — a viral disease which affects carp, its closest relatives, and possibly other cyprinids such as Orfe.

Briefly, symptoms are similar to those of dropsy, and the disease is not uncommon in continental Europe. Only four cases had been confirmed in Britain prior to this year, the last being in 1986.

But let me assure you immediately that, with common-sense and good husbandry, your fish need not become affected.

Naturally, the editorial team at *Aquarist and Pondkeeper* is diligently investigating the full background of SVC and its possible effects on the hobby. Until we have the full picture we would not wish to cause any alarm by publishing incomplete information.

In the meantime, care and patience on the part of hobbyists and retailers will help to ensure some protection against possible infection.

The basic rules have often been repeated in the columns of this publication:

1. BE SELECTIVE when obtaining new stock — restrict your purchases to those from reputable dealers or hobbyists and check your intended purchase before buying. DO NOT REMOVE FISH OR EGGS FROM THE WILD;

2. QUARANTINE all new acquisitions for as long as possible (at least one month) using a separate tank or pond before

introducing fish to existing stock. Use different equipment (nets, buckets, etc) for quarantined stock;

3. ISOLATE any fish which appears to be infected with any ailment. Such a fish may well be seen "sulking" away from its tank- or pond-mates;

4. STERILISE all equipment immediately before and after using with any fish, whether infected or not, and rinse thoroughly in clean water before use.

Finally, I would appreciate any information about SVC, its history, causes and effects. Perhaps Continental readers, who have learned to continue with the hobby in spite of such a virus, can also provide some information.

Meteoric response

Among the responses to my query regarding the existence of the Meteor (*Coldwater Jottings* — May 1988) I was delighted to receive a most informative letter from Jack Hems.

Jack is co-author of one of the first "serious" books on Goldfish which I ever read — *The Goldfish* — and which I would strongly recommend to anyone with anything more than a passing interest in the hobby.

In his letter, Jack writes: "As early as 1926, A. E. Hodge (founder of this magazine) and Arthur Derham gave a description of the Meteor in *Goldfish Culture for Amateurs*. That they derived their information about this fish from W. T. Innes' *Goldfish Varieties and Tropical Aquarium Fishes*, published in Philadelphia in 1917, is acknowledged in their text."

Jack continues: "In 1979 Frank Orme acknowledged his indebted-

I was delighted that a far-from-humble Common Goldfish won Best in Show at Fishworld '88 in May. The fish is pictured with owner Dick Latliess of Romford and Beacontree A.S. (see First-class Goldfish...)



TFH PUBLICATIONS

ness to G. F. Hervey and J. Hems, together with their publisher, Faber and Faber, for permission to quote from their book *The Goldfish* (first published by Batchworth Press in 1948).

"In their chapters on History and Fancy Breeds, the authors say that they have no acquaintance with the Meteor. They do say, however, that it is bred 'having no caudal fin ... and that it may be connected with the remarkable Egg-fish'.

"Hervey and Hems' chief source of information about the Goldfish in China was the Rev. A. C. Moule (1873-1957), who kept Egg-fish and other grotesque breeds of Goldfish in Hangchow, where he was born, long before the end of the 19th century.

"In the preamble to *A Version of the Book of Vermillion Fish* which the Rev. Moule translated from the Chinese in 1946, he tells us that the Egg-fish seen on numerous occasions in Hangchow had stout and broad bodies with heavy deep bellies and often, but not always, a short stiff tail and no dorsal fin.

"We know beyond doubt that many breeds of Goldfish exist in China which are seldom, if ever, seen elsewhere. It is not improbable then that fish which lack a caudal fin (Meteor Goldfish) may be numbered among them."

Jack continues by asking why such a fish should not be popularised, as I stated in *Coldwater Jottings*, and concludes: "Turning to the Australian zoologist and aquarist T. C. Roughley, in his book *The Cult of the Goldfish* published in Sydney, Australia in 1933, we find the following: 'Personally, the more bizarre the fish the greater the attraction it has for me; intrinsically ugly it may be, but I can never cease to

marvel at the infinite patience and care exercised over long centuries which have brought it into being.'"

I certainly agree that beauty is very much in the eye of the beholder, and it is the many and diverse forms of the Goldfish which help to provide the widespread appeal and fascination of the hobby.

However, I cannot help but return to my initial question: "Does anyone possess any evidence of the Meteor, either pictorial or, even better, living?"

First-class goldfish...

Heartiest congratulations are due to Goldfish-keeper Dick Latliess (pictured) of Romford and Beacontree Aquarist Society, whose Common Goldfish won the Phillips Trophy for Best Fish in Show at the first Fishworld exhibition at Alexandra Palace in May.

Over 13,000 visitors attended the exhibition, which celebrated the 50th anniversary of the Federation of British Aquatic Societies.

Also successful at the show was Sparsbolt College, offering a course in ornamental fish management. Interest in the course far exceeded expectations and further supplies of literature had to be obtained after only the first day!

... Never so humble!

It didn't take long for the first response to my suggestion for an alternative name for the Common Goldfish (*Coldwater Jottings*, June 1988).

Even before I had received my own copy of *A&P* from the editorial offices in June, Alex Stephenson of Norfolk was in touch with his most appropriate suggestion of "Primary Goldfish".

"Since this is the fish which virtually started the hobby," explained Alex, "it seems the obvious name."

TFH Publications, however, really should know better. In their press release about Fishworld '88, they described Dick Latliess' show-winning specimen as a "humble" Goldfish.

Ouch!

OUT AND ABOUT

with John Dawes

Every 'Aquarian' Fish keeping Exhibition far has been better than the previous one ... and this year's was no exception.

Sandown was ablaze with aquatic colour and buzzing with the hustle and bustle generated by nearly 13,500 visitors during the weekend of 18-19 June. The venue, of course, helps — it is attractive, light, spacious and offers plenty of room outside (should the weather be fine — as it was) to relax and take the weight off your feet when your legs begin to go after your twentieth tour of the packed hall.

It is very difficult to single out individual success stories (there were many) but some of the innovations proved their worth beyond any doubt, and deserve a special mention.

For example, this year's show saw the first Big and Beautiful display — a fantastic array of large, "weird and wonderful" fish which attracted a non-stop stream of admirers throughout both days. From catfish to cels, to giant cichlids, to knife fish — they were all there. This was undoubtedly a very good idea which, while probably needing further refinements, should be retained, and perhaps, expanded next time round.

The inflatable children's play castle of past years was, thankfully, gone. In its place was a colourful, supervised, children's corner suitably decked out with pictures and fish tanks ... and full of children who seemed to be having a whale of a time.

The idea actually originated from a letter sent to the 'Aquarian' Advisory Service by 13-year-old Sallie Pears who asked if she could bring her fish along to Sandown. In the end, Sallie, plus two of her friends, Lucy Walton and Emily Tyrer, did precisely that and spent the weekend talking to other young fishkeepers about the hobby.

Children were also invited to put crayon to paper, with the resulting masterpieces being put on show and forming part of a school competition (won by Ben Reilly of Glynn School,

A.F.E. notches up yet another success



Ray Cooke of Tongham Aquarist Society receives the best in show award from Dr David Ford of the 'Aquarian' Advisory Service.

A.F.E. MAJOR AWARDS

BEST IN SHOW		
Ray Cooke	<i>Theraps synspilum</i>	Tongham & D.A.S.
BEST PAIR		
Cliff Walton	<i>Madagascar Rainbow</i>	Bracknell & D.A.S.
BEST LIVEBEARERS		
George Staniou	<i>Brachyraphis rhabdophora</i>	S.L.A.G.
BEST BREEDERS		
Ray Cooke	<i>Aspidoras mensezi</i>	Tongham & D.A.S.
BEST COLDWATER		
Demis Tonna	<i>Anguilla anguilla</i>	Reading & D.A.S.
TABLEAUX		
1st Havant & D.A.S.	3rd Bracknell & D.A.S.	
2nd Tongham & D.A.S.	4th Reading & D.A.S.	
SUE POLLARD TROPHY	Havant & D.A.S.	

There were 280 competition entries, 14 tableaux entries and 114 Show Cards awarded.

The Highest Pointed Exhibitor was Ray Cooke from Tongham & D.A.S.

A Gold Pin and Association of Aquarist Diploma are awarded to Pete Moye for his *Pimelodus albifasciatus*.

The following Societies also received £100 of 'Aquarian' fish food as a reward for the informative aspects of their tableaux:

Basingstoke	Piscene	Bracknell	Reading
Hucknall & Bullwell	Rainbow	Havant	Tongham

Epsom). Yet another good idea.

On the more serious side, there were, of course, the highly competitive tableaux with their respective complements of high quality fish. As ever, the dedication and skill of the tableaux builders were in evidence everywhere.

Judging tableaux is among the most difficult and thankless jobs going. One of the many reasons for this is that the sheer time, effort, dedication and skills poured into these constructions by the societies is such that, even though judges are fully convinced that the points they award are fair (you've got no business being a judge otherwise), they know only too well that the results of their deliberations are going to cause both great delight and heartbreak. They also know, as judges, that they can't win — they'll be heroes in the eyes of some — and most definitely misguided villains in the eyes of others.

With this in mind, 'Aquarian' awarded, in addition to the top four prizes, "bonusses" consisting of £100 of 'Aquarian' fish food to several societies for the "informative" aspect of their tableaux.

Going round the hall this year, I felt that there was more for the general public to see than on previous occasions. In other words, it seems as if A.F.E. is getting closer to being more of an exhibition, as its name implies. As a result, there was a fair bit for aspiring aquarists (and pondkeepers) to admire, and it was very pleasing to note just how many new aquarists there were around.

In fact, it is fair to say that there was something for everyone (with the possible exception of out and out Koi specialists).

Once the threat of the dreaded Spring Viraemia of Carp recedes, it is hoped that even this situation will be rectified next time round.

As ever, the Association of Aquarists and 'Aquarian', together, produced a show to remember, coped with the inevitable hiccups competently, and can look forward to 1989 with great optimism. Congrats to all concerned.

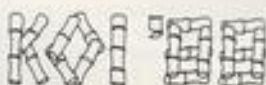
You are well on the way towards staging the Koi show of the year, and news of an epidemic of Spring Viraemia of Carp (S.V.C.) breaks out. What do you do?

This is, of course, the problem that faced the organisers of Koi '88, the premier event in the Koi calendar.

One of the first things you need to do is establish whether there is, indeed, an epidemic — over-reaction and sensationalising are characteristics not unknown in such situations. Then, even if you discover that there is no epidemic, you are still left with a ticklish problem. Do you cancel/postpone the show? Do you proceed with your (unchanged) original plans, regardless? Or, do you modify your plans and, in the process, perhaps take a fresh look at your show and its possibilities?

The B.K.K.S. opted for the last of these, and the result of their deliberations could well act as the blueprint for even better Koi shows in the future. For a start, they discovered that no individual Koi-keeper seems to have been affected by S.V.C. Further, fish from certain countries, such as Japan, are absolutely "clean." S.V.C.

KOI '88 BREAKS NEW GROUND



is, in fact, apparently unknown in Japan. While there have been outbreaks of S.V.C. within the UK trade this year (some, sadly, resulting in the compulsory destruction of thousands of poundsworth of Koi to prevent the spread of the disease), most stocks of Koi and related species do not appear to have been affected.

In the end, the Koi '88 committee decided to alter the nature of this year's show. Instead of a Japanese-style competition where fish from different owners are kept in the same vat for comparison purposes (thus enhancing the risks of cross-infection), they have opted for a Koi exhibition with no competitive component whatsoever.

Leading Koi-keepers, judges and dealers will each be sup-

plied with vats, nets, baskets and (very importantly) a fish handler who will only handle the fish from a single exhibitor for the duration of the show.

In this way, no fish from any two separate exhibitors will ever come into contact with each other. Neither will their water, nets... or anything else for that matter. After the show, everything will be hand-sterilised.

This new approach opens up all sorts of possibilities. For instance, judges don't often enter their fish in competition. However, an exhibition is a different thing altogether — so we may well see some fantastic fish which have never been shown before. Also, the fact that individual exhibitors are not competing, could well lead to larger and more representative selections/collections of fish of all sizes being made available for public viewing. In fact, there are many exciting possibilities which, if successful, could well herald the birth

of a new era in Koi shows.

Other than the above, things will be as before, with dry goods, pumps, accessories, fish (yes, they will be on sale, with the dealers concerned taking their usual stringent precautions), craft fair, refreshments, Martial Arts display, "Saxon Marauders" (watch out!), plus all the usual offerings available at the Billing Aquadrome.

In addition, at the time of going to press, attempts were being made to organise a seminar for Saturday afternoon. It is hoped that, at least, one judge from the U.S.A., two breeders from Japan, and a representative from the Ministry of Agriculture, Fisheries and Food, will be in attendance, the last contributor tackling the issue of S.V.C. (which goes to show that the B.K.K.S. have no intention of sweeping the problem under the carpet).

Koi '88 is scheduled for 20-21 August at Billing Aquadrome Sport & Leisure Centre, Great Billing, Northampton. For further details (including the £33 Weekend Package — hotel, cabaret, dance, free admission to show), contact John Beattie (Koi '88 Chairman) on (0604) 416316.

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Books

Atlas of Marine Aquarium Fishes

Dr Warren E. Burgess
Published by: T.F.H. Publications Inc.
Price: £50.00

You've heard of books you can't put down? Well, here's one you can hardly pick up!

This massive work almost defies attempts to review it — the first problem is to know where to start. With over 4000 photos in full colour (and hundreds of full-colour line drawings, too) of all the marine fish you've ever seen — and then some — your mind finds it hard to concentrate!

Although an 'ATLAS', the layout does not follow the same format as the freshwater volume: fishes are not described strictly according to geographical areas. The reason for this is simple: the areas in question are so vast, and some species may occur in more than one, thus making duplication of descriptions both necessary and, perhaps, annoying.

The work is based around Nelson's 1984 systematic order (*Fishes of the World*, John Wiley Interscience), and describes fishes in an "ascending" order of evolution. Cartilaginous species, such as aquarium-suitable Sharks and Rays begin the work, which quickly moves through the Eels to the more conventional, expected species. A simplified geographical distribution map of natural location is provided, divided into 15 areas in which each family is allocated; one admitted drawback to this system is that very localised species (say, those from Hawaii) have to be accommodated in otherwise very large areas (the whole Pacific Ocean), but, like this review, you've got to start somewhere!

On the practical level, to find the fish of your choice, you need to start with some idea to which family the fish belong; alternatively, you can, in cases of well-represented families (or if you know roughly where to look), simply flick through the pages until a familiar or similar shape catches your eye, and then work from there.

The introductory AQUARISTIC SECTION deals with the care of the various families under aquarium conditions (or not), as the case may be. Each family is given a reference number, but readers should not waste time wondering why the numbers do not run continuously — the missing numbers refer to freshwater species and so are beyond the scope of this book.

Considering the large number of species shown, the information on each is appreciably brief, but highly constructive, from the potential aquarium care point of view. Like the freshwater related ATLAS, the book uses ideograms beneath each photograph: these give details on FAMILY REFERENCE NUMBER, AREA WHERE FOUND, SEX OF FISH ILLUSTRATED

(the usual Lance of Mars and Shield of Venus symbols are used to show male and female, respectively), FEEDING HABITS, TEMPERAMENT, AQUARIUM SETUP, AQUARIUM LIGHTING, SWIMMING HABITS, SIZE, TEMPERATURE, SPECIFIC GRAVITY REQUIRED and CAPACITY (of smallest suitable tank). Keys to these ideograms are found on both sides of each flap of the dustjacket for ease of use — leave folded out if required — this avoids the need to turn repeatedly to the front or back of this very heavy book.

Two very comprehensive Indexes (Scientific — Common names, and vice-versa) complete the work; the former even lists specific names, so tracking down the exact species is made even easier, especially in this day and age of ever-changing generic name classifications. If you are a marine hobbyist, then this is a must for you — well worth saving up for — although a strong bookcase will be needed if it is to remain very long on the shelf, which I doubt, considering its usefulness.

Dick Mills

Water Gardens for Plants & Fish

By Charles B. Thomas
Published by: T.F.H. Publications Inc.
Price: £7.95

Despite its American pedigree, there is no difficulty in absorbing everything you want to know about installing and stocking a garden pool, as described by the author, who is President of Lilypons Water Gardens in Maryland.



No 'only available in America' equipment is described, the author obviously appreciating that the beauty of the fully furnished pool is truly international in its own right: such is the quality of the sound, practical-experiences-based, writing. The installation of a 'liner pool' is excellently portrayed both in illustrations and in detailed text. The coverage of Water Lilies and their pool cultivation cannot be bettered and accounts for a good proportion of the work. Near-related Lotus, Ornamental Fish and Scavengers finally make way for other aquatic, marginal and hardy and tropical bog plants.

The author does not restrict his efforts in telling the reader the good news, but shoulders his responsibilities honestly (and unselfishly) to say what NOT to do from time to time, all based on a lifetime of experience in developing his successful water garden business. The illustrations are excellent and the 144 pages are well worth reading — over and over again.

Dick Mills

Koi Varieties (Japanese Coloured Carp — Nishikigoi)

By Dr Herbert Axelrod
Published by: T.F.H. Publications Inc.
ISBN: 0-86622-885-3
Price: £13.95

Even if you were paying £13.95 just for a series of 250 colour photographs of Koi and associated subjects, the money would be well spent. Add to this an interesting and informative text, and you have a really good book on your hands.

This, in summary, represents my opinion of *Koi Varieties*. It also shows what can be done, timewise and moneyside, when the will, plus all the facilities necessary for producing a colourful, well-bound book in double-quick time, are forthcoming.

There is no doubt in my mind that this latest book from Herbert Axelrod will prove a very big seller indeed — and not just among established Koi-keepers. Its price, readable text and introduction to the thirteen basic varieties of Koi should, together, ensure that it also finds a ready market among relative (and possibly even total) newcomers to Koi-keeping.

Some of the photographs were taken as recently as January of this year — hence my comment, above, to "double-quick time", but the bulk, making up the substantial catalogue of prize-winning fish starting on page 72 and ending on page 142, were taken at the 19th All-Japan Nishikigoi Show held in Haneda, Tokyo, in 1987.

Yet, the pictures, eye-catching and envy-generating as they may be, only form part (albeit an important one) of what is a pretty



good Koi book all-round.

Anecdotal references, particularly in the early sections, give a "different" feel to the well-trodden, and yet still incomplete, early history of the origins of Koi. Useful insights into Chinese and Japanese lore, peppered with modern-day references, such as the issue of an 1988 Carp postage stamp from Hong Kong, add a little spice to a potentially "heavy" subject.

If you are a brand-new Koi-keeper, I don't think you are going to get very far in learning about Koi-keeping from this book — there's nothing on home-pool construction, filtration, bottom drains ... or the like. Don't forget, though, that this book is not meant to act as a guide to Koi-keeping (even the author acknowledges this on page 61). What you will get, though, is a selection of fish that you won't find in any beginners' book.

You will also find a section on the inheritance of scalation and, even, a page on Long-finned and Pigmy Koi. While, personally, I wouldn't wish to attempt to produce Pigmy Koi by rearing young fish in aquaria and feeding them on a flake containing less than 35% protein — twice a week, for one minute per feed, the guidelines are there, nevertheless.

And there's a lot more besides ... all for just £13.95.

John Dawes

Discus Fish (The King of all Aquarium Fish)

By: Eberhard Schulze
Published by: Discus Ltd
ISBN: 974-87574-9-8
Price: £17.95

Distributed by: Aquadocumenta London,
70 Wood Vale, London N10 3DN. Tel:
01-340 7766.

He's been threatening to do it for years ... and I've been daring him for nearly as long. Now, at last, he's accepted the challenge and has come up with what, to me, is a terrific response ... a Discus book to delight all the numerous fans of this spectacular (and sometimes difficult) fish.

In **Discus Fish**, Eberhard Schulze has attempted to produce a definitive work. While I (not being a Discus specialist) may not be quite able either to confirm or refute this in the way that a Discus expert could, I am nevertheless left with the impression that no significant area has been missed.

This is not to say that I agree with everything that appears in this book, of course. For instance, my own, and very limited, experience of collecting Discus in the Rio Negro, leads me to believe (quite subjectively, I hasten to add), that the "scarcity" of good wild-caught specimens that is referred to in this book may not be anywhere as acute as we are told in the Introduction. Even so, as a conservation-minded person, I fully support the author's endorsement of carefully regulated captive breeding programmes.

Most fish, or other animals (including ourselves for that matter), carry a certain "load" of parasites. Yet, this doesn't mean that either we, or these other animals, can be referred to as being "diseased". I therefore feel that the statement: "Basically ... all imports are diseased ..." may not be quite as accurate as it sounds. It certainly is open to debate, at least.

As so often is the case (though I totally fail to see why this should be so), there is a slip-up on the classification of Discus, where one of the sub-species, the Green Discus, is simply given the name *Symphysodon aquifasciata* rather than its full, and more correct, label, *Symphysodon aquifasciata aquifasciata*. On the credit side, though, mention is made of that other, not-usually-accepted and not-usually-publicised, proposed sub-species, *Symphysodon discus willrichi*.

On the practical side, virtually every aspect of Discus-keeping has been well covered, from advice on how to buy young, adolescent, adult and breeding pairs, to acclimatisation, choice of equipment (including aquaria), the use of U-V and ozone, filtration, ion-exchange resins, water chemistry, plants, algal control, "companion" fish, breeding, foods and feeding, diseases ... and so on.

Taken as a whole, the selection of subjects, plus the competent treatment they have been given, should ensure that anyone contemplating Discus-keeping as a hobby will find this book extremely useful indeed. I consider it a very good buy and wish it well.

John Dawes

Alphabetical Cichlid Catalogue

By: A. Uferman, R. Allgayer & M. Goerts
Available from: Cichlid Data, 7 Allan
Walk, Newton Aycliffe, Co. Durham
DL5 5RN. Tel: (0325) 313035.
Price: £20.00 (including p&p).

If you are really serious about cichlids, then you'll want to know (among numerous other things) at least what the current valid name for a particular species is. If you flick through the pages of the **Alphabetical Cichlid Catalogue** you will find that, as far as this mind-blowingly thorough piece of work is concerned, that is only the starting point.

Every cichlid genus and species known to science is listed. Further, if a species has been assigned to more than one genus, then it is listed under each of those genera, with its current accepted designation beside it. Obviously, it is listed under its correct genus as well. Should a species be currently considered a synonym of another one, then it appears under the one or more genera with which it is synonymised. Also listed, where known, are all the relevant dealers'/trade names, along with an indication as to where the name was first published, and its latest known status. Included, in addition, in 400 packed pages, are references to 1,200 original descriptions of species.

I cannot think that there can be a more comprehensive listing anywhere ... nor a more useful one, once you've mastered the technique of finding your way around the pages of small, coded text.

If there is a weak point in this book, it must be in the guidance given to users in the Introduction. Personally, I think that instructions should be explained, and presented on the page, in as simple, attractive and easy-to-follow a manner as possible. The guidelines given in the Catalogue are far from impossible, but they are, nevertheless, a bit of a handful. Work your way through them, though, and the real and immense potential of this volume then begins to adopt its true significance.

I am informed that the **Alphabetical Catalogue** is the first in a series of six reference works on cichlids, encompassing systematic, historic, zoogeographic and literature reviews with (possibly) volumes on behaviour and other subject areas to follow.

It seems, therefore, that the world of the serious cichlid keeper/student/researcher will be admirably catered for in the next few years.

Like the Forth Bridge, though, work is already underway on updates. The cycle is never ending ... so let's be thankful that there are dedicated people like the authors of the **Catalogue** and their host of "assistants" around. Without them, we'd be lost.

John Dawes

KOI SUPPLEMENT

**A GUIDE FOR THE MORE
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- MOT's for Koi
- All-season Koi care
- Guide to breeding Koi
- The ideal Koi diet
- Koi origins



KOI SUPPLEMENT

Cyprinus carpio, Koi, Nishikigoi, Brocaded Carp, Living Jewels . . . call them what you will (but please NOT Koi Carp), are in the grip of yet another huge surge of interest.

Just glance through the pages of this colourful, comprehensive supplement, and you'll see this reflected in the wealth of Koi products which are now available for the hobbyist. There's something for everything . . . and "Koi for All" is now very much a reality.

Last year (in our August issue), we published a Supplement brimming over with guidelines for beginners. The tremendous enthusiasm with which it was received left us in no doubt that,

come this year's "Koi month" (August), we just had to repeat the exercise, but at a slightly more detailed level. However, if you are a beginner, don't despair — there's a great deal in the coming pages that is just as applicable to you.

We hope you enjoy the contents of our Koi Supplement and that it will encourage you to take up Koi-keeping, if you haven't as yet, joined the "Club". If you already are a Koi-keeper, then we hope that it will help you take the hobby a significant step further along the road to new successes.



JOHN DAWES

MOT'S FOR KOI

Koi are very much like motor cars. Treat them well and they will operate effectively without breakdown, but neglect them and, sooner or later, you will have big problems. Nigel Caddock shows how safe, regular checks can be carried out.

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BREEDING KOI

Whether by accident or design Koi can be bred in pools in the UK. Roger Cleaver offers some expert advice for the aspiring Koi breeder.

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FOOD FOR THOUGHT

There's more to feeding Koi than just regular handfuls of pellets . . . as Dr David Pool of the Tetra Information Centre reveals.

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FOR THE RECORD

The careful monitoring and observation of Koi and their environment should form an important component of every Koi keeper's armoury. Nigel Caddock provides some important guidelines to the "Art" of accurate record-keeping.

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KOI — THE MOST BEAUTIFUL 'FREAKS' IN THE WORLD

Despite the numerous varieties of Koi available today, most can be traced, either directly or indirectly to three basic forms of the Common Carp. John Cuvellier attempts to unravel the origins of some of the best known types.

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SEASONAL CARE OF KOI

As Barry James of Everglades points out in this excerpt from his book, *An Interpet Guide to Koi*, the amount of time you need to spend on your Koi will vary according to the season of the year. Each month poses different problems, most of which are generally related to weather.

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ADVANCE PUBLICITY

Still to come this year — MARINE SUPPLEMENT (October) also special features for the beginner and for the reptile and amphibian supporter — plus our normal informative regular and commissioned articles from the very best writers.

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KOI SUPPLEMENT

MOT'S FOR KOI

Koi are very much like motor cars: treat them well and they will operate effectively without breakdown, but neglect them and, sooner or later, you will have big problems. Nigel Caddock shows how safe regular checks can be carried out.



Anaesthetised Koi ready for its MOT. Note that all the necessary equipment and treatments are easily to hand. During examination, a wet towel is draped over the fish's head and tail to protect them. Only the parts of the body being examined should be left uncovered. This helps keep the fish quiet and maintains the body as moist as possible.



A floating basket and Japanese-style "pan-type" Koi net are essentials in carrying out MOT's. The photograph shows a Koi just "going under" in an anaesthetising bowl. Note: A rectangular container should only be used for Koi up to 16in (c. 40cm) in length. It is important, of course, that the fish has sufficient room to turn around comfortably. A circular Koi photography bowl is, however, better and should always be used for larger specimens.



This anaesthetised Koi has had a dead scale removed. There is usually some fluid beneath such scales and this has been expelled by gentle, but firm, pressure applied at the base of the scale prior to its removal (the pressure is directed from front to back). The wound has been treated with a 5% solution of Malachite Green and then Friar's Balsam to seal it (both medications applied using cotton buds). Note: Extreme care should be taken with all medications. The use of plastic gloves is strongly recommended.

Although Koi are designated "coldwater fish" the fact is that they do not do well in water temperatures of less than 45°F (7°C) for any length of time. This intolerance of low temperatures also applies to resistance to disease and sickness, as Koi also have relatively low resistance to many potentially deadly afflictions.

Experienced Koi-keepers will tell you that it is far easier to prevent disease than it is to cure once contracted. This means that Koi-keepers must be especially diligent in observing their fish in order to detect early symptoms of problems that can effect their health.

FACTORS AFFECTING HEALTH

There are two factors which affect Koi and the incidence of disease and illness.

The first, and by far the most important, is ENVIRONMENTAL. Many diseases are merely symptoms, and the results of a poor environment. The single most important factor in good Koi-keeping is water quality. The maintenance of good water should be a primary objective; often, this will be the only preventative measure necessary.

The second group of factors are INFESTATIONS/INFECTIONS. These can come from numerous sources but, very often, a healthy collection of Koi can be infected by the introduction of a new fish which may be carrying a multitude of "nasties". Extreme care should be taken when buying additions to a collection, as a mistake could not only cost you the new Koi but also your existing collection, as many of the deadliest infections are extremely contagious. Sound general advice would be: Never buy a Koi that:

- (1) is hanging in the water/corner away from the others;
- (2) has a big head and small body;
- (3) has a wasted body;
- (4) is breathing heavily;
- (5) has any visible signs of damage or infection:
 - a) split finnage — especially pectoral and anal fins.
 - b) visible parasites — Anchorworms/Fish Lice — A good tip is to hold the Koi up to the light in a plastic bag, enabling close inspection from underneath the fish.
 - c) any signs of gill infection — strands of fungus or inflammation in or around the gill area.
- (6) you are in any doubt whatsoever about it being healthy.

REGULAR M.O.T.'s

Regular inspections and observation of

in the battle to keep healthy fish. A certain capital investment is necessary, but once bought, a suitable pan-type Koi-net (not LANDING NET) and floating basket are great assets to any Koi-keeper. These will allow the Koi to be netted and inspected at close quarters. Any problems can, on close inspection, be identified and then treated.

There are two main ways of inspecting your Koi: firstly, by passive observation (which is just observing your Koi as they swim around their environment); and secondly, by positive observation, which involves catching your Koi and inspecting them at close quarters in the floating basket or, where you suspect something more serious is wrong, by anaesthetising the fish using MS222 or, less preferably, Benzocaine.

I would advise a full inspection of your Koi under anaesthesia is carried out at least once a year. Before you begin this delicate process you should be fully prepared, with everything you are likely to need being close to hand. It is advisable to have a large, old bath towel, well damped, to wrap your Koi in once it has been anaesthetised.

ANAESTHESIA

Koi are like people; some respond better than others to anaesthesia and, like humans, some Koi react disastrously and die. In short, there is always a risk. However, if carried out correctly, the risks can be minimised to the extent that they are totally acceptable.

There are two proprietary Koi anaesthetics, Benzocaine (which is not soluble in water and needs to be dissolved with a small amount of Acetone) and MS222, which is soluble in water.

Like all things, there is a choice, but also, like many things, "you get what you pay for". It is my experience that, in general, Koi respond better and recover quicker to MS222, and I would strongly recommend that MS222 is used, although it is more expensive.

I would emphasise that, although it is quite within existing legislation for anyone to administer anaesthetics to Koi, it is a skilled process that requires experience and should NOT be undertaken by the novice. It is always a good idea to have a friend present, and many local sections of the BKKS have members who have much experience in this field and will be pleased to pass on their expertise.

It is advisable to have an appropriately sized bowl, preferably a large Koi photography bowl 2ft in diameter, containing 10 gallons (45 litres) of water. The normal dose for 10 gals would be 5grams, but this can vary from Koi to Koi, and experience will be a great help in determining the exact dose. The Koi is put into the bowl and

are seen. The best test to see if a Koi is anaesthetised is to grasp its tail gently and turn the Koi upside down. When it offers no resistance to this operation, the Koi is ready. This, again, becomes easier with experience.

The fish will be OK to work on for up to 15 minutes, although I prefer to complete work as soon as possible. During the period of examination the Koi should be wrapped in a WET towel and, where possible, its eyes, head and tail covered, as this seems to make the fish feel more secure.

Following close examination, the Koi should be returned to the pond and closely observed. It should recover fully within 5-10 minutes, and any signs that the Koi is in distress, ie no gill movement, should be reacted to immediately. I always have a pond air stone connected to a blower or large air pump handy. The airstone can be gently rested under the Koi's chin and the action of the air passing through the gills usually revives the specimen with no problems. In my seven years, I have never had a Koi die under anaesthetic, although I know dealers who have, so there is a risk, but a small, and (if carried out properly), acceptable one.

Inspection routine

It is important to develop a routine to ensure a thorough examination is made and the chances of missing anything minimised. It is best to start at the Koi's head, working down its body, paying particular attention to the gills and finnage, and also the mouth as *Lernaea* (Anchor Worms) and *Argulus* (Fish Lice), are often found here and are easily missed.

This type of inspection is especially useful for detailed examination when parasitic infestations are suspected. This also allows one to build up confidence in anaesthetising and handling Koi in a routine situation, rather than in an emergency situation when, often, the inexperienced make serious mistakes.

It is also important to observe water quality as well as Koi. This can be done by general observation supplemented by weekly water quality tests. Kits are readily available and inexpensive, and could save your Koi's lives. Nitrite and pH are the most important, but ammonia and water hardness are also useful indicators of general water quality.

The best indicators of water quality are, however, the Koi themselves. Their behaviour will tell you if there is a problem and, with diligent observation, you will soon be able to tell at a glance whether or not your water is good and your Koi are happy. It may sound crazy, but an experienced Koi-keeper will be able to tell at a glance how good one's water quality is and how healthy a collection of Koi is. This may sound strange, but just try it and see.

KOI SUPPLEMENT BREEDING KOI

Whether by accident or design, Koi *can* be bred in ponds in the UK. Roger Cleaver offers some expert advice for the aspiring Koi-breeder.

“‘ve bred my Koi.” How many times have you heard this when what has actually happened is that the Koi have bred themselves with no outside help from their owners. It's only natural for a female, if she is ripe, the conditions are favourable and there are males present, to lay her eggs. A little pat on the back may be given to the owner in so far as they have kept their fish in a manner which has enabled them to be in condition to spawn, but that is all.

Right, a fully conditioned trio just prior to spawning. Note the spawning rope in the top corner and along the side of the trap.

Below, male Kohaku — note how slim the body of this fish is.

Bottom, female Hariwake — note how much plumper the body is when compared to the male Kohaku in the accompanying photograph.



ROGER CLEAVER



ROGER CLEAVER

“Why breed my Koi?”, I can hear you asking. The answer is obvious to anyone who has bred their fish, in whatever manner, for the enjoyment raising fry can give. Also, from a health point of view, females should be encouraged to lay their eggs. From this viewpoint, just letting your Koi get on with random spawning in the pond is probably the best way. However, many people want to try to spawn their fish using selected parents.

Koi spawning nets

What, then, are the problems facing you if this is what you want to do? The first obstacle to overcome is where are you going to spawn the Koi. Not many of us are fortunate to have a separate pool which we can use for spawning. Building a temporary pool needs space and may not be suitable, unless rigidly constructed. It also requires its own filtration system.

So what is the answer? This problem can be overcome by using a spawning net. These nets are made from soft, very fine mesh and are available in several standard sizes as well as made to order. Standard sizes vary from four foot square (approx 1.2m) to four foot by twelve foot (approx 1.2 x 3.7m) and come in two depths: 20in and 40in (c. 50cm and 100cm). They can either be supported by a floating collar of pipework or can be hung from framework above the pool. This latter is probably the better idea as it helps prevent the Koi jumping out of the trap. A cover net is available for the floating nets but this reduces the light as well as preventing the fish jumping out, and sunlight is one of the stimuli that Koi need for breeding. Similar nets, but in larger meshes, are available as separation nets and are quite useful additions to your equipment.

Spawning nets have several advantages. Firstly, your Koi are kept in the water they are used to, and which also has good filtration. Secondly, they are soft, so your fish are less likely to damage themselves during the spawning chase. Lastly, they make a good well-filtered tank in which to raise your fry.

Sexing Koi

Sexing Koi is another major problem. Many male Koi can have female characteristics and vice-versa; also, fish which are out of condition may exhibit signs of the opposite sex.

What then do you look for? Female Koi often grow faster than males and usually have a much fuller figure. The abdomen is usually large and is softer than the males. This is particularly noticeable from the underside where the adominal swelling can be clearly seen. The anus on the female is large and flat while on the male it is small, usually elongated and concave.

On the male fish the pectoral fins usually look strong and often have a thick leading edge. Small white spots are supposed to appear on the leading rays of the pectorals during April, May and June, although I have never seen this on any Koi. The head of a male Koi also looks large in comparison to its body, while the female seems to have a

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small head in relation, and it is usually more pointed.

Spawning techniques

What age fish should you use for spawning? Although males of one year may prove fertile, two-year old fish would probably be more satisfactory. Females should be at least three years old before you attempt to spawn them, while those over the age of ten years are seldom likely to produce a satisfactory spawning.

Koi should spawn only once a year, unless interrupted during a spawning, when they may lay their remaining eggs a few weeks later. One complete spawning should be aimed for with each female. Males, on the other hand, are able to produce milt almost any time, but a period of ten to fourteen days should be given between spawnings if the males are to be used more than once.

The ideal ratio to use is three males to one female. For an energetic spawning choose males and females which look slender while still being in spawning condition, as they will be more vigorous in their courtship.

Apart from condition, some thought should be given to selecting parent fish of the same variety. Koi do not produce offspring which are identical to their parents (which may be one of the attractions of spawning Koi). In fact, fry can be produced which fall to fall into any of the recognised varieties, but this is more likely to occur if the parent fish are chosen from a mixture of varieties.

Most amateurs are interested in trying to produce Kohaku, Sanke, Showa Sanke or metallics. In the last case the use of metallic parents of several varieties may well prove beneficial. To produce a large proportion of Kohaku, use only Kohakus as parents. Using Sanke as parents will give a large proportion of Sanke, and using Showa should produce a large number of Showa.

To be pretty certain that you will achieve a spawning with a large majority of the



A spawning rope should always be provided.

variety that you have chosen you would need to know something of the history of your Koi. Only Koi which have been line bred for many generations will be assured of producing very large numbers of their own type. Koi of this type will be very expensive to buy, especially as you really need four fish to obtain the best results. The drawback in using very expensive Koi is that they may be damaged due to their quite violent courtship. Females are often lifted completely out of the water by the chasing males.

Once the fish have been selected they can then be placed in the spawning net. Sometimes, better results are achieved if the female is placed in the net for a week or two before the males are added.

Before any spawning is likely to take place, some form of spawning material should be placed in the net to collect the eggs. Either natural or artificial spawning media can be used. Hornwort and Water Hyacinth make ideal natural materials to use.

Some Japanese breeders also use the

roots of the willow or the leaves of the cedar tree for spawning material. I feel these are a little hard and may cause some damage. Several types of artificial spawning media are commercially available, the best being the Japanese-style Koi ropes, or the foam spawning mats. Once the medium is placed in the spawning net it seems to act as a stimulant to the Koi.

The final requirement for a successful spawning is the weather. Temperatures in the region of 20°C (68°F) seem to be ideal for spawning, although an increase in temperature of 5°C (9-10°F) above normal seems to act as a trigger. If the fish have been in the net for some time without spawning, then a large water change can sometimes act as the necessary stimulant.

Spawning often begins in the evening with the males following the females around the pool. After a while the female seems to seek refuge in whatever spawning material is available. The vigorous action of the males stimulates the female to release her eggs onto the material and the males release their milt and fertilise the eggs.

As many as 200,000 eggs or more may be laid from a large well-conditioned female if active males are present. This is far too many for the amateur to hope to contend with, and no more than a thousand or two should be considered for hatching into potential fry, even though many of these will not survive. A Japanese breeder says that from each 100,000 eggs 60-70,000 eggs hatch after five days, 30,000 fry are alive at twenty days, 16,000 remain after six weeks, 6,000 after three months, 3,500 after five months and 2,300 after a year.

Is the effort worth it? For the people who successfully raise a few fry then the effort is definitely worth it, and, who knows, they may even produce a fish to rival the Japanese Koi. One thing is for certain, any home-bred Koi will mean as much to its breeder as any bought Japanese Koi will do.

Below, left, Koi-breeding trap being lowered into main pool.

Below, right, two-week old Koi fry. Even at this early age, colour and size differences are clearly apparent.





DAVID POOL



DAVID POOL



DAVID POOL

Top, feeding time is important not only to ensure that Koi receive the correct nutrition, but also to check that the fish are not suffering from disease.

Above, earthworms are high in protein and so form a useful supplement to diet in the summer.

Right, Koi (such as this superb Shiro Utsuri) need to be given a complete balanced diet if they are to remain in the best possible condition. The same is true for all Koi, of course.

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FOOD FOR THOUGHT

There's more to feeding Koi than just regular handfuls of pellets . . . as Dr David Pool of the Tetra Information Centre reveals.

For the majority of Koi-keepers the composition of the food that they feed to their fish is of little interest. Instead they rely on trial and error, or perhaps fellow Koi-keepers' recommendations, in order to select a suitable diet. In this article I would like to examine the dietary requirements of Koi and, by understanding these, explain some of the often quoted rules of when and what to feed the fish.

A balanced diet

Koi, like most animals, require a balanced diet in order to grow and be in their best possible condition. By this we mean that they require the correct amounts (and quality) of proteins, carbohydrates, fats, minerals and vitamins. The relative amounts of each of these nutrients required in the diet varies depending on water temperature, size of the fish, condition of the fish, type of fish, etc. Before considering how the requirements change it will be useful to examine

Table 1, which shows how these nutrients are used in the body of a Koi.

All of these nutrients are required throughout the life of a Koi, but in greatly differing proportions. Protein requirements are perhaps the best example. Fry and young fish grow very rapidly in their first two years, attaining a length of up to 10in (25cm).

As proteins, or more correctly amino acids, are used for tissue formation, and because they cannot be stored in the body, Koi fry and young obviously need to obtain large quantities of protein on a regular basis. In the wild, young carp feed largely on zooplankton, followed by benthic invertebrates (such as bloodworms and freshwater shrimps) which are both high in protein. In captivity we should reproduce this by feeding a diet which has a relatively high protein level of 40-50%. As the fish get older, their rate of growth slows down. Consequently they require a lower protein concentration in the food of approximately

30%.

This decline in protein requirement is subject to fluctuations. So, for example, when mature Koi form reproductive material (in the spring and early summer), they require more protein — to form the extra tissue. Similarly, if a fish is physically damaged, it will temporarily use more protein in order to repair the damaged tissue.

What to feed

The type of food to give Koi varies, not only with the age of the fish (as discussed), but also with the water temperature. The staple diet should be one of the many commercially available foods. These foods are available in flake, stick and pellet form, and the choice will depend largely on what the fish can fit into their mouths.

Commercial foods vary considerably in terms of their quality and the nutrients contained within them. It is, therefore, important to choose a proven make of food to ensure that your fish receive all of the nutrients that they require. This is particularly so with Koi, which are often kept in a bare pond with few other sources of food available.

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To encourage their fish to grow during the warm summer months, many of the leading Koi-keepers in the UK and Japan supplement the diet with silkworm larvae. These larvae have a high protein level, but unfortunately a price tag to match. An alternative is to use earthworms, which have a slightly lower level of protein, but can be collected free of charge.

It is also advisable to supplement the staple diet with occasional feeds of fresh vegetables. By doing so, the fish receive large quantities of fresh vitamins to increase on those present in the dried food. Whole lettuce, water cress or even orange segments are commonly used.

Whole lettuces are particularly liked by large Koi. If introduced in the evening the lettuce will often be shredded, or have disappeared completely by the following morning. Blanket weed is also (surprisingly) a good source of vitamins, and a small amount growing in the pond should not be discouraged.

In the late autumn and winter, when the water temperature begins to fall, Koi will be less inclined to feed. At this time, lower protein, sinking foods should be offered in small quantities. These foods are more easily digested and, by sinking, preserve some of the valuable energy reserves of the Koi.

What not to feed

Many Koi-keepers give their fish a wide variety of foods, some of which are unsuitable, particularly if given in large quantities.

White bread, trout pellets, sweet corn and potatoes are examples of feeds which should not be given in large quantities as they will result in the fish becoming very overweight. Dyed maggots should also be avoided as there is evidence to suggest that some of the dyes (ie chrysoidine — a bronze dye) may cause cancers.

How much and when to feed

As I mentioned earlier, the amount of food to give to a Koi depends on numerous factors, including temperature and the size of the fish.

I have already discussed how the protein requirement varies as the fish grows. This is also true of the quantity of food required for healthy growth as is shown in Table 2. In general, as the fish grows, its metabolism slows down and, consequently, its food requirements are reduced.

Anyone who keeps Koi or other coldwater fish will be aware that they consume less food as the temperature decreases. This is due to the fish being cold-blooded. As their body temperature decreases, so does their metabolic rate, which, as already mentioned, results in them consuming less food.

Koi will continue feeding even at a temperature of 39°F (4°C), although the quantities of food consumed at this lower temperature is very small. In fact, it is advisable to follow the often-quoted rule

and not feed the fish when the temperature falls below 46.5°F (8°C).

The reason for this is that Koi will be able to obtain what little nutrition they require from within the pond (eg from algae), or from their energy reserves. If you feed at the temperatures below 46.5°F (8°C) there is a good chance that some food will be uneaten and will subsequently pollute the water. Additionally, if the temperature falls still further after feeding, some of the food may remain in the intestine for a long period of time and lead to intestinal disorders.

On occasions throughout the winter, the water temperature rises slightly and the fish begin actively to search for food. At these times, very small quantities of cereal-based foods or earthworms may be given. Earthworms are particularly good as they are over 90% water, making it difficult for the fish to overfeed. If not eaten, they can easily be removed.

Throughout the warmer months (water temperature above 50°F (10°C)), Koi should be fed 2-4 times each day on as much food as they will consume within 5 minutes. By following this rule, you will automatically alter the feeding in accordance with the changing water temperature throughout the summer.

The time of feeding is unimportant.

There is no truth in the idea that Koi should not be fed in the early morning or evening — after all that is precisely when wild carp are feeding most actively!

Pond additives

Not all of a Koi's nutrient requirements are obtained from its food. In fact, many vitamins and minerals can be absorbed across the gill membrane.

The algae which form 'green water' provide one example of this. They release a number of vitamins into the water which improve the coloration and overall health of Koi. Anyone catching Koi, or goldfish, from a pond which has been 'green' throughout the summer will certainly notice this. These vitamins are present in commercial preparations such as Tetra Koi Vital, allowing you to have the benefits of 'green water' with none of the disadvantages.

The subject of fish nutrition is a very complex one, and is expanding rapidly due to research by universities and the major fish food manufacturers. In this article I have concentrated on those areas which are of particular interest to the Koi-keeper. Hopefully, after reading it, you will be able to provide the correct nutrition, in the correct quantities, in order to ensure that your Koi remain healthy.

TABLE 1. NUTRIENTS REQUIRED IN A BALANCED KOI DIET

Nutrient	Composition	Use in body	Examples
Protein	Various combinations of 23 amino acids	Form or repair body tissue and for energy production. Cannot be stored	Meat and fish
Carbohydrate	Generally formed by plants from carbon, hydrogen and oxygen	Energy production. Excess stored in muscle and liver	Sugars, starch
Fats (Lipids)	Formed from fatty acids	Energy production (+ tissue formation). Excess stored in fatty deposits	Oils, fats
Minerals	Chemical ions	Regulate body processes	Iron — used in blood Calcium — used in bone
Vitamins	Complex compounds	Regulate physiological processes, eg. by forming enzymes	Vitamins A, B, C, D, etc.

TABLE 2. QUANTITY OF DRIED FOOD REQUIRED EACH DAY TO ENCOURAGE RAPID GROWTH OF KOI

Fish size	Amount of food required per day (as a percentage of body weight)
Newly-hatched fry (less than 0.8in (2cm) long)	15-20%
Older fry (0.1oz (3g) in weight, 0.8-1.6in (2-4cm) long)	10/15%
0.3oz (10g) in weight, approximately 2in (5cm) long	5%
3.5oz (100g) in weight, approximately 4.7in (12cm) long	2%



HEIDA ALLEN

Below, a 24-in (60cm) Hamwake under sedation for treatment of fungus following sunburn (the head has been uncovered for photographing). It is obviously important to keep a careful record of date, complaint, treatment, reaction of fish, plus any other relevant bits of information. Left, it is essential to know as much as possible about both your fish and pond (and keep the data in a readily accessible form) to stand any real chance of detecting subtle changes, taking accurate remedial action, and then having a detailed record of your success/failure for future reference.



JOHN CUMBER

KOISUPPLEMENT

FOR THE RECORD

The careful monitoring and observation of Koi and their environment should form an important component of every Koi-keeper's armoury. Nigel Caddock provides some important guidelines to the "art" of accurate record-keeping.

KOI DATA RECORDS

When hard-earned cash is paid in pursuit of this crazy hobby and a Koi is purchased for what seems to be ever-increasing amounts, it is rewarding to monitor the progress of your "investment" to see if your confidence is justified and, as the Koi grows, whether it improves or deteriorates. Even the best memory will be unable to make this assessment without the aid of some form of record.

When you buy a Koi, you should take a photo, and this can be supplemented by information on size, shape, patterns, and price, and place of purchase. A typical record card could look as follows:

Card A — Koi No: 17

Variety Kohaku
Purchased from Acme Koi Ltd
Price £50
Date 10/1/87
Size 12in (30cm)

Comments
Sturdy-looking specimen. Good coloration.

In addition to this basic information, a second card should be maintained containing medical data:

Card B — Koi No: 17

Diagnosis Split pectoral fin
Treatment Mercurochrome
Increased pond temperature to 65°F (18.3°C)
Started 15/5/87
Completed 29/8/87
Response Split healed

Anaesthesia

Did not respond well to Benzocaine. Took 20 minutes to recover fully. However, when anaesthetised with MS222, responded better and recovered more quickly, clearly does not like anaesthesia and should only be anaesthetised when necessary (ie) not for routine check.

Comments

Six applications, accompanied by an increase in temperature, were required to achieve successful healing.

From these examples you can see that a great deal of useful information can be gathered using simple inexpensive means. This information can be kept in either a book or a card index system, but it will help you monitor your Koi's development and help you remember what problems you have had with individual Koi and, more importantly, how you solved them... and with what success.

Photographic records can also be invaluable, especially if the unthinkable should happen and your Koi are stolen. This type of record-keeping was largely responsible for the detection and recovery of the Koi stolen some time ago from Matlock Garden Centre, as the police had photographic evidence which identified the Koi and proved that they belonged to Matlock — a salutary lesson to us all.

POND DATA RECORDS

In addition to records on your Koi, you can also keep records of your pond, detailing information on pH, Nitrite, Water hardness, Ammonia levels, in addition to temperature.

and climatic conditions. These can be very useful in ensuring a stable environment and, most important, in the early detection of something going wrong.

Pool Records

Date	Water/Air Temps	Nitrite	pH	Weather	Water Change
15/8/86	65-70°F (18.3-21°C)	0.05	7.2	Hot & Sunny	100gal (450 l)
17/8/87	67-70°F (19.5-21°C)	0.05	7.2	Humid/O. Cast	125gal (500 l)
21/8/87	67-74°F (19.5-23.4°C)	0.05	7.2	Very Hot	100gal (450 l)

You could also include a column for pond treatments and comments eg: "Because it was so humid, I sprayed the koi on the surface for one hour to increase the oxygen level of the pond. Also added aeration through an air pump". The possibilities are, of course, endless, but you will, I am sure, be able to see the advantages that are possible.

that the EXACT volume of your pond is measured and recorded (easily achieved by using a flow meter). This will enable you to treat your pool when, and if, required by administering the correct dosage of appropriate remedial chemicals. It is, clearly, important to keep a record of "when and how much". A typical pool treatment record could be:

A vital final area is the recording of pool data and treatments. It is most important

Pool Treatment Records

Date	Pond Temp	Treatment	pH	Nitrite	Additional
15/5/87	65°F (12.8°C)	Formalin & Malachite	7.2	0.05	Extra Air
16/6/87	62°F (16.6°C)	Hi-rate Marsoten	7.2	0.05	Extra Air
25/7/87	62°F (16.6°C)	Salt 5oz per gal	7.2	0.05	None

In addition, when you have determined your pond volume, you can work out exact dosages for a variety of pond treatments and, as I do, keep a record card detailing exact dosages for MY pond.

Chemical/Treatment Data

Formalin
Dosage rate 0.06819 per gallon: 6250 gals = 426mls
Short dip dosage = 1ml per gallon for max 20 mins.

Notes

Store in dark place. Shelf life 2 weeks. NEVER use if white dots of powder are present in the bottom of the bottle as this indicates the formaldehyde is breaking down and is LETHAL to Koi.

This is an ideal project for winter's nights when there is nothing much else to do, except look forward to spring when you can, once again, enjoy the hobby of Koi-keeping. This project also has the added advantage that the records can be as simple or comprehensive as you wish. Some Koi-keepers, even have their records computer-

ised and have devised programmes to include all sorts of data. Clearly, you can spend weeks or minutes preparing them, but what better project for a miserable British winter evening unless, of course, you can heat your water and make the hobby a year-round one, but that's another story... Enjoy your Koi-keeping.

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KOI — THE MOST BEAUTIFUL 'FREAKS' IN THE WORLD

Despite the numerous varieties of Koi available today, most can be traced, either directly or indirectly, to three basic forms of the Common Carp. **John Cuvelier** attempts to unravel the origins of some of the best-known types.

Lest the reader should think my title a little cruel to these most beautiful of fish, just remember that, as far as can be ascertained from research and legend, the very first Koi was, in fact, a genetic freak thrown up from a spawning of carp being bred for table use!

For many centuries, *Cyprinus carpio*, the Common Carp, has been bred as food, particularly in Asiatic countries (relax, that's the only Latin you'll see in this article!) and

it is generally recognised that in the early 1800's an accident of nature resulted in the first coloured carp.

This event is reputed to have taken place in a part of Japan known as 'Nigata' and, even in those far-off days, the Japanese had the commercial acumen for which they are now famous, to isolate these 'oddities' and attempt to breed them commercially as ornamental fish. That they were successful there can be no doubt, as can be seen

during any visit to the larger Koi dealers in the UK, where good-quality Koi command prices which only a few years ago would have bought a fair sized mansion.

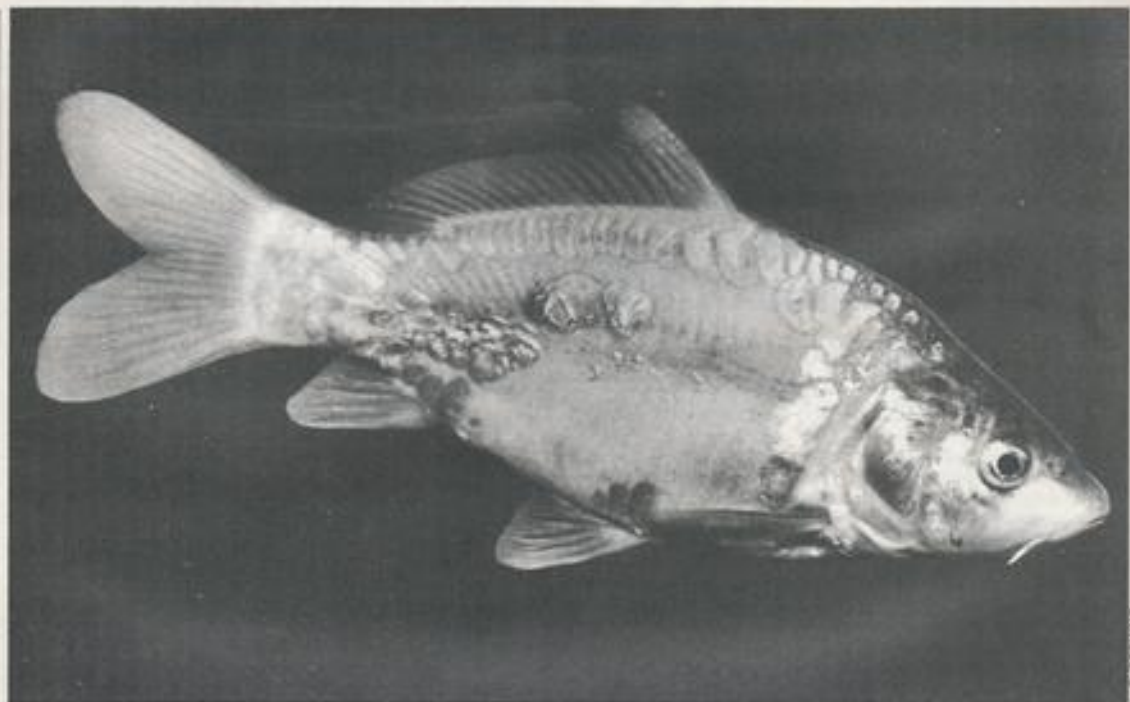
Koi — not Koi Carp!

Just in case you need reminding, I'm no academic, and what follows are merely my own impressions gained from personal experience and research into the "evolution"

Left, a 27lb Leather Carp — note the very few large scales (those above and behind the gill cover are the most clearly marked). Right, Kujyaku Ogons are spectacular descendants of fully-scaled Common Carp.



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of Koi as we now know them.

Firstly, I will upset a lot of folk by putting the record straight about something which always makes me see red! The word Koi is derived from the Japanese word NISHIKIGOI, meaning CARP. All these advertisements for KOI CARP which fill our aquatic magazines would look so much better if they read KOI (Ornamental Carp) or, KOI (Japanese Carp). If you think about it, at present they read Carp Carp, which is a little odd!

Origins

It has been almost universally accepted that the first 'freak' (as it were) was probably a black carp, with some red markings. From this first 'coloured' carp, successive spawnings brought out other colours resulting, eventually, in a totally red carp (HIGOI), a blue variety (ASAGI), and many other mixes of colour. Eventually, the white skinned fish with red markings appeared (KOHAKU) and the Japanese breeders really got into gear. Possibly owing to the resemblance to their national emblem, the Kohaku has become the symbol of all that is superior in Koi-keeping for the Japanese and, indeed, to enthusiasts all round the world. Personally, I feel that many of the other varieties can visually outshine the Kohaku many times over for sheer beauty and eye appeal, as we shall see later.

The very first collection of Koi which I saw many years ago consisted almost entirely of 20-inch fish of indescribable colours and markings. The particular enthusiast who

The few scattered large scales of the Mirror Carp have been bred into numerous varieties of Koi.

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KENT KOI KO

Doitsu Hariwake showing the distinctive large, decorative scales of its Mirror Carp ancestors.



KENT KOI KO

Few scales and very smooth skin identify this spectacular fish as a Leather Platinum Ogon, indicating that it carries some Leather Carp "blood".

owned them had a liking for fish with large scales because, as he put it, of their resemblance to 'brocade,' and to see these fish swimming around in quite shallow water was a sight not easily forgotten.

These Koi, of course, were of the variety known as DOITSU which I think of as the most beautiful of all Koi. This particular variety originated from German carp, hence the Germanic name. Goodness only knows how many spawnings of other varieties with ordinary German and Mirror Carp were needed to produce the first true Doitsu. We ordinary enthusiasts will probably never know.

The variety which comes a close second in popularity to the Kohaku is the SANKE, a white Koi with red and black markings. A first class example of this variety will win almost as much acclaim in Japan. Again, when bred as a Doitsu, its beauty is enhanced to a considerable degree.

Custodian or keeper?

At this point I'll digress for a few lines just to tell you a rather sad story. All hobbies tend to throw up a few 'renegades' for want of a better word. Some 'Koi Collectors' do go over the top in their search for the ultimate Koi. One finds difficulty in appreciating the mentality of an individual who actually painted a couple of scales on a Kohaku with nail polish because the pattern of red was a little uneven!

Such people are not fish lovers, but merely custodians of something which will engender envy in others. These types can be met expounding their theories on the position of that particular patch of colour, or whether or not the fins should be striped, etc, etc, sounding just like wine buffs, and you know what twits they can sometimes be!

The true Koi-keeper will not be concerned at perfection of pattern or colour in his/her Koi, or whether it would be capable of winning a trophy at a show, but merely enjoy the pleasure gained from watching their fish swimming around their own pool.

The underrated Ogon

Returning to the matter in hand, the variety known as Ogon has, for some peculiar reason, never been highly thought of among the so-called aristocracy of Koi-keeping. Some of the most spectacular Koi one could wish to see can be found in the Ogon 'family.' An Ogon is basically a coloured but unpatterned Koi, although there are variations to this rule.

One of the most attractive of the Ogon group is the Parachina or Platinum, which can be brilliant white and have reflective scales. This class of Koi probably originated from the smooth-skinned or Leather Carp. When evaluating an Ogon, the 'connoisseur' will look for a head devoid of any marking or colour change as these would detract

from its value as a show fish (Ugh)!!!

As stated above, variations of the Ogon do occur, classic examples being the very attractive HARIWAKE Ogon (white overlaid with golden yellow) and the YAMABUKI Ogon (yellow overlaid with darker yellow) and the MATSUDA Ogon DOITSU (a combination of yellow, white, with large black scaling along the back and lateral line), this last, of course, owing something to the German carp.

It should be fairly obvious by now to the reader, that identifying the various classes of just one group of Koi can prove to be something of a minefield for the novice, particularly as there will always be a 'know-it-all' around to correct you!

Sparkling Gins et al

The situation is further compounded by the fact that there are still many geniuses in Japan churning out even more exotic varieties as an examination of the more recent publications will show. Even a brief description of Koi varieties should include a mention of the many 'GIN' classes of Koi. GIN is the abbreviated term for Gin-Rin (or sparkling) Koi. It is in this class that the real beauties can be found. An ordinary Kohaku is transformed into something really special when it displays random reflective scales which sometimes resemble a smear of molten metal when struck by sunlight. Almost any variety can be thus blessed and the effect can only be described as magnificent, never mind what the 'experts' say.

Another most attractive class are the 'Blues,' ASAGI, SHUSUI, et al. The contrast afforded by the blue and red of a Shusui, particularly when the division is lined out in black, is really stunning and a real talking point.

Koi lineages

In the accompanying Table I have tried to formulate an approximate indication of the lineage of various members of the Koi 'family,' a very difficult exercise in view of

the complex cross genealogy involved (and I must stress that many of the possible colour combinations have had to be omitted owing to lack of space).

Careful selection and matching of breeding pairs of Koi can undoubtedly influence the actual colour of the resultant progeny which are spawned, but pattern itself is something which no amount of effort on the part of the breeder can influence. This is the part where nature has the final word, luck playing a considerable part in the proceedings, which, naturally enough, accounts for the very high value attached to a Koi of perfect or near-perfect patterning.

However, notwithstanding all that, the most eye-catching Koi for the everyday Koi-keeper will invariably be the one which the 'Pundits' will not give a second look. There must be a moral there!

Obviously, a magazine article such as this cannot even begin to scratch the surface in describing the various varieties of Koi, but if it does stimulate you into finding out more, then I consider my job well done.

I would leave you with one further thought, however. Should you wish to see the ultimate in Koi, then you will need to travel to their country of origin, Japan. Make no mistake about it, the true top-of-the-league Koi never leave that country. Even those relatively few VERY expensive Koi which now and again set tongues wagging in the UK do not represent the 'Rolls-Royce' of Koi. After all, if you were a breeder, would you let a fish out of your sight if it presented the possibility of spawning even more beautiful Koi?

The abridged list below, represents the principal main groups of Koi, but as each member of each group has been interbred both with others of the same group as well as with members of other groups, the total number of variations runs into hundreds, with new varieties appearing continuously. I certainly would make no claims as to the accuracy of my interpretations of lineage as much argument exists between even the experts, which I do not number myself among!

APPROXIMATE KOI LINEAGES

COMMON CARP	MIRROR/GERMAN CARP	LEATHER (Scaleless) CARP
Kohaku, Sanke, Hi-go, Showa, Utsuri, Bekko, Asagi, Ai-goromo, Kawarimono, Goshiki, Ogon, Hariwake, Tancho, Kujyaku.	Doitsu (Master title for all Koi with large decorative scales), ie, Doitsu Hariwake, Doitsu Ogon, Platinum Doitsu, Kujyaku Doitsu.	Kikusui, Kinsui, Kigoi, Yamabuki-Hariwake-Doitsu, Kawagoi, Leather-Platinum-Ogon.

KOI SUPPLEMENT

SEASONAL CARE

OF KOI

As Barry James of Everglades points out in this excerpt from his book, *An Interpet Guide To Koi*, the amount of time you need to spend on your Koi will vary according to the season of the year; each month poses different problems, most of which are generally related to the weather.

Spring

This is an exciting time for the Koi enthusiast as it is the beginning of the Koi year. However, your fish will be at their lowest ebb; the fat reserves built up during the previous summer and autumn to tide them over the winter will be all but used up. This, combined with fluctuating temperatures, means that your Koi are most at risk from infection.

The water temperature will be about 7°C (45°F) and the fish will not be very active. Ensure that you provide easily digestible food at this time of the year, ideally including carbohydrates and live foods, such as chopped earthworms. If you feed the fish more indigestible foods, and there is a cold spell, they will be carrying half-digested food in their intestines, which could lead to inflammation.

It is a good idea to drain or backflush your filters before filter activity increases as the bacteria begin to proliferate in the rising temperatures. Expect 'algal blooms' because the plants are not yet growing strongly, filter activity is low, and sunny days will encourage the growth of algae feeding on the nitrates that have accumulated in the pool from winter rains.

'Green water', which consists of millions of microscopic algal cells, should be cleared by the filters. Filamentous algae, or blanket weed, can be more difficult to eradicate. If persistent, it may be killed using a high-grade algicide as directed by the makers. The decaying filaments should then be removed by the filter or you can suck them out with a self-priming vacuum pump.

Summer

As far as Koi are concerned, summer



Proper seasonal care will ensure that Koi will be at their best, and friendliest, during the height of the season.

begins when the temperature of the water reaches 13°C (55°F). When the temperature reaches 19-24°C (66-75°F), the Koi will be at their most active. They will look eagerly for food and, if fed correctly, will quickly put on weight.

Do not forget that by feeding the fish well now, you will be building up their reserves to face the winter hibernation period. High-protein foods will be appreciated, but remember that the higher levels of nitrogenous wastes produced will increase the load on the filter system. Carry out regular water changes to compensate. The oxygen content of the water will decrease, so adjust your aeration system accordingly.

As the temperature rises, parasites breed faster and so your fishes' health should be a major concern. Observe your fish every day for signs of infection. It may be necessary to provide shade on very hot days if there are no water lilies in your pool. Strong sunshine will bleach the colours of your fish.

Early summer is spawning time, so if you are breeding fish be sure to get up early to detect signs of breeding activity.

Autumn

At the beginning of autumn, the water temperature will begin to fall but your fish will still be feeding well. At this time, with the sun's rays weakening, the fishes' colours are at their best.

In mid-autumn start to make preparations for the winter. Check your fish carefully for parasites and wounds and take appropriate action. With the first frosts, the leaves of aquatic plants will shrivel and die, and these should be removed. Put nets in place to catch falling leaves and to deter herons, which are most active in the misty autumn mornings. (They too want to build up fat



reserves.)

In late autumn, purify the pool with methylene blue according to the manufacturer's instructions. A good clean up of the bottom of the pool is also advisable. A build up of mud and leaves will constitute a health hazard to the fish. This should be removed regularly before it decays, either by means of the bottom drain, by netting or, if possible, by siphoning.

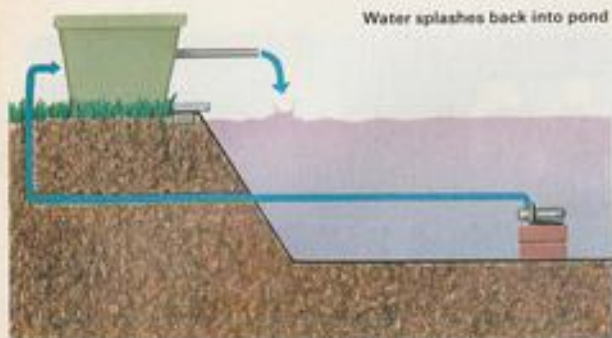
However, a speedier and more efficient option is to use a self-priming vacuum pump. This is the type used to clean swimming pools and is also ideal for Koi ponds. The pump is surface mounted and portable, often carried on a small trolley. The flexible suction tube is supported on a long rigid handle and can be used in the same way as a vacuum cleaner, the debris being sucked up to the sump.

Winter

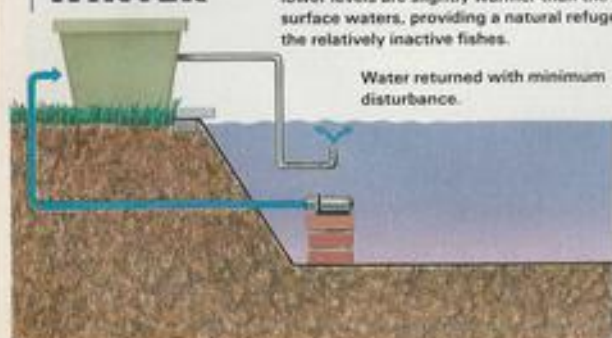
Koi are kept all over the world in a variety of climates. The following safety measures will not apply to those living in warmer countries. Koi are basically very hardy fish that will flourish in temperatures of 2-30°C (36-85°F). Japan has a cold but short winter, which means that extra precautions have to be taken in countries with longer winters, such as Northern Europe and North America. For small fish, this longer period with little or no food puts a greater strain on their fat reserves, and mortality rates will therefore be much higher unless special measures are taken.

When the temperature drops below 7°C (45°F) Koi begin to hibernate. Their metabolism slows down and their heart rate, respiration and digestion become irregular. They do not move around as normal and their appetite declines. Above 13°C (55°F) Koi do not hibernate and will swim and feed normally. Below 2°C (36°F), Koi are at risk and may die.

To prevent the pool freezing over completely, you can install a commercial pool heater to be switched on during cold periods. A pool cover, supported on poles laid across the pool, is useful. Polythene and



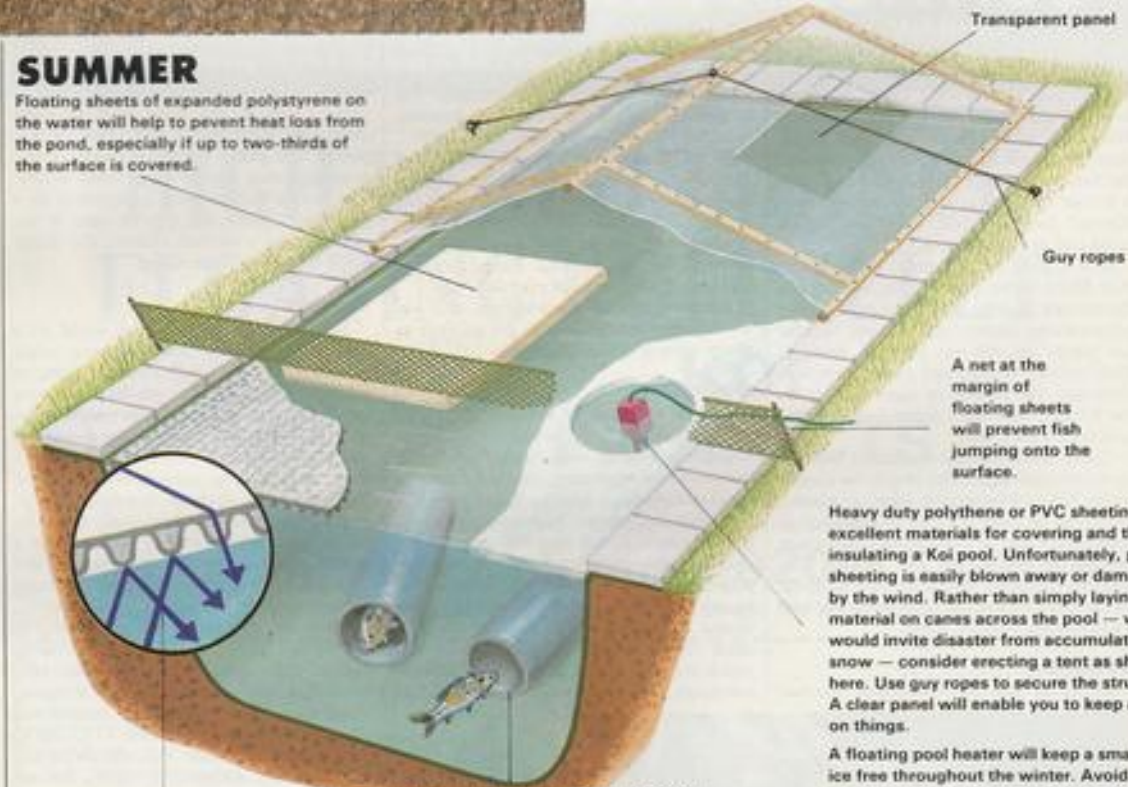
WINTER



In the summer, the surface waters are warmest. However, at or below 4°C (about 40°F), the lower levels are slightly warmer than the surface waters, providing a natural refuge for the relatively inactive fishes.

SUMMER

Floating sheets of expanded polystyrene on the water will help to prevent heat loss from the pond, especially if up to two-thirds of the surface is covered.



'Bubble' plastic packing material forms an excellent insulating layer. (The same principle is used for swimming pool covers). The transparent bubbles allow the sun's rays through but trap the heat.

Large diameter concrete pipes on the bottom of the pool are often recommended as winter refuges for Koi. However, the fishes may damage themselves moving in and out of the pipes. Consider the possible hazards.

PVC are both excellent materials for this purpose, but make sure they are secured correctly or the wind will tear them to shreds.

In Japan it is common practice to lay flat polystyrene sheets on the pool surface. If you cover two-thirds of the pool, this will prevent a great deal of heat escaping from the water surface. 'Bubble' plastic wrapping material will also act as an efficient insulator. To prevent fishes from becoming stranded on top of these floating sheets, position a net at the margin of the open water, as shown in the illustration.

If you do feed in winter, use sinking rather than floating food, as Koi seldom rise to the surface in colder weather. And feed only 10-20 per cent of the quantity usually given in the summer. It is not advisable to feed Koi when the water temperature is less than 10°C (50°F), however.

Leave filters switched on in winter, especially undergravel types. External filters should only be switched off if the conditions are so severe that water freezes as it flows.

This article is taken from the section entitled *Seasonal Care in An Interpet Guide to Koi*, by Barry James, published by Salamander at £4.95. Our sincere thanks to the publishers for allowing us to reproduce the text and artwork.

Heavy duty polythene or PVC sheeting are excellent materials for covering and thus insulating a Koi pool. Unfortunately, plastic sheeting is easily blown away or damaged by the wind. Rather than simply laying the material on canes across the pool — which would invite disaster from accumulating snow — consider erecting a tent as shown here. Use guy ropes to secure the structure. A clear panel will enable you to keep an eye on things.

A floating pool heater will keep a small area ice free throughout the winter. Avoid using a heater at the bottom of the pool because this will cause colder water from the top of the pool to circulate down to the slightly warmer lower levels, thus disrupting the 'layering' of the water that occurs at or below 4°C (about 40°F).

FISH MUSEUMS WITH A DIFFERENCE

Keen "Public Aquarium" fan Jonathan Moss visited three out-of-the-ordinary exhibitions in the course of his travels in Brittany and found that they all had a great deal to offer.

As you enter the Marinarium, in Concarneau, Brittany, you are greeted with a colourful poster packed with information. In bold print is written: HOW TO KEEP ALGAE, and what follows is an in-depth, easy-to-read explanation of the various types of algae — that is to say, 1) *Green Algae* 'caused by pollution.' 2) *Brown Algae* 'invariably situated under the green algae.' 3) *Red Algae* which the poster states 'can be eaten with soya.'

After a brief introduction to the various types of algae, namely, *Fucus vesiculosus*, *Peltaria canaliculata* and *Chondrus crispus*, the poster goes on to describe, step by step, Blue Peter style, how to prepare an algae dinner! The algae, which the French call 'Nori,' can be made into a soup, or served cold with a ball of rice.

One would think that such a poster is somewhat of a strange opening feature in an



The 'Old Town' entrance to the Museum des Poissons.



establishment like the Marinarium de Concarneau, which was founded in the Mid 19th Century by Professor Victor Coste, for research into Biorhythms and to find a scientific explanation for plankton.

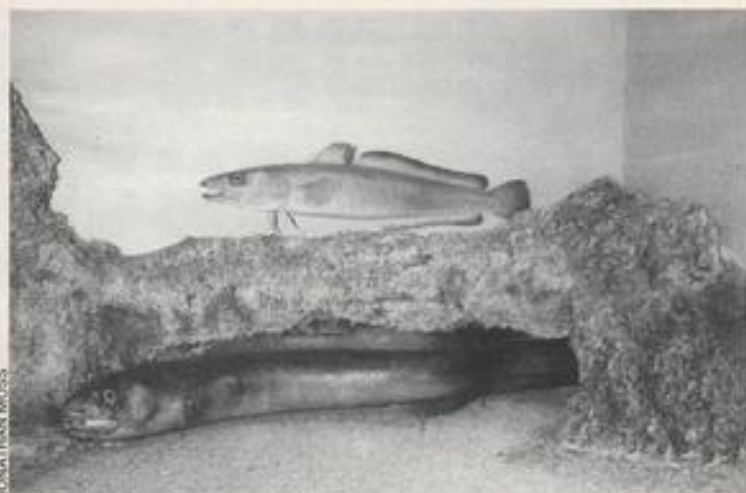
The Marinarium works for the eradication of pollution in the waters that surround Brittany. However, the exhibition, as the recipe for algae illustrates, is extraordinary enough to be interesting as well as extremely informative. The public's concept of an oceanographic museum or aquarium is a place where there are rows of separate aquaria, all of the same size, with an equal amount of species in each tank, with, perhaps, a brief explanation of the creatures that swim among the 'three chunks of Yugoslavian Red Rock,' and two pieces of bogwood and gravel.

However, the three fish museums in Concarneau throw a completely different light on this theory. In size, neither the Marinarium, Musée de la Pêche, nor Musée des Poissons can be compared with the great public aquaria — the Musée Oceanographique in Monaco, or the Coral World in Eilat, Israel, for instance. But, in my opinion, these three exhibitions devoted to sea life have much to offer that the large aquaria miss out on.

Having visited the Marinarium, the Musée de la Pêche and the Musée des Poissons, I came out with a real understanding of the fish that inhabit the Breton coast, the problems that the ecosystem faces and the worries of a polluted ocean. Each of the three museums leaves you with a different feeling for the underwater world. Having visited the Marinarium, you feel that Man is a beast that threatens the peace of the ocean. Through Man's efforts, the waters become polluted and the balance of nature is upset. The Marinarium also highlights the strangeness of people's desire to catch and kill a large fish.

In the Musée de la Pêche is described the history of France's third largest fishing port. When you have walked through the courtyard, you come across the aquarium, where the fish, whose culinary qualities and susceptibility to being caught have previously been described, are on show in tanks. We learn about the famous auction rooms in Concarneau where the bidding for the fish takes place. Three hundred and fifty employees make sure that the fish are sold for substantial prices. This is no place for the sensitive hobbyist!

The Musée des Poissons in the historic old town of Concarneau contains 50 species of fish from Northern Europe which are currently being fished for by Bretons. The collection takes the form of the bodies of



One example of the unusual varnished real-fish exhibits in the Museum des Poissons.

real fish varnished and painted and put in cabinets. This bizarre museum pulls in the crowds and it is with little wonder, for the Museum des Poissons is an excellent example to illustrate how the Museum of Concarneau so successfully educates the visiting public.

On the side of each cabinet or exhibit is a chart, which any European can understand. Firstly, the names of the species are given, in several languages, including Latin. Under

that is shown a map of the seas that surround Brittany and the area that the fishes swim around are shaded in on the map. There is also an in-depth account of the biological structure of each fish, as well as general comments. Such charts keep the visitors' interest and greatly increase the public's awareness of life under water.

It is this feature, the clarity and detail of the charts and posters that accompany the exhibits in all three museums that, in my opinion, make the fish museums in Concarneau, Brittany, a cut above the rest.

ESSENTIAL DETAILS OF EACH MUSEUM

MUSÉE DE LA PÊCHE

Address: Ville Close (The Old Town), Concarneau.

Times: 09.30-20.00. Closed Sunday.

Prices: Five to Eighteen Years — 12 Francs; Adults — 20 Francs.

MARINARIUM

Address: Quai De Sainte Croix, Concarneau.

Times: 09.30-12.00, 14.00-18.30. Closed Sunday.

Prices: Children — 6 Francs; Adults — 10 Francs.

SQUALIS (GRANDE EXPOSITION DE POISSONS)

Address: Ville Close, Concarneau.

Times: 10.00-12.30, 14.00-19.00. Open from 15 June-30 September. Closed Monday morning.

Prices: Children — 5 Francs; Adults — 10 Francs.



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News from the societies

Catfish Association of Great Britain

The Catfish Association of Great Britain Open Show was held on **Sunday 24 April 1988**. There were 244 entries, ranging from the small *Corydoras pygmaeus* to an enormous 24in *Malapterurus electricus*. While judging was in progress, an auction was held containing 316 lots. There were many bargains available, ranging from fish to plants, to equipment and live food.

The Yorkshire Area Group very kindly supplied a computer and a program which challenged the participant to figure out a scientific catfish name which was not already stored on the computer. A prize of 50p was rewarded to anyone beating the computer.

The raffle was well supported and, as well as CAGB merchandise for sale, there were also some cacti and some examples

of crochet work.

The superb first place prizes, and consisting of a specimen of catfish from each class etched onto glass and mounted in a frame, to form a picture, were supplied by FNAS Judge Brian Walsh.

Best Fish in Show — *Corydoras pygmaeus* (R. F. Adams).

Best Pair of Catfish — *Sturisoma panamense* (A. Hough).

Best Breeders — *Sturisoma panamense* (A. Hough).

Highest Pointed Exhibitor — C. Osborne (17 points), A. Hough — 17 points).

Tongham Aquarists Society

Tongham Aquarists Society held their Annual Open Show on **Sunday 15 May 1988**.

There were 320 tropical and coldwater fish entries and the quality of the exhibits was very high.

Competitors came from all over the South of England to take part. All of the local Clubs were well represented and, from

further afield, came exhibitors from Havant, Hounslow, Milton Keynes, North Bucks, Nailsea (near Bristol) and many others.

Best Fish in the Show — *Botsia horae* owned by Mr. S. Aylmer of Milton Keynes.

Highest Pointed Visiting Society — Reading with 56 points.

Highest Pointed Junior — Crispin Pierce of Tongham with 9 points.

Highest Pointed Lady — Mrs Iris Gale of Basingstoke with 22 points.

Highest Pointed Exhibitor — Bob Gardner of Tongham with 42 points.

Discus Study Group

Due to renewed interest and enthusiasm from Discus hobbyists around the world, the Discus Study Group has been reorganised. The Discus Study Group is a non-profit organisation established under the auspices of the American

Cichlid Association for the purpose of the study, exhibition and research of the genus *Symphysodon*.

Membership in the Discus Study Group is open to all persons interested in Discus (membership in the American Cichlid Association is not a pre-requisite). Membership of the Discus Study Group includes a subscription to "Discussions", an in-depth publication which has become a collector's item. The group will also be working to set national standards for Discus. Dues for one year are \$16.00 (USA) and \$21.00 (Foreign) and are payable to the Discus Study Group in U.S. currency. Please mail dues to the Treasurer.

For further information contact: **Co-Chairman/Editor:** Marc Weiss, 90 Lexington Ave, No 7D, New York, N.Y. 10016; **Co-Chairman / Treasurer:** Ellen Halligan, 73-74 184 Street, Flushing, N.Y. 11366; **Co-Chairman/Secretary:** Tom Hayes, 95 Duncan Road, Hempstead N.Y. 11550.

Diary dates

Six Towns Aquatic Society

Six Towns A.S. are holding their first auction of fish and equipment at The Railway Inn, Heron Cross, Fenton, Stoke-on-Trent, on **7 August**. Doors open: 10.00 a.m.; Auction: 1.00 p.m. For further information contact Alan Rothwell: (0782) 317741.

South East London Catfish Group

The South East London Catfish Group are holding an Open Show on **Sunday, 28 August**, at Paisley Hall, Stopford Road (off Manor Place), London SE17. Benching: 9.00 a.m.-12.00 noon. Open to all from 4.00 p.m. onwards. Also scheduled: auction, raffle and trade stands. Details from P. R. Thurbon (Secretary), 204 Ladysmith Road, Enfield EN1 3AE. Tel: 01-363 3252.

Salisbury & District Aquarist Society

The S.D.A.S. 1988 Open Show

will be held at the Technical College, Southampton Road, Salisbury, on **Sunday, 11 September**. For further information, contact Ivor Goddard (Secretary), Victoria Cottage, 11 Pennys Lane, Fordingbridge, Hants SP6 1HQ.

Evesham Fishkeepers Society

E.F.S. are holding their 1988 Open Show on **Sunday, 11 September**, at Evesham High School, Four Pools Road, Evesham. Booking in: 10.00 a.m.; Judging: 1.00 p.m. Further details from N. D. Angell, 12 Riverside, Alcester, Warks B49 6RD.

Northampton & District Aquarist Society

The N.D.A.S. Open Show is scheduled to take place on **Sunday, 18 September**, at the Gladstone Centre for the Disabled, Gladstone Road, Northampton. For further

details, ring C. Swain on (0604) 403058.

N.E.F.A.S.

The North East Federation of Aquarist Societies 3rd Open Show will take place on **Sunday, 25 September**, at the Robert Atkinson Community Centre, Thortree Road, Thornaby. Further information available from S. King (P.R.O. — N.E.F.A.S.), 59 Tollesby Bridge, Coulby Newham, Middlesbrough, Cleveland TS8 0SE. Tel: (0642) 591017.

East London Aquarists & Pondkeepers Association

The 40th Annual Breeders Open Show held by E.L.A.P.A. will be stage on **24 September** at the Catterall Hall, Cecil Road, Chadwell Heath, Romford, Essex. For further details, ring Hazel on 01-509 1824. E.L.A.P.A. meet on the first and third Thursday of the month at Catterall Hall. Infor-

mation from K. Stannard (P.R.O.), 135 Marks Road, Romford, Essex RM7 7AF.

Darwen Aquarist Society

The D.A.S. 1988 Open Show will be held on **25 September** at the Library Theatre, Darwen. For further information, contact D. T. Milner (Show Secretary), "Rusland," 4 Marsham Grove, Darwen, Lancs BB3 3JN.

Mid-Sussex Aquarists Society

The 1988 Open Show of the M.S.A.S. will be held in conjunction with the Brighton Festival of Fishkeeping due to be held at the Pavilion Theatre, Corn Exchange, Brighton, on **30 October**. Further details from John Smith (Chairman), 51 Eastbourne Road, Brighton BN2 4DL. Tel: Brighton 602407.

Your questions answered

Having problems? Send your queries to our panel of experts who will be pleased to be of service. Every query receives a personal answer and, in addition, we will publish a selection of the most interesting questions and responses each month. Please indicate clearly on the top left hand corner of your envelope the name of the expert to whom your query should be directed. All letters must be accompanied by a S.A.E. and addressed to: Your Questions Answered, The Aquarist & Pondkeeper, c/o Dogworld Ltd, 9 Tufton Street, Ashford, Kent TN23 1QN.



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PLANTS
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MARINE
Graham Cox



DISCUS
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Marine A question of power

Due to the lack of space available I am limited to keeping a tank of the size 36in x 15in x 12in.

Much has been written recently about the use of powerheads in conjunction with power filters and undergravel filter plates. The problem is, which ones? What sizes are required for the above dimensions?

A properly designed undergravel filter operated in reverse-flow mode by either an internal water pump (see Hockney Systems) or an external powerfilter (Fluval/Sicoe/Eheim, etc.) is the most efficient means of water management usage. However, if the aquarist cannot afford either of these two alternatives, then a wide-diameter, airlift-operated undergravel filter, properly silenced by use of a wooden micro-diffuser in the airlift, is the most cost-effective and biochemically superior alternative available.

To be "fail-safe" in use, you first of all need two uplifts so that, should either fail during your absence, the delicate balance of the marine aquarium will not be destroyed. Using powerheads to operate the uplifts of the U/G filter, you still need two uplifts and two powerheads for safety. I personally find the Fluval powerheads to be the safest and best-designed on the market, though there isn't really a bad one available;

they're all pretty effective and reliable.

Using even the Fluval Aquaclear 200 (ie the smallest units made), and even reducing the turnover rate to 80 gallons/hour by using the powerhead's air venturi to pump air as well as water, two such units would pump, together, about 150-160 gallons of seawater per hour. Allowing for water displaced by your coral sand/cockleshell filter-bed and rocks/corals, etc, your tank will only contain about 22 gallons of actual seawater. Thus your **TURNOVER RATE** will be $160 \div 7$ times each hour or, 22

in other words, a complete pass through the filter bed every 85 minutes!

Such a turnover rate would create a colossal degree of turbulence in the aquarium which would quickly wear out all known corals/fishes. Your best

Java Fern — a suitable plant for the brackish aquarium.

and cheapest solution therefore is to use two powerful airpumps, (eg. Hoffman 150 or Rena 301), one to drive a wooden micro-diffuser in each airlift. The use of such a special diffuser would simultaneously silence the water delivery and saturate the seawater with oxygen.

Plants Brackish-tolerant plants

Are there any plants which will tolerate brackish water conditions?

Cryptocoryne ciliata comes from backwaters associated with estuaries where the water is often brackish. *Microsorium pteropus* (Java fern), *Vesicularia dubyana* (Java moss) and *Sagittaria subulata* (Dwarf Sagittaria) also do well under brackish conditions.



REILY WHITE/SCIENCE

Tropical Lungfish dentals

I would be very grateful if you would give me some information on the dentition of Lungfish.

Both the African Lungfish (*Protopterus annectans*) and its Australian counterpart (*Neoceratodus forsteri*) are air-breathing carnivores whose teeth are fused into a number of sharp bony plates.

Eye losses

Several of my fish have lost one eye. I've been told in my local fish shop that this is an incurable complaint caused by a cyst which develops behind the eye and pushes it out of its socket. Your comments would be appreciated.

I cannot agree with your local aquarist shop about the reasons for the eye losses. Cysts are very rare behind the eye and so, to see it in several fish in the same tank is most unlikely. A more common source is cataract, caused by parasites or, possibly, tuberculosis; the eye usually turns white but, in severe cases, the tissue dies and bursts giving the appearance of having actually lost that eye.

This, again, is a rare event, so, for several fish to show eye loss, indicates some predator attacking them. Only careful observation will identify the culprit. When identified, what

to do with the fish is your choice — but I know what I would do!

Noisy filter

I have an air-operated filter which is very noisy. How can I quieten it down?

To make your filter quieter attach an airline clamp to the airpump's plastic tube and screw it down enough to reduce the air flow to a quiet level.

This will also reduce the filter's effectiveness of course, but it will still operate. For really quiet filter action, get a submersible power filter.

Freshwater inverts

Are there any invertebrates, other than snails, that I can keep in my aquarium?

For a selection of inverts which you can keep in your aquarium see 'Life in the Aquarium' by V. Dal Vesco *et al* from Octopus ISBN 0 7064 0461 0 (1975).

Aquatic animals listed include Water Beetles, Caddis Fly and Mayfly larvae, Water Spiders, Water Boatman, Crayfish, River Crabs, Snails, Swan Mussel, Freshwater Sponges, Round worms, Flat worms, Planarians, and even a freshwater Jellyfish. Whether or not the creatures will live together depends more on the relative sizes than species.

Coldwater Colour Changes

Following a successful pond spawning of my goldfish two years ago, I gave away quite a few of the resulting fry. Of the remainder, four or five have changed colour but the rest are still black, although when nested, they can be seen to have a gold sheen underneath. Why is this? Could I bring out their colours?

Young goldfish are a dark greenish colour which usually changes to almost black, before paling on the belly, and gradually changing to orange, red, or silver. This process can take weeks, months or even years, depending on the strain of fish and/or temperature of the water.

Some strains of metallic gold-

fish may produce fish which begin to colour at about four weeks. In fact, I have had young Lionheads which have completely changed at six weeks in a water temperature of 70°F (21°C). Of course, even among such quick-colouring fish, there will be some which will take much longer. In cooler temperatures the process will take even longer still. Quick colouring strains have been brought about by selecting breeding fish from those which change colour early and then selecting from each generation only those fish for breeding which colour up quickly.

In a pond where natural spawnings take place, unless slow changing fish are first removed (and therefore not allowed to breed) the time taken by each generation will be longer. In fact, the process of 'advancement' will be reversed and, eventually the fish will revert back to the wild type.

It is therefore advisable to remove all uncoloured fish and re-stock with young, well-coloured specimens from a better strain which will revitalise the failing colour in your pond.

Culturing livefoods

I would like to culture Daphnia and Bloodworms to obtain a supply of livefood for my coldwater fish. Is this possible?

You can use different types of containers such as plastic tubs to start off a *Daphnia* culture. However, do not use anything too small as plenty of oxygen is vital. If it is possible to aerate your water with an air-stone to increase the supply of oxygen, all the better.

You will need to feed the *Daphnia* and a good source of food is baker's yeast, but take care not to overfeed and therefore pollute the water. Mix about ½ teaspoon of yeast to about 30 gallons of water twice per week. Make sure that a part of the water is changed at least once a week, preferably with green water rich in algae. *Daphnia* cultures should receive plenty of light to thrive.

Unfortunately, a culture of Bloodworm is not quite so simple to start as the Bloodworm is, in fact, the larva of a Chironomid (midge) and not a worm at all. However, White Worm cultures are easy to start and maintain. Starter cultures

are available from aquatic shops or specialist "breeders" and these can be spread out into shallow plastic trays which contain loam and peat which is slightly damp. The soil is then covered with a loose-fitting piece of glass and a piece of board, or such-like, is placed over the top to exclude the light. The worms are fed with brown bread or porridge and given the chance to multiply before any are removed about three weeks later.

Good books

Is there a good book I can buy which will cover all the facts on fancy coldwater fish (ie) sexing, breeding, diseases, etc?

There are quite a few excellent books on the subject of the goldfish. My own personal choices are: *The Goldfish* by George F. Hervey & Jack Hems. *Fancy Goldfish Culture* by Frank W. Orme. *Goldfish Guide* by



There are quite a few good coldwater books around at the moment, including this colourful one by Dr Chris Andrews.

Dr Yoshichi Matsui. *Fancy Goldfishes* by Dr Chris Andrews. *A Fishkeepers Guide to Coldwater Fishes* by Dick Mills. *Cyclopaedia of Coldwater Fish and Pondlife* by Frank Orme.

Northern Society

I live in Bolton and would like to get in touch with my nearest coldwater society. Is there one local to me?

Your nearest society is The Northern Goldfish and Pondkeepers, whose members meet at the Sports Centre, Silverwell

Street, Bolton. Meetings are held on the second Tuesday of each month at 7.45pm in the upstairs meeting room. The Secretary is Mr David Padfield, 'Broadlands', Westfield, Ossett, West Yorkshire WF5 8JH.

The Northern Goldfish society stage their Open show in September of '88, at the Trinity United Reform Church, Altrincham, Cheshire.

Koi Feeding maggots

Is it safe to feed my Koi maggots as a form of livefood?

Maggots are perfectly safe to feed to Koi, within reason. They represent a very easy way in which you can feed livefoods, especially to larger Koi. Unfortunately, if too many are given too often, then Koi tend to become very fat which, as with humans, can lead to many health problems. However, feeding two or three times a week in place of a usual feed should prove no problems at all.

The plain white maggots are the best, as some of the colouring agents used could prove dangerous to your fish. Casters, which are maggots that have turned to pupae prior to becoming flies, also form a good alternative food to give Koi but, again, feed only occasionally. A good guideline with most alternative food sources for Koi is to feed occasionally (2-3 times a week), rather than as a regular daily part of the diet.

Koi society addresses

How many Koi societies are there, and how could I contact them?

There are several Koi societies in the UK. Below are the details of the three main ones:

British Koi Keepers Society
Mrs B. Barton, 316 Bourne-mouth Park Road, Southend-on-Sea, Essex SS2 5LY.

Midland Koi Association
Mrs J. Hewitt, 1 Durham Crescent, Allesley Village, Coventry.

Yorkshire Koi Society
Mrs H. Bent, 58 Broom Crescent, Rotherham, Yorkshire.

THE BLACK BEAUTY

Derek Lambert of the Livebearer Information Service reports on the creation of a "new" and spectacular livebearer.

It is now nearly 100 years since the existence of livebearers was first known to the European aquarium world. During this time four livebearers have come to dominate the hobby. These are Guppies, Platies, Mollys and Swordtails. Of these, only Guppies (*Poecilia reticulata*) can be regarded in any way to represent a true pure species now. The other three are, to a greater or lesser extent, hybrids. It is still possible to obtain the wild forms of these fish, but, in general, it is the more colourful hybrids that aquarists want today.

These hybrids have been developed into a myriad colour patterns and fin conformations sufficient to dazzle the eye of any hobbyist. However, many aquarists forget the years of endeavour needed to create these fish. They see fish like the beautifully-coloured Tortoiseshell Molly and forget all the hard work Dr Joanne Norton of the American Livebearer Association had to put into it to develop it from a poorly-coloured commercial Molly.

In the last 20 years a new family of livebearers has come to the attention of the aquarium world. These are the Goodeids (family Goodeidae). As yet, they have not

become a "commercial" group of fish but they have all the makings of doing so: lovely colours, in general, peaceful temperaments, and sometimes easily bred. Therefore, I suppose it was only a question of time before someone would try to "improve" them.

That person is James K. Langhammer, and he earns a place in the history of the aquarium world because he has created the first cultivated Goodeid. "Hammer," as he is known in the hobby, was, at the time, Chairman of the American Livebearer Association Board of Directors and was working at the Belle Isle Aquarium as curator. He is a trained cytogeneticist (cytogenetics is the study of genetics at cell level) and, as such, knew what he was doing.

I mention all this because, in a way, I hope to warn other aquarists of the dangers of doing what Hammer has done. Hybridisation is a useful tool in the creation of a new cultivated fish for the hobby, but it can also be the death of a pure species if it is done indiscriminately and the resulting fish are passed out as the pure species they were derived from.

One of the victims of this sort of thing is *Poecilia chica*. Two different hybrids of this

fish are freely circulating in the hobby under the name *Poecilia chica* and, since it is impossible to find out just when and where the hybridisation occurred, it leaves a question mark over all *Poecilia chica* in the hobby. It was for this reason that Pat and I went out of our way on our recent collecting trip to Mexico to obtain new wild stocks of this lovely species and re-establish a pure strain in the aquarium hobby. This has now been done and fish from this collection can be obtained through the Livebearer Information Service species maintenance programme.

Development of the Black Beauty

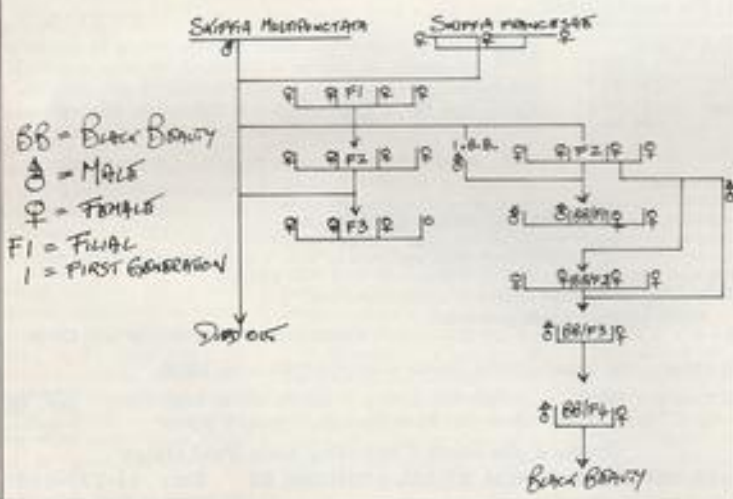
After failing to establish a population of *Skiffia multipunctata*, Hammer was left with just one male. (It is worth noting that no-one anywhere in the aquarium hobby has been able to domesticate this species.) *Skiffia multipunctata* is a lovely species in its own right. Being covered in gold and black blotches, it also has the sawfin so characteristic of the *Skiffia* genus. The only thing it lacks is the ability to adapt to aquarium conditions. Therefore, Hammer's goal was to combine these lovely colours with the captive vigour and fecundity of another *Skiffia*.

Only two species of this genus were, at that time, established in the aquarium hobby. These were the distantly related *Skiffia (Neotoca) blinnata* and *Skiffia francesae*. This latter species is very closely related to *Skiffia multipunctata* and is a highly vigorous and fecund species in the aquarium. Unfortunately it is also extinct in the wild and must be maintained permanently in captivity if it is not to disappear altogether.

Skiffia francesae is one of those delicately coloured fish which it is both difficult to describe and to photograph accurately, as many of the colours are lost when flash is used. The underlying body colour is a delicate gold, overlaid with an iridescent blue sheen which is strongest towards the head, giving the fish an almost bi-coloured appearance. Along the sides are a few black spots; there is also a dark marking in the caudal peduncle region. The fins are greyish green with some spotting and the dorsal fin is the typical *Skiffia* sawfin.

Skiffia francesae was first collected by Dr Robert Rush Miller and J. M. Fitzsimons early in 1970. It was re-collected in 1976 and it was from this collection that all aquarium stocks have been derived. Indeed, everything in the hobby today has come indirectly from Hammer's basement. For

THE ROUTE TO THE BLACK BEAUTY



Y SAWFIN GOODEID



Above, *Skiffia francesae* (female above), the second species involved in the Black Beauty story.

Above, left, The Black Beauty is a spectacular fish. It is, nevertheless, a hybrid and, as such, should be handled responsibly.

Below, left, This is the *Skiffia multipunctata* male used for the first cross on the road towards the development of the Black Beauty.



many years, Hammer was the only person keeping and breeding this species with any success, and it is a tribute to his concern for the wild species in their own right that we still have this fish today.

Hammer took several female *Skiffia*

francesae and placed them with the male *Skiffia multipunctata*. Fry from this original cross were then mated back to their father and also to each other. The resultant fry from father/daughter matings had little or no body colour and did not improve with

further inbreeding. This line was terminated, in the end. However, among fry from the brother/sister matings was one male with a blotchy pattern. This male was mated with several of his sisters and, among the resultant fry, was one exceptional male. This male was then mated back to his mother and her sisters. Since then, the strain has been steadily improving. In fact, I have just heard from Hammer that he is working on the females of the strain and some of these now have the blotched patterns.

The best males are now a jet black all over as can be clearly seen in the photograph. None of my males have such intense coloration as yet, but some have the blotched pattern, and it can only be a question of time before mine reach the same stage as Hammer's.

What the future holds for this hybrid no one can say, but one thing I can't stress strongly enough is **DON'T PLAY WITH HYBRIDISATION**. Only aquarists dedicated enough to work with a fish for a decade or more should even attempt to create a new cultivated fish like the Black Beauty Sawfin Goodeid.

Further information about all kinds of livebearers can be obtained from the Livebearer Information Service, c/o 20 Queen Mary Avenue, Morden, Surrey SM4 4JR.

JAMES K. LARSHAMMER II

JAMES K. LARSHAMMER II

AQUARIAN FISH FOODS



DAVE GARRATT

The Long-nosed Hawkfish, unlike its relatives, poses no real threat in the marine community aquarium.

THE LONG-NOSED HAWKFISH

Dave Garratt recommends this Hawkfish with a difference — both in appearance and community tank suitability.

First impressions of the Long-nosed Hawkfish are of a fish totally different from any other Hawkfish that the marine aquarist may encounter. The cause of this apparent mistaken identity is its elongated snout, but despite this oddity, the fish is a true member of the Hawkfish family, the Cirrhitidae.

The family consists of elongated, fully scaled fish that have spiny dorsal fins and three well-developed spines in front of the anal fin. The lower rays of the pectoral fins are elongated and are used to help the fish 'perch' on coral heads in typical Hawkfish fashion. From such a position the Hawkfish can rapidly strike at any passing food. The family derives its name from the small tufts of cirrhi that arise at the end of the dorsal fin spines. The function, if any, of these cirrhi has never been scientifically proven. Hawkfish constitute a widespread family occurring on most of the world's reefs and are found in East Indies, Philippines and California to Hawaii. There are also a few species encountered in the more northerly Atlantic reef areas and in the Red Sea.

The Hawkfish are related to the Scorpion fish (such as the Lionfish) but do not possess their venomous spines. All Hawkfish are solitary fish and are perfectly adapted to their existence among the coral branches where they spend most of their time waiting for unsuspecting prey.

The Long-nosed Hawkfish fulfills all the above criteria and so genuinely qualifies as a member of the Cirrhitidae, while at the same time being immediately set apart from the rest of the family by its elongated snout. The fish's coloration is a pattern of bright red lines on a whitish background, with

black edges to the caudal and pelvic fins.

The Long-nose is found mainly in the Indian Ocean and also in Hawaiian waters, usually at depths of below 50ft (15.25m). The fish is commonly found perched on its pectoral fins among the finger-like branches of Black Coral. As its red coloration appears black at this depth, it is superbly camouflaged. From such a position it can ambush its prey which consists of tiny crustacea, fish larvae and fish eggs. The fish grows to a maximum length of 5in (12.7cm) in its natural environment.

Aquarium care and breeding

The long nose of this fish also serves the aquarist very well when considering tank mates for it. Hawkfish are predators by nature and many attain a length of 6-8in (15-20.3cm) and possess a large mouth to facilitate such a predatory existence. Therefore, the marine aquarist must be very careful as to the size of fish or crustaceans that (s)he mixes with Hawkfish in home aquaria. However, with its long slender snout, *Oxycirrhites typus* presents no such problems as it can obviously only take very small-sized food particles, thus leaving its tankmates in safety. The Long-nose is also a very peaceable fish and will even share coral perches with other fish. All of this makes it immensely suitable for a mixed fish system, if kept with similarly docile fish. However, the fish really comes into its own as a candidate for a mixed fish/invertebrate system, or even an invertebrate-dominated natural system.

Catering for its aquarium diet is fairly easy as, once settled in, the fish competes well for food and accepts most food offered, although the size of particle offered should

be considered. Small invertebrates and meat-based foods are what should be offered, such as brine shrimp, *Mysis*, fish eggs, squid, high protein formulae and many other gamma-irradiated foods are all successful, and flake may also be accepted.

The Long-nose will reach 3-4in (7.6-10cm) in the aquarium and may be quite long-lived. The female is larger than the male and has a darker red coloration to the lower jaw. Records of aquarium spawnings are scarce, but it would appear that demersal eggs are laid. This means that groups of adhesive eggs are laid on a hard surface and are fertilised and hatched at the chosen site.

Personal experience

My own experiences with this fish fully bear out its suitability for tank life. My fish quickly settled in and installed himself on an outcrop of Red Organ Coral from where he actively competed for nearly all foods offered. The fish was kept with Green Chromis, Blue Damsels, *Pseudochromis*, Common Clowns, a Regal Tang and a Bi-colour Blenny.

I kept the fish for two years and its own greediness appeared to contribute to its demise. The long snout appeared to sustain damage from an attempt to take a large piece of lancefish. After this incident its appetite gradually diminished and the fish faded away over a two-month period. The fish showed slight haemorrhage around the pectoral fins during its terminal stages, hence the mouth damage could have been coincidence.

Summary

To summarise, I can thoroughly recommend *Oxycirrhites typus* for the relatively inexperienced aquarist, providing it is not kept with large aggressive fish. The fish really comes into its own in a predominantly invertebrate system where its full beauty and peaceability come to the fore.

News

'Aquarian' AFE competition winners 'do the town'

Aquarist and Pondkeeper readers responded in their hundreds to the special 'Aquarian' Fishkeeping Exhibition competition in the May issue. Unfortunately, as in all competitions, there was only one winner and one top prize — but what a fabulous one it was!

The lucky winner was **Derry Wharton** of Merseyside, who won an all-expenses paid weekend for himself and his wife to visit London and the 'Aquarian' Fishkeeping Exhibition in style.

Derry's and his wife's weekend was spent staying at



Derry Wharton, winner of the *Aquarist and Pondkeeper* 'Aquarian' competition, with TV celebrity Nick Davies.



OFI president retires

Keith Barraclough, President of Ornamental Fish International has retired from office after four years outstanding service to the organisation.

Keith was a founder member of OFI, also serving as Chairman before accepting the Presidency. He now intends to devote his time and considerable energy to his other demanding business interests.

In appreciation of his enormous contribution in the structuring and development of OFI, from a European body to the present international platform, fellow board members presented Keith with a crystal decanter at the recent OFI Assembly, held at Interzoo in Nurnberg, West Germany.

Switch from loaves to fishes pays off

A switch from loaves to fishes has proved just the job for a Sidcup man.

Until last year, **John Amos** was a bakery supervisor, but a move to a company in London offering better prospects proved to be a bad one when it made him and other staff redundant. At that point, John did what other fishkeepers in a similar position have done — examined the possibilities of making a business out of his hobby. He chased around for finance, heard about the **Enterprise Allowance Scheme** and went along to Sidcup Jobcentre to find out more.

An "awareness day" at Bromley College spelt out exactly what self-employment entailed.

"We were told of the importance of preparatory work, where to go for finance, and about tax. It was very enlightening and gave me the confidence to go ahead," said John, 41.

On 7 March this year he launched **Jaru Tropical Wholesalers** — Jaru deriving from "John Amos — Rare and Unusual" — at **Swanscombe Business Centre, Dartford**. Tel: (0322) 846402.

"My market research had

shown there was a big slot in the market for rare and unusual fish, and I was soon getting stock from contacts in Holland and Germany. Now I have a contact in southern Brazil and I'll be travelling out there soon to get my own collecting-station set up in an area where no one has been collecting since before the war."

At any one time, John has 60 different species in stock, ranging from half an inch to one foot in length, and from 20 pence to £80 in price. He also stocks a dozen different types of plant for aquaria.

Within three months of starting trading, John is already thinking of expansion.

NOTE: John Amos is just one of thousands of adults of all ages who have turned unemployment into enterprise with help from **EAS**. Applicants should be aged between 18 and 65, receiving unemployment benefit or income support, and have been out of work for at least eight weeks. They must have at least £1,000 to invest in their business, or be able to raise it by loan or overdraft.

Details of the scheme are available from Jobcentres.

the London Hilton Hotel, Park Lane, visiting the lights of London by night and enjoying all the fun of the 'Aquarian' Fishkeeping Exhibition by day — not to mention the little matter of £100 spending money.

The Wharton's first class fishkeeping weekend started when, on Friday afternoon, they boarded the train at Wallasey station en route to their prestigious Park Lane address and their dream weekend. "The hotel room was fantastic with every little luxury you could think of. We just couldn't believe it. There was champagne in our room when we arrived, and when we pulled back the bed cover, there were even chocolate mints on our pillow and a note wishing us sweet dreams — we even had champagne with our breakfast!" explained Derry.

Shopping, sightseeing, eating and, of course, fishkeeping were packed into the busy weekend schedule. On Saturday night the Whartons visited the bright lights of London's Theatre Land and the hit musical, 'South Pacific'. "My wife really enjoyed the show," said Derry. "She loves musicals; all those songs."

At the 'Aquarian' Fishkeeping Exhibition at Sandown Park, on the Sunday, Derry met with the experts on the 'Aquarian' Advisory Service Stand, and looked around the show which he described as "very professional". At the end of the day celebrity **Nick Davies**, co-presenter of the BBC children's programme, 'The Really Wild Show', brought his dream weekend to a close with a handshake and a smile for the camera, and the final part of his prize — a year's supply of 'Aquarian' fish food.

After a busy, exciting and luxurious weekend, the Whartons made their way home to Merseyside to tell of their very special holiday. "It has been one wonderful weekend," Derry beamed.



Cynolebias (this is the habitat of *C. prognatus*) live in pools which dry up during the hot season.

SOUTH AMERICAN PEARLS

(Some Comments on Breeding)

John Skillcorn continues his occasional series on Killies with a look at the natural habitat and aquarium spawning of these "annual" fish.

C*ynolebias* fishes are not new to the aquarium world, but they are unusual in that they are not commonly encountered in aquarists' shops. Furthermore, this is probably not the first series of articles you will have read on this subject nor, I hope, will it be the last. If it's all been done before, perhaps you're asking, then why bother to go over old ground?

The answer to that, as far as I'm concerned, is that the habits of the Pearl Fishes are so strange and intriguing, as well as being so varied, that no-one can possibly have found one foolproof method of breeding all species. If we pool our ideas, however, then many more people will benefit, not to mention the fish in our tanks, as the stocks of some species appear to be hanging on almost literally by a thread. I intend in this article to go over some of the techniques which I have found successful, and which have made me successful, whereas others have failed. If we accept what I have said up to now, what, then, is so special about these fish?

Imagine a stretch of water with an abundant supply of food organisms suitable for a healthy fish population, and which is

being exploited by just such a population. What would happen if, during a hot summer, the water completely dried up? Well, it doesn't take a genius to work out that the fish population would die out. Yes, we may know about Lungfish species being able to survive in a chamber below ground, but I am referring to fish which, to all intents and purposes, are normal, without the benefit of lung-like structures of any sort.

Does this mean, then, that bodies of water such as those described cannot support any population of fish? Of course, those of you who are used to questions like this about the Animal Kingdom will be able to guess that there must be, somewhere in the world, some marvellous species of fish which will be able to colonise even this most unlikely habitat, even though water may not be present all the year round. You may even have guessed that these fish belong to the genus *Cynolebias*! Fine! But the question remains — how do they do it?

The natural habitat

Cynolebias are usually prolific egg layers, the males and females diving headlong into the mud and debris at the bottom of the

poonds in a most spectacular fashion, the more powerful male making the going a little easier for the less well-developed female.

During each dive the pair may disappear completely, during which time a single egg is laid. This is repeated time after time, usually early in the morning, each female being able to produce eggs on a continuous basis during her entire life. Some are real egg machines! In this manner, the eggs are buried in the bottom debris, out of sight and, to all intents and purposes, forgotten about.

All the while, the water level may be falling, even to the point where it can no longer support the fish. Without water they, of course, die. But what of the eggs? These remain buried a few inches below the surface of the, now, caked mud, and, indeed, this hardened skin may well protect the mud from drying out any further.

The eggs become dormant, and may not develop further for many months. However, slowly but surely, the embryo does complete its development and, with luck, may be just in time for the onset of the rains the following year. Many of the eggs hatch within an hour or two of the first fall of rain, but they may well be doomed due to a second drying of the ponds early in the wet season. These babies die, but are soon replaced by others which have had the good fortune to complete their development later on when the water content of the ponds becomes more permanent. In fact, it has become clear that the eggs of some species, and some of the eggs of many species, need to be wetted and dried several times in order to hatch — Nature's safeguard.

These baby fish begin feeding on the myriad tiny aquatic organisms which also begin to resume their existence after the rains. The fish grow at an amazing rate, becoming adult in as little as six weeks in some cases, and so, complete their life cycle by laying as many eggs as possible in as short a time as possible.

In theory, at least, the ponds in which these fish are found need only contain water for as little as two months or so in order to sustain a viable population. In practice, they usually contain water for a lot longer than that, so ensuring optimum conditions for the maintenance of the species found there.

Because these fish are adapted to living within an annual cycle, they are commonly called **Annual Fish**. This term not only includes the *Cynolebias* species of South America, but also the genus *Pterolebias*, and the *Neotobraschius* of Africa. There are also related groups to these, for example, the *Cynopocillus* of the New World.

The perfect spawning medium

For breeding, I use peat from my local garden centre, which stocks good quality Irish MOSS peat. This is very cheap, and can be bought by the bale in compressed form. The peat is boiled thoroughly in small quantities as needed, and after this treatment, it must be washed very carefully by holding small amounts in a fish net under a



A male *Cynolebias alexandri* displaying in an attempt to attract the female's attention.



Above. The male tests the peat in search of a soft spot where he can burrow.

Right. The male has now almost disappeared into the peat. His larger size (compared to the female) and vigorous movements create sufficient room for the female to follow him and position herself beside him in readiness for spawning.



FRED THE PIRANHA.



© 1988 PETER W. GILGUS.



running tap. You will find that it will now sink to the bottom when placed in water. At the same time, you will also extract excess acidity from the peat, the acid water produced being perfect to add to your Tetra tanks (in small controlled quantities) once it has cooled.

I prefer to scatter the peat over the entire floor of the aquarium to a depth of two inches or so (5cm), as I love to watch the fish in their characteristic spawning activities, and this method allows fairly natural behaviour. There are, however, many enthusiasts who use the peat inside plastic margarine tubs.

This method has advantages and disadvantages (the deep, round types of tub are the best I've found). Each tub is filled to about half its depth with boiled, washed peat and the lid is placed on, you having first cut a round hole in the centre large enough to permit the entry of the fish. If necessary, the tub can be weighted down using a piece of flat slate in the bottom. The idea is for the spawning fish to enter the tub and to lay their eggs inside, and it does indeed seem to work.

However, I do not use this technique of spawning the fish for a couple of reasons. Firstly, I like to watch the spawning activities of my fish (I'm beginning to sound like a Peeping-Tom!), and the tub technique does not really permit this. Secondly, some of the eggs are dislodged from the tub and end up on the bare floor of the aquarium where they are exposed to light, fungus and the parent fish, although I have seen no evidence that these fish are avid egg-eaters. Thirdly, with a bare base to the aquarium, the fish (to me) do not seem to behave at all naturally, and do not develop their true, most vivid colours, as they do when the entire base is covered with the dark peat.

The advantages of this system are, however, several. The fish are spawning in a relatively small amount of peat, and so it is much easier to find the eggs once they are produced. As all the peat used is contained inside the tub, the floor of the aquarium is quite bare, except for the small amount of peat which inevitably overflows. This makes it much easier to maintain a clean tank, as uneaten food is easily spotted and removed. When you do eventually come to harvest the eggs, you have to deal with only a very small amount of peat, and I suppose, that this would be much easier. All in all, you may be thinking that the tub method is much better. Perhaps it is. I know of many people who use it successfully, but I still prefer to watch the (almost) natural habits of my fish, and so I doggedly cover the entire base of the aquarium! The fish are at ease, and reward me by spawning non-stop.

Whichever method you use for providing a spawning medium for your fish, the time will come when you will have to remove the peat in order to store it for incubation purposes. In the following instalments I will take a look at how we may carry out incubation and how we may encourage fully-developed eggs to hatch — even if they don't want to!

PRODUCT ROUND-UP

BY DICK MILLS

KOI FILTERS

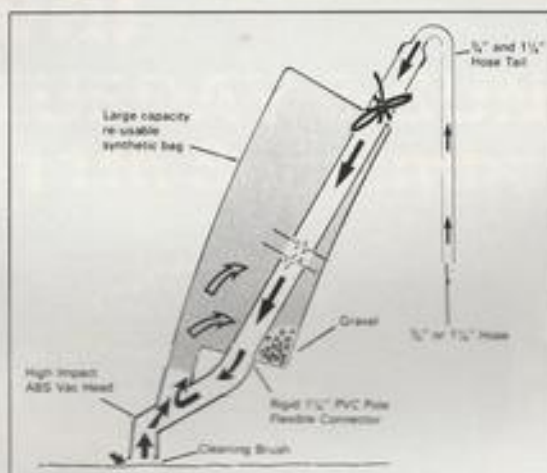
The efficient filtration of Koi pools is very necessary: in addition to the paramount importance of keeping the water pure, thus playing an important role in maintaining fish health, the resulting crystal-clear water will also let you see more of your fishes.

Like its indoor aquarium counterpart, a Koi pool can be filtered using much the same principles and equipment, albeit on a proportionately large scale. Mechanical, chemical and biological filtration methods are all employed, sometimes apparently separately, but more usually in, perhaps, unsuspected combinations.

Because of the large volumes of water to be moved, a pump of adequate power should be fitted.

Removal of detritus can be achieved quite simply by using a drain to draw off water from the bottom of the pool, either as a gravitational 'siphon-out' or in conjunction with a removable stand-pipe system which provides the necessary head of water to eject the dirty water through the bottom-located drain. Both these systems require the necessary drains and pipes to be incorporated into the pool during the constructional stage; adding at a later date is difficult. The use of a pool-sized 'vacuum cleaner' will facilitate the draw-off of water from pools not fitted with drains. The new CYPRIO MINI-VAC (at around £29.50) is a mains-water operated unit proving to be a best-seller both in terms of performance and price.

The normal biological filter found in aquariums may be upgraded in size to suit pools; the sub-gravel pipework should be of at least 38mm (1.5 inches) diameter and the holes drilled at, say, 8-inch intervals near the pump, with 4-inch intervals at the farthest points to ensure a constant drawing power through the entire filter-bed. The area of the bed should be at least one-third of the area of the pool, and it is quite usual practice for the filter-bed to be



The Cyprio Minivac.

contained behind a restraining wall of some description and to have the pipework protected against exposure by foraging Koi by a plastic perforated sheet acting as an outside 'gravel-tidy.'

D.I.Y system

For the practically-minded aquarist wishing to make up a filtration system for a particular pond, there is a very useful fact-sheet available. It details the construction of such systems, and contains many practical hints and ideas on other types of filters and their uses (including UV for efficient green water control); an excellent listing of pumps, gives performance figures and pond-size suitability. UV sterilisers, filter brushes, reticulated foam, plus, of course, pond-lining materials, are also listed and priced. The leaflet can be obtained from:

AVENUE FISHERIES, 19 The Avenue, Sandy, Bedfordshire SG19 1ER (Tel: 0767 80728).

Compartmentalised systems

By far the most popular form of filter for Koi (or any other large ponds) is the 'compartmentalised' type. Based on the open-box, flow-through principle, they require careful planning, both for optimum efficiency and minimum visibility

(how many Koi-owners have been suspected of having oil-fired central heating systems, because of the large 'box' in the garden?).

Each of the compartments is assigned to some individual form of filtration: a multi-box design will include a settlement tank, brush filters, finer filter medium (such as foam) and a biological section employing anything from nylon pot-scourers, plastic hair-rollers, or Canterbury Spa chippings, upwards. The direction of water-flow through the units appears to vary with design; while most favour the usual 'pump in, gravity-feed, trickle-through' direction, some use the 'reverse-flow' principle where the water is pumped in at the bottom and then rises up through the medium to overflow back into the pool.

Filter designers have been quick to make all their modules compatible, both with each other, and with commonly-available plastic pipes and fittings. Provision for the drainage, back-flushing and even by-passing of each module is not a luxury, but very necessary

for the continuing regular maintenance of the filtration unit.

Now that the 'green water' season is in full swing, considerable application of effort and research has gone into dealing with this problem; the use of UV sterilisation lamps has been accommodated into some filter designs, although it should be pointed out that this combination can only be used once the biological bed has fully matured — switching on the lamp from Day One will result in maturation never occurring!

Returning to the question of camouflaging of the units, many ingenious ideas have been put forward, from burying them in a rockery to enclosing the simpler, smaller-scale units within, say, a decorative 'well-head.' Of course, those units fed by gravity can be sunk in the ground alongside the pool and all connecting pipework and/or pumped returns can be similarly hidden.

Koi filters being large, are usually best seen in situ at a neighbouring Koi-owner's pool, or at physically large enough retail outlets such as water garden centres, where the 'works' can be studied far more easily than through a catalogue. A number of companies will provide very adequate literature for you to study (as will the artwork in advertisements carried in this magazine).

AMPTHILL AQUATICS have recently launched a new range of Koi Filters. Related to the successful smaller **AQUA 83** filter, the two new filters (**25D** and **50D**) are tandem units, the preceding tank employing filter brushes to clean the water mechanically before the biological stage (in the second tank) is reached. The smaller **25D** unit uses 12 filter brushes, the **50D** unit twice as many. A **FILTER TECHNICAL LEAFLET**, with associated stockists, is available on receipt of an S.A.E. from: **AMPTHILL AQUATICS LTD., Abridge Road, Theydon Bois, Essex CM16 7NR (Tel: 037881 4545/6).**

To judge by their brochures, CYPRIO LTD. have really got to grips with pool filtration. The standard range of BIOFILTERS (reverse flow and normal flow biological external filters) cope with small ponds admirably using the company's own specially developed Dimplefoam and the plastic medium Florcor.

For Koi pool use, extra materials are brought to bear in the SC3P range of filters. For a start, two different sets of brushes are used — six coarse brushes to help settlement of detritus, and twelve fine brushes to provide additional biological filtration. The full SC3P-3 unit is suitable for pool capacities up to 3000 gallons and employs six stages of water purification — settlement brushes, bio-brushes, foam cartridges, plastic media for secondary biological purification, UV sterilisation and vacuum removal of solid wastes. The unit can be gravity-fed or pumped so that in- or above-ground operation is possible.

The similar SC3P-5 and SC3P-10 units are progressively larger and deal with 5000 and 10,000 gallons pools, respectively.

Limited space prevents further description of the applications of filters and the range of accessories; all these



The Bio-cartridge Purification Tank component of Cyprio's SC3P system. The SC3P-3 tank will take up 15 cartridges and 3.5ft³ plastic media. The SC3P-5 tank will take up to 20 cartridges and 5.5ft³ plastic media. While the SC3-10 tank will take up to 32 cartridges and 80ft³ plastic media.

can be found in the excellent 1988 Catalogue. Send £2.50 for the catalogue (or simply an S.A.E. for the Standard Range Filter leaflet) to:

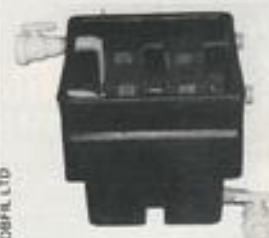
CYPRIO LTD., 133 Eastgate, Deeping St James, Peterborough PE6 8RB (Tel: 0778 344502).

In addition to Koi and prefabricated Koi pools, **ENGLISH WATER**

GARDENS also have three- and four-chamber Koi filters (6ft x 4ft x 3ft and 10ft x 4ft x 3ft) on offer for very reasonable prices, together with a selection of high density filter brushes in differing diameters and lengths. It should be worthwhile dropping in for a visit to:

ENGLISH WATER GARDENS, Rock Lane (A24), Washington, West Sussex (Tel: 0903 892006).

ROBFIL LTD have added an extra service to their expertise in designing and building filtration equipment for pools. **Alan Benson,** fish-farming expert at parent-company **Guinea Plastics,** feels that it is not sufficient merely to market the devices: "We're particularly keen to offer a fuller service than most."



The third stage in Robfil's Multifilter consists of a fine mechanical filtration unit.

This ranges from initial consultancy to the design, final provision and guidance into the use and maintenance of the hardware for any garden centre entering into (or already in) the aquatic sphere."

The **ROBFIL BIOLOGICAL FILTRATION MEDIA** offer a comparable surface area for 'bacterial grazing' to a similar volume of half-inch gravel or ceramic pieces, but at one-tenth to one-sixteenth of the weight. The **ROBFIL MULTIFILTER** is based on a 20in cube module and is designed to be connected in any combination to suit individual pond requirements. A typical 4-unit combination would include sedimentation brush section, coarse and fine mechanical filtration units and a final biological purification section. Prices are approximately £90.00 per module. Each module is completely equipped with all media, valves, back-flush facilities and necessary plumbing. Foam sheet and blocks, rubberised animal hair brushes, mechanical filtration mesh of various grades, filter and strainer cartridges are all available separately. The **ROB-**

FIL UNIFILTER, especially designed for pumps such as the Dabnova, does not invalidate the pump manufacturer's two-year guarantee. Illustrated brochure available from:

ROBFIL LTD., Unit 83, Barking Industrial Park, Alfred's Way, Barking, Essex (Tel: 01 591 3753).

NEW PRODUCTS

BWG Multi-switches

Fishkeepers are frequently reminded that the combination of electricity and water is dangerous, and this applies equally to the two elements when found outdoors. Safe (and tidy) electrical supply and connections to garden pool equipment is now much simpler thanks to **GARDENSAFE MULTI-SWITCHES** from **Better Water Garden Products.**

Available in four models, the design incorporates a single supply cable inlet and three fused outlets (1, 2, 3, or none, of these outlets can be switched as required). It is a simple job to mount these switch boxes around the garden close to their application sites, thus avoiding any dangerous and unsightly trailing cables. For the water gardener a typical application might be for the switches to control the pool pump, pool and garden lighting independently.

Because of their intended 'hard-wired' permanent use, the switches are not suitable for use with electrically-powered garden tools, such as lawnmowers, hedge-trimmers etc. Widely available at garden



BWG's range of Gardensafe Multi-switches.

centres, the units cost £19.89 for the plain unswitched model and £24.83, £28.78 and £33.22 for the 1, 2 and 3 switched output versions, respectively. Full details from:

BETTER WATER GARDEN PRODUCTS, Blagdon Water Garden Centre, Bath Road, Upper Langford, Avon BS18 7DN (Tel: 0934 852973).

Waterlife's Aquazone

A valuable aid in the battle against disease in marine fish-keeping is the use of ozone. This unstable, tri-atomic form of oxygen is a powerful oxidiser, and, while its use is both theoretically and practically well-known, care must be exercised.



Waterlife's Aquazone

In the close confines of the fish-house, any excess of ozone will make the hobbyist nauseous, to say nothing of the damage done to any rubber diaphragms or tubing. Typical ozonisers for aquarium use make ozone by passing atmospheric oxygen through a high-tension electrical discharge field where normal di-atomic oxygen breaks down to reform in the tri-atomic state as ozone.

In practical terms, the output from a normal airpump is connected to the ozoniser before continuing on to the appropriate aquarium device (usually a 'Reaction chamber' through which the aquarium water is passed, thus exposing the water to the ozone's germicidal powers). It is usual to use ozone in isolation, away from direct contact with fishes, to prevent burning of the gills should the fishes venture into the stream of ozonised air bubbles rising from any diffuser stones.

THE AQUAZONE is available from **Waterlife Research Ltd.** This solid-state electronic instrument has a fully-controllable output ranging from zero to 75 milligrams of ozone per hour. Priced at £96.00 (inc VAT) it is available from: **WATERLIFE RESEARCH INDUSTRIES LTD,** Bath Road, Colnbrook, Middlesex (Tel: 01-964 2487).

IT SWIMS LIKE A FISH

There is a great deal to interest the aquarist who looks carefully at fish as they swim. The variations in technique seem endless, but, as **Dr Michael Benjamin** explains, you get some hint of the possibilities from body form.

Land creatures that walk, run or crawl, are supported by the ground on which they move, but the birds that fly through the air, or the fish that swim in your tank, are moving through a fluid medium that offers no firm support. Water, of course, is much denser than air and provides a greater resistance to movement. Yet it supports the body weight far better.

This support has led to the evolution of a buoyancy bag called the swim bladder, that has liberated many fish from the effects of gravity and made them weightless in water. No bird has ever had such freedom. When a budgie flies around the lounge, part of its energy is used to stop it from falling on the carpet! But the neutrally-buoyant fish in your tank can use all their energy to move where they want.

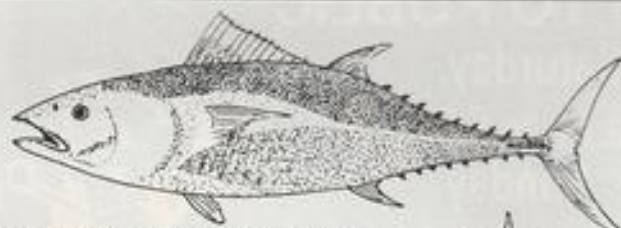
This is not so with the true sharks

though, for they have no swim bladder and sink to the bottom when they stop swimming. Consequently, their design incorporates certain features that provide lift — notably their distinctive and assymetrical tail fin and their paravane-like pectoral fins.

When a fish tries to fly through air, it is at a considerable disadvantage compared with a bird, for it lacks such weight-saving devices as hollow bones and feathers. It takes enormous muscular power for a fish to make even short aerial excursions. This accounts for the extraordinary shape of the hatchet fish. The 'hatchet' houses the powerful chest muscles that "flap the fins, that fly the fish".

Speed merchants

Fish that can swim quickly for a long time have a streamlined body with gently curving lines and no sharp edges. The eyes



Above, the fastest swimmers are torpedo-shaped fish with stiff, muscular bodies, a pointed head and a lunate tail. Such fish (the one in the drawing is a tuna) are poorly suited to aquarium conditions. Right, Boxfish are encased in rigid armour and rely entirely on their fins for movement.



MICHAEL BENJAMIN



Gaint Loaches (seen here spawning) are eel-like fish that swim by throwing their whole body into waves. Fish that swim in this way are typically bottom dwellers and their mode of locomotion can serve them well in burrowing.

and gill covers are flush with the body and the fins can fold back into slots or depressions. Water streams backwards over such a moving fish in well defined lines that hug the body tightly so as to create few eddies. Their torpedo-shaped frame is propelled by a stiff tail that swings through a wide arc, while the rest of the body is flexed little. The 'propeller' is linked through a pulley-like system of tendons to huge muscles that generate the power. The caudal fin has a large vertical span compared with the area it presents to the water, i.e. it has a "high aspect ratio" (a term borrowed from aerodynamics). Such a fin creates little turbulence and drag. As the tail swings from side to side, the water is thrust backwards and sideways. It is the backward shove that moves the fish forwards, and the sideways component is an unwanted side effect — if you'll forgive the pun! Two features of body design help to minimise these side-to-side movements: (1) an extremely narrow region just in front of the tail fin (called the caudal peduncle); (2) a massive and deep body towards the front of the fish. Stiff,

ted by interludes of coasting. The careful observations of Charles McCutchen show that course changes occur at the tail flicks.

Keeping still

Fish do not simply stop all movements when they wish to hover in mid-water. Life is not that simple. The fish must continue to breathe and any backflow of gill water, no matter how gentle, will produce an opposite and corresponding forward movement of the fish — unless the animal does something about it. Delicate movements of the pectoral fins are particularly useful in cancelling out the propulsive effect of gill flapping.

Boxed in

Many fish can swim without flexing the body at all, though they invariably sacrifice speed in so doing. The graceful movements of seahorses are mainly powered by their dorsal and pectoral fins and their tail fin is virtually useless as a propeller. Individual fin rays can be moved independently and at great speed. Watch a Green Puffer moving and note that its progression hinges largely on the movements of its dorsal, anal and pectoral fins.

Michael, row the boat ashore

Many fish (e.g. damselfish belonging to the genus *Abudefduf*, and some wrasses and parrotfishes) can row with rounded and fan-shaped, pectoral fins. They can bring the

fins forward narrow edge on, and thrust them backwards broad side on — just like an Olympic rower. Members of the genus *Cichlasoma* can move forwards by curling the top and bottom edges of their pectoral fins outwards while the fins are flush with the body. Pectoral fins that are placed high up on the body can be stuck out sideways to make good brakes — especially when the lower-placed pelvic fins are thrust out as well. The lift produced by the pectoral fins is counteracted by a downward drag of the pelvic fins in this "four-wheeled" braking system.

Featherbacks and the like

In contrast to the movements produced by fins with a short base, that I have mentioned so far, there are those associated with much broader-based longitudinal fins. Featherbacks family *Notopteridae*, for example, have an extremely long anal fin that can stretch all the way from the tip of the tail to the throat, along a body that is flattened from side to side.

By keeping their bodies straight and undulating their anal fin, they can hover or glide backwards or forwards through the water. The direction in which they move depends upon which way the waves pass along the fin. The method of movement is very similar to that in Coolie (Kuhli) Loaches, except that the waves are passing along the fins and not the whole body. The wavelength is shorter and the waves can be moved a lot quicker. When the fish is

hovering, the waves in the front and back parts of the fin pass towards each other.

Other fish that move by passing undulations along the whole length of their attenuated dorsal and/or anal fins include the Bowfin, *Amia calva*, whose common name refers to the extensive dorsal fin, and the various trigger fishes. In the latter, the dorsal and anal fins are inclined away from the horizontal, but in opposite directions, so that the net effect of equal activity in the two fins is forward rather than upward or downward movement. There is an intriguing suggestion that certain 'electric fish' swim by undulating long fins rather than by flexing their bodies, because of the electric organs they use for orientating and for catching their prey. Such a system probably requires a stable base that is unaffected by body movements. This explanation, however, cannot account for the mode of movement of featherbacks, for they lack electric organs.

And finally — jet propulsion

The water forced out of the gills during breathing helps to move a fish forwards, but how important this is varies greatly. It may be very significant in the Boxfish, *Gnathypops schoepfi*, for this has nozzle-like, gill apertures that would seem well suited for jet propulsion.

In terms of propulsion, therefore, it seems that whatever ideas we come up with, fish have already put into practice in one way or another... and to great effect.

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