

FEBRUARY 1991

£1.40p

AQUARIST

AND PONDKEEPER

FREE

FISH DISEASES CHART

(FROM WATERLIFE RESEARCH INDUSTRIES)

**£700
T.F.H.
BOOK
COMPETITION**

RED SEA SHARKS

**U-V POND
STERILISERS —
KILL OR CURE?**

**40 PAGE
FISH HEALTH
SUPPLEMENT**



Features

Koi Pool U-V Sterilisers
— Kill or Cure? Peter Skinner of Koi Kraft tackles this difficult question **8**

COMPETITION

Your chance to win one of the cichlid books of all time — courtesy of TFH Publications, Inc. **11**

Feel the thrill of a Red Sea Shark Experience in the company of adventurer Jack Jackson **14**

In India Part 3, Stephen Clark goes in search of a mysterious, predatory snakehead **22**

FISH HEALTH SUPPLEMENT
Full details on page 29

AQUARIST AND PONDKEEPER

Contents

FEBRUARY 1991 VOL. 55 NO. 11



See Kenyan Killies, page 70

Kenyan Killies (Part 2)
— Allan and Barbara Brown round off their trip, bring their fish home . . . and breed them **70**

Hand-fed Cod? Yes, honest! See Jane C. Smith's report in *A Pondful of Cod* **78**

Regulars

NEW SERIES:

What's Your Opinion?	5
Cover Story	6
Herpetology Matters	21
Koi Talk	25
News	26
Seaview	67
Coldwater Jottings	68
Letters	72
Your Questions Answered	74
Diary Dates	77
News from the Societies	77
Product Round-up	81
Next Month	90

EDITORIAL

GOOD NEWS ABOUT CHOPPING DOWN TREES

"Chopping down trees for books and journal production is environmentally sound".

I think that most people would disagree with this statement at the first reading. It doesn't sound very 'green', does it? Yet, having recently read, and 'digested', an editorial in the *Biologist* (Vol. 37, No 5 — November 1990), I've come round to thinking that the statement is actually quite right — probably more so than some people would like to think it is.

It can't have escaped the notice of even the most casual reader, that we take our environmental responsibilities very seriously here at *Aquarist & Pondkeeper*. It was therefore with considerable regret that we discovered sometime ago that there was no economically viable way of printing the magazine on recycled high-quality paper; at least, not unless this was accompanied by quite a substantial increase in cover price. We therefore decided to continue with our current policy, consoling ourselves that we were, at least, printing the magazine on paper obtained from sustainably managed forest resources.

Now along comes this statement which seems to fly in the face of all widely accepted tree conservation views. I therefore decided to investigate.

The argument — and a most interesting one it is — goes something like this:

When trees are chopped down for books and journals, the resulting paper tends to end up stored in libraries and readers' homes. Paper contains carbon (about 40% by weight) — carbon that

would be converted to carbon dioxide should these publications be burned, thus helping to accelerate the Greenhouse Effect. However, by keeping the books and journals, they act as a 'carbon bank'. Further, lining our walls with books and journals provides extra insulation which, in turn, leads to fewer atmospheric emissions from the burning of fossil fuels.

And this is not all. If paper is produced from a sustainably managed forest, this means, by definition, that each tree that's chopped down is replaced by a new one which, as it photosynthesises, actually removes carbon dioxide from the air.

This, claims the *World Conservation Strategy 1980* report on which the *Biologist* editorial is based, makes a more positive environmental contribution than straightforward recycling.

Makes a lot of sense to me. It also makes me feel a lot happier to know that, since most of our readers file away their copies of *A & P*, we are actually helping the environment by maintaining our current printing policy — enforced though it was on us by the economics of the situation.

Works wonders for the conscience!

John Dawes
Editor

EDITOR John Dawes, ART EDITOR Ian Hunt, ADVERTISEMENT MANAGER John Young, PUBLISHED BY Dog World, 9 Tufton Street, Ashford, Kent TN23 1QN. TELEPHONE: ADVERTISING AND PRODUCTION (0233 621877), FAX NUMBER 0233 645669, SUBSCRIPTIONS £19 per annum post paid. Overseas rates on application. All subscriptions payable in advance to: *Aquarist & Pondkeeper*, 9 Tufton Street, Ashford, Kent TN23 1QN. Origination by Wishpark Ltd. Printed by Headley Brothers Ltd both of Ashford, Kent.

What's your opinion?

Billy Whiteside,
BA, ACP



Almost five years ago I asked our editor if I could take a rest from *What's Your Opinion?* and he kindly agreed. I had produced the feature every month since 1967 and felt I needed a break. I enjoyed my rest but missed receiving readers' letters each month; therefore, when John Dawes telephoned me recently and asked if I'd consider starting *WYO?* again I was happy to say "Yes".

W.Y.O.? HISTORY

I'm sure there'll be many long-standing readers who will remember the feature; but for younger, and newer, readers I'll give a quick account of this feature's history. It started in 1967 when, in a dentist's waiting room, I read an agony aunt's column in a magazine for women and thought about reversing the idea of answering readers' queries. I decided to suggest several topics for discussion each month and to invite readers to send me their personal opinions. You don't have to be an expert to have a valid or interesting opinion, and readers' letters always attract a large number of readers in any magazine or newspaper.

I decided to allow myself the freedom to express my own opinions on the topics and to comment on the opinions of those who wrote to me. One of the things I liked best about *W.Y.O.?* was the fact that it attracted letters from the whole spectrum of fishkeepers — from Doctors of Philosophy in biological sciences, to manufacturers, shop-keepers and young teenage aquarists.

I'm a schoolteacher by profession and am particularly pleased to hear from younger aquarists. Everyone is entitled to his — or her — own opinion, and letters that are quite short tend to have a better chance of being published in these columns. I reserve the right to shorten or edit letters, of course, and to summarise them.

I have kept tropical and cold-water fishes for over 40 years, having started with sticklebacks in glass jars and having moved on to goldfish and tropical fishes. Currently, I have six tropical aquariums, in my home, all thickly planted. I like to see thickets of plants in all my tanks and like plants at least as much as I like fishes.

I don't count myself as an expert but I have written around a half-million words about aquaria in British, American and German magazines; and I've had hundreds of aquarium photographs published. Perhaps the most important point of all is the fact that I am an ordinary aquarist who loves to keep fishes and plants in home aquaria. Also important is the fact that I have never manufactured or sold any fishes or aquarium goods, so I can be quite impartial about product and events.

SIGN WITH A DIFFERENCE

I've been visiting some of the world's most famous public aquaria over the past couple of years; and in the summer of 1990, while visiting a relative in Toronto, I was delighted to read the sign shown in my photograph. It appeared on the side of an aquarium shop and it was a pleasure to whip out my camera and capture it. I was unable to visit the shop and still wonder if the owner or the sign-writer might just have had a Chinese

or Japanese accent.

Have you seen any amusing signs outside aquarium shops? If so, please send me details.

WATER QUALITY

Well, that's enough about me and about the feature. I turn now to this month's letter — singular this month because no one has had an opportunity to write to me except Dr Neville Carrington, the head of Interpet Ltd, of Dorking, Surrey. Neville Carrington was one of my most experienced and regular contributors for many years, so it was natural for me to drop him a line inviting him to send me a few lines about any topic of general interest to aquarists.

"... I expressed delight when (the editor) told me he was hoping that you would revive the *What's Your Opinion?* column in the *Aquarist*," wrote Dr Carrington in reply to my request. Neville continued: "One particular interest of mine at the moment is water chemistry. I am convinced that many fish diseases are stress-related, caused either by unfavourable conditions such as a build-up of waste products in the water, or even by the shock of being transferred from perfectly good water at one pH, hardness and temperature to another quality of water which would be perfectly satisfactory if the change were made gradually."

Dr Carrington said, "You cannot even rely on the quality of tapwater, since a lot of water in the UK does not even appear to comply with EEC standards. We have many reports of drinking water which has a nitrate level which is so high that it is only just acceptable for some of the hardiest fish, for instance. Fish can even be stressed by the reverse situation where they have grown used to polluted

water and become too stressed when moved suddenly to water which would otherwise be considered entirely satisfactory."

Dr Carrington concludes by saying that water chemistry is a very interesting topic and he believes that it will become more and more important to aquarists over the next few years.

WATER CHANGES

I agree with much of what Dr Carrington says about water quality. I never add anything to aquarium water if I can avoid it. I take water straight from the tap and allow it to stand for some time before adding it to the aquarium — unless for a top-up, in which case I use it straight from the tap. I don't normally carry out water changes of any kind, and my tanks have only minimal or no filtration or aeration. However, I do have lots of plants thriving in all my tanks, and plants do tend to improve the water quality by using up waste products that could otherwise pollute the tank.

Indeed, I find that plants grow best in decorative aquaria where the water is not changed and most of the waste is allowed to remain in the tank. In my tanks I tend to add water only when evaporation causes the surface level to drop below the level of the tank's upper frame; and I add nothing to the aquarium except some fish food about twice per day. I find that plants thrive, the fishes spawn and the water remains clear. Eventually, I have to thin out the vegetation so that light can reach the lower-growing plants.

FORTHCOMING OPINIONS

For next time please send me your opinion on water chemistry; shop signs; getting good plant growth; aquarium lighting; breeding Discus; shapes for aquarium hoods; and managing garden ponds in spring. Address your letter to B Whiteside, *What's Your Opinion?*, *Aquarist* & Pondkeeper, 9 Tufston Street, Ashford, Kent TN23 1QN.

Good-bye until next time. I hope you'll write to me!



An aquarium shop sign with a difference!

THE VERY BEST IN AQUARIUM DECORATION
FOR YOUR TROPICAL, MARINE OR COLD WATER TANK
CHOOSE THE BEST

CHOOSE **SHORELINE**

You know it makes sense to choose SHORELINE, the best for SHAPES, the best for DETAIL, the best for QUALITY — but most IMPORTANT, the best for VALUE



Shown are just three models in our new exciting range
SHORELINE aquatic decor
SELWOOD WORKS — BAKER STREET — FROME
(0373) 61572
All Enquiries: F.T.W. PROMOTIONS LIMITED
SANDY WAY, AMINGTON INDUSTRIAL ESTATE,
TAMWORTH, STAFFS. Tel: (0827) 53206

COVER STORY — GREY REEF SHARK

(Photograph: Jack Jackson)



If you want to get pictures like this, then all(!) you have to do is place some bait on your head and go looking for sharks. It also helps if you've got a good underwater camera . . . and nerves of steel! Our cover photographer, Jack Jackson, obviously, has both as his cover picture — and those in his article elsewhere in this issue of *A & P* — clearly testify.

The shark shown on the front cover is a Grey Reef Shark (*Carcharinus amblyrhynchos*). This shot was taken in the Sudan Red Sea where some of the other remarkable pictures in Jack's article were also taken.

Grey Reef Sharks are generally curious, but not dangerous, although one can never be 100% certain, of course.

At least, this species gives you warning of an impending attack in the form of a characteristically stiff posture and swimming patterns. Comforting, isn't it?

VISA

**RUTO
FROZEN**

**Monkfield
The Aquatic Centre**

offers the following **TANK BRED FISH**

<i>Cyprinochromis leptostoma</i>	<i>Syno granulosus</i>£525*
"Chiatika Bay"..... £6.25	<i>Emperor Peckoltia</i>£65.00*
<i>Parracyprinochromis</i>	<i>Orange seam Peckoltia</i> ...£65.00*
<i>nigripinnus</i> £6.25	<i>Pel. taenlatus Yellow Form</i> £3.25
"Sulphur flash"..... £6.25	<i>Peacock Goby cichlid</i> £2.50
<i>Brieni</i> £6.25	<i>Yellowtail Congos</i> £2.25
<i>Lamp compressiceps "Gold"</i> £8.75	<i>Pentazona Barbs</i> 90p
<i>Lamp cyanocephalus</i> £5.00	<i>Popondetta furcata</i> £2.95
<i>Lamp calvus</i> £8.25	<i>Angels assorted colours from</i> 80p
<i>Lamp leleupi</i> £5.75	<i>Neons from</i> 60p
<i>Lamp fasciatus</i> £12.50	<i>Many others and full range of wild</i>
	<i>fish and plants</i>
	<i>Dry Goods, Tanks and Cabinets</i>

ACCESS

**DUTCH POTTED
PLANTS**

NEW
SEASON'S
2' plus
BABY
REDTAIL
CATFISH*

£49.50

TRADE SUPPLIED
*** NOT TANK BRED**

Telephone: 0223 412527

Fax: 0223 412094

35 Cherryhinton Road, Cambridge CB1 4BP

KOI POOL

ULTRA VIOLET STERILISERS — KILL OR CURE?

U.V. sterilisers have become extremely popular in recent years, particularly with regard to their green-water eliminating qualities. However, careful thought must be given to purchase and installation of these units, as **Peter Skinner**, of Koi Kraft, explains.

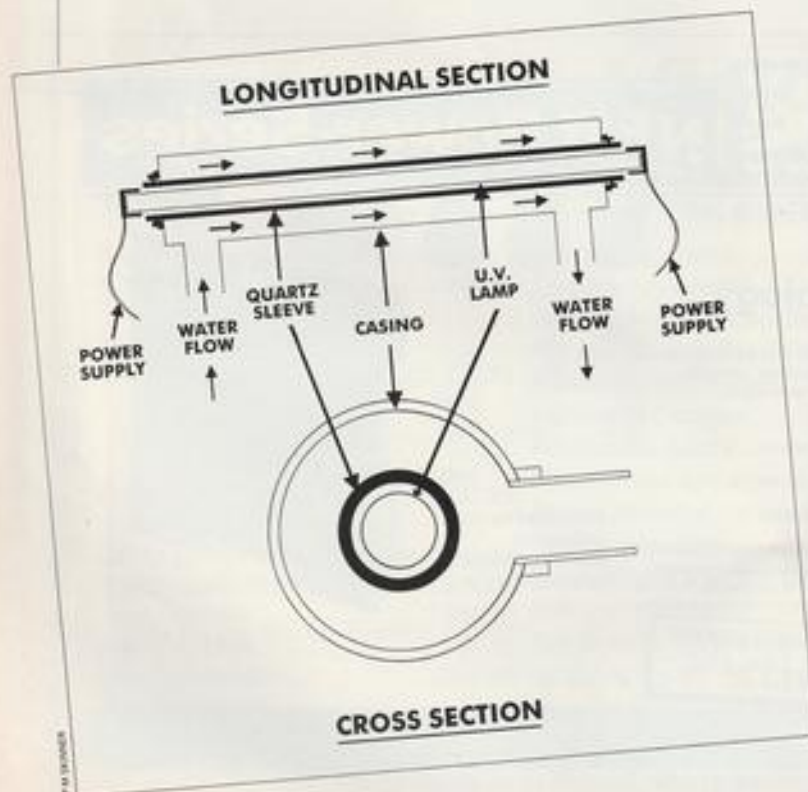
Many people mistakenly refer to ultra violet sterilisers as "U.V. filters". This is wrong. A filter is "an apparatus to remove im-

purities by straining". An ultra violet steriliser does not, in any way, alter the chemical or physical make-up of the water which passes through it.

What it does do, however, is reduce the

numbers of protozoan parasites, pathogenic bacteria and viruses which are 'free' in the water. It will also flocculate unicellular algae (the culprits when water turns green) which means that the algae will stick together and form particles which are too large to pass through a filter.

When used correctly, an ultra violet steriliser can have a marked beneficial effect on the clarity and quality of water but, if used incorrectly, it can have a more sinister effect.



DANGEROUS THEORY

Virtually all garden ponds that are stocked with fish will have an unnatural stocking level for the area they occupy; i.e. in a natural lake the population may be, say, 50 fish per 10,000 sq ft, whereas a garden pond may contain 50 fish per 200 sq ft! Further, in the natural situation, there will be an established ecosystem to cope with the waste products from the fish, but in the garden pond there will not be room for sufficient plants, zooplankton, etc. and, therefore, filtration is necessary to ensure the purity of the water.

If the method of filtration it serves, then there will be a build-up of nutrients in the water which, as soon as there is enough sunlight, will provide ideal conditions for algae to grow. The end result will be a pea-green pond but, at least, the chemical imbalance of the water will be stabilised by the algae.

At this point many pondkeepers look for a means of eliminating the algae. If an ultra violet steriliser is used, the algae will be cleared and Hey-presto (!) a clear pond. Unfortunately, if the algae are killed, then, owing to the inadequate filtration, there will follow an accumulation of nutrients (primarily nitrite and ammonia) which, in the long term, will be detrimental to the health of the fish.

The conclusion to this theory is that if you have a good filtration system, then a steriliser will be beneficial because it will prevent the very thin algal blooms which will occur when the sun is very intense, but if the filtration capacity is inadequate, the use of a steriliser could mask a problem.

Since having green water is the most common motivation to improve a system, the use of a U.V.S. will probably remove this motivation until the next batch of unexplained fish mortalities.

The ability of ultra violet sterilisers to inhibit the multiplication of pathogenic organisms in the water is a very valuable function, but it is by no means a once-and-for-all cure for disease problems among fish. If the fish are healthy and they are in optimum conditions, then the likelihood of contracting any serious ailment is remote, but if the water conditions are poor, then the mere absence of large numbers of parasites will not be sufficient to avert a problem.

BUYING, INSTALLING AND MAINTAINING STERILISERS

There are several different sizes of U.V. steriliser on the market. The correct size of unit will be determined by the capacity of the pond in question. To help guide potential buyers, manufacturers issue performance figures from which one will be able to select the right model.

If one installs the correct unit, then it should eliminate an algal bloom within about ten days. If it doesn't do this, then it is possible that there is a chemical imbalance in the water, as I have already discussed. Another reason for lack of performance

could be the age of the lamp in the unit. The normal lifespan for the bulb is only six months. At this age, its efficiency will be halved from the day it was installed and it should, therefore, be replaced.

The positioning of the unit in the system is very important. It is normally installed on the delivery side of the pump because the connections are fairly small on most units, which means that the water must be pumped through, rather than be allowed to run through under gravity. This means that if the system has a pump-fed filter, then the U.V. will be located between the pump and filter. On a gravity system, the pump will suck from the filter and so the U.V. will be between the pump and the pond.

It is also important to remember that the more slowly the water passes through a U.V. unit, the better the 'kill' will be on each pass. The manufacturers supply maximum flowrate figures for each unit. If a pump exceeds this figure, then the U.V. should be installed in a 'bleed' system. This means that the pump output is split two or more ways and the U.V. intercepts only one of these so that only a proportion of the flow will be directed through the U.V. unit.

Inside the U.V. steriliser is the germicidal lamp which is encased in a quartz sleeve. If the water is turbid, then this sleeve will get dirty, thus preventing light transmission to the water. If this happens, the unit should be dismantled so that the sleeve can be cleaned. While doing this, one needs to be extremely

careful not to break the sleeve because it is the most expensive component in the steriliser; not to mention how sharp the broken pieces are!

U.V. STERILISERS AND NEW PONDS AND FILTERS

When commissioning a new filtration system, it is wise to leave the steriliser turned off for the first six to eight weeks so that an algal bloom is allowed to form. This will not only help counteract so-called 'new tank/pond syndrome' but will also reduce the amount of phosphates, nitrates and other nutrients that are undoubtedly present in the fresh tapwater. If this is done, then the likelihood of developing uncontrollable blanket weed will be minimised.

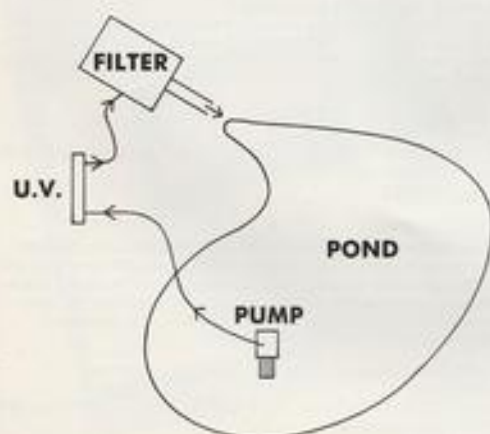
One further point: if a new Koi pond is being planned from scratch but it is not intended to purchase all the equipment in one hit, then it might be well worth considering excluding an ultra violet steriliser in the first instance, since these units are quite costly and the money might be better spent on having the largest and best filter one can afford. By doing this, one will ensure that, at least, healthy conditions are being provided for our beloved Koi, even though the water may not be perfectly clear. However, one needs to make allowances in the plumbing so that when the pond is ready for the installation of a U.V.S. this will not be too much of a traumatic experience.

REMEMBER:

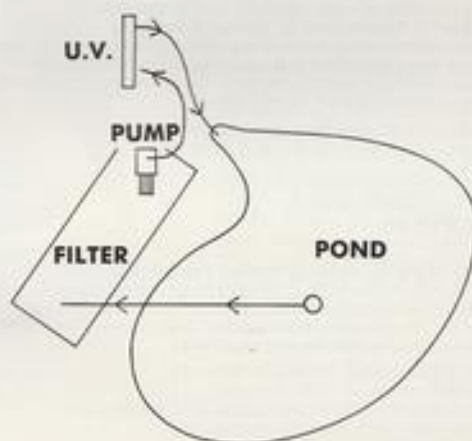
Clear water is not always healthy water. Hydrochloric acid is clear!

U.V.S. LOCATION

PUMP FEED SYSTEM



GRAVITY FEED SYSTEM



RED SEA SHARK

To some, attracting a shark's attention by placing a piece of bait on your head is about the last thing that any sane human being could conceivably contemplate. To others — among them underwater photographer and adventurer **Jack Jackson** — danger is the one vital ingredient that makes life worthwhile.

(Photographs by the author)

Six sharks swim directly towards me, twenty-six others are counted circling, but I force these out of my mind, hoping that the lure of the bait above my head is stronger than their interest in me.

The leading shark is one of two large Silvertips, over 2.5 metres (over 8ft) long. Its senses are on the dead fish, but its eyes are on me. One metre away it fills the frame for the super wide 15mm lens. I fire the camera just before it snaps at the dead fish. Immediately, there is an eruption of thrashing sharks, air bubbles, remoras, pilotfishes and me, as the shark sets off a feeding frenzy. I curse the slow recharge of the flash guns. In thirty seconds, it is all over and I have only managed two more shots.

The sharks quieten down and resume circling, while the smaller fishes reappear from hiding in the coral. I regain my balance, check the cameras, then set up for more shots.

What am I doing photographing sharks at close quarters without protection? The simple answer is that I need adventure and enjoy the rush of adrenalin that comes with danger. Twenty-three years ago I gave up a successful career as an Industrial Chemist, to follow the call of adventure — mountaineering in the Himalayas, dog sledging in Green-

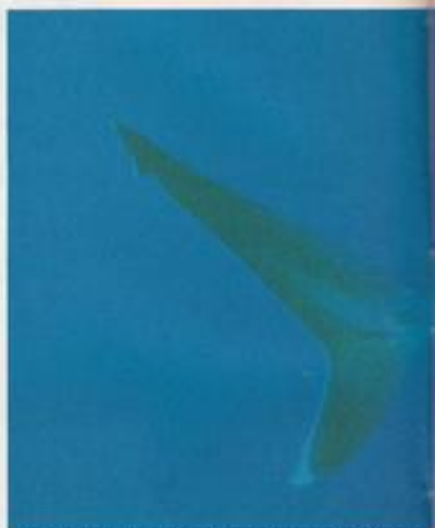
land, four-wheel drive desert crossings in Africa and Asia, photographing remote tribes and diving; funding myself with photography, lecturing and, latterly, writing.

OPPORTUNISTIC FEEDERS

Sharks feed infrequently and mostly at night, but will feed opportunistically during the day. They detect vibrations over long distances by sensitive cells along their lateral line, and are particularly attracted to vibrations emanating from distressed fishes. I have seen sharks swim at high speed into a shoal of fishes and take one individual.

Speared or hooked fishes struggle violently. Sudanese fishermen can rarely fish in one place for more than fifteen minutes, before sharks are attracted in and take struggling fishes off the line before they can be landed. I have even seen a shark puncture an inflatable when snatching a hooked fish. The size of the bites on the remains of some fishes landed indicates that large deep water sharks are often implicated.

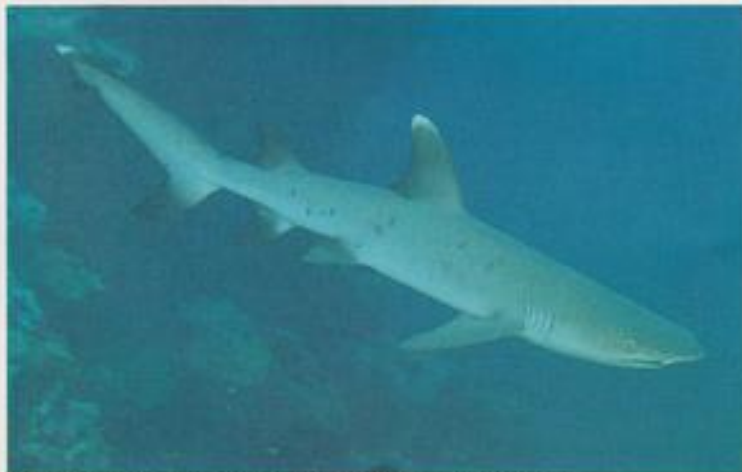
People splashing about in shallow water can attract sharks with their vibrations. Sharks arriving on such a scene, in turbid water, only see parts of limbs, which appear



A Silvertip exhibiting a threat posture. Note the small



Grey Reef Sharks are graceful fish than often swim in



This is a baby Whitetip Reef Shark. New-born pups measure about 55cm.

EXPERIENCE



Pilot Fish right in front of its nose!



groups.

to be separate animals, small enough to be normal prey. This is probably the reason for shark attacks in lagoons, harbours and on beaches.

INSHORE SPECIES

Sharks occurring on inshore reefs are usually smaller than man. Most common are Whitetip Reef Sharks (*Triaenodon obesus*), Blacktip Reef Sharks (*Carcharhinus melanopterus*) and Grey Reef Sharks (*Carcharhinus amblyrhynchos*). All are grey on top, fading to white underneath.

Whitetip Reef Sharks

Whitetip Reef Sharks can reach 1.75 metres (5.7ft) in length, are very shy, and have white tips to their dorsal fins and tails. Easily distinguished from other Whitetip Sharks by their slender bodies and short blunt snouts, they are primarily nocturnal, hiding in crevices or caves during the day. They feed mainly on reef fishes and octopuses. Litters vary from one to five pups, around 55 centimetres (c 21.6in) long at birth. Males mature at 105 centimetres (c 41in) and females slightly larger.

Blacktip Reef Sharks

Blacktip Reef Sharks reach 1.8 metres (c 5.9ft) in length, have black tips to their dorsal fins, and dark ends to their pectoral fins. They are more inquisitive than Whitetip Reef Sharks and both species are often seen on top of shallow reefs.

Blacktip Reef Sharks are known to have bitten persons wading in shallow water.

They feed on a variety of reef and inshore fishes, octopuses, squids and cuttlefishes. Litters consist of 2-5 pups, 33-52 centimetres (c 13-20in) long at birth. Males mature at 90-100 centimetres (c 35.5-39in) and females at 96-112 centimetres (c 38-44in).

Grey Reef Sharks

Grey Reef Sharks can reach two metres (6.6ft), have a white tip to their dorsal fins, are more heavily built than Whitetip Reef Sharks, and have black shading on the rear half of their tails. They are usually in schools of 5-35, sometimes together with Hammerhead Sharks or Silvertip Sharks.

Grey Reef Sharks feed mainly on bony fishes, but will take octopuses, squids, cuttlefishes, lobsters and crabs. Their attacks on man elsewhere are well documented, but the Red Sea population seems more benign. This species exhibits an obvious threat display, exaggerated sinuous movements, the head arched upwards, the jaws snapping and the pectoral fins pointing down.

Other species

Also found inshore are bottom dwelling sharks, including Nurse Sharks (*Nebrius concolor*), Wobbegongs (*Orectolobus ogilbyi*), Variegated Sharks (*Stegostoma varium*) and small Hound Sharks.

DEEP-WATER SPECIES

Deep-water offshore reefs are also home to large sharks, Scalloped Hammerhead Sharks (*Sphyrna lewini*), Great Hammerhead Sharks

(*Sphyrna mohamman*), Silvertip Sharks (*Garcharhinus albimarginatus*) and semi-pelagic Silky Sharks (*Garcharhinus falciformis*).

Scalloped Hammerheads

Scalloped Hammerhead Sharks, which reach a length of 4 metres (over 13ft), have obvious hammer-shaped heads with a scalloping leading edge. Heavily built, brown/grey on top, fading to white underneath, they can be found alone, in schools of up to 45, or schooling with Grey Reef Sharks. They prefer depths greater than 70 metres (c 230ft), and ignore bait fish, so I have never got one close enough for a clear photograph.



Large hooked Grouper attacked by a shark. To give some idea of scale, the knife is 10in (c 25.5cm) long.

They feed on fishes, small sharks, squids, octopuses, cuttlefishes, lobsters and crabs. Litters can be 15-30 pups, 42-55 centimetres (16.5-21.6in) long at birth. Males mature at 140-160 centimetres (c 55-63in) and females around 212 centimetres (c 84in).

Great Hammerheads

Great Hammerhead Sharks also feed on stingrays, and have litters of 13-42 pups that are 50-70 centimetres (c 19.6-27.5in) long at birth. Males mature at 243-269 (c 92-106in) and females at 250-300 centimetres (c 98-118in). Unauthenticated reports claim 8-metre (26.5ft) individuals.

Silvertip Sharks

Silvertip Sharks, which reach a length of 3 metres (c 9.8ft), have white tips to their dorsal fins, pectoral fins and tails. They are heavily built, black on top, fading to white below. Implicated in various attacks on people elsewhere, they gained notoriety when Jacques Cousteau's team photographed one in Sudanese waters, removing a leg from a baited scuba diver. Silvertip Sharks are easily distinguished from Oceanic Whitetip Sharks by their black upper bodies, pointed dorsal fins and shorter, pointed pectoral fins.

Silvertip Sharks feed on smaller fishes and sharks, including Grey Reef Sharks. Litters

pelagic fishes, squids, c
have had problems wit'

Litters vary from
centimetres (c 27.5
Males mature at 170-
67-85.4in) and females at 217-
tres (c 83.9-90.6in).

PELAGIC SPECIES

There are many pelagic species of sharks in the Red Sea.

Oceanic Whitetip Sharks

Oceanic Whitetip Sharks (*Garcharhinus longimanus*), reach a length of 3.5 metres (11.5ft). Heavily built, with short snouts, brown/grey on top, fading to white below, their rounded dorsal and pectoral fins are mottled with white. Their pectoral fins are long and broad.

Preferring to stay well away from land, and often travelling with migrating pilot whales, they feed on fishes, squids, sea birds, turtles, crabs, lobsters and dolphins.

Oceanic Whitetip Sharks are thought to be the main culprits for attacks on survivors of air and sea disasters in tropical waters. Litters vary from 1-15 pups, around 65 centimetres (c 25.6in) long at birth. Unusually for sharks, the females attain maturity at a smaller size than males, 180-190 centimetres (c 72-74in); males mature at 200 centimetres (c 78.7in).

Shortfin Mako Sharks

A Shortfin Mako Shark (*Isurus paucus*), probably the fastest of sharks, has attacked a swimmer in the Gulf of Aqaba, although, when I worked with Hans Haass, he still maintained that he had been attacked by a Great White Shark (*Carcharodon carcharias*), at Sanganeb, in 1950.

Whale Sharks

More common, and every diver's dream, are Whale Sharks (*Rhincodon typus*), which attain a length of 14 metres (c 46ft). Oval in cross section, with flattened heads, they are grey to black, with rows of white spots on top, fading to white underneath. These harmless surface dwelling giants feed on plankton, small fishes and squids.

Tiger Sharks

As always, there is a joker in the pack! Tiger Sharks (*Galeocerdo cuvier*), can be anywhere. Reaching a length of more than 6 metres (19.7ft), they are heavily built, grey on top, fading to white underneath, with darker vertical stripes on the upper body.

Normally in deep water by day, and rising into shallow water to feed at night, they eat a wider variety of prey than other sharks: fishes, sharks (including their own species, if hooked), turtles, dolphins, lobsters, jellyfishes and sea birds. They also feed readily on carrion, taking any terrestrial animals disposed of in the sea by man, and garbage, including plastic bags, tin cans and old boots!

Silky Sharks

Silky Sharks reach a length of 3.3 metres (10.8ft). They are slender-bodied sharks (though broader than Whitetip Reef Sharks), light grey on top, fading to white underneath. They have very long rounded pectoral fins with black tips. Very fast and usually loners, they sometimes school with Oceanic Whitetip Sharks, and feed on



A Scalloped Hammerhead — one of two species of Hammerheads found in the Red Sea.



Close encounter between a male Silky Shark (note the claspers) and diver.

Tiger Sharks wander over large areas, but are often found in the turbid waters of harbours and river mouths, and around ships' anchorages. Well known for attacks on humans in shallow water elsewhere, they are often caught at the entrance to Port Sudan harbour. Tiger Sharks are probably responsible for two attacks on children splashing about in that harbour over the last five years.

CLOSING THOUGHT

Quality underwater photography requires camera-to-subject distance of less than 150cm (5ft) and the addition of flash. Cages intrude in the pictures; they are only acceptable for photographing large Great White Sharks.

Hiding baitfish behind and above my head causes sharks to swim at, and then over, me; this produces the strongest pictures. Occasionally, as with humans, one meets a shark with a sore head and then, anything can happen; but that is what adventure is all about!

FURTHER READING

D. J. Randall *Arabian Sharks*.
Published by: Immel Publishing.
ISBN: 090 71 51 094
Sharks — Silent Hunters of the Deep.
Published by: Reader's Digest.
ISBN: 0 86438 0143



Pay a visit to WHOLESALE TROPICALS (RETAIL ONLY)



Large selection of Tropical Fish always in stock
Plants and Equipment

Many of our customers say we have one of the best selections of tropical fish in London, and probably the country. With over 20 years experience supplying the aquatic trade.

A special offer on all Eheim filters and water-pumps in stock
1007 Power Heads ... £10.75 2209 Int Filter ... £20.50
1008 Power Heads ... £13.95 2211 Ext Filter ... £31.50
1209 Power Heads ... £16.55 2213 Ext Filter ... £41.50
2007 Int Filter ... £56.45
2217 Ext Filter ... £86.65

All External Filters include medium
All 240 volt and covered by full manufacturer's guarantee

150 Tanks of tropical fish which normally include 20 species of Synodontis, 30 species of Corydoras, 25 species of killies, Blue Brown Tefe — Turquoise — Heckel discus. Clown — Blue-eye, a good selection of Cichlasoma Apistogramma, and many others. Also Corydoras Panda and Brochis Britskil.

A selection of aquatic grown Cryptocorynes

● SPECIAL OFFER — CASH ONLY AT THESE PRICES ●

Tank, nylon-coated F/top cover, heater, thermostat, internal power filter, GroLux lighting, thermometer, gravel.
24" x 15" £52.00 — 36" x 15" x 12" £67.50 — 48" x 15" x 12" £80.00 k/down tubular steel stand 24" £18.75 — 36" £21.50 — 48" £26.50
All-glass aquariums 24" x 15" x 12" £10.75 — 36" 15" 12" £14.00 — 48" x 15" 12" £17.50
Any size of All-glass aquariums made to order at competitive prices

Eheim fountain 3150 (1200 Lt phi) £38.00 — 1050 Universal pump, internal or external (1200 Lt phi) £36.00

If you are in the area please pay us a visit **Ask for Terry — Club visits welcome**
Open: Mon, Tues, Wed, Fri, 10am-6pm. Thurs, 10am-2pm. Sat 9am-6pm. Sun 9am-1.30pm.

**10% DISCOUNT WITH A CUTTING
OF THIS ADVERTISEMENT,
APART FROM SPECIAL OFFERS**

On No 8 Bus Route — Opposite main Post Office
220 BETHNAL GREEN ROAD, LONDON E2
Tel: 071-739-5356 Fax: 071-729-2444

PRICES CORRECT AT TIME OF GOING TO PRESS

Herpetology matters

By Julian Sims



SKIN CARE FOR SNAKES

The type of habitat which is provided for snakes in captivity is an important factor in ensuring that these reptiles remain in good health. Infection of the skin by bacteria and / or fungi, especially under the ventral scales, may occur if snakes are kept in damp conditions. Therefore, the type of floor covering used in the vivarium is most important.

Small rounded stones, bark and dry leaves can be used as vivarium 'furniture' to provide a natural appearance. Rounded stones will not cut the skin of the snake. The disadvantage of using such materials is that they are very difficult to keep clean and dry.

The alternative to using these natural materials is to cover the floor of the vivarium with newspaper. This medium is clean, dry and very easy to replace when it becomes fouled. Unfortunately, it is not very appealing to look at.

A dish of clean water must be provided in the vivarium, but again, care is required in the selection of this item. Many species of snake which are commonly maintained in captivity, particularly Rat Snakes of the genus *Elaphe* and King Snakes of the genus *Lampropeltis*, tend to spend a long time fully submerged in water, if they are given the opportunity. To prevent this, the water dish must not be too large or too deep.

There is an exception to allowing a captive snake to remain in water for a prolonged period

might not slough its old skin completely. Old skin which persists can be removed relatively easily by allowing the snake to soak in water maintained at about 21°C (70°F) for 12 hours; the old skin can then be gently peeled away.

The piece of skin which covers each eye is called the spectacle or eye-shield. This scale can persist even if the rest of the skin is sloughed successfully. After two or three moults, a thick layer of old tissue can accumulate over each eye. With the help of a moist cotton bud, these retained spectacles can be removed, but again, it is easier if the snake has previously had a soak in warm water. Care must be taken not to damage the newest spectacle underneath the old skin.

Pieces of sloughed skin should be removed from the vivarium as soon as possible, since old skin might carry fungal spores and invertebrate parasites. By shedding its skin, the snake can lose some of these external parasites. If these pieces of old skin are collected promptly, the parasites can therefore be removed from the vivarium.

Sometimes newly-acquired snakes carry parasitic mites, for example, *Ophionyssus natricis*, on their skin. Mites belong to the Arachnid (spider) 'family'. They often collect on the head, especially around the eyes, where their presence under the scales gives a swollen appearance.

Parasitic mites are blood suckers and they can result in the snake becoming anaemic.

Mites can also transmit disease-causing bacteria and/or protozoa to their host. Therefore, if they are left untreated, mites can lead to the death of the snake. These parasites can also spread to other vivaria and infest previously healthy snakes.

Although mites are very tenacious, they can be killed relatively easily by placing a short strip of Vapona in a perforated container in the vivarium. It is most important that the snake is prevented from coming into direct contact with this toxic material, though. Vapona is the registered trade name of a product used for killing invertebrates. It contains the active ingredient Dichlorvos, and is distributed by: Nicholas Laboratories Ltd., 225 Bath Road, Slough SL1 4AU.

Leave the Vapona strip in the vivarium for no longer than three days, during which time it will kill any invertebrates present. It may be necessary to repeat the treatment in a further 10 to 14 days as any eggs previously laid by the mites will have hatched during this time.

Finally, many species of snake love to climb; indeed, it is a good idea to include a branch in the vivarium. However, the branch must not allow the snake to come in contact with lamps (which are used to create basking 'hot spots' in the vivarium), or with a suspended ceramic infra-red heater, if this is used to provide warmth. With careful vivarium design, there is absolutely no excuse for the skin of a snake to get damaged in this way in captivity.

AXOLOTL SURVIVAL

In the June 1990 edition of *Herpetology Matters*, attention was drawn to the plight of the Axolotl (*Ambystoma mexicanum*). This totally neotenic amphibian is now almost certain to become extinct in the wild.

Even in its hey day, the Axolotl had only a very limited distribution in the wild, being found only in two high altitude lakes (and possibly the surrounding drainage channels) in the Valley of Mexico — an area to the south of Mexico City. The two lakes formed part of a much larger freshwater complex constructed by the Aztecs in the fifteenth century. However, the ecological balance of this wetland area is now being irreversibly altered (even totally destroyed) by a variety of activities undertaken by twentieth century 'civilisation'.

One of the two lakes, Lake Xochimilco, is being developed by the local tourist industry to make the most of its famous floating gardens or chinampas. The longterm stability of this lake and, thus, the survival of the Axolotl there, must be in question. The other lake, Lake Chalco, has already been destroyed as a result of the overzealous extraction of water for domestic and industrial use.

Anglia, who produce the *Survival* films shown on independent television, are sending a film crew to Mexico City this year to record the Axolotl in the wild before it becomes extinct — a production to look forward to in the future.



Axolotls will almost certainly become extinct in the wild in the near future.

INDIA

Part 3 — IN SEARCH OF THE MUD MURREL

Stephen Clark rounds off the final leg of his journey in search of a mysterious, but widespread, Snakehead.

With the completion of my fish expedition, it was now time for a rest (or so I thought!) at the playground of the rich, Juhu Beach, a few miles from, and looking towards, Bombay.

A relaxing day trip was planned to Manori and Gaori beach, set in an isthmus six miles (nearly 10km) north of Juhu, which one could easily mistake (and my memories will record such) as an island. I negotiated the estuary separating it from the mainland by a small ferry, then walked through the palm trees to a small agricultural village nestling within a four-hundred yard (some 365 metres) strip of dry land. Sleepy inhabitants dozed on verandahs. Small boar, chickens and cats scurried through the narrow winding streets.

The neat two-storey buildings were decorated with colourful murals depicting Indian mythology and religious Catholic symbols. I later learned that the east coast Portuguese influence was still flourishing sixty years after their departure.

I managed to find my way back on to the only road north of Gaori, but astonishingly, failed to attract the full auto-rickshaws transporting locals from the ferry terminus to my destination.

INTRIGUING POND

After walking half way (approximately 1½ miles — 2.4km) towards my destination, I spotted a small pond, complete with a backdrop of wild goats, and decided to rest from the sun's intense mid-day heat. Only 30 yards (some 27 metres) away, could be seen the dark green marshy mangrove swamps which would, in the monsoon, flood the pond with saltwater. My suspicions were aroused by fish constantly rising to the surface for air, a classic trait of air-breathers — but which species?

Without a net, I continued my stroll, eventually arriving at the lovely Gaori village and past lines of saltwater fish drying in the sun. Cooling my hot feet in the cool surf, I set off back to catch the returning bus (running every two hours). Sinking five sparkling lemon soft drinks in 15 minutes, I asked the friendly café owner if there were any children to fish the pond for me, but there was no luck.

So, impulsively, I once again set off walking back to the pond. On my way, a friendly young Bombay-educated boy on a bike,

made the mistake of saying hello to me. He was soon, along with his cousin, fishing the pond, but found the net was less than ideal. Therefore, we set off for a short distance to a communal washing pond and, here, we caught the mysterious fish, the beautiful lime-green form of *Channa punctata*, the Mud Murrel.

WIDESPREAD PREDATOR

This fish was first described as *Ophichthys punctatus* by M E Bloch in 1793 and is commonly known in India, as the Spotted Snakehead. Here, it is one of the most common freshwater fishes in the country, and can be found in ponds and rivers. They are also found in 'tanks', which are man-made more-or-less square enclosures of water (from half to 10 acres in area), with high embankments. These are used by the natives for bathing, washing and also drinking!

This medium-sized carnivore attains an adult size of 10 inches (250mm). Its long dorsal (29-32 soft rays), anal (20-23 soft rays) and rounded caudal fins adorn a stocky tubular body with a typical bony, predatory head. The paired pelvic fins are situated on its belly, vertical to the base of the gill covers.

The natural geographical distribution of this fish in South-Eastern Asia includes the countries of India, Pakistan, Bangladesh, Sri Lanka and Burma. Claims of colonisation outside of this area must be regarded with caution or attributed to human interference.

Because of its large geographical range, there are many colour variations from Bloch's original black-spotted type. A notable Bengalese (India) variant, is a browner-bodied fish with a pectoral fin which is not striated, but striped in the majority of specimens.

Channa punctata (like most predatory species) has well-developed eyes that occupy a 24th of the total body length. It has been found that this fish can discriminate red from green, yellow, grey and violet, as well as violet from blue, green and grey with equal ease. The ability to distinguish colours is directly attributed to their apparent trichromatic vision, a combination of the three primary colours, red, yellow and blue.

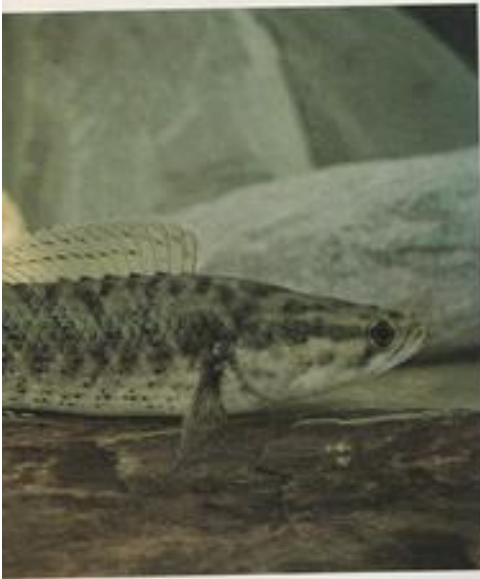
In the aquarium, *C. punctata* prefers filtered water but without a deal of movement. Water temperature and pH are not critical, although sudden, sharp variations can cause death. Forage fish such as *Barbus sophore*, *Oxygaster bacula* and *Barbus sigma* are used



KEVIN WEBB



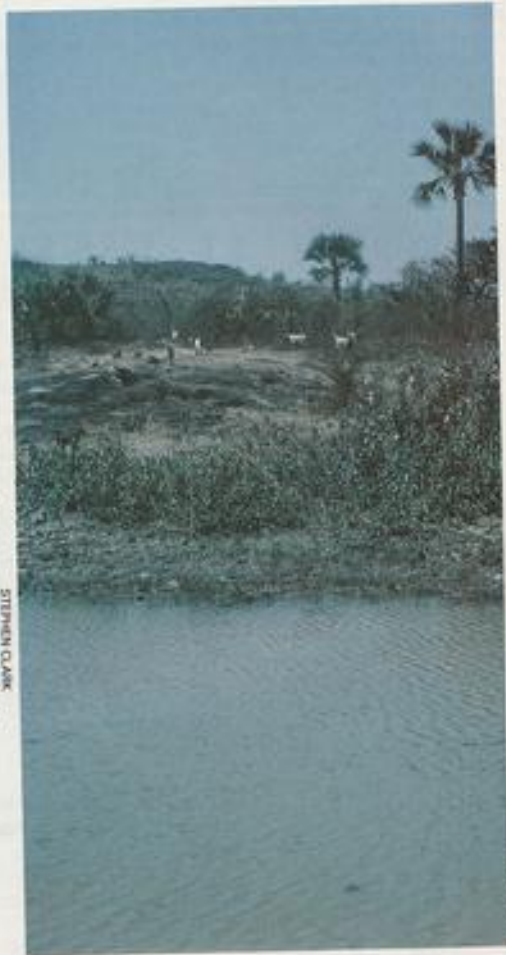
STEPHEN CLARK



BEEMA NAJIB



STEPHEN CLARK



STEPHEN CLARK

Top left, The Spotted Snakehead of Mud Murrel (*Channa punctata*). This is a green variety.

Top right, close-up of a perfect predator.

Left, the ferry from mainland Bombay to the Manori isthmus.

Above, 'Large headed' women passing the pond.

Right, Biotope of *Channa punctata*, complete with wild goats.

as livefood in aquaculture in India, but these can be supplemented in a captive environment by beast heart and earthworms.

REPRODUCTION

The sexual differences show the male displaying pin-head spots on its yellow underbelly, while females, apart from their swollen abdomens, have, instead, diffused black blotches in the ventral region. Temperatures from 26°-29°C (c 79°-84°F) brought about by cool rainy weather, will induce breeding. The striped young of *C. punctata* have been collected at different times of the year in Sri Lanka, and this would indicate they have several breeding seasons.

The amber-coloured eggs (1.2mm - 0.05in) are laid in shallow water. There is no surface-built nest and, like all *Channidae* eggs, these contain an oil globule in the yolk which make them float. Hatching occurs in 24 hours at 26.5°-28°C (c 80°-82°F) when the dull brown fry are 2.7mm (0.1in) long. At 20 days, they measure 7.2mm (c 0.3in) and are guarded by both parents (in particular, the female) which, even when confronted with hunger, do not harm the offspring.

The fry display a golden lateral stripe which runs from the snout, through the eye, to the middle of the caudal fin. At a length of 13mm (c 0.5in) a black outline to the body scales appears, along with three dark bands on the caudal fin and, at this stage, they consume mainly *Cyclops* and daphnids. Adult coloration begins from the size of 70mm (2.8in) upwards.

So, I had found the mysterious Mud Murrel Snakehead and, in the late afternoon, adjoining my new-found friends' lovely home, we also caught a fish in a large well, by dangling a hook and line 20 feet (6m) to the fresh water below, bringing up 4in (10cm) specimens of the silvery *Rasbora daniconius*.

Spotting a pony cart heading in my direction, I muttered hasty farewells, passing 'large-headed' women (laden with loads of brushwood) on their way home...

I, too, was now looking forward to getting to my home... but that was all of half a world away.



TROPICAL FISH IMPORTS

AQUATIC HOUSE, QUEENS PARK, AYLESBURY, BUCKS HP21 7RS, UK

Tel: Aylesbury (0296) 39230, Mobile: (0836) 285893, Telex 837803 TFIG, Fax: (0296) 392082

• IMPORTER • EXPORTER
• MARINE FISH • INVERTEBRATES
• FRESHWATER FISH • PLANTS

POND LINERS
20 YEAR GUARANTEE
35p PER SQ FOOT

"SPECIALISTS" IN
LAKE
TANGANYIKAN AND
MALAWI CICHLIDS

ALL
DRY GOODS AT
DISCOUNT
PRICES

TROPICALS,
MARINES
AND
COLDWATER
FANCY
FISH

Imports from: HOLLAND, SINGAPORE, MIAMI, JAPAN,
ISRAEL, SRI LANKA, INDONESIA, NIGERIA, GERMANY

OPEN 7 DAYS A WEEK

* CONSOLIDATORS * WHOLESALERS * RETAILERS
* TANKS ON LEASE FOR OFFICES, DOCTORS SURGERIES ETC
* POND INSTALLATIONS AVAILABLE

STOCKISTS
OF A LARGE
RANGE
OF
CABINET
AQUARIUMS

ESTABLISHED 12 YEARS

UNTIL 31st
DECEMBER
1991

JOIN OUR CLUB — For only £25 you get
30% off FISH 25% off DRY GOODS
FEBRUARY OFFER

30" tank, fully fitted with Fluval 3 filter, AM heater, hood, Triton
lighting, Arcadia Starter, Silica gravel, Algarde power centre

* ONLY £79.99 *

Koi Talk

By John Cuvelier

DISTRESSING COME UPSTANCE

As a completely amateur Koi-keeper for more than twenty years, I have often convinced myself that there are very few Koi-related problems which I couldn't solve one way or another. However, during the second week in December, I got my comeuppance!

You may recall that I related the story of my offering B & B to some homeless Koi and other assorted fish last year, just until a new home was built for them. In less than a week, six of the seven Koi in the batch had died in very mysterious circumstances and, bearing in mind the old adage that two or more heads are better than one, I'm asking our readers to study the following description of this 'fish kill' and come up with any ideas, because I'm completely baffled and am unashamed to admit it.

Baffling symptoms

The symptoms were a gradual slowing down of all movement, (including respiration, which, towards the end, was simply not visible), lying motionless just below the surface of the water and, eventually, simply rolling over and sinking to the bottom, dead. Post-mortem examination revealed nothing apart from a very slightly darker appearance of the gill filaments, so slight in fact, that I'm not completely certain that a difference existed at all!

Needless to say, exhaustive tests upon water quality were immediately carried out at the onset, the results being as follows:

- pH: 7.8 (normal for both my pools).
- Chlorine: Undetectable.
- Nitrite: Undetectable.
- Ammonia: Undetectable.
- Temperature: Average of 7 to 8°C (44.5 — 46.5°F).

Unlikely causes

Kicking around a few ideas of what it could have been comes up with zilch.

Could it have been something brought in by our visiting heron? Unlikely because of the

low temperature not being supportive of either bacteria or parasites and, in any case, none of the 30 or so large orfe, shub-bies, goldfish, rudd etc. have been affected.

Could it be lack of oxygen? Most unlikely, in view of the fact that respiration reduced, rather than increased. Again, other fish were not affected and we all know how orfe react to dodgy water quality!

Could it have been airborne fumes, pesticide, weedkiller etc.? Again, unlikely, because of the other fish not being affected.

The symptoms I've described are very similar to those listed by van Duijn for carbon dioxide poisoning in his book *Diseases of Fishes* but, the pool having been cleaned ready for winter some weeks previously, there is no decaying organic matter to generate CO₂, so I think that's another dead end, unless all the other fish are resistant to CO₂!

The remaining single Koi from the batch appears to be in rude health, so your guess is as good as mine. What has really saddened me about the whole episode is the way these fish had improved while in my care, all having put on considerable weight and colour improvement, their owner hardly being able to believe his eyes when he saw them a couple of months after their move.

You can imagine how I felt when I had to break the news to him. I would have felt better if I had made some mistake in their care which killed them, but

there was just no viable explanation which I could offer to soften the blow. I can't help feeling responsible and have offered to start him off again with some of my own 'growing on' Koi once his new pool is ready.

Nagging questions

The one factor which never ceases to nag at my mind is the fact that only the Koi were affected. Why? Can there be something endemic to Koi of which we are unaware, or was it just another case of 'Murphy's Law'? As I said earlier, I would be grateful for any suggestions, however unlikely, as I certainly wouldn't wish my experience on anybody!

PERSISTENT PREDATORS

Our heron has made several return visits following my efforts at pond protection. There are now several holes punched through the netting, each with its own oily slick on the water below. It really seems a pointless exercise, as there is no chance of reaching a fish, never mind pulling it out of the pool.

We have also, for the first time, been visited by a pair of kingfishers at various times. We have no stock left which is small enough for them to eat, the inescapable conclusion being that the birds are starving, thanks to a summer of low river levels and green/blue algae

which have killed off their usual food supply. A very sad state of affairs when you consider how rare these beautiful birds are.

THREE-INCH DEATHS THEORY

A question which I know for a fact is very often asked among Koi-keepers, is why the mortality rate is so horrendously high for 3-to-4-inch (c7.5—10cm) Koi which are purchased in their thousands across the country each season. I, myself, purchased six exquisite 3-inch (c7.5cm) Japanese Koi in a batch last year, only to lose the lot within a week! I might add that it isn't the first time it's happened to me either, or to many of my correspondents.

It appears to be relatively rare for the larger Koi to die shortly after purchase, so what is the answer? I do have a theory which, needless to say, is open to argument, it being this:

Small Koi fry simply do not have the stamina to withstand the trauma of being shipped halfway across the globe, probably in overcrowded and partially 'doped' water, then to be transferred into holding/treatment tanks at their destination, again at very high stocking levels, until they are sold.

I think it is at this point that the trouble begins as, if the buyer knows his/her stuff, the new Koi will be transferred into a quarantine facility containing water of superb quality and, possibly, a wide spectrum medication, although this last shouldn't be added until after a settling in period. The shock of going from poor water into ultra pure water could, in my opinion, be the last straw for these little fish who simply give up the ghost! Even if this theory stands up, I'm unable to offer a solution to the problem, as I wouldn't know where to start as regards 'making' poor water to act as a 'buffer' for a transitional period. I'm sure it could be done, but a better idea might be to have a simple clay pond in which to keep your new babes for a few weeks or months, letting nature look after them, this being a route which I'm giving serious thought to for the coming season.



The persistence of beautiful predators like herons, has to be admired, despite the most unwelcome consequences of their presence in, and around, our ponds.

News

Double celebration at Airport Aquaria . . . and a touch of Glasnost too!

Saturday 1 December saw the presentation of the £1,350 Aquarium set-up featured in the August '90 issue of *A & P* and offered as a prize by Airport Aquaria to all visitors to the Supreme Festival of Fishkeeping at Weston-Super-Mare in November.



Dick Mills presents Martyn Wright with an autographed copy of one of his books. Also in the picture (along with her tank) is proud winner Pauline Wright.

The lucky winner was Mrs Pauline Wright of Stoke-sub-Hamdon in Somerset. Pauline, whose husband had entered her for the draw, travelled to Airport Aquaria's shop at West Drayton with her family to be presented with her prize by an envious *Aquarist & Pondkeeper*

editor John Dawes. Mike Clarke of Interpet Ltd, joint sponsors of the Weston show, was on hand to take the photographs, while writer and FBAS Secretary Dick Mills was able to call in to present Pauline's son, Martyn, with an autographed copy of his book *Guide to Coldwater Fish*.

In a unique bid to help raise money for BBC TV's 'Children in Need Appeal', Airport Aquaria had set up an auction for a 14-in Snakehead which they had acquired and which had had a starring role at the Festival of Fishkeeping at the

beginning of November. Bids were accepted over a period of a fortnight and closed at 6pm on Friday 30 November, the day of the television appeal.

Mrs Mabbutt of Staines secured the fish with an £85 bid, and promptly, and generously, made the amount up to



A&P editor John Dawes receives a £100 cheque for Children in Need from Mr. & Mrs. Mabbutt.

£100 "just to round things off". The cheque for 'Children in Need' was accepted by John Dawes on behalf of Airport Aquaria during his visit on 1 December to present Pauline Wright with her prize aquarium.

And the Glasnost bit? Well, that refers to Airport Aquaria's latest venture — the sale of Russian-bred tropical fish of exceptional quality. If you'd like to know more, ring Peter Rambaut on 081 897 2563.

EuroFish competition plans completed

EuroFish, a vital component of the forthcoming EuroZoo trade exhibition which will be held in Maastricht, The Netherlands, on 24-26 May '91, will incorporate an international fish competition, the details of which have now been completed.

There will, in fact, be two identical competitions, one for European-bred fish, and one for imported fish. There will also be a category for new imports into Europe (ie fish that have either never been imported before, or else have been imported for the first time over the preceding year).

Categories in the European-bred and imported sections include: Koi, Goldfish (separate classes for different varieties), Other Coldwater Species, Livebearers, Discus, Angels, African Cichlids, Central and South American Cichlids, Catfish, Tetras, Barbs, Anabantoids and 'Any Other Species', eg Loaches, Rasboras, Killifish, etc.

Sponsorship has already been arranged with several major European manufacturers and discussions are underway for further sponsorship of the main trophies and awards.

Among the companies which have already taken up exhibition space at EuroFish are such well-known names (in the UK) as Tetra, Schott, Juwel and Rena (France), plus other European companies like Plexability (Belgium), Feller Stone (USA) and Euro-Light (Germany) which are probably better known on the Continent.

The EuroFish competition is open to:

a) All commercial breeders of freshwater tropical or coldwater fish, irrespective of the

numbers or range of stocks produced.

b) All importers of freshwater tropical and/or coldwater fish.

By now, many importers, fish hatcheries and breeders will have received their first mailings, including entry forms and full competition and exhibition particulars.

Any interested parties who may not yet have received these details are urged by the organisers to contact them direct:

InterMedium Exhibitions, PO Box 1318, 3800 BH Amersfoort, The Netherlands. Tel: 010 31 33 638490; Fax: 010 31 33 638200.

Aquarama '91 latest

Preparations for Aquarama '91, Singapore's unique international aquatic exhibition and conference, are fast gathering pace as the dates (27-30 June 1991) begin to feature more and more prominently on the horizon.

With well over half the total available exhibition space now firmly booked, the international flavour of the event is becoming truly apparent. Already, companies from (at least) Singapore, the US, Germany, Holland, Italy, Malaysia, Sri Lanka, Taiwan, Japan, Thailand, Indonesia and the UK (so far represented by three companies, with others showing interest) have taken up exhibition space.

Interest in the conference which will accompany the exhibition is also very keen. The main theme chosen for Aquarama '91 is *Towards the Year 2000*. The official 'Call for Papers' is now underway soliciting contributions from international figures on the following subjects: Management of Endangered Species, New Opportunities for Marketing, Advanced Culture Systems, Handling and Transportation, plus a special section on Koi.

For further details, contact either *A & P* editor John Dawes (*A & P* is one of the official supporters of the event) or Irene Goh, Academic Associates Pte Ltd, Block 808, French Road, #03-185 Kit-chener Complex, Singapore 0820. Tel: 01065 2926166; Fax: 01065 2924625; Telex: RX 34032 ACADEM.

GOLDEN RULES OF FISH HEALTH

PUBLISHED BY
AQUARIST
AND PONDKEEPER



GOLDEN RULES OF FISH HEALTH AQUARIST AND PONDKEEPER

WELCOME to the first of our 1991 Supplements. This year, we are concentrating on the **Golden Rules** of aquarium and pondkeeping. So what better way to start than with a subject that affects every single aspect of a fish's life — health?

The emphasis nowadays is very much on *health* — as opposed to *disease* — a reflection of the more *preventive* — as opposed to *remedial* — approach that has gradually developed over the years as we've gained more and more knowledge about how to avoid problems, rather than have to correct them later.

Of course, despite our best efforts, things will go wrong from time to time and, when they do, we need to know how to recognise a problem and what to do about it. Happily, the range of remedies and water treatments available today make life considerably easier than it was even ten years ago.

Added to this, there is a fast-growing number of vets who are well-informed and equipped to handle fish health problems.

Our hope is that, with the aid of this Supplement, the excellent books on health which abound today, plus the backing of 'fish vets', our fish — both in our ponds and aquaria — will be able to enjoy a good and healthy 1991.



John Dawes
Editor

SUPPLEMENT COVER PHOTOGRAPHS

Top	Tapeworm eggs
Left,	(Dr Robert Goldstein)
Top	Eye Fluke — <i>Diplostomum</i>
Right,	(Dr Jimmy Chubb)
Centre,	<i>Aphyoplatys daboisi</i> (a Killifish) suffering from
	Black Spot — encysted trematode larvae
	(Dr Robert Goldstein)
Bottom,	Koi exhibiting Dropsy and ulceration
	(Dr David Pool)

SUPPLEMENT CONTENTS

Golden Rules of Fish Health (Questions/Answers)	
John Dawes — Editor, <i>Aquarist & Pondkeeper</i>	31
Environmental Health Factors	
Dr Chris Andrews — Curator, London Zoo Aquarium	35
Fish Pathogens	
Dr David Ford — Senior Consultant, 'Aquarian' Advisory Service	42
Fish Parasites	
Dr Robert Goldstein — Environmental Consultant	51
Recent Advances in Fish Health	
Dr David Pool — Head, Tetra Information Centre	59

HOFFMANN PUMPS

Probably the best air pump in the world.

Beware of expensive imitations.

300 series — so quiet you can hear a whisper.

250 series — capable of pumping to a depth in excess of 6ft.

150 series — just a very competitively priced powerful air pump.

IN CASE OF DIFFICULTIES PHONE THE SOLE DISTRIBUTOR:

J & K AQUATICS LTD 0823 66443 1

MODEL AL 150 = 150 l/h, AL 250 = 250 l/h, AL 350 = 300 l/h at 20 inches of water



KOLLAOORISHA TROSCHEI/STOCK PHOTO/ALAMY

Follow the 'Golden Rules' of health and the fish, such as this superb *Cichlasoma altifrons*, will reward you many times over.

GOLDEN RULES OF FISH HEALTH

(Questions/Answers)

John Dawes — editor *Aquarist & Pondkeeper*

Fish suffered from diseases and these, of course, needed diagnosing and treating. Fish today, still suffer from diseases which need treating. That hasn't . . . and cannot . . . change.

What has changed, though, is our approach. We are much more positive today. Helped by improved diets, water treatments (as opposed to disease remedies), equipment and — very importantly — know-how, we now tend to approach the hobby with, what one could call, a much 'healthier' perspective. This is probably also a reflection of our

Elsewhere in this Supplement our team of fish health experts will be dealing with specific areas of this large and complex subject. In their articles, you will find guidelines on how to identify and treat many of the most commonly encountered fish diseases, along with sound advice on their prevention and on various sources of help and information.

The one inescapable fact is that, no matter how good we become at diagnosing and treating diseases, this will be of little or no use to us, unless we observe the 'Golden Rules' of fish health. Failing this, problems will return with monotonous and distressing regularity resulting, sooner or later, in despondency for the aquarist and unacceptable hardship for the fish.

HEALTH V DISEASE

Q Why 'Fish Health' rather than 'Fish Diseases'?

A In the past, the general approach to fishkeeping was considerably more negative than it is today.



STUART HARRIS

Overcrowding will lead to health problems . . . unless you really know what you are doing. Few, if any, know how to do this better than the Tropical Marine Centre (where this photo was taken).

being more health-conscious overall in the way we lead our lives.

In any case, the modern approach to aquarium and pondkeeping centres round the premise that we must always attempt actively to maintain the state of health of our fish and other organisms, rather than adopt a 'reactive' approach where we wait for something to go wrong and then try to put it right. The stress is therefore on *health* rather than *disease*.

BUYING FISH

Q How do I go about ensuring that I only buy healthy fish?

A In short, it is not possible to guarantee 100% health in the fish we buy, particularly when even 'healthy' fish harbour any number of disease-causing organisms. The

① Buy only a fraction of your eventual stocks on your first trip (absolute maximum 50%). At all costs, avoid buying all your fish in one go — your filter will not have matured sufficiently to be able to cope. See, for example, Dr Chris Andrews' article elsewhere in this Supplement for fuller details.

② Avoid improper transportation, and introduction methods. For guidelines on how to do this properly, see my article in the *Beginners' Supplement* published in the December, 1990 issue of *Aquarist & Pondkeeper*. Some details of quarantine procedures are also given in that article.

③ Avoid buying incompatible species. Seek advice.

④ Do not buy hastily. Just because Neons, Cardinals, Zebras, Harlequins, Rummy-nosed Tetras, Pencilfishes and other shoalers look pretty, don't buy one or two of each. It is far better to restrict the range of

you can provide.

⑤ Should any fish show obvious signs of disease, these should not, of course, be bought... unless, that is, you badly want the fish in question and can provide a separate aquarium in which you can nurse it back to health. You can't, of course, either mix such fish in with healthy ones, or return to the shop to complain if it dies! Tanks containing unhealthy fish must also be given a miss.

Much of the above may sound like commonsense... and is precisely that. However, the urge to buy can be so great that, unless some sensible precautions are taken at the outset, the health of the fish will be put at risk.

STOCKING AQUARIA

Q Can stocking an aquarium or pond have any effect on the health of fish?

A It most certainly can! Over-stocking almost invariably leads to problems, unless the aquarist or pondkeeper can provide the back-up equipment necessary, plus the dedication and expertise on how to deal with such conditions.

Details of stocking levels have appeared frequently in *A & P* (especially in our *Supplements*). Most books also contain this information, including the excellent *Interpet Manual of Fish Health* published by Salamander which supplies the following guidelines for small fish.

	1cm of fish per:	1in of fish per:
1. Coldwater (native) and tropical marines	120 sq cm	48 sq in
2. Coldwater fresh-water fish	75 sq cm	30 sq in
3. Tropical fresh-water fish	25 sq cm	10 sq in
4. Pondfish (small)	120 sq cm	48 sq in

These figures allow for a certain amount of growth and incorporate some margin of error. They must therefore be used as they



Adequate tank decor and layout, plus appropriate planting, will help maintain healthy conditions. Note also that the fish in this shot (Cardinals) are in a shoal.

main reason why a healthy fish remains healthy, despite this, is that it is in a state of balance, both with these pathogens, and with the environment. Shift this balance in any direction and problems could result.

The mere fact of buying a fish and taking it home will stress it and open it to a potential disease problem. However, as long as the fish is pretty healthy, and netting, transporting and introduction procedures are adequately followed, things should turn out alright.

I dealt with all these subjects at some length in the *Beginners' Question/Answer Supplement* which was published in the December 1990 issue of *Aquarist & Pondkeeper* and will not, therefore, repeat all the details here.

It is, perhaps, worth noting, though, that a healthy fish *looks* healthy. It is, in fact, quite difficult for one to be looking at a healthy fish and believe it to be unhealthy. If you haven't bought fish before, ask for guidance from the shop staff or, if you don't want to take up too much of their time (particularly if you are buying your fish at a busy period), take along a fishkeeping friend who'll help you sort things out.

Q What, if anything, should I avoid when buying fish?

A There are several things that have to be borne in mind, particularly if the fish which are being bought are for a new aquarium.

such fish you buy and go for larger numbers of each shoaling species selected, eg six Cardinals and six Rummy-nosed Tetras, rather than twelve fish consisting of two of each of the above species.

③ It is also best to avoid fish whose water requirements are quite different to the ones



Without these snail shells, species like *Lamprologus magara* will be less than happy and will, therefore, be likely to be put under undue stress, with adverse effects on their health.



BILL TOMMEY

An obvious — and distressing — case of total incompatibility.

are intended, ie as guidelines only. Specific requirements and circumstances must, obviously, always be borne in mind.

It should also be noted that adequate plant growth in an aquarium or pond will help to maintain good water conditions which, in turn, will influence the health of the fish.

In aquaria, about 50 small plants per square foot (900 sq cm), will do the trick, while, in ponds, 20 oxygenating plants per square foot (900 sq cm) of available planting space should prove adequate. Again, these figures are only guidelines and must be adapted accordingly.

OTHER FACTORS

Q *What other 'Golden Rules' should I follow to ensure that my fish remain healthy?*

A There are numerous things that we can do to help our fish enjoy a healthy life. Detailed instructions and guidelines are, of course, outside the scope of an article. There are, however, many good books around today and these should be consulted on a regular basis.

Some of the important topics that need to

be considered with regard to fish health (in addition to those already mentioned in this article) include:

1. Adequate aeration;
2. Good filtration, including water turbulence;
3. Proper positioning of a tank or pond;
4. Suitable (and safe) diets and feeding routines;
5. Adequate maintenance, including regular water tests;
6. Aquarium decor and layout, eg adequate shelters, lime-free gravel (except for hard water/alkaline-loving species);
7. Avoidance of sudden fluctuations in temperature or other water conditions;
8. Regular visual examination of the fish for any signs of trouble;
9. Prompt action — and a willingness to seek advice — should anything appear to be going wrong;
10. Correct use of water treatments and disease remedies.

CONCLUSION

Once we place fish in aquaria or ponds, we take on responsibility for their survival. They, therefore, deserve the very best we can offer... nothing less. The 'Golden Rules' I've outlined should, at least, help get things going on a safe footing. The articles that follow should help further — both in avoiding problems, and in tackling them effectively if and/or when they arise.

U.K.
CICHLID
CENTRE

**LIVING
WATERS**

TANGANYIKAN
MALAWI
SPECIALIST

Spectacular main Fish House now open, offering fabulous selection of Tropical Fish from all over the world...

GROUP 1 — Emperor Pleco, Black and Orange Pleco, Orange Seam Pleco, Gold Spot Lasiacistrus, Blue Dot Peckoltia, Peckoltia Pulcher, Pseudacanthicus Adonis, Pter. Gibbiceps, Xenocara, Lasiacistrus, Royal Plecos + many more Plecos

GROUP 2 — Stin-grays, Potamotrygon hystrix, P. Santarem, Face Heckel, Blue, conaethiops Green, Heckel Tigrinus, Baby Red Tail Catfish

GROUP 3 — Wild Discus, Beautiful Congo, Blue Yellow Congo, Brycon, Microstoma

GROUP 4 — Red Tetra, pheus, Cyprichromis, Ophthalmitis, Lamprologus, Julidochromis



LIVING WATERS

28 BEDDINGTON LANE, CROYDON,
SURREY CR0 4TB

(400 yards from Asda Superstore)

Telephone: 081-680 3533.

Fax No: 081-680 4653

OPEN 10.00 - 6.00 MON-SAT.
CLOSED SUNDAYS

**CATFISH
COMMUNITY
TANK BREDS
LARGE SHOW FISH
CURIO WOOD
RAINBOW ROCK
FULL RANGE OF
DRY GOODS
(Major Brands Stocked)**

ENVIRONMENTAL HEALTH FACTORS

A healthy aquarium environment results in healthy aquarium inhabitants. Dr Chris Andrews, of London Zoo Aquarium, discusses the golden rules of environmental health
(Photographs by the author)



A balanced aquarium depends on correct care and maintenance of adequate environmental conditions.

Fish live in intimate contact with their aquatic environment — an environment which is very different from our own. Water is 800 times more dense than air, yet contains only one twentieth (5%) of the oxygen. Water is also known as the “universal solvent” as a result of the huge range of substances which dissolve into it — most of which will (in turn) influence the nature of the water itself. Compared to air, water

changes temperature very slowly and fish are ‘ecto-thermic’ (ie they take their temperature from their environment), unlike us endo-thermic or warm-blooded mammals.

Sounds, and even smells, travel very well through water and, furthermore, the environment of fish is very much a three-dimensional world, as fish may streak forwards or backwards, up or down, or even hang motionless in the water column.

It is one of the essential “Golden Rules of

Aquariology” that aquarists familiarise themselves with this very different aquatic world — since they can exert total control over it and thus determine the long-term health and wellbeing (or demise) of their fish. Generally speaking, fish do not just become diseased, but they suffer from lack of knowledge or understanding on the part of the hobbyist — which may then manifest itself as a disease.

LATENT INFECTION

Since the aquatic environment of fish is, for the most part, far more stable than the terrestrial environment of man and other animals, fish are very sensitive to unsuitable or fluctuating conditions. Such conditions may bring about their death directly, or indirectly by affecting their internal condition which results in stress and a lowering of their natural resistance to many infections.

It is seldom realised that most fish (whether in a lake, river, pond or aquarium) often harbour low numbers or latent infections of a range of potential pathogens without exhibiting any abnormal symptoms or obvious ill-effects. However, such organisms are often held in check by the natural resistance of the fish. If this resistance is lowered by the stress resulting from (for example) unsuitable or fluctuating environmental conditions, the infection may be allowed to proceed unrestrained, with a resultant outbreak of disease and fish deaths.

So what environmental conditions should freshwater aquarists be aware of?

pH AND WATER HARDNESS

The pH of a solution is a measure of its degree of acidity or alkalinity. A pH of seven is termed “neutral”; pH values below this are “acid” and pH values above this (up to a maximum of fourteen) are “alkaline”. Various test kits are available from aquarist shops to measure pH accurately and easily.

Water hardness is a measure of the amount of dissolved salts which are present. So-called “hard” water contains fewer dissolved salts. An indication of water hardness may be obtained from trying to produce a lather from soap with the water: soft water produces a lather quite easily, while it is much more difficult to obtain a lather with hard water.

However, water hardness may be measured much more accurately using one

of the available test kits from an aquarium shop. These usually express water hardness in degrees of German Hardness (dH) or parts per million of calcium carbonate (ppm/CaCO₃).

In order to keep most of the common types of aquarium and pond fish, all that is necessary is to avoid extreme values of pH and water hardness, noting that the extreme values may influence the toxicity of certain metals, ammonia and nitrite to fish. Also, some fish (eg Rift Lake Cichlids) prefer harder, alkaline conditions.

In order to keep these rather more fussy fish successfully, and breed some of the more common types of fish, attention will have to be paid to pH and water hardness, and information on modifying prevailing water conditions can be found in most good aquarium books. For example, hard alkaline water can usually be made more soft and acid by dilution with clean rainwater and then by allowing it to stand for a period of days in contact with aquarium peat. If necessary, soft acid water can be made harder and more alkaline by allowing the water to stand in contact with limestone-bearing rocks or crushed cockleshell.

AMMONIA, NITRITE AND WATER TEMPERATURE

Measurement of levels of nitrogen in the aquarium (specifically ammonia and nitrite) are important in determining the degree of organic pollution, whether the filters are working properly or not, and whether the tank is over-stocked or over-fed. For most purposes, nitrate levels in the freshwater aquarium can be considered relatively unimportant, although very high levels may affect certain fish fry.

Ammonia and nitrite are measured using the test kits available from an aquarium shop. The toxicity of ammonia to fish is influenced to a large extent by water temperature and, especially, by pH. A well-established aquarium should contain little or no ammonia when measured with a test kit, and particular care must be taken if ammonia is detected in water with a pH above 8.0 in a tropical aquarium. Ammonia test kits come with full instructions for use, and a fuller explanation of the relationship between temperature, pH and ammonia toxicity can be found in the book *The Manual of Fish Health*, published by Salamander.

Nitrite is another potentially toxic nitrogen compound, although levels below 0.1 milligram per litre of nitrite nitrogen are probably safe for most fish.

Elevated levels of ammonia and nitrite may, of course, be prevented by the avoidance of over-stocking and over-feeding, ensuring regular partial water changes and by the provision of an efficient, well-maintained water system. As a result, it is a good idea to measure ammonia and/or nitrite regularly (perhaps every two to four weeks) so that any deterioration in water quality can be detected at an early stage and remedial action taken. Of course, quite high levels of both ammonia and nitrite often occur in newly-established aquaria, which is



Aeration (this is a display at a trade show) is vital in establishing and maintaining a healthy aquarium environment.

SOME ENVIRONMENTAL GUIDELINES FOR AQUARIUM FISHKEEPING

pH	Avoid sudden changes; 6.5-7.5 is satisfactory for most freshwater fish; approx 8.3 for marines
Water hardness:	Avoid extreme hardness
Temperature:	Avoid sudden changes. 12-20°C (c53.5-68°F) for most coldwater fish 22-26°C (c71.5-79°F) for most tropical fish
Nitrite levels:	Less than 0.1 mg/l (as nitrogen)
Filtration and aeration:	Important in most aquaria. Ensure regular filter maintenance and leave filters running for 20-24 hours every day
Stocking level:	Allow 10 sq in (c64 sq cm) of water surface per inch (2.5cm) of fish in tropical aquaria Allow 24 sq in (c150 sq cm) of water surface for each inch (2.5cm) of fish in coldwater aquaria Allow 1 in (2.5cm) of fish/4 gallons (18 litres) in new marine aquaria; 1 in (2.5cm) of fish/2 gallons (9 litres) in established set-ups
Compatibility:	Take account of the social requirements of the fish. ensure that all the fish in the same tank will mix. Ensure that there are sufficient refuges for timid fish
Foods and feeding:	Provide a balanced, varied diet. Avoid overfeeding
Water changes:	25-30% every two to four weeks (the latter in marine set-ups); always use a reliable tapwater conditioner

why only hardy fish should be stocked under such circumstances, and larger than normal partial water changes carried out, until the levels fall as the filter system or systems become established.

FILTRATION AND AERATION

Filtration is a very important part of correct aquarium care. For tanks up to about 20-25 gallons (90-110 litres), an excellent form of filtration is via one or more good-quality polyfoam cartridge filters. These are easy to maintain and can provide a simple efficient means of aquarium filtration which will not adversely affect plant growth. In larger aquaria, or if messy and/or delicate fish are kept, a reliable power filter which

tubes. However, additional aeration can be obtained by the use of an air pump and airstone. Keep in mind that vigorous aeration will add useful oxygen to the water but may drive off too much carbon dioxide with a consequent deleterious effect on plant growth. Aquarium carbon dioxide diffusers are now available to supplement carbon dioxide levels in a heavily-planted tank safely.

STOCKING LEVELS AND COMPATIBILITY

There is a tendency for many newcomers to the hobby to overstock their aquarium. An indication of safe maximum stocking density is provided in the Table. These levels

allow a certain amount of room for subsequent fish growth, pump failures, etc.

When stocking a new aquarium, it is important to add (say) four or five hardy fish to begin with. This gives the system and its filters time to mature and begin to function properly, and helps prevent a sudden build-up of toxic waste products (such as ammonia and nitrite) as mentioned above. If all goes well and the fish initially bought survive, the stocking level may be increased to its maximum level gradually over the following weeks.

Most of the fish normally kept in a community tank are best kept as pairs or shoals of five to ten individuals. The species kept in the same tank must, of course, be compatible and guidelines on this can be found in most good aquarium books. The provision of plenty of plants, along with rock caves, upturned flowerpots etc, is useful in providing refuges for timid fish and breeding places for others. Some otherwise quite aggressive fish (eg certain barbs) can be mixed with other species if they are kept in small shoals rather than as individual fish or as pairs.

FOODS AND FEEDING

It is my opinion that the stress which results from mixing incompatible fish (and keeping some species in inadequately-sized shoals) is often overlooked as a pre-disposing factor in many disease outbreaks.

A balanced diet contains proteins, fats (lipids), carbohydrates, vitamins and minerals, all present in the correct amounts, since too much or too little of certain nutrients can lead to problems. There are available a range of commercially-prepared dried fish foods which can be used to form the basis of a balanced diet for all aquarium fish, and as a result, nutritionally related

circulates the aquarium water several times a day is the filter of choice (this turnover should be several times per hour for marine aquaria).

These filters come with full instructions for maintenance (ie regular cleaning of the filter media) which, if not carried out, will result in poor filtration and, perhaps, a deterioration in water quality. Undergravel filtration is, in my opinion, best suited to marine systems (where it can play an important part in the maintenance of satisfactory water conditions). Internal or external box-type filters (although quite useful in some situations), are sometimes rather inefficient and can be messy to maintain.

Whichever filter is used, it is important to leave it running for 20-24 hours each day for optimal effects. Turning the filter off for long periods will give rise to water quality problems, even fish losses.

Very often, sufficient aeration will be provided by the turbulence of the filter return

allow a certain amount of room for subsequent fish growth, pump failures, etc.

When stocking a new aquarium, it is important to add (say) four or five hardy fish to begin with. This gives the system and its filters time to mature and begin to function

properly, and helps prevent a sudden build-up of toxic waste products (such as ammonia and nitrite) as mentioned above. If all goes well and the fish initially bought survive, the stocking level may be increased to its maxi-

diseases seem rare among ornamental fish.

However, since these foods are very concentrated, they should be fed sparingly. Tropical aquarium fish should be fed two to four times per day with only as much food as is consumed within a few minutes and perhaps "fasted" for a day every few weeks. Coldwater aquarium fish can be fed about twice a day during the warmer months of the year, although their appetite will decrease below about 12°C (53.5°F) and they usually cease feeding at 10°C (50°F) or less. Over-feeding aquarium fish must be avoided, since it may lead to the accumulation of uneaten food pollution of the water and, perhaps, even fish deaths.

It is also important to vary the diet of fish. Within each range of prepared fish foods there are usually a number of special foods which may be used to add variety to the diet. In addition, live, fresh or frozen food may also be used. Livefoods, in particular, are an excellent source of vitamins etc, and often help to bring some fish into breeding condition. Since livefoods of an aquatic origin (eg *Daphnia*, *Tubifex*) may introduce organisms into an aquarium, livefoods such as earthworm, white worm and (cultured) brine shrimp are preferred.

WHAT IS "DISEASE"

- "A lack of ease"
- "An unhealthy condition, disorder or illness"
- "An interruption, cessation or disorder of body functions, systems or organs"

TYPES OF DISEASE

- | | |
|-----------------------|--|
| Infectious | — caused by infections with other living agents (eg viruses, bacteria, parasites) |
| Non-infectious | — caused by physiological changes to the fish (eg spawning alterations, overwintering starvation, malnutrition)
— caused by adverse environmental conditions (eg algal blooms, pollution) |



Treatments are available for a wide range of diseases, yet, most problems can be avoided by paying due attention to environmental factors.

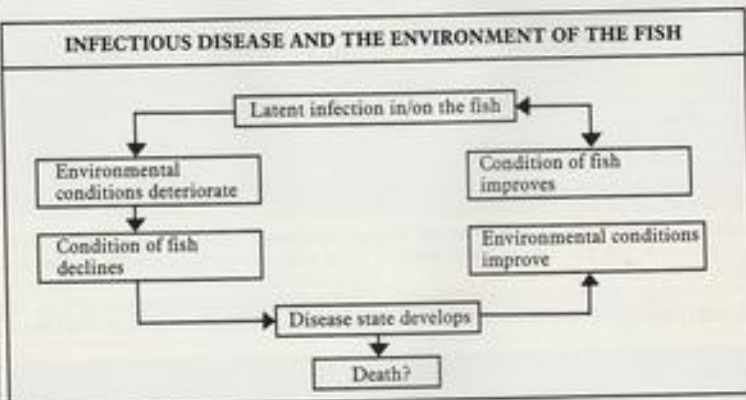


Overcrowding invariably leads to health problems sooner or later.

WATER CHANGES AND TAPWATER

Regular partial water changes are a very important part of routine aquarium maintenance. About every two to four weeks, 25-30% of the tank water (along with any accumulated debris) should be removed by a siphon tube and the tank topped-up with clean water brought to the correct temperature with a little boiling water. If tapwater is used, it should be dechlorinated and conditioned (prior to use in the aquarium) with a reliable tapwater conditioner, several brands of which are available from most aquarium shops.

Much concern has been expressed over the present quality of tapwater, both from the point of view of humans as well as fish. While aquarium tapwater conditioners will remove chlorine, chloramine and potentially toxic metals like copper, certain other 'pollutants' like pesticides and nitrate will not be removed and, indeed, cannot be removed very easily. If there is any doubt about the quality of a tapwater supply, the



local water company (listed in the telephone directory under "Water") are able to provide recent analytical results which should permit some interpretation which, in turn, may help in confirming (or otherwise) a problem. Remember that such analyses can only record the parameters which the tests set out to measure!

Various water filters are now available to 'purify' tapwater. They must be used and maintained according to the manufacturers' instructions and it is advisable to seek advice before using them for aquarium fishkeeping.

FURTHER INFORMATION

The relationship between fish and the aquatic environment is a close one, and generalisations can lead to misunderstandings. Further information can be found in: *Water Chemistry and Fish Diseases*, in *The Aquarium Digest International*, No 49 published by Tetra Press (about £2.) *An Interpet Guide to a Healthy Aquarium*, published by Salamander Books (about £5.) *The Manual of Fish Health*, published by Salamander Books (about £12.)

FISH DISEASES AND THE ENVIRONMENT	
Infectious Diseases	Some Possible Pre-disposing Factors
Fungus	Fluctuating temperature, rough handling, recent breeding activity
Bacterial disease (eg ulcer disease)	Overcrowding, poor water quality, pollution
Parasitic diseases (eg White Spot)	Overcrowding, fluctuating temperatures, poor water quality and tank hygiene

FISH PATHOGENS

Everything you ever wanted to know — but never dared ask (!) — about disease-causing micro-organisms, courtesy of **Dr David Ford**, senior consultant to 'Aquarian'.
(Photographs by the author)



A Common Goldfish with a melanoma on its head. No treatment is possible, but the growth may become static.

The dictionary definition of pathogens is "a micro-organism or substance causing disease". Therefore the term 'pathogen' includes toxins in the water, but does not include the large parasites. Water quality and parasites are dealt with in other sections of this *Aquarist & Pondkeeper Supplement* publication, but remember always that these problems are inter-related. For example, pathogenic bacteria are always present in aquarium water, but healthy fish can resist them. If the water quality is poor, however, the fish become stressed and lose the ability to resist these pathogens. Parasites are tolerated at low levels, but the confines of the aquarium means that the parasites can overwhelm the fish and, again, the will to resist disease is lost.

MICRO-ORGANISMS

These fish pathogens deserve the name micro-organisms because the majority are less than 1 micron in size. A micron (symbol μ) is one thousandth of a millimetre, or one millionth of a metre. A tablespoonful of bacteria would contain about ten trillion individuals!

A microscope is needed to see these micro-organisms; even then, most require staining to make them visible. This staining makes

pictures of bacteria, protozoans and higher animals just black spots or blobs. This does not do justice to the organisms, with biologists referring to them as 'primitive' or 'lower animals'. They are, in fact, complex creatures that have survived millions of years and evolved to perfection for survival

in their own special environment. The problem is that some of the survival methods involve killing the host via symptoms we call disease. Here are the major fish pathogenic micro-organisms in order of size.

Viruses

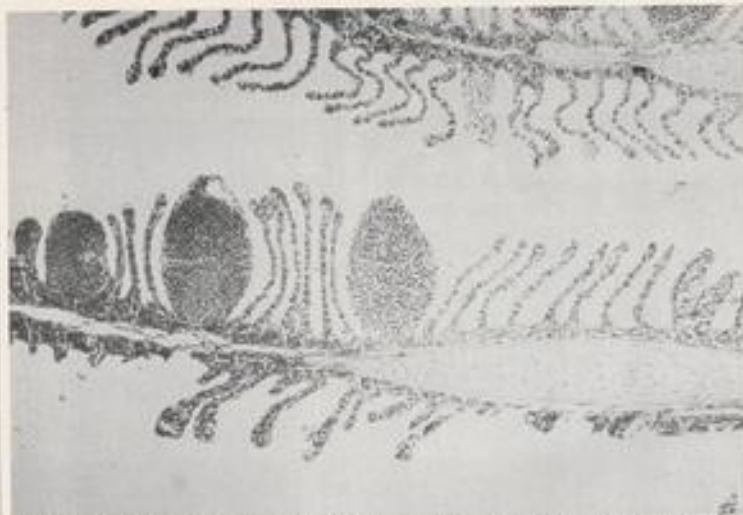
These are so small they are not measured in microns but in $m\mu$, a millionth of a millimetre. They are a collection of molecules, often as a crystal, and are at the borderline between life and non-life. They cannot be seen under a light microscope and their form can only be studied with an electron microscope. They do not self-reproduce, not even asexually, but require the reproduction method of the host cell that they take over, to duplicate their molecular structure.

That structure is complex, however, with crystals of protein designed to fool the cell of its host to absorb the viruses. They also contain the molecule of life, DNA (deoxyribonucleic acid) and the RNA (ribonucleic acid) used to duplicate the DNA chains that contain the genetic information of the virus.

Without a cell wall or means of mobility, viruses are unstable and readily destroyed by a fish's natural defence systems, but a weakened fish may allow the virus to gain a hold on its cells where it (the virus) can reproduce until it overwhelms the fish. Some viruses remain in the skin, giving tumours; others



Microscope view of gill filaments damaged by Gas Bubble Disease.



Fish gills (stained for microscopic examination) showing swellings caused by toxic damage — in this case, formaldehyde, as a result of over-dosing.

migrate to a particular organ, causing death when the organ fails. . . some even remain living within the host like a parasite, so the fish becomes a carrier to infect others. Parallels with humans are the common cold or the terrible AIDS virus.

There are no cures; antimicrobial agents (e.g. antibiotics) are not effective against viruses. Even anti-viral agents like Interferon have proved less effective than scientists hoped. The only cure is to alleviate the symptoms so that the fish can develop its own immunity — just like we do with a common cold or 'flu. Therefore, a fish with viral problems (Carp Pox in Koi or Lymphocystis in marines for example) can only be treated by maximising the water quality and giving perfect husbandry for the particular species.

The anti-viral agency that the fish produces can be induced by immersing the fish

in a culture of the virus that has been modified in some way to make it inactive, such as heating or irradiation. It is even possible to inject the fish just as we use vaccination for human viral diseases. Experimental work is underway in several countries to produce fish vaccines for farmed salmon, trout and catfish. Some success has been reported in the scientific literature for certain diseases, even for parasitic problems like White Spot. It can only be a matter of time before these vaccines are available to the hobbyist. (see Dr David Pool's article elsewhere in this Supplement for further details).

Bacteria

Next size up from the viruses are the bacteria, single-celled organisms that form into colonies. Some are round, others

cylindrical or spiral, with the colonies in chains or clumps. They reproduce by transverse division; that means, a cell wall forms that divides the original cell into two, with the DNA dividing into identical forms in each of the new cells. This one cell becomes two, then four, eight, sixteen, and so on, this doubling giving astronomical numbers of identical bacteria in just a few hours.

The danger for fish is that many of these bacteria are motile, that is, they have cilia, little whip-like structures, that give the bacteria the ability to move around in the water looking for hosts. Also, many can form spores. When conditions are unsuitable, the cytoplasm (the chemicals of life within the cell) forms into an egg-like shape that bursts from the cell wall and remains in suspended animation until conditions improve. Then, the spore germinates like a seed, and the cell reforms to start reproducing again. The spore can resist heat, freezing, dehydration and many toxic chemicals (such as disinfectants). Bacterial spores in soil samples have been found to be alive after storage since the 17th Century!

Of course, most bacteria are not pathogenic. . . in fact, some are beneficial, or even essential, to the life of fishes. The best-known examples are the *Nitrosomonas* bacteria that convert the ammonia fish excrete to nitrite and the *Nitrobacter* bacteria that then convert that nitrite into nitrate. Another example is found in the Goldfish which has gut bacteria that break down vegetable cells, allowing the fish to digest material such as cellulose. In fact, the Goldfish and its carp cousins have been called 'underwater cows' by nutritionists.

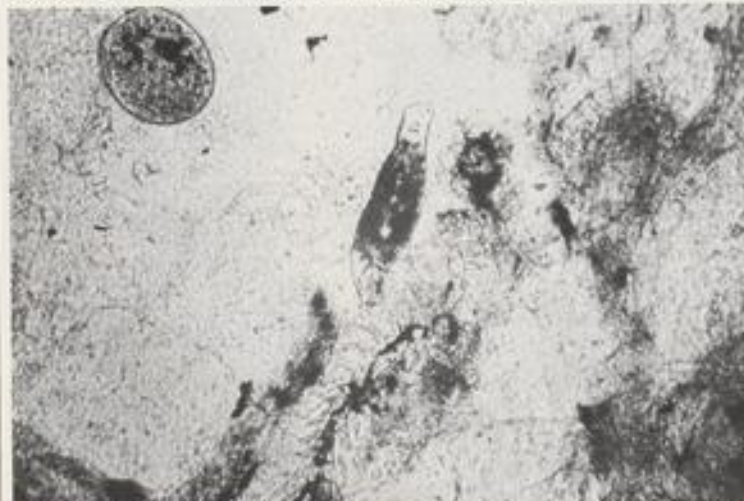
The major pathogenic bacteria in water are *Aeromonas* and *Pseudomonas* spp which cause diseases such as Dropsy and Body Rot. These bacteria are always found, even with healthy fish in a clean tank, but cause no trouble at normal levels. If the tank is overcrowded, the filter gets dirty (especially undergravel filters that keep all the dirt within the tank!) or partial water changes are neglected, the *Aeromonas* levels double and double again until they overwhelm the fishes' natural resistance and start to eat away the edges of the fins (Fin Rot).

Cleanliness is the answer to bacteria. In emergency, however, antibiotics are remarkably effective, but it is a waste of time and money if the water quality is not improved at the same time. The pool of bacteria just develops again, possibly with resistance to the antibiotic chosen, so the second infection leads to the fishes' death, despite treatment.

Protozoans

Another leap in size of pathogen gives the protozoans. Much larger than bacteria, but still needing a microscope for identification, protozoans are complex life-forms that feed on organic material. If that material needs to be alive, then the protozoans are parasitic, and the damage they do leads to disease.

The most common protozoan is freshwater White spot, *Ichthyophthirius* or its



This section of a Goldfish's gills shows a protozoan, *Ichthyophthirius* (Whitespot) at 11 o'clock and a trematode (Gill Fluke) centrally. A simple salt bath would have cleared both.

marine fish equivalent, *Oodinium* or *Cryptocaryon*. These are Sporozoans, all of which are obligatory parasites. They are spore-like with strong cell walls to protect themselves against the fish's natural defences. They reproduce both sexually and asexually.

Other protozoans are the Flagellates, single-celled animals with a flagellum or whip-like structure that whips the animal through the water. You can see them whirling around under the microscope if a swab is taken from a fish with characteristic scratching or flashing behaviour. These protozoans bury themselves in the mucus of the fish that normally is just a thin slimy coat to allow the fish to slide through the water when swimming. If the water is toxic (overcrowding, dirty, ammonia or nitrite present etc.) the fish reacts by forming extra mucus... sometimes so much it is visible (as in Velvet Disease). The organic matter this supplies to the protozoans encourages reproduction and the fish becomes covered in 'ectoparasites'. The irritation gives more mucus and the fish is on a downward spiral.

Antibiotics are not effective against protozoans... they need powerful chemicals to kill them. This is why treatments such as copper (for example 'Aquarian' No.8 White Spot Cure is a copper compound) are used. Another method suitable for large fish such as Koi is to immerse the fish in a salt solution. This doesn't kill protozoans, but they do not like the change in water chemistry (water physics, actually, because it is the osmotic pressure changes that do the trick) and so 'let go' and drop off the fish. This is why salt baths for pondfish must be carried out in a separate tank and the bathing water discarded... there is no point in treating the pond.

Still single-celled animals (and, therefore, protozoans), the Ciliates are larger and more complex. They usually have a fixed shape with tough cell walls striated with troughs carrying tiny hairs (cilia) that wave together to propel the animal through the water.

Unlike Flagellates that whip around randomly, the Ciliates can move with purpose, to find a fish to parasitise, or another Ciliate to conjugate with (reproduce sexually). However, they can still reproduce asexually, so one Ciliate can become many if conditions suit them.

Helminths

The next stage in size is for creatures that can grow to be visible to the naked eye. These are the worm-like pathogens and many are gut parasites introduced via live aquatic foods such as *Daphnia* and *Tubifex*. Others lay eggs that are eaten by fish and develop internally into Tape Worms longer than the fish itself, or can be seen protruding from the anus of fish such as *Camallanus* in Guppies.

The Helminths are tough... anything that will kill them would also kill the fish. There are several compounds, however, that they do not like, called the Anthelmintics, which make the worms let go of their host and get passed through the gut. Veterinarians

can prescribe the most powerful Anthelmintics and some non-prescriptive forms are available as 'Worming Powders' for dogs and cats. These are mixed with the fish's food as a one dose treatment and, 24 hours later, the base of the tank is thoroughly cleaned to remove any shed parasites (better still, use a medicine tank and move the fish out after treatment).

Helminths are pathogens although they may not produce disease symptoms themselves. Most wild fish carry some parasites of this group throughout their lives. The problem is that the damage the parasitic feeding may do to the gut lining can allow pathogenic bacteria to enter the fish and then disease does occur. (see Dr Robert Goldstein's article in this Supplement for comprehensive coverage of parasites).

Substances

The non-living pathogens are toxic substances, usually chemicals, that cause massive fatalities in fish, a condition all too common in this modern world.

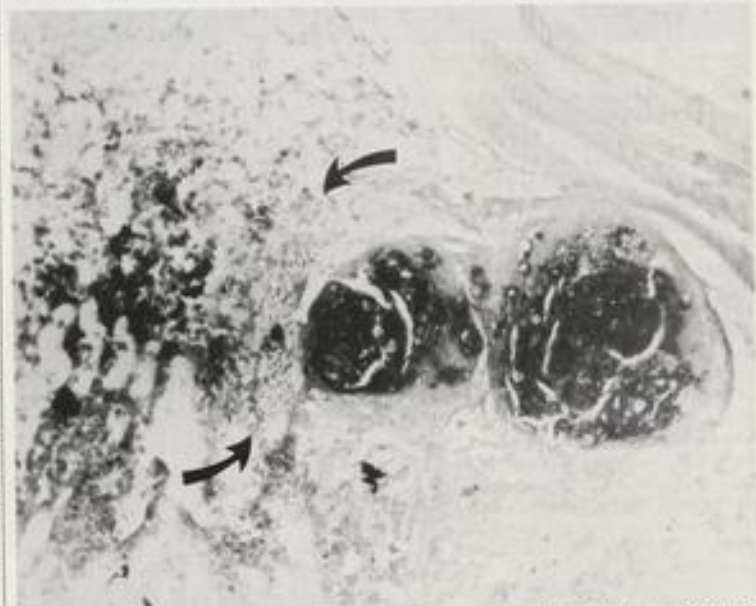
swimming rapidly and trying to jump out. Death can be rapid in some freshwater species kept below pH5 and the fish die in a natural position.

In alkaline waters of pH9 or more, the fish become lethargic and develop frayed fins and a translucent skin. These fish die in an unnatural position.

There are so many toxic substances pathogenic to fish that it is impossible to list them, but the following are the most common ones met by the ornamental fishkeeper.

Free Chlorine

To kill off any bacteria in drinking water, the Water Boards add chlorine to a level of 0.2ppm. If necessary, this can be increased, but, at 0.4ppm, the chlorine is noticeable as an odour when the tap is turned on. A level of 0.2ppm is acceptable to most species of fish, but, at 0.4ppm, the chlorine will destroy gill filaments, so the fish cannot absorb oxygen properly and is condemned to die some hours, or even days, later. Never use fresh tapwater if the smell of chlorine is noticeable.



Stained tissues from the liver of a tropical fish. The arrows point to clusters of bacteria (magnified 250 times) called "tubercles"... Therefore, the fish has tuberculosis (Fish TB).

The sensitivity of fish to chemical pollution is well documented. This kind of research is carried out by the Ministry of Agriculture, Fisheries and Food, the Water Research Centre, the Freshwater Biological Association and similar bodies in other countries. Publications such as 'The acute toxicity of 102 pesticides and miscellaneous substances to fish' in *Chemistry and Industry* (1975) are well-known data bases referred to by scientists in this kind of research.

Other conditions causing pathogenicity include acidosis and alkalosis. The majority of freshwater fishes accept water in the pH range 6 to 8; marine fish pH8 to 8.3. In low pH (acidic) water fish show distress by

ble. Age it, boil it, or add a dechlorinator, even if the water is only used for partial changes.

Metals

Copper is deadly, but it is not really present in water from domestic copper pipes, despite the warnings in every beginners' book on fishkeeping. There may be a trace from brand-new pipes, but a short flushing will remove this.

There is an often-published method of killing snails using a battery and wires dipping into the tank. It is not the electricity that kills the snails but the copper that



Ulcer and Fin Rot in a Common Goldfish — usually a sign of poor water quality when both are seen on the same fish.

dissolves in the water from the wires. There is too fine a dividing line between killing snails and killing fish for this method to be recommended.

The greatest danger to fish from metals is in the marine aquarium because seawater will dissolve most metals, whereas freshwater will just leave what is called a passive coating (an oxidised layer that stops further chemical activity). That is why aluminium can be used as a hood in the freshwater tank but must never (in my opinion) be used over the marine tank. Lead, too, is very poisonous in solution, but the passive layer allows its use as a weight in freshwater, but again, never use in seawater.

Iron is tolerated at quite high levels; this is why the old-fashioned rusting metal framed tanks did no harm, other than to spring leaks! Zinc is deadly, so never use zinc baths for fish (such as the old-fashioned water tanks in lofts) or use brass fittings with their zinc and copper content.

Other metals

Research has shown that even the common metal ions like sodium, magnesium and potassium can be toxic to fish, if in excess. These elements do occur in nature, but the ever-present calcium in natural waters has the effect of neutralising the metal ions' toxicity. That is why lime can be added to ponds (not in excess of course) without harming the fish (to neutralise acidity or encourage algal growth for carp) because lime is a salt of calcium.

This is also the reason why Permutit and similar domestic water softeners must not be used in fish tanks. They replace calcium with sodium, so the water does not react with soap, making it feel 'soft'. Removing the calcium takes away the fish's protection, and

the increased sodium can then be toxic. To soften water chemically, it is essential to use an ion-removing resin, not an ion-exchange resin. If the resin is rechargeable with brine, it is unsuitable.

Air-borne compounds

Air-borne toxins include aerosol sprays, not only insect killers, but also cans of polish or air fresheners; don't use them near tanks.

Cigarette smoke is a killer (for everybody) which can concentrate nicotine and tars in the water by bubbling smoky air through the aquarium via the airpump. If you can't give it up, place the airpump elsewhere and run a long airline tube through the wall or window frame.

Pond pollution

Never use garden sprays near the pond. Weed killer is deadly to fish, so are insect sprays or combined feeders and treatments for roses etc. However, a new cat/dog liquid repellent (Rearguard) from Interpet is harmless to fish.

If the pond is on or near a farm where

commercial spraying is done, the slow water change technique is useful. Arrange for the pond to overflow at some point where it is not a problem to soak away. This should be surface flow so the top water is skimmed off.

Seal a long length of airline tubing into a cork (Araldite is best) that fits into the nearest tap in the garden or garage etc. Run the line under the soil (this hides it and stops freezing in winter) all the way to the pond, where it can drip water constantly. The amount is too small to cause chlorine problems, but a surprising amount of water is actually added in 24 hours, certainly enough to skim off chemicals settling on the surface. This is still legally a hosepipe, of course, so do not use when a ban is in force.

DISEASES

Diagnosis

The diseases that these pathogens create are well-known, and treatments are listed in many aquarium books or leaflets within proprietary remedies packs. It is the unknown disease that causes the biggest problem, because the hobbyist tends to treat and hope. A little study and thought may

BOOKS

For more information, especially on postmortem examination techniques, read the following books. The more expensive ones can be borrowed via the local library, so one can be chosen to buy as a suitable reference book for your level of interest in the subject. Any pet or aquarium shop can obtain the books.

From Interpet Ltd:

A Fishkeeper's Guide to Maintaining a Healthy Aquarium by Dr N Carrington, Salamander Books, (1985), ISBN 0 86101 233 6

The Interpet Manual of Fish Health by Dr C Andrews, A Exell and Dr N Carrington, Salamander Books, (1988), ISBN 086101 368 9

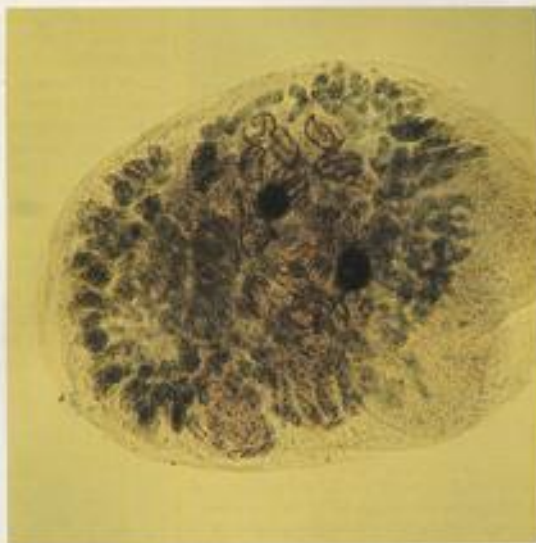
From TFH Publications:

Handbook of Fish Diseases by Dieter Untergrasser, TFH, (1989), ISBN 0 86622 703 2

Textbook of Fish Health by Dr G Post, TFH (revised 1987), ISBN 0 86622 491 2



Some parasites, like this isopod, are very large indeed. Isopods are common in the gill cavities and mouths of both marine and freshwater fish but do little damage despite their size. This particular isopod occupied practically the entire mouth cavity of its host.



This is an adult digenetic trematode removed from the gut of a Moorish Idol. It has two dark testes, abundant yolk glands all around the body and about one dozen amber-coloured, angular eggs in the centre of its body.

FISH PARASITES

Dr Robert Goldstein takes a close look at some of the common, as well as some of the rarely-encountered, parasites that attack freshwater and marine fish.

(Photographs by the author)

All animals have parasites ... unless they're sick! I've conducted thousands of examinations of living and dead bony fishes, elasmobranchs (cartilaginous fishes), birds, mammals, reptiles and amphibians. In most cases in which I failed to find parasites, the host was extremely debilitated and had probably shed them. Put another way, the fittest, healthiest animals were the ones with the heaviest parasite loads. And why not? You don't get hitch-hiking parasites unless there is a surplus of food. Keep this in mind when you do an examination. The finding of animal parasites is frequently an indicator of health, not disease.

A lot of people presume that parasites takeeth away and doeth dirt, while symbionts offer succour or remain neutral. Symbiosis is an almost meaningless word, referring only to the living together of organisms. And, like marriage, there are all kinds of costs, benefits, and outcomes to the relationships.

A parasite is an organism that has a NEED to live in or on another organism, while the 'other' doesn't require the parasite. In some cases involving viruses, the presence of one kind of parasite actually protects the host against being attacked and debilitated by a

nastier parasite, which now has no anchorage; that phenomenon may be more widespread in nature than we know.

The parasite may need the host either for its entire life or only a brief period, and the relationship might be obligatory or an option. So you can see that 'parasitism' is also a pretty vague concept.

While most parasites in the natural environment do little or no discernible harm, there are some that put a strain on the host. If the host is sick or otherwise debilitated, that added strain may be too much to bear. What happens then? Well, if the parasite can't get enough nourishment, it perishes or drops off/out. If the host can't take the strain, it eventually dies and the parasites, having nowhere to go, die as well.

What about the unnatural environment? Under the sometimes stressful conditions of captivity, the host may find that it uses excessive physiological effort to cope with a deficiency in essential nutrients, lack of exercise, lack of high quality water, lack of sufficient oxygen, a noxious environment filthy with waste products, or constant exposure to infectious microbes. Just staying alive takes a tremendous effort.

Such a highly stressed host is susceptible to being overwhelmed by the demands of

normally innocuous parasites which become the straws that break the camel's back. Are the same two outcomes inevitable, the host either dying and killing the parasite in the process, or the host shedding the parasite? There's now a third possible outcome.

In the home aquarium, as in agriculture, silviculture, and fish farming, susceptible, stressed hosts are crowded together. Transmission of parasites (like cold viruses or certain worms) from neighbour to neighbour is unavoidable and inevitable. Epidemics occur, parasites multiplying in each successively infected host, spreading to new hosts, and dying as their worn-out hosts die. Think of the 13th Century Black Death where plague bacteria were spread from person to person by sneezes and pulmonary and nasal droplets. The same thing can happen under aquarium or fish farm conditions of host-to-host transmission.

Fortunately for the fish, and for us, that's not the way all parasites spread. For example, tapeworms, many roundworms, and all the digenetic trematodes (internal flukes) have complex life cycles requiring at least one intermediate host, one that may not be in the aquarium. We'll go into that in more detail later, but for now, I'd like to take a look at how to diagnose parasite infestations.

SPECIAL NOTE: If in any doubt whatsoever, don't carry out any of the examinations outlined below yourself. Consult a specialist professional instead.

PERFORMING AN EXAMINATION FOR PARASITES

Some parasites are large and readily seen with the naked eye, while others are so minute as to require the use of a microscope. You can see many larger external parasites if the fish is placed in a small aquarium in angled sunlight and scanned with a magnifying glass. Many larger crustacean parasites, like Fish Lice and Anchor Worms, are immediately apparent to anyone who simply looks for them.

Some giant (three-quarters of an inch/1.9cm long) isopods live in the mouth, the gill cavity, or the body cavity. You can prop open a fish's mouth or gill cover with a toothpick; the Pill (bug-like) Isopod is so large that it cannot be missed. Discus and other imported Neotropical cichlids sometimes have huge isopods in the body cavity;



Most tapeworms are dull, but not this *Acanthobothrium* taken from an elasmobranch (cartilaginous fish). Note the pairs of wishbone-shaped hooks.

you'll see their legs waving through a hole in the fish's abdomen.

Some intestinal parasites shed eggs with the fish wastes, so you can siphon wastes from the bottom of an isolation jar and examine them under the microscope. Digenetic trematode (internal fluke) eggs typically have a lid or operculum and are thin-shelled. Roundworms (nematodes) sometime shed living tiny larvae; when they shed eggs, the eggs tend to be thicker-shelled and never have a lid. Acanthocephalan (thorny-headed worms) eggs are similar. Tapeworms shed eggs or segments containing eggs or both. Their eggs can look like almost any other kind of egg and are usually difficult to identify; the segments, however, are typically mobile and each one looks like an individual squarish or elongated lumpy worm with one squared-off end.

Gill and skin flukes (Monogenetic trematodes) are mostly small, less than the

thickness of a hair, and only a millimetre or two long. They're hard to see. If a fish is anaesthetised (e.g. by using a fish anaesthetic, or by blowing carbon dioxide into the water with a straw) the gill cover can then be lifted. The granular blackish or amber egg masses are inside the minute, translucent white worms. Those on the skin are usually visible with a magnifying glass, and may be so abundant as to resemble hair all over the fish.

What about a dead fish? There are some very simple ways to do a necropsy. The first rule is, however, that you won't learn anything if the fish has been dead very long.

The best preservative is one part commercial formalin which you can buy at a drug-



Argulus, the Fish Louse, occurs on all kinds of fishes and is best removed with tweezers.

store (it will be labelled 37% or 40% formaldehyde; ignore those numbers) to nine parts of ice-cold water. If you don't have formalin, substitute full-strength whisky, vodka or gin, or (as a last resort) half-strength rubbing alcohol.

It is best to examine a freshly-dead fish that is not preserved at all. First, check the skin for anything suspicious, and then pick it off with tweezers and examine it under a microscope. Examine the inside of the mouth with a toothpick and tweezers.

Next, lift up the gill cover, and cut it away with cuticle scissors. I usually lift each gill arch for a separate examination. When I'm done, I then cut all the arches at the bases, and examine each gill arch separately in water, teasing the gill filaments apart with a needle or toothpick.

The intestinal tract of a healthy fish often has parasites. Cut the belly of the fish open from the urogenital vent(s) to the throat. Pull out and uncoil the intestinal tract by tearing the thin membrane holding it together. Separate the tract into lower gut, upper gut, pyloric caeca area (it looks like a bunch of tiny bananas surrounding the gut), and the flaccid, loose stomach area.

With each section of intestinal tract separated into different dishes, cut each one open along its length, or simply tear it open with needles. Brush and squirt the contents free of slime and debris, and look for the worms or eggs. The most common tapeworms look like strips of flat, white segmented tissue and only occur in the small intestine. They are easily brushed free. Thorny-headed worms (*Acanthocephala*) are also only here, but they are attached to the intestinal wall; they have the ability to absorb huge amounts of fluid and can be flattened like tapeworms or rounded like nematodes.

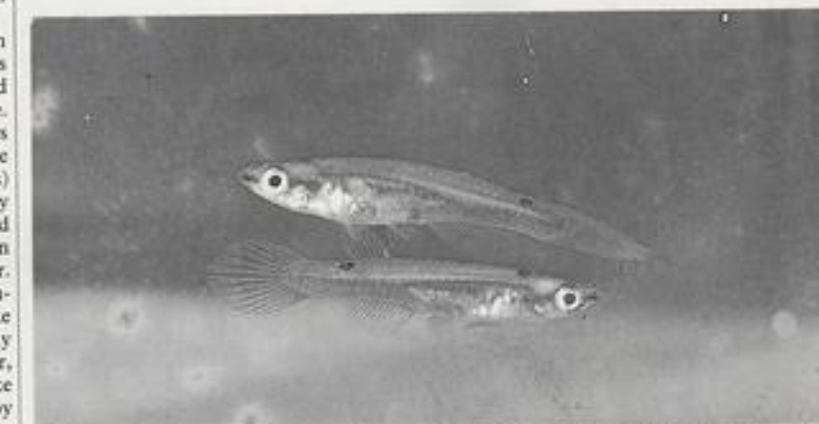
Digenetic trematodes look like pieces of translucent white or pink skin that can be slid over the host by simply pushing with your finger. They can be anywhere inside the intestine, outside on the liver, within the bile ducts, inside the heart and blood vessels, or loose in the body cavity. Nematodes (hard, tightly coiled, rounded worms) can also occur any place at all.

All parasites should be studied alive when possible, and preserved quickly thereafter.

Okay, so you've done the examination and recovered some parasites. You've even identified them with the help of some pictures in fish disease books. But what does the information mean?

MONOGENETIC TREMATODES — SKIN AND GILL FLUKES

These common, important external parasites graze on gill filaments, blood, slime, or



Black-spot in a fish indicates areas of encysted dormant larval digenetic trematodes . . . just waiting for the fish to be eaten by a bird. The fish is a Killie: *Aphyoplatys duboisi*.

epithelial tissues. Some may even transmit infectious bacteria, protozoa, or other disease agents.

A few skin or gill flukes on a host are not important, but they sometimes multiply into hundreds of worms that can debilitate or even kill the host.

They are called "monogenetic" because they go through a direct life cycle. Adults are sometimes livebearers, but usually egg-layers. The eggs have long filaments that snag on the gills of the same or nearby fish (hence the importance of crowded conditions), where they hatch into juveniles that remain where they are, feed, grow up, and reproduce. One parasite can become hundreds, and transmission from fish to fish can cause epidemics.

While a few species of these flukes can only live on particular kinds of fish, most aquarium species of monogenetic trematode are not specific and can attack a variety of fishes.

Although virtually all monogenetic trematodes are gill or skin parasites, there is one group that lives in the urinary bladder of tree frogs! Tree frogs may visit water for a brief period at two or three years of age to breed. The individual worms mature and lay eggs, which are then shed to the outside in the frog's urine, but only when the host tree frog returns to the water to breed, and at no other time. So how does the worm know to produce eggs? Russian studies have shown that the tree frog's sex hormones, which cause the frog to mature and head for water, are also physiologically effective on the worms, causing them to mature and begin egg production.

Formalin, about four to ten drops per US gallon, *(see footnote) is the drug of choice for treating gill and skin flukes, but there are proprietary remedies as well. Use whatever it takes, as the various species of monogenetic trematodes, and fish hosts, have sensitivities to the drug. I usually start with four drops



Monogenetic trematode taken from a catfish (*Pseudoplatystoma*). Note the attachment 'anchors' at the rounded end.

per gallon, and continue adding until the worms either drop off or the fish become very agitated. Usually, the worms are more sensitive than the fish.

DIGENETIC TREMATODES — INTERNAL FLUKES

Much ado about nothing. Remember your Shakespeare? I tell you what one needs to know about digenetic trematodes, and, whether you're an aquarist or a collector, you're going to be surprised.



A Black-spot larval digenetic trematode — *Neascus* — (stained with dye) removed from the skin of an African Killifish (see also photograph of infected fish in this article).

Aquarists often find fish with black spots on the body (Black-spot Disease) or yellowish white lumps (Yellow-grub Disease) on the rim of the eye, the mouth, or elsewhere. The fish are always pond-raised or wild, but never stock that was raised by another aquarist indoors. People worry about the 'disease' spreading, and buy all kinds of remedies, such as picric acid of a snail-killer. Or, you might do an examination of a dead fish and find digenetic trematodes, looking like bits of flesh, in the intestinal tract or elsewhere, and wonder what drug to get in order to keep this 'disease' from spreading.

Relax! Digenetic trematodes have life cycles that require a snail (usually) host. The adult worm lays eggs that get outside and hatch to produce a tiny, ciliated infective larva that seeks out a snail. When it sniffs the right kind of snail (and it must be only a certain kind), it burrows inside and goes through several stages of metamorphosis and multiplication. Finally, a new kind of larva emerges from the snail and seeks out a fish or another kind of host.

There are multiple variations. The simplest variation is that the egg is eaten by the snail, eliminating the ciliated larval stage. Another variation is that the fish skin is a dead end, for this fish is not the final host. Or the larva that emerged from the snail encysts, not on the fish, but on vegetation. The final host might be, for example, a vegetarian mammal or a fish-eating bird. That's the case for Black-spot and Yellow-grub. In the bird, those dormant parasites break out of their cysts, mature, and lay eggs

inside the throat of a certain kind of heron or other waterfowl.

What does this mean in terms of our fish? It means that Yellow-grub and Black-spot are dead-end conditions that cannot be 'cured' in the aquarium, but neither can they get worse or spread from fish to fish. In order to have an epidemic in your fish room, you would need the right kind of snails. And, of course, a heron!

It is, obviously, possible to go out, collect wild snails, put them in your tanks, and have your fish come down with symptoms of Black-spot or Yellow-grub. However, in all my years of experience, I've never seen this happen anywhere except at tropical fish farms, which typically attract fish-eating birds.

Furthermore, I have seldom found cases in which the number or volume of adult digenetic trematodes inside a fish could be attributed to its demise or even its debilitation. Usually, I've found large numbers of worms in fat, sassy wild fish that had expired from water quality degradation ([eg] being in the shipping bag too long), drug overdose (usually copper), chlorine (failure to dechlorinate), or rapid pH change.

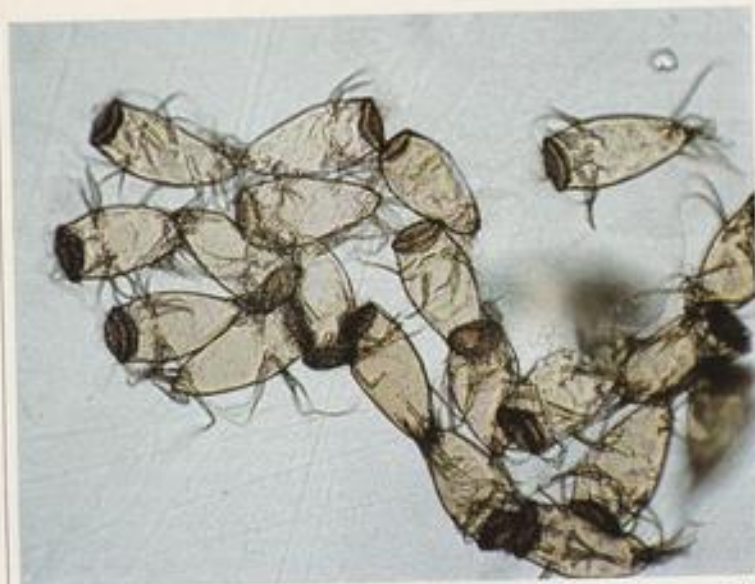
Q When are digenetic trematodes bad?

A When YOU are the host. If you're planning a collecting trip to the Tropics, you'd be wise to avoid direct contact with the water in areas known to have Schistosomiasis (= Snail Fever or Bilharziasis). Write to the Centre for Disease Control (or its equivalent in your country), and ask if your target locale has this disease or any other of which you should be aware.

Species of schisto, which are digenetic trematodes, live in the blood vessels of birds and mammals. A few species live in man. The disease is endemic in some parts of the world because people defecate or urinate in the same water in which they wade or wash clothes. The schisto eggs hatch in that water, their larvae find the right kind of snail, multiply, and are then released from the snail in large numbers. These late-stage



Nematodes can be found anywhere. In this case they are encysted in a Serpae Tetra, and are untreatable.



These unusual tapeworm eggs, found on a small shark, don't look like tapeworm eggs at all — more like tiny insects.

larvae then seek out human skin, which they penetrate. They then go to your blood vessels, mature, mate, and lay eggs that, in many cases, get lodged inside, rather than getting outside. In severe infestations, there is great debilitation even from brief exposure. The famous killifish scientist, Colonel Jorgen Scheel, almost died from schisto, and several other aquarists have had similar experiences.

NEMATODES — ROUNDWORMS

Nematodes are usually tannish, yellowish or off-white, and coiled like a watch spring. Like digenetic trematodes, nematodes most often occur in wild fish, and usually indicate a healthy host, rather than a cause of disease.

There are exceptions, of course. One group of long, very thin, usually reddish roundworms occurs commonly in the intestine of livebearing and other aquarium fishes and, apparently, can be spread from fish to fish by consumption of the larvae. Other nematodes are spread by aquatic insects and may have complex life cycles. Most, however, require only the one host.

The worms can sometimes be eliminated from the intestinal tract with some very harsh drugs that also weaken fish. If the nematode has a location other than the intestinal tract, it is virtually impossible to eliminate.

The only class of mild drugs known to be very effective in treating intestinal nematodes, thiabendazole and its newer relatives, is not being marketed for the pet fish trade to my knowledge and, in any case, that would not be my treatment of choice.

In the case of a red nematode intestinal infestation, the best control is isolation and destruction of the infested stock, and disinfection of the aquarium with formalin and bleach, followed by a week of drying.

Because nematodes are so resistant to destruction, any delay in isolating the problem tank only extends the risk of infestation to your entire fish stocks.

CRUSTACEANS — ISOPODS AND COPEPODS

Isopods and copepods are outdoor parasites that only come indoors with host fish that are wild or grown in hatcheries. Except for *Argulus* and *Ergasilus*, these creatures are usually non-reproducing under aquarium conditions and cannot cause epidemics.

Anchor Worms, left alone, tend to live a long time, grow inside the fish, and can kill the host. But they don't multiply. They are

unsightly in show pondfish, and can be killed by snipping (not pulling; they won't come out). Be mindful of the risk that the imbedded remains of the dead parasite, whether killed by chemical or scissors, may cause a gangrenous-type necrosis (dead tissue) that could kill the fish.

Hole-in-the-body of *Discus* and *Severum* is caused by a large parasitic isopod that lives in a cyst in the abdominal cavity. Untreated, the fish may survive a long time in high quality water. Any chemical treatment at all may agitate the parasites into tearing the fish's blood vessels and intestinal wall, putting the fish at great risk of septicemia.

Argulus (Fish Lice) wander over the surface of fish, puncturing them with poisonous jaw structures and sucking their body juices. They are easily removed by lifting them from the fish with tweezers or toothpicks; I would not recommend trying to eliminate them from an aquarium with chemicals although some remedies/treatments do exist.

For all crustaceans, especially the tiny, gill-inhabiting *Ergasilus* group most common and abundant on African Rift Lake Cichlids, *Dipterex* has long been the fish farming industry drug of choice, but check with a vet on its availability.

OTHER PARASITES

I haven't covered leeches, thorny-headed worms, or several other less important groups of parasites. If you want to learn more, use the available hobby books. There is a wealth of information available on parasites of fishes and, if you're like me, you won't run out of new parasites, new diseases, new treatments, and new ideas for protecting your fishes.

Footnote: US gallons are slightly smaller than Imperial (UK) gallons (1 Imp gal = c1.18 US gal).



Ergasilus copepods from African Rift Lake Cichlids can infest the gills by the dozens.

Some Worm and Crustacean Infections

1 WORMS

Symptoms

Inflamed gills; excessive secretion of mucus on gills; accelerated respiration; gill covers may be held open; scratching of gill covers on plants, rocks and equipment

Inflamed patches on the skin and fins; erratic swimming; excessive secretion of body slime; accelerated respiration (if gills are affected); some loss of colour; scratching on plants, rocks and equipment

Lumps (cysts) in muscles; mainly among newly imported fish; no apparent discomfort or progression of the symptoms detectable.

Exhaustion; anaemia (detectable by the pale colour of the gills)

Retarded growth; abnormal swelling of abdominal region, sometimes causing lopsidedness; body may lose weight and appear thin despite swollen belly

Pointed red thread-like structures protruding from anus

Extended abdomen; general debility; one or more worms protruding from abdomen

Emaciation; exophthalmia; small bumps may be detectable in the abdominal region

2 CRUSTACEANS

Nervous swimming and jumpiness; frequent, vigorous scratching against rocks and equipment, often resulting in loss of scales; heavy infestations are accompanied by anaemia and loss of colour; the almost-transparent parasites can be seen attached to the body mainly along the fin bases (adult parasites can be nearly 1 cm long)

Long, thin, white worm-like parasites (up to 2 cm in length) attached to the body and/or fins; two white egg-sacs at the posterior end are usually visible

Disease

Gill Fluke Infection

Skin Fluke Infection (may also affect the gills)

Internal Fluke Infection (caused by metacercariae — an immature stage in the parasite's life cycle)

As above

Tapeworm Infection

Roundworm Infection

Roundworm Infection

Thorny-headed Worm Infection

Fish Louse Infection

Anchor Worm Infection

Causative Agent

Dactylogyrus spp — a Monogenetic Trematode

Gyrodactylus spp — a Monogenetic Trematode

Digenetic Trematode, e.g. *Cloostomum*

Digenetic Trematode (often *Sanguicola*)

A Cestode, e.g. *Ligula*

Nematode — *Camallanus*

Nematode — *Capillaria*

An Acanthocephalid

Argulus spp — usually *A. foliaceus*

Lernaea spp

Treatments

Some proprietary remedies are available based on a range of compounds, e.g. Copper Sulphate; salt bath (10-15 gm/litre for 20 minutes or 25 gm/litre for 10-15 minutes); Formalin (20 ml commercial formalin/100 litres) 30-45 minutes; Methylene Blue (3 ml of 1% stock solution/10 litres) indefinitely

As for *Dactylogyrus*

No effective cure but individual cysts may be removed with a sterile blade or needle and the area disinfected with a proprietary aquarium disinfectant; spontaneous recovery sometimes occurs; fatalities are usually rare

No effective cure; spread may be prevented by eliminating snails which can act as hosts

No treatment available; rare in aquarium species

No treatment readily available but trichlorphon (1 mg/litre) has sometimes proved effective (check on availability)

As for *Camallanus*

No treatment available, but light infestations can be tolerated by otherwise healthy fish: the infestation may not even be detected

Organophosphate bath (e.g. Dip-terex or Naled — follow instructions closely); Potassium Permanganate (1 gm/litre for 30-45 seconds or 1 gm/10 litres for 5-10 minutes); physical removal of individual parasites with forceps followed by disinfection with a proprietary disinfectant, e.g. an Acriflavine-based compound

Organophosphate (as for *Argulus*). Some proprietary remedies are available, e.g. based on Copper Sulphate; Potassium Permanganate — as for *Argulus*. Salt bath (10-15 gm/litre for 20 minutes or 25 gm/litre for 10-15 minutes); Trichlorphon (1 mg/litre) indefinitely may also dislodge the parasite (check on availability)

RECENT ADVANCES IN FISH HEALTH

Dr David Pool — Head of the Tetra Information Centre — reviews the latest developments in the fast-expanding field of health care.

(Photographs: Tetra)



Anemones and Anemone fish. The recent development of marine fish remedies without copper allows fish in invertebrate aquaria to be treated without first removing them.

There are numerous factors which influence the health of our fish to a greater or lesser affect. Disease, nutrition and water quality have an obvious influence on health, but we should also consider immunology, fish interactions, genetics and toxicology, each of which affects the wellbeing of ornamental fish. Our knowledge in all of

these areas is increasing rapidly and, in this article, I hope to discuss some examples of how this can affect ornamental fishkeepers.

CHANGING ATTITUDES

Our overall attitudes to fishkeeping have changed considerably in the last 10-20 years. Most fishkeepers have now entered the



Discus community. Healthy Discus in an aquarium — it is now easier than ever!

modern hi-tech world and are using advanced equipment, water treatments and foods in order to maintain their fish in the best possible condition. Along with the technology, there is also a better understanding of the conditions that the fish require in order to remain healthy.

This combination has resulted in many fish that were once regarded as "difficult" to keep now being found in many aquaria and ponds. Koi provide a good example of this. In the 1960's, when they were first imported into the UK, few hobbyists kept them successfully. Now they are found in ponds in every town and village.

INCREASED AVAILABILITY OF KNOWLEDGE

Information on the more common varieties of fish diseases, including their life cycles, conditions they favour, and how they can be controlled, has been available for many years in specialist texts, often written in a very scientific way.

Now, with Supplements like this one, and recently published texts such as *The Manual of Fish Health* by C. Andrews, A. Excell and N. Carrington, and *Water Chemistry and Fish Diseases* published by Tetra, this information is available in an easy to read and understandable form.

Information services are also available to help fishkeepers with any problems with fish health, or any aspect of fishkeeping. These are provided by the major aquatic companies, with the best in the know being the Tetra Information Centre and 'Aquarian' Advisory Service. Free information literature on all aspects of maintaining healthy fish is available on request, and a more detailed reply can be provided if required.

VETERINARY SURGEONS

Until recently, there were very few vets in the UK who had any knowledge of fish health and, consequently, fishkeepers had no local source of expert help should severe problems develop.

Fortunately, this situation is changing rapidly, and there are now over 250 vets throughout the country with some knowledge of fish health. For obvious commercial reasons, many of the vets with an in-depth knowledge of fish health are associated with the fish farming industry. However, with ornamental fish now being the third most popular pet in the UK, public demand has resulted in many other vets taking an interest.

There are now a number of courses which veterinary surgeons can attend in order to gain further information on fish health. These range from a one-year MSc course on Aquatic Veterinary Studies at Stirling University, to two-day courses organised at venues throughout the country.

NEW DISEASE REMEDIES

Continual research by the major aquatic companies has resulted in disease remedies being updated and improved on a regular basis. Such improvements not only incorporate new chemical methods of killing parasites, but also better ways to administer the chemical and improve its efficiency. The end result of these improvements is that most diseases can now be treated more quickly and effectively than before.

Notable developments have occurred with the remedies for marine fish diseases. Very effective copper-free remedies are now available which can be used in marine aquaria containing invertebrates.

The UK differs from other countries in that there are a number of remedies which are only available through a veterinary surgeon. These 'prescription only' medicines, which include antibiotics, are being used in increasing quantities by ornamental fishkeepers. In many cases this is by Discus and Koi-keepers who have recognised the importance of antibiotics in controlling previously lethal bacterial infections.

Due to demand by both ornamental fishkeepers and fish farmers, prescription-only medicines have now been formulated specially for fish use. These products include antibiotic medicated flakes and pellets, both of which provide an ideal, stress-free method of curing bacterial problems.

Drugs formulated for human and animal use have also found favour in the treatment of some of the more unusual fish parasites. Praxiquantel (manufactured by Bayer) is one example which is widely used to control tapeworm infections in ornamental and farmed fish.

METHODS OF TREATMENT

The methods of applying disease remedies has also developed considerably in recent years. Immersion treatment, where the remedy is added to the water in which the fish swims, is still the most commonly used, owing to the ease with which it can be applied and its effectiveness if used correctly. However, the use of medicated feeds, injection and stomach tubes is now also used by experienced personnel when necessary. These developments can be largely attributed to Koi-keepers who have adapted the methods used in agriculture in order to administer antibiotics to Koi with bacterial ulceration or other bacterial infections.

Unusual methods of disease control are currently being attempted in certain areas of agriculture, which may, in time, catch on in fishkeeping circles. Of particular interest is the use of biological methods of parasite control.

This is being attempted by salmon farmers who keep large numbers of adult fish in cages anchored in remote coastal regions of the UK. These salmon are kept in dense concentrations and, consequently, parasites spread rapidly from one fish to the next. Some success in controlling these parasites has been achieved by introducing Gold Sinny Wrasse into the cages (for further

details see the forthcoming — March — instalment of *Naturalist's Notebook*). The Wrasse pick at and eat the parasites on the skin of the much larger salmon.

Similar behaviour will have been observed by marine fishkeepers who have Cleaner Wrasse or Cleaner Shrimps in their aquaria. It is noticeable that, in such aquaria, diseased fish receive more attention from Cleaner Wrasse and Shrimps than their healthy colleagues.

VACCINES

Vaccination of fish against viral and bacterial disease is the subject of considerable research, funded largely by the aquaculture industry. These vaccines, when fully developed and tested, will be invaluable to the fishkeeper as a means of preventing valuable fish becoming diseased and unhealthy.

The vaccines available at present include those to counter *Vibrio* and Furunculosis, two economically important bacterial diseases which affect salmon and trout. Others,

the vaccine can be administered by placing the fish in a bath of the solution, whereas larger individuals can receive an injection.

RESEARCH

Research into various aspects of fish health is being undertaken at centres throughout the world. The major aquatic manufacturers have laboratories in which work on improving disease remedies, water treatments and foods is being undertaken continually, with direct benefits to the ornamental fishkeeper.

Indirect benefits come from the extensive research being conducted on cultured species such as salmon, carp and shrimps. Although this research is generally directed towards the intensive culture of farmed fish and invertebrates, some of the findings can be used on a smaller scale in ornamental aquaria and ponds. The filters used in a Koi pond are one example, where the basic design developed in fish farms has been developed and refined to give the units available today.



Vaccines currently in the development stage may soon help to prevent ulceration — a common problem in coldwater fish throughout 1990.

still in the research and development stage, include vaccines against White Spot (*Ichthyophthirius multifiliis*), Spring Viraemia of Carp and *Aeromonas salmonicida* — a bacterium often associated with ulceration in Koi and goldfish.

The developmental costs for these vaccines is very large and, at present, it is only the aquaculture industry who are funding this research (they will also receive the major benefits when the vaccines are produced). However, there will be some spin-off for ornamental fishkeepers, as many of the diseases which attack cultured fish are also a problem in aquaria and ponds.

Vaccination of fish will prove to be relatively easy and inexpensive. For small fish,

Universities and Polytechnics also undertake detailed research into parasitic diseases, fish culture etc. The two institutions of particular note within the UK are the University of Stirling's Institute of Aquaculture and Polytechnic South West in Plymouth.

This research continues to produce information which is of interest to fishkeepers and helps to explain previous observations. Take, for instance, the work being undertaken by Peter Burgess at the Polytechnic South West whose research has concentrated on Marine White Spot (*Cryptocaryon*).

Fishkeepers only observe the parasite when it is encysted on the body of the fish. After this, it drops off and sinks to the

substrate, where it reproduces and then releases the infective stage into the water. Peter has observed that the infective stages in different cysts may be released over a period of 4-5 weeks — instead of all at once as is the case with freshwater White Spot — *Icthyophthirius multifiliis*. Consequently, the fish may appear to be free from parasites for up to 5 weeks before the white spots reappear.

This explains some difficulties that have

been experienced in treating marine White Spot, with the remedies only killing any free stages of the parasite and not those that emerge several weeks later.

IMPROVED METHODS OF DETECTION

Experience is important in detecting a fish which is unhealthy and diagnosing what is causing the trouble. Bacterial infections are

more difficult to diagnose accurately, even for fish pathologists. Accurate identification usually requires laboratory facilities and can take several days, for the bacteria to be cultured and identified.

New identification techniques are being developed, such as antibody assays, which will allow much quicker identification of bacteria and other parasites. Antibody assays involve placing some of the bacteria-infected material onto a series of strips or containers of test solutions and then noting any colour changes after a predetermined length of time. The different colour changes which occur are then compared to a key in order to identify the bacterium causing the infection.

Such identification methods will be of particular use to veterinary surgeons, who will be able to identify individual types of bacteria within 24 hours, rather than the present 4-5 days. Once identified, a specific antibiotic can then be prescribed which will control the bacteria and, hopefully, save the fish.

FINAL THOUGHTS

The advances described in this article, and those which will undoubtedly occur in the near future, will help all fishkeepers to maintain their fish in good condition and control disease outbreaks if and when they occur. However, it is important to remember that they will never substitute *knowledge* and *thought*, both of which need to be applied at all times if our tanks and ponds are to remain a credit to us.



Injections were first developed to treat cultured fish, but are now widely used by vets and advanced Koi-keepers to administer antibiotics.

NORWOOD AQUARIUM

Specialist Aquatic Wholesaler

NA 1

- For operation up to 150 24x12x12 tanks
- Low noise level
- Trouble free low cost running
- Versatile system connects to minimum 1 in. pipe



NA 2

- For operation up to 250 24x12x12 tanks
- Low maintenance
- No moving belts
- High performance at competitive prices



TWO TOP QUALITY AIR PUMPS FOR THE PROFESSIONAL

Trade only from: **NORWOOD AQUARIUM LTD**
 631 LIMPSFIELD ROAD, WARLINGHAM, SURREY CR6 9DY
 TEL: 0883 625454 FAX: 0883 624157

Seaview

By Gordon Kay

SNIPPET EXTRAVAGANZA

There is very little that is new for me to report on this month. This page is therefore being given over entirely to Snippets. So, without further ado, let's get on with the Snippet Extravaganza.

CETACEAN SNIPPETS

[1] The vocalisations of Minke Whales (*Balaenoptera acutorostrata*) fall within the range of 80Hz to 20kHz, with some signals lasting only 30 milliseconds.

[2] Humpbacks are sufficiently different from other members of the Baleen family, *Balaenopteridae*, in form and behaviour, to merit their own genus — *Megaptera*. This means "Big-Wing" and clearly refers to the animals' enormous flippers, which are the largest of any whale.

[3] The Humpback Whale (*Megaptera novaeangliae*) spends much of its time in shallower water than the other *Balaenopterids*. It usually feeds and breeds on offshore banks but crosses thousands of miles of open ocean between summer and winter grounds.

[4] The scientific name of the Bowhead Whale — *Balaena mysticetus* — means, literally, "Moustached Sea Monster".

[5] The mouth of the Killer Whale (*Orcinus orca*) is well equipped to deal with large

prey, having 10-12 pairs of large, oval-sectioned teeth in both upper and lower jaws.

[6] Oceanic dolphins (family *Delphinidae*) form by far the largest existing family of Cetaceans, comprising 26 living species of what might be termed 'classic' dolphins. They are distinguished from porpoises by their distinct beak, and they have two or more fused cervical vertebrae and twenty or more pairs of teeth in the upper jaw. No dolphin is more than four metres long.

[7] Did you know that the St. Lawrence Seaway is so polluted that the Beluga Whales living within it are now officially classified as toxic waste? Absolutely disgusting!

MIXED BAG

[1] In the North and South Pacific, a fishing fleet of some 1,500 vessels — from several nations — lays an estimated 20,000 nautical miles of gill nets out every night and sweeps everything larger than the mesh from the seas' top 25 feet every morning. This includes thousands of sea birds, dolphins and seals. Some countries (New Zealand for one) have banned this drift-netting from their waters, but most subsidiaries are in international waters and beyond national regulations.

[2] The West Indian Manatee (*Trichechus manatus*) is a remarkably gentle creature which has a face that only a

mother or another Manatee could love — a blunt snout with nostrils mounted on a box-like head which is two sizes too small for the oval-shaped body, eight to ten feet long (c 2.4-3 metres). Sea Cows (as they are called around their Florida home range) leave the coast in winter to seek warmer havens in rivers and estuaries. It is believed the Manatees cannot endure temperatures below 60°F (15.5°C). Pneumonia is a frequent result, often ending in death. Warm water influences from power stations have proved to be irresistible forms for combating the risk. With a population of less than 1,200, Manatees are one of America's most endangered marine mammals. (For more information on the endangered Manatee, see Rick Gibson's brilliant article *Manatees on the Brink* in *A & P*, September 1990).

[3] Seals are the most diversified of the Pinnipeds (or Flipper-footed) sea mammals, which include walrus. Pinnipeds are divided into two main groups on the basis of their ears. There are those with external ears — the most common of which are sealions — and those without, sometimes called the 'true' seals. Funny, I always thought the 'eyes' had it!

[4] The surface zone — the first 350 feet below the surface — contains only 2% of the volume of the world's oceans, and yet it accounts for perhaps as much as 90% of its living organisms.

[5] Though most Zooplankton are poor swimmers, they easily alter their buoyancy. Daily, they commute between the surface and the oxygen-rich colder water hundreds of feet below, arranging themselves at preferred levels of temperature and pressure. Major concentrations have been found at depths of 5,000 feet (c 1,525m), and some communities have been located as deep as six miles! It is doubtful if these abyssal animals migrate vertically, but others in the water column ascend from as much as 1,600 feet (c 490m) as the light fades. This is the single largest daily movement of animals anywhere in the world, and that includes commuters in any great city!

[6] At low-water mark, where the sand mixes with mud, lug-

worms make their home. They eat mud which they 'enrich' before consuming. The worm digs a U-shaped tube and then lines it with mucus. It then fills one arm of the U with sand and — while hanging onto the wall with its bristles — moves up and down at the bottom of the tube. This sucks water through the tube, trapping food items as it does so. The worm then eats the sand, extracting the food-stuff and excreting the sand in the other arm. After a while, the worm pushes the processed sand out of the tube to form the casts which can be seen on the sands at the seaside. What a carry-on! I'm glad that I just have to go to the chip shop for something to eat!

[7] The mind-blowing statistics department tells me that life first appeared in the oceans about 3500 million years ago. They also tell me that there are some 200,000 phytoplanktonic organisms in every cubic metre of seawater.

[8] Most species of crab live in the sea and breathe by passing water through their gill chambers. Fiddler crabs, on the other hand, have to breathe out of water and they achieve this by retaining water within their gill chambers when they take to dry land. The oxygen in this water is soon depleted, of course, and so the crab circulates it through its mouthparts and beats it into a froth. Having absorbed more oxygen from the air, this water is then passed back into the gill chamber.

[9] Perhaps the most fascinating example of symbiosis is that of the Pearlfish (*Carapus* sp.) and the Sea Cucumber. The fish hunts for plankton at night and returns to its home — inside the Sea Cucumber in the morning. On its return, the fish nudges the cucumber's anus with its nose. Because the Sea Cucumber breathes by drawing water through its anus to irrigate its respiratory 'trees' (see last month's *Seaview* for an item on this), the anus eventually opens and the fish curls its body and sticks its tail in. It then wriggles its body to open up the passage further and eventually disappears!

"Where does he get these 'gems' from?" I hear you say. I'll see you next month.



Manatees — gentle giants under threat.

Coldwater jottings

By Stephen J. Smith



SCOTTISH AMBASSADOR

The celebrations of Burns Night are a major event in the Scottish calendar and, while their after-effects are still lingering, this month's Jottings provide some recognition of an oft-neglected corner of the fishkeeping world.

Scotland is a thriving participant of the pleasurable pursuit of fishkeeping, with the coldwater scene being one of the most popular areas of the hobby. The biggest problem, it would appear, is in obtaining adequate stocks of good-quality fish.

According to correspondent Fergie Brown, from Glasgow,

the nearest place to obtain good quality Fancy Goldfish is in Doncaster, while several specialist Goldfish-keepers travel regularly to Tommy Sutton's breeding establishment in the Midlands.

Fergie Brown's pride and joy is his prize-winning black-and-white butterfly, an eye-catching Fancy Goldfish which has the distinctive eyes of a Moor, beautifully proportioned round body, and an exquisite butterfly-tail. Indeed, this fish is of such a high standard that it won its class at the Northern Goldfish and Pondkeepers' Society Open Show towards the end of last year.

Fergie has been keeping fish for two decades, having started with a tropical aquarium and, in his words, "graduated to Fancy Goldfish." "My main activity is breeding Red Orandas, but I intend to concentrate on some of the new varieties, such as Pom-pons and Butterflies." Such is his interest in the hobby that he is currently PR Officer of the Scottish Goldfish Society and, from the enthusiasm which he has demonstrated during our meetings and telephone conversations, there would appear to be no finer ambassador North of the Border.

Golden Phoenix Fisheries, Bank End Road, Finningley,

Doncaster, DN10 6EX. Telephone: 0302 771667. Contact: Andrew Hudson.

Tommy Sutton, Specialist Goldfish Breeder, 83 Coleshill Road, Water Orton, Birmingham. Telephone 021-749 3711.

SCOTTISH GOLDFISH GROUP

The pleas from these columns for information on societies have not fallen entirely upon deaf ears, and I am grateful for the following details supplied by Alan Gardner, Show Secretary of the Scottish Goldfish Group.

According to Alan, the group has been established for 12 years and consists of members from all over Scotland. Meetings are held quarterly at members' homes, where the hobby receives in-depth discussion, and the member's aquarium and pond set-ups, as well as their breeding successes, are viewed.

The Scottish Goldfish Group's annual Open Show is held on the last Saturday in August, at Davidson's Mains Parish Church Hall, Edinburgh. Last year's event attracted no less than 180 entries from all over Scotland and the North of England, while judges attended from as far afield as Inverness, Edinburgh, Bolton, Altrincham and even Southampton!

Subject to confirmation of arrangements, this 'Coldwater Jotter' is pencilled in for an appearance at this year's show, on Saturday, 31 August. I am happy to support the Scottish Goldfish Group in their appeal for a sponsor for the event, so come on all your manufacturers and suppliers, the hobbyist is doing a great deal to promote the industry, this is so little to ask in return...

Scottish Goldfish Group, c/o 25 Kingsley Avenue, Stenhousemuir, Stirlingshire, SK5 4LE. Telephone: 0324 562782. Contact: Alan Gardner.

MANAGING AQUARIA

The rapid development of the coldwater hobby has resulted in a significant increase in garden

centres featuring aquatics as a major part of their business, as well as specialist aquatic centres. An additional industry which has arisen is the professional aquarium management service.

Glasgow-based **AquariumManagement** is one such company. Formed in 1988 by enthusiastic fishkeeper **Brian Patterson**, AquariumManagement provides a regular maintenance opportunity, mainly to hotels and restaurants.

Brian has been involved with fishkeeping since the age of 12, and, during his late teens, worked for some of the leading aquatic retailers in Glasgow.

"While travelling around Scotland and the North of England, I noticed many poorly-kept aquaria in business premises," remarked Brian. "So a regular maintenance service was an ideal business opportunity."

"I aim primarily at business installations, as opposed to private houses, where the fish tank is generally a hobby. Since the business was launched, it has expanded from a maintenance service to complete design and installation of aquaria and ponds, as well as supplying fish and accessories from stock."

Coldwater aquaria are of especial interest to Brian, who has been particularly attracted by the great variety of ornamental fish available. "The shapes, sizes and colours can be most spectacular. I did not realise just how fantastic the fancier Goldfish could be until I came across some of the specialist breeders."

But Brian does have a major concern, and fish suppliers should take note of just what their public is experiencing: "Some people are being sold poor quality fish which are dying within a week or so, through no fault of their own."

"Consequently, they seem to think that such a short lifespan is normal. I am convinced that more people would keep fish if the quality was improved; even if this did mean that they would be slightly more expensive."

AquariumManagement, 16b Bruce Road, Glasgow, G41 5EJ. Telephone: 041-429 0363. Contact: Brian Patterson.



Scottish Goldfish-keeper Fergie Brown won best in section at last year's NGPS Open Show with his Black-and-White Butterfly, one of the newer varieties of Fancy Goldfish. However, according to Fergie, good-quality Goldfish are difficult to obtain in Scotland.

KENYAN KILLIES

(Part 2)

Allan and Barbara Brown complete their report on the collecting and subsequent breeding of four *Nothobranchius* species.

(Photographs by Allan Brown)



A very colourful male *N. elongatus* collected at Location 1/89.

On our return to the UK, we split the fishes into small groups and placed a pair, or a male with two females, into tanks of 20x20x30 cms - 8x8x12in (10 litres (c2.2 gals) approx) with water of pH 7, DH 3 and temperature of 22°C (71.5°F). Into each tank we placed a small plastic tub 10cms (4in) in diameter by 7cm (2.75in) deep containing peat fibre in which we hoped the fish would spawn. The fish were well fed on *Tubifex* worms, *Daphnia*, white worms, and chopped earthworms. They would not eat flaked fish food.

The peat fibre was taken from the tanks each fortnight and checked for eggs, then



The females *N. elongatus* collected at Location 1/89 lack the brilliant colours of the males.

dried between newspapers until damp, when it was placed in a plastic bag for storage at fishroom temperatures in the low seventies Fahrenheit (around 22°C).

BREEDING

We have now successfully bred the following fish:

- Nothobranchius elongatus* Kaloleni
- Nothobranchius paluquini* Ramisi
- Nothobranchius melanopilus* Ramisi
- Nothobranchius interruptus* Bamburi

The *N. paluquini* were very productive and eggs were obtained from this species in large quantities. These easily hatched after three months dry storage. On one occasion, over 300 eggs were spawned by three pairs in two weeks. We have also had a good hatch after storing the eggs for five months.

The *N. melanopilus* were very difficult to spawn when we first returned to the UK in August 1989, and it was December before we were able to collect eggs from these fishes. After storing the eggs for three months in damp peat fibre, we were able to hatch 15 fry. Eggs of the wild fish have also been stored for five months with a few fry hatching. The FI fish have been easier to breed.

The *N. elongatus* were also difficult to spawn at first. By November we were collecting eggs from this species. We were unable to hatch any of these eggs after three months storage, but after four months, the hatching rate was quite good, with a hatch resulting in 40-50 fry. From the FI fish, we have had a good hatch at three months, with plenty of eggs still undeveloped in the peat fibre.

The *N. interruptus* from Bamburi were quite young when collected and, at first, few eggs were produced. However, as the fishes have matured they have become prolific spawners. We have hatched some of the earlier collections of eggs after three months dry store, with 20 fry produced. We hope for greater hatches when we try the bags with the larger numbers of eggs. Later bags of stored eggs have had plenty of eggs, indicating that the more adult fish have spawned more freely. At present, the raising of the fry has been difficult because the fry and young fishes have been dying of fright. This seems to be caused by the water becoming too acid; the problem has now been solved by the addition of limestone chips to the aquarium.

HABITATS VISITED

Location 1/89

This habitat consisted of a shallow pool with water plants growing in clumps at the banks and in the main area of the pool. The water was not deeper than 30cm (12in) and the bottom consisted of very soft light brown mud. All the fish that we collected were found in the shade of the plants. The pool was being used as a drinking pool for cattle. The location of this pool was 0.5km (0.3 miles) north of Kaloleni. Kaloleni is at the northerly end of the road C111, 33km (20.5 miles) from Mombasa by road.

DATE: 27.7.89 TIME 12.40pm SKY: 5/8 cloud over

WATER: pH 8.0, DH < 1.0, NITRATE 0.05

COLOUR: colourless

DEPTH: < 30cm (12in) FLOW: nil

WIDTH: 7metres, (c23ft) BASE: light brown clay

TEMPERATURE: WATER 22.5°C

(72.5°F) AIR 29.5°C (85°F)

LIVE SPECIES TO UK: *Nothobranchius elongatus*

OTHER SPECIES PRESENT: none, other than small frogs similar to *Xenopus*.

Location 2/89

This was a pool formed in a drying river bed of the River Kivunga, 2km (1.24 miles) north east of Mariakani. From Mariakani we followed the road signposted to "Ronald Ngala Secondary School". Mariakani is 32km (20 miles) northwest of Mombasa on the road A109 to Nairobi. The pool formed by the drying river was shallow, up to 50cm (c19.7in), with a soft yellow mud base. Clumps of water plants at the water's edge and in the pool provided shelter under



Pool at Kaloleni (Location 1/89) — home of *N. elongatus*.

which we found the fish. This river flows into the River Mwatsuma.

DATE: 28.7.89 TIME: 1.00pm SKY: total cloud with rain starting

WATER: pH 7.5, DH <1, NITRATE 0.05 COLOUR: clear

DEPTH: <30cm (12in) FLOW: nil

WIDTH: 15metres (49ft) BASE: light brown clay

TEMPERATURE: WATER 26°C (78.8°F) AIR 28°C (82°F)

LIVE SPECIES TO UK: Several *Nothobranchius*

(2.4 miles) south of the disused Ramisi sugar factory. Part of the rice paddy had been left uncultivated and, in this area, we were able to collect one male *N. melanospilus*. No other fish or frogs were collected.

DATE: 30/7/89 TIME: 2.40pm SKY: totally overcast

WATER: pH 6.6, DH 0.5, NITRATE 0.05 COLOUR: brown like tea

DEPTH: <25cm (9.8in) FLOW: nil

WIDTH: 12 metres (39.4ft) BASE: black soft mud



The colour of *N. interruptus* males collected at Location 5/89 was not quite as brilliant as that of some of the other species.

branchius specimens were collected at this habitat. Unfortunately, the fish were in very poor condition and all the males died before we left Kenya. The few females that we collected did not survive long enough to be photographed on our return to the UK.

OTHER SPECIES PRESENT: some small cichlids with little colour.

Location 3/89

This location was a corner of a cultivated rice paddy to the east of the A14 road south from Mombasa to Lunga Lunga, just 3.8km

TEMPERATURE: WATER: 26°C (78.8°F) AIR: 24°C (c75°C).

LIVE SPECIES TO UK: One male *N. palmqvisti*

OTHER SPECIES PRESENT: no other fish or frogs were collected. However, there were several Hammerkop birds present.

Location 4/89.

A road side ditch on the east side of the road A14 between Mombasa and Lunga Lunga 6.3km (3.9 miles) south of the disused Ramisi sugar factory. The ditch was culver-



This is Location 5/89 — the narrow stream which yielded *N. interruptus* and small 'colourless' cichlids.

ted under the road and drained into a large pool on the east side of the road. The fish were collected in a small shallow side branch of the ditch because the main part of the ditch that flowed under the road was too deep to fish with our limited equipment. We were surprised to find two different species of *Nothobranchius* in this ditch.

DATE: 30/7/89 TIME: 4.30pm SKY: 7/8 cloud

WATER: pH 6.8, DH <1, NITRATE: 0.05 COLOUR: clear

DEPTH: <30cm (12in) FLOW: nil

WIDTH: 1 metre (39in) BASE: soft yellow clay

TEMPERATURE: WATER 26°C (78.8°F) AIR 24°C (c75°F)

LIVE SPECIES TO UK: *N. palmqvisti*, *N. melanospilus*.

OTHER SPECIES PRESENT: none collected

Location 5/89

A stream that had dried to form small pools 5.2km (3.2 miles) inland from the Bamburi cement factory and Baobab Farm. The stream did not contain plants. There were grasses at the water's edge.

DATE: 31/7/89 TIME: 12.00pm SKY: 1/8 cloud

WATER: pH 7.2, DH 1, NITRATE: 0.05 COLOUR: colourless

DEPTH: <50cm (19.7in) FLOW: slight

WIDTH: 2 metres (c6.6ft) BASE: soft yellow clay

TEMPERATURE: WATER: 28.5°C (83.3°F) AIR 28°C (82°F)

LIVE SPECIES TO UK: *Nothobranchius interruptus*.

OTHER SPECIES PRESENT: small colourless cichlids.

Letters

The Great Import Debate

I write with reference to David Sands' *Reflections* in your November 1990 issue. My reaction:

Mr Sands lost his 30 Angels and became very enraged. His conclusion was that all fishes imported from Singapore are of poor quality and are kept in heavily salted water. As a result of this, 75% perish after three months. Worse still, some shadowy hands in the trade secretly tolerate and continue the practice of "more mortality means more sales" — like planned obsolescence.

My conclusion is that his comments contributed a very shallow and ill-presented article, fraught with misperceptions and sadly devoid of empirical support. This leads me to construe that he has little or no knowledge of the tropical fish industry in Singapore, and that he has probably never set foot on the island before. Anyone having only a fair inkling of what it is like, would have refrained from penning the article at all.

Re. "His Conclusion": Sympathies aside, David Sands' loss of the 30 Angels does not give him a warrant to blanket ALL fishes ex-Singapore as poor quality. Remember the classic one rotten apple in the basket? As in all other fish exporting countries, one finds good and bad fishes.

Without any hard facts and figures David goes on hacking imported Singapore fishes. Is this fair to himself and to the trade? Is it fair comment, or sheer speculation? If he thinks a real problem exists, he should

come out with primary researched data. There is no point in hawking burgers without the meat.

"We put salt in with all our Singapore fish." How much? 1 ppm? 1 kg. per gallon? One handful per tank? How big is the hand, and what size is each tank? Sweeping generalisations like this do not help the trade. Accepting it *in toto* would be naive by anyone having fair knowledge. I take it that David has more than fair knowledge.

Some fishes need salt and others do not. If his particular wholesaler puts salt into ALL his Singapore fishes, one must conclude that not all wholesalers do the same.

There is NO TRUTH that ALL Singapore holding waters are heavily salted. Salt is only added where it is necessary, and brackish species are usually highlighted as such in Singapore price lists.

This leads to the general assumption that ALL fishes exported out of Singapore are Singapore-bred (I mean strictly Singapore-born) fishes. This is a fallacy.

Singapore has long been one of the largest brokering and trans-shipping countries for ornamental fishes and aquatic plants. Almost all Neons originate from Hong Kong and all Clown Loaches from Indonesia. Likewise, it would be a surprise to find a breeder of Redtail Sharks in Singapore or, 1% of 1% of wild-caught fishes exported to have been 'wild caught' in Singapore waters. My guess is that no more than 10% of the fishes exported out of Singapore hold Singapore 'citizenship'. How come David Sands is so sure that the Angels he bought were Singapore-

bred? I am almost 100% sure that the Angels were Malaysian-bred.

Yes, there was a shortage of water in Singapore lasting several months, but one should not confuse that with an absence of water during this time. The bulk of Singapore's water is imported from Johore, Malaysia. Anyone that has crossed the Causeway linking Singapore to Johore will not have failed to notice the massive piping along it that serves this very purpose and remains one of Singapore's vital lifelines. As a matter of interest, Peninsula Malaysian water generally has a pH of 7.

Allegations that 75% of breed fishes die after three months in captivity and that losses on Singapore imports have been extreme for 20 years and are continuing, are without empirical support. On what were these figures based? A controlled study, a sample study, or what? How much constitutes extreme — 10%, 30% 50%? Quantify your statements so that we have a basis to work on. Produce some substantiated facts and figures.

Presently, imports from any of the 10 leading Singapore exporters sustaining an average of more than 5% losses over 10 shipments (under normal circumstances) is considered very bad and a tremendous loss of face for the Oriental. My own experience with imports does not exceed this figure. Presumably, David must know where to get good Singapore fish. If he continues to get unacceptable ones he should dump the present supplier and, if he still faces problems, I am sure there are adequate trade organisations to help him.

To infer a conspiracy among Singapore exporters consciously to continue to ship poor-quality fishes likens them to a sector bent on promoting *hara-kiri*. On the contrary, all major Singapore exporters strive to provide the best.

No other similar exporting country has the commitment (including governmental commitment), the overall expertise, the infrastructure, the support services, the very modern holding and packing facilities, the 'seriously' skilled and knowledgeable manpower, the unparalleled efficiency (second to none, including Japan) and extremely short response time (surpassing Japan).

For the variety of species, ease, convenience and almost everything else in a buyer's guide, imports from Singapore are good value for money. Otherwise, with the alleged high mortality and poor quality, the industry would have died a natural death ages ago. Other neighbouring countries with abundant natural resources and cheap labour would have replaced Singapore, like Singapore replaced Hong Kong. If tastes and preferences, and demand and supply criteria, contribute to the market finding its own level, Singapore fish exporters must be doing it, largely right. Admittedly, some blemishes do exist from time to time, as in everything else in life.

Singapore will remain No 1 for many more years, and plans are being laid by the fish industry to see that it remains.

Teh Swee Kiat
Tropical Waters Ltd,
Feltham,
Middx.

[2] I write to pass comment on the recent debate following Dave Sands' article on fish imports. While this is obviously a serious matter, I am astonished that anyone should consider editorial emasculation as a response (Editorial — Page 3 — December '90). Did Dave's article inflame a guilty conscience? Might I suggest a protective investment in that medieval fishkeeper's garment

— the codpiece?

Regarding losses in transit, I make no comment, having no factual knowledge of the matter — but, as regards the quality of the fish that are imported from some overseas producers, I suspect many hobbyists would be quick to agree with Dave's concern. Anyone who actually looks at the quality of community fish arriving from some countries will be aware that this

quality is falling year by year. Here I speak of my own observations of stock in shops throughout England, over the last ten years.

While I have no doubt that there are notable exceptions to the rule, overall, the quality of many farm-bred species appears to be in decline. This decline seems to me to be directly linked to the aims of production. When you aim to produce

as many as possible, as cheaply as possible, and as fast as possible, then quality is the first thing affected, whether you're producing tetras or teapots.

Perhaps the way to reverse this trend is to convince the producers that we, the consumers, are willing to pay a fair price for quality fish or, conversely, to convince them that we will not pay for poor quality, inbred, diseased stock. In

theory, this sounds fine — most retailers agree that quality fish sell themselves — but there must be at least ten 'passive' fishkeepers for every 'active' hobbyist, and how will they react to paying 50% or even 100%, more for 'bread-and-butter' fish? How many retailers are going to have the commitment to put their prices well above the competition? Some already do so.

The bottom line is probably educational. If customers know that they are paying for healthy, quarantined stock and can see that the price is justified (and I believe that most people can tell good fish from bad), then perhaps the emphasis for production can be changed — a change which would do no harm to the image of the hobby as a whole.

Finally, an optimistic thought — the mere fact that people care enough to debate these issues has to be a good thing. Let's just ensure it is a constructive discussion, and not a descent into personal jibes or even threats — Communication not Castration!

Colin Tweddle
Tyne and Wear

Having read your editorial in the December issue of *AGP*, I have decided to put pen to paper to help defend both you and David Sands.

"Castration" does seem rather harsh for allowing someone their right to "free speech". I believe we still have that in this country. Don't we?

Having worked in the aquatic trade, as well as being a hobbyist, I would like to agree with Mr Sands in his opinion that overseas suppliers are "not all" as good as they undoubtedly should be. It is about time someone had the guts to stand up and say so.

In my opinion, based on what I have seen in many aquatic outlets, the problem also lies with the retailers at this end.

How many, for example, have heard of the word 'Quarantine'? If so, do they realise the word comes from the French 'Quarantaine' meaning 40 days?

This magazine is written for hobbyists to learn, and perhaps Mr Sands has given the most honest, useful information of anyone yet.

I, personally, would be glad to see a survey carried out among readers who are concerned about their fishes' survival and who would like to share

their knowledge by sending details of (eg) length of ownership of tank, fish stock, dates purchased, fish lost, maintenance carried out on tanks etc. The more details, the more accurate such a survey could be.

Well done, Mr Sands. Don't worry about the moaners. They are probably the ones most guilty of neglect. The problem lies in this country, as well as abroad.

P. R. Crosby
Crewe,
Cheshire.

Positive planning

You must all be fully aware of the threat that the hobby is currently under from the EC proposals for the positive listing of some fish species. No marine species at the moment appear to be included on this list, so this would seem to indicate the end of our hobby as we know it.

Within the ranks of the BMAA we have a small, but dedicated group, who have breeding pairs of several different species. It is therefore our intention to set up a centralised unit to concentrate and refine some of the techniques that we have developed. As well as forming a central information unit, it is hoped to provide cultures and growing-on facilities, as well as programme of research on new species.

At the moment we have several species of Clownfish which we have raised to adult size and, although the numbers are small, we are certain that with the proper facilities, this can be improved on. Smaller numbers have also been raised of Yellow-tailed Damselfish, Mandarins, and Seahorses. Spawning fish we are working on now include *Centropyge argi* the Pigmy Angelfish, and the Neon Goby, two varieties of shrimps and any invertebrates we have proof of reproduction in members' tanks.

We are looking for donations of equipment, specially built aquariums (pre-drilled for over-flow and reef type filtration), broodstock and information for this project to get off the ground. If any *AGP* readers feel that they can give any assistance to us on this ambitious project please contact me. We have already sketched out some basic ideas. I can assure everyone that any donations will be used for

the purpose which they are intended; and a full list will always be available for inspection if required.

There is so little time left for the hobby to improve its image that it may already be too late.

Alan Hale,
Membership Secretary,
British Marine Aquarists
Association

YAF's furnished plans for 1991

The 1990 Yorkshire Aquarist Festival saw the start of a new competition, which proved so popular, that it is to be repeated in 1991. The idea was to show the would-be hobbyist just what can be achieved with a little imagination. We asked that they set up a free-standing



One of the furnished coldwater aquaria at YAF '90

aquarium, complete with fish and plants etc housed on either a stand or cabinet, and enter this into a competition to be judged by non-professionals. This was to see what the ordinary person would choose if (s)he were to have a tank in his or her home, and to enhance the Festival, thus, hopefully, encouraging more people into the hobby.

Cash prizes of £300, £200, £100, £50 and £25 will be awarded to 1st, 2nd 3rd, 4th and 5th places in 1991, together with a handsome trophy for the winner, and rosettes for the first five places.

David Sands frequently airs his views on tableaux at Festivals. Perhaps this time, we might even see an entry from him — a challenge if ever there was one! I do not agree with much of what David says, and feel that he has, somewhere down the line, lost the feeling of just what the tableaux are for. Without them, the faithful showperson would be unable to enter his/her treasured 'pet' at

any of the big Festivals. Rules do stipulate that fish must be exhibited in a tableau. I do assure readers, though, that every care is taken of the exhibits, even during the night; it is very rare that fish are 'lost'. I do, however, take David's point, that most tableaux have nothing whatsoever to do with fishkeeping, but I am also very much aware of the many hours spent by members of the societies, and the enthusiasm freely given to building their tableaux.

Rules have been kept to a bare minimum and entry to the competition is free. The only thing competitors must provide is the tank, housing or stand, and the contents of the aquarium, including fish. The finished product must be capable of sup-

porting the lives of the inhabitants, and any infringement of this rule will lead to instant disqualification. Further details and entry forms can be obtained from me.

The competition was a huge success last year, so we are hoping for increased entries this time round. We have already had many enquiries, so competitors are asked to complete their entry forms early to enable us to have a rough idea of just how many exhibits we can expect. This, in turn, will help us to place the tanks in positions which will show them at their best.

This particular competition is open to anyone; it is not necessary to be a member or affiliated member of any club. The cash prizes are waiting and are well worth winning!

The Yorkshire Aquarist Festival will be held at Doncaster Racecourse on 20-21 April 1991.

Marie L Harrop,
Secretary,
Yorkshire Aquarist Festival.

Your questions answered

Having problems? Send your queries to our panel of experts who will be pleased to be of service. Each 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 experts to whom your query should be directed.*

All letters must be accompanied by an S.A.E. and addressed to:

Your Questions Answered, The Aquarist & Pondkeeper, 9 Tufton Street, Ashford, Kent TN23 1QN.

Herpetology, Julian Sims. Koi, John Cuvelier. Tropical, Dr. David Ford. Coldwater, Pauline Hodgkinson. Plants, Barry James. Discus, Eberhard Schulze. Marine, Graham Cox.

TROPICAL

SEX AND SIZE IN SEVERUMS

I have four Severums. I think two are males and two are females, based on their fin shapes. Two of the fish are bigger than the others (and not necessarily according to my male/female identification). Why is this?

Cichlasoma severum (Heros)

severum) is called either the Severum or the Banded Cichlid by British aquarists and the Convict Fish by USA aquarists (we use the name Convict Cichlid for *C. nigrofasciatum*). It is an Amazonian cichlid that is reasonably well behaved until it decides it wants to breed. Then, all plants are uprooted, gravel shifted and other species attacked.

The fins vary in shape and should not be taken as the only identification of sex. The males have the most red spots on their bodies, especially at breeding time. If your fish have pronounced black stripes, they are still too young to breed. These fade away when adult.

The variation in size of your fish is probably genetic, especially if they are from the same

brood. Obviously, you need to choose the most vigorous and colourful fish for breeding, with male and female similar in size. If these are brother and sister, however, choose a partner from another brood to prevent inbreeding.

One point of interest — a shoal of Severum fry look just like a shoal of young Discus as they grow.

KOI

LEAKY KOI?

I have a 12-inch (30cm) Ogon, a very pretty Koi, which has lately tended to stay on the bottom of my pool, only coming up to feed with all the others. In all other respects it appears to be fine. Any suggestions?

This sounds to me very much like a swim bladder problem, and you have my sympathy. I, too, have a very beautiful Koi with the same problem; in my

case it's a Goshiki of about 10 inches (c25cm).

Unfortunately, I know of no infallible treatment for this problem, although some years ago a theory was doing the rounds to the effect that raising the water temperature and feeding a strict vegetable diet did ease the symptoms. I've never heard of any real success with this treatment.

It's difficult to understand how the problem arises with adult fish. Perhaps someone



with more knowledge could enlighten us as to the cause of swim bladder 'leakage'?

I do hope you will not be tempted to destroy your fish, as I'm sure it can lead a more or less normal life. Let's face it, the shark manages quite well without a swim bladder doesn't it?

Koi are gregarious by nature. If an individual spends most of its time away from the shoal, it may well be experiencing 'leakage problems'.

COLDWATER

SAFE STOCKING

I would like to set up either a 24 x 12 x 12in (60 x 30 x 30cm) or a 30 x 15 x 12in (76 x 38 x 30cm) coldwater aquarium and stock it with coloured Common Goldfish, Redcaps, Calicos and Shubunkins. How many of these fish could I safely keep?

The larger the aquarium you

choose for coldwater fish, the easier it will be to maintain. There are several reasons for this. First is the important fact that smaller volumes of water pollute more quickly. In addition, the temperature is easily affected by outside elements, so resulting in quickly rising and falling water temperatures which badly affect the fish.

Fish, like people, need space

to live their lives and have room to develop and grow, so all these factors are crucial to their health and well-being.

The accepted rule for stocking coldwater fish in aquaria is 1 inch of fish per 24 square inches of surface area (2.5cm/900 sq cm). This means that a tank with a surface area of 24in x 12in (60 x 30cm) can house only a maximum of 12in (30cm) of fish.

However, if the fish are to grow well, lower concentrations than the above should be kept. This size of tank can only house two adult fish at most.

Never overcrowd the fish or it will be almost impossible to maintain good-quality water conditions and your fish will be always susceptible to the organisms which cause Fungus and Fin Rot.

MARINE

FILTER ADVICE

After a few years' experience of keeping tropical freshwater fish, I would now like to venture into the field of marines and would be very grateful if you could give me some advice. The tank will be either 3ft or 4ft (c90 or 120cm) and I would like to keep fish such as a Domino Damsel, Royal Gramma, Dwarf Angel or other small hardy fish.

My biggest worry is the type of filtration to use. I am not too keen to use an undergravel filter, but from what I have read, it would be of great benefit.

Would it be possible to fit a suitable external filter and connect the returning water to a reverse flow undergravel via two return inlets?

Can I filter via two external filters, and would this cater for all mechanical, biological and chemical filtration requirements?

Also, if I fit an undergravel filter, can you tell me the capacity of the powerheads to fit the two uplifts and what other filtration would be required?

In order to answer most of your questions, we first must determine what size tank you intend to use.

If you settle for an aquarium 3 feet (c90cm) long, then the best option would be to go for a 36 x

18 x 24in (90 x 45 x 60cm) or even a 36 x 24 x 24in (90 x 60 x 60cm). The former tank would have a gross capacity of 56 gallons (254 litres) and the latter would be 75 gallons (340 litres). Do you see what a huge difference to the tank's holding capacity that extra 6in of front-to-back width makes?

Always remember to buy the largest tank which you can make space for — especially if planning to keep marines.

In any event, never consider a tank smaller than 36 x 12 x 15in (90 x 30 x 38cm) for keeping marines in, and even then, you must realise that such a small tank of 23.4 galls (c105 litres) gross capacity would be hard work for a beginner. You mention that you might be able to go for a 4-foot (120cm) long aquarium. Here again, don't consider a tank smaller than 48 x 12 x 15in (120 x 30 x 38cm) (gross cap = 31 gallons = 142 litres) and, ideally, go for a 48 x 18 x 24in (120 x 45 x 60cm) which has a gross cap of 75 gallons (= 340 litres).

The finest possible form of aquarium filtration is, in my opinion, reverse-flow undergravel filtration, i.e. either an integral system such as the Hockney System or one that you construct yourself using

undergravel filter plates and external powerfilters. When choosing your powerfilters, choose two (i.e. one for an 'airlift' in each of the rear corners) whose combined turnover rate will turn over the total volume of seawater 4 times in each hour. The reason for such an apparently high turnover rate is that the opposition to flow, caused by the 3in (7.6cm) deep layer or coral gravel/coral sand sitting on top of the U/G plates, is quite considerable. Thus, if you settled for a 36 x 18 x 24in (90 x 45 x 60cm) 56 gallons (254 litres) tank, you would want two external powerfilters, each of which turned over about 100 gallons (450 litres) per hour. For example, you could buy two Project 400 units, each of which passes 95 gallons (430 litres) per hour, at a cost of around £34 each incl of VAT, although there are now several Italian and German manufacturers of comparable powerfilters.

The 3in (7.6cm) layer on top of the filterplates should be made up of, firstly, a 1in (c2.5cm) layer of coral gravel and, finally, a 2in (c5cm) layer of coral sand — hence the need, ideally, for a 24in (60cm) vertical depth aquarium.

The external powerfilters should contain the first 3/5ths

of their capacity filled with coral gravel, 1/5th with filter-wool and, finally, at least one of the powerfilter canisters should have 1/5th of their capacity filled with a nylon bag (ladies stocking?) or marine-grade charcoal such as "Seacoal".

I think that you will not improve on the filtration system described above — no matter how much money you spend. It will take care totally of all the aquarium's mechanical and biochemical filtration.

REMEMBER:

(1) You must remove the charcoal bag from the filter(s) if ever you need to use medication;

(2) Do not exceed a stocking ratio of 1 inch (c2.5cm) of fish per each 4 gallons (18 litres) of seawater for at least the first 6 months. Thereafter, if felt appropriate or necessary, the stocking ratio may be increased to one inch of fish to each 2 gallons (9 litres) of water, although, personally, I wouldn't exceed one inch of fish to each 3 gallons (13.5 litres) of seawater, especially if you're keeping invertebrates as well.

(3) Don't put ANY fishes in the aquarium until the filtration system has been matured and the nitrite reading has collapsed to zero.

DISCUS

IT'S ALL IN THE GENES

Will a pair of Discus always breed true to type?

This very much depends on their pedigree. Discus, like all other living things, obtain their characteristics from the genes of both parents: if the parents are of an identical strain, then their offspring will also show all the same characteristics i.e. colour, markings etc. (But it is recognised that it will take at least six to seven generations of in-breeding or line-breeding to achieve this).

Pure-bred Discus of the same coloration and/or markings can

only produce offspring of their own colour etc (eg -XX- x -XX-, or -YY- x -YY-, and so on).

It may be the case that two fish 'look' identical but their characteristics may not have been established. In that case, each parent will give its offspring a set of genes, but one set will be recessive and the other set will be dominant. Only the dominant set of genes will give the characteristics to the offspring; this may be colour, markings or any other distinguishing qualities.

In short, parents with, say, the -XX- genes will always produce offspring with the -XX- genes; parents with the -YY- genes will always produce offspring with the -YY- genes. Crosses of -XX- and -YY- will



A healthy shoal of baby Discus — but will they turn out to be identical to their parents? Their genes will determine that.

result in offspring with both the -XY- genes, but only the dominant one will show.

If one crosses Discus with both -XY- genes (a dominant and a recessive gene) then 50% of their offspring will have the -XY- genes like the parents, 25% will have the genes -XX- and 25% will have the genes -YY- from both of the parents.

I suppose that if the above was better understood by some hobbyists, I would get fewer complaints about the offspring from certain breeders. The buyer of these offspring would also have a less frustrating life! I must have heard it a thousand times: "but the parents were full of colour etc., etc., etc. and my fish look nothing like them..."

Simply, in such cases, the strain was not yet fixed, prior to spawning, so such pairs of Discus cannot breed true.

HERPETOLOGY

HIBERNATING/ BREEDING FIRE-BELLIES

Do I need to hibernate Oriental Fire-bellied Toads to get them to breed? If so, how do I do this? Equally important, how do I go about breeding and rearing these toads?

Bombina toads can be hibernated in slightly damp, but not wet, conditions. However, as hibernation can be a time of stress for amphibians (and reptiles), it is probably better not to risk the lives of your toads. If you can, keep your toads warm, active and feeding throughout the winter months. In any case, it is not necessary to hibernate Oriental Fire-bellied Toads in order to induce them to breed, if you follow the details given above.

B. orientalis usually breeds in late spring to early summer. A comparatively small number of eggs are laid at a time, around 30. However, spawning is repeated many times throughout the breeding season. To achieve this continuous production of eggs by the female, she must be well fed.

Clean water to a depth of at least 5cm (2in) should be provided. Canadian Pondweed (*Elodea canadensis*) and Curled Pondweed (*Potamogeton crispus*) are useful species of water plants on which eggs can be supported. Warm temperatures and sunlight are important in

stimulating amplexus (the mating clasp) and egg release by the female. The eggs can be laid singly or in small clumps.

At room temperatures, these usually take about a week to hatch. The hatching tadpoles don't feed for the first two days while they use up the remains of the yolk inside their abdomen. They then feed on fine plant material — grazing on the algae which grow on submerged rocks or those which sometimes grow on the glass of the aquarium. Alternatively, finely ground vegetation can be provided, for example, nettle powder or chopped-up grass pellets. These pellets are obtained from most pet shops where they are sold as rabbit food.

Dried food should not be

allowed to form a film over the surface of the water. If such a film forms, then the entry of oxygen from the atmosphere can be prevented. It is also most important regularly to change the water in which any species of tadpole are developing. Toxic nitrogenous excretory products can build up in water which is not frequently changed. Such excretory products can inhibit the growth and development of tadpoles.

As growth of the tadpoles continues, they become carnivorous, feeding on tiny invertebrates such as *Cyclops* and very small water fleas (*Daphnia* sp.).

Metamorphosis occurs after about four weeks. At this stage, the tadpoles, which have developed four legs but still

have their tail, should be transferred to very shallow water. The water container must have an escape ramp (eg a piece of tile) which the young amphibians can easily use to move onto a land area. At this time in their life cycle, the toadlets can drown all too easily.

Once the tiny toads have metamorphosed, they should be fed on very small invertebrates, for example aphids and fruit flies (*Drosophila* sp.). As these can be quite difficult to provide in large numbers, it is probably better to concentrate on feeding just a few of the toadlets in an indoor vivarium. The remaining toadlets can be reared in a well ventilated greenhouse (if available). A shallow 'pond' which the amphibians can easily enter and escape from must be provided.

If Oriental Fire-bellied toadlets are maintained in warm conditions with a plentiful supply of invertebrates, their growth rate is rapid and they can reach sexual maturity within a year. However, the growth rate of any animal should not be artificially accelerated. It is more usual for *B. orientalis* to breed in the second spring after they have metamorphosed.

Editor's Note

For details of a vivarium layout suitable for Fire-bellied Toads, see Julian Sims' article *Amphibian Basics* in the January '91 issue of A & P. **John Dawes**



Bombina orientalis — the most commonly available species of Fire-bellied Toad.

PLANTS

HORSETAILS

Last year I saw a marginal plant in my local aquatic centre called Equisetum japonicum. I can find no reference to this plant in any of my books, but would like to buy one this coming season. Can you supply me with any information?

You are quite right; none of my literature refers to the plant either. However, I have had this species for some years. It is quite popular in the USA, where its 'architectural form' makes it quite sought-after.

Equisetum is the only remaining genus of a large group of plants which are well represented in earlier periods of the earth's history, as is shown by the fossil evidence. Pre-historic representatives reached huge sizes.

Popularly known as 'Horsetails', there are only 25 species still surviving. Related to the ferns in their ancestry, these plants inhabit a variety of habitats, but are most at home in damp, marshy soil.

Horsetails grow from a branching horizontal rhizome, giving off aerial shoots and numerous adventitious roots.

The leaves borne on the aerial shoots are small and scaly and are arranged in whorls. Horizontal branches, also arranged in whorls, may be produced at the nodes. The leafless stems so characteristic of this plant produce an apical sporophyll which releases numerous spores.

These plants can reproduce rapidly, both by runners and spores, and so, can colonise large areas in a very short time. However, *E. japonicum* is not as rampant as other species and can form a talking point in any water garden.



Horsetails are attractive but potentially invasive.

News from the societies

New club for Tyne and Wear

A new club is being formed in the Low Fell area of Gateshead. The main aim of Low Fell Aquacub is to encourage a wide membership, "ranging from the novice with the community aquarium, to the more experienced hobbyist". As the organisers say, "No matter what your 'aquatic passion', from Guppies to Groupers, we have something to offer".

For full details, contact: Susan Salter, Low Fell Aquacub, Low Fell Aquatics, 59 Dartmouth Avenue, Low Fell, Gateshead, Tyne and Wear, NE9 6XA. Tel: 091 482 3999.

Hucknall and Bulwell Aquarist Society

The 1991 Committee of Hucknall and Bulwell AS consists of the following officers: Chairman — Clive Hinton
Secretary — Paula Hinton
Treasurer — Tom James

Social Secretary — Arnie Daniels
Show Secretary — Luke Daniels
Committee Rep/Sales Officer — Graham Cooper

All correspondence should be addressed to Paula Hinton, 45 Wollaton Avenue, Gedling, Nottingham NG4 4HY.

Corby and District Aquarist Society

The new secretary of Corby and DAS is Mrs Lyn King, 30 Evison Road, Rothwell, Northants NN14 2AL.

Federation of British Aquatic Societies

Following this year's Supreme Festival of Fishkeeping sell-out, plans are already underway for another important show at the same venue, Pontin's Holiday Centre, Sand Bay, Weston-super-Mare, for the weekend of 8-9 November 1991.

Fuller details will be

announced as soon as they become available. In the meantime, reservation enquiries should be addressed to: Colin Richards, 3 Uplands Avenue, Chesham, Bucks, HP5 2EA.

The new secretary of the FBAS is Adrian Dempsey, 194 Greenhill Road, Greenhill, Herne Bay, Kent CT6 7RS.

West Cornwall Fishkeepers 6th Open Show

Top aquarists from throughout the West Country congregated in Camborne for West Cornwall Fishkeepers 6th Open Show which incorporated the Devon and Cornwall Aquarist Societies Inter-Club Show.

The show was held at Holmans Sports Club in Pendarves Road, Camborne on Sunday 21 October, 1990. Competitors

benchmarked a total of over 250 fish tanks.

Monty Ray, Chairman of West Cornwall Fishkeepers, introduced Len Lomax, Assistant Show Manager, and invited him to present the 46 trophies for the 40 classes.

The Best in Show trophy was won by Eddie Mabey of Mullion, near Helston, Cornwall, with his *Tilapia banikoferi*. Eddie, who is a member of West Cornwall Fishkeepers, won a total of 15 trophies, which included the *Aquarist & Pondkeeper* Gold Pin for Best in Show, Best Cichlid, Best Livebearer, Best Catfish (G) and Best Barb.

In the Devon and Cornwall Inter-Club Show, West Cornwall Fishkeepers retained the Inter-Club Competitions Shield against competition from the Plymouth and District Aquarist and Pondkeepers and the Exeter and District Aquarist Society.

Diary dates

MAJOR SHOW DATES

Yorkshire Aquarists Festival

Venue: Doncaster Racecourse · Dates: 20-21 April
Contact: Derek Harrop, Croft View, Oldfield, Honley, Huddersfield HD7 2RL. Tel. 0484 666591.

Nishikigoi '91

Venue: Festival Hall, Basildon · Dates: 26-27 May
Contact: Ron Saunders, Ching Koi, 21 Burnham Road, Chingfield, London E4. Tel. 081 524 7332.

Aquarium '91

Venue: Sandown Racecourse · Dates: 8-9 June
Contact: Mervyn Strange, Hilltop Nurseries, Sherborne St John, Basingstoke, Hants RG24 9LL. Tel. 0256 22545.

Aquaria and Watergardens '91

Venue: National Exhibition Centre · Dates: 15-16 June
Contact: Savits Ayling, Concept Conferences and Exhibitions Ltd, 27 Brandreth Avenue, Dunstable, Bedfordshire LU5 4JP. Tel. 0582 601456.



"Mummy!! Mummy!!
I think Dad's found the electric catfish . . ."

A PONDFUL OF COD

Ever heard of tame cod that you can hand feed? Neither had **Jane C Smith** — that is, until she visited a quite remarkable pool in Scotland.

How many pondkeepers can boast of 'just popping out' to feed the cod? At Logan Fish Pond in the Rhins of Galloway, the tables are turned on the age-old British tradition of cod and chips; the thirty or so tame cod here are quite accustomed to poking their heads above water to accept tasty morsels, liked scalded limpets, from their keepers' hands.

Although Logan Fish Pond is the official title, I suppose "pond" is a bit of a misnomer because what I am referring to is actually a fair-sized pool, 15 or so feet deep (around 4.5 metres) at low water and a metre above that when the tide is full in. It sits at the bottom of a natural amphitheatre some 50 feet across and 30 deep (c 15 x 9m) which was carved out over thousands of years by the sea.

A few things have since been added for human convenience: a set of stone steps leading down to the pool, a perimeter walkway and — last but certainly not least — a metal grille across the narrow entrance, which allows a through-flow of new water with each tide, but retains the occupants.

Brief history

The pool was first exploited way back in 1800 by Colonel McDonnell of Logan, a cousin of the present owner, Sir Ninian Buchan-Hepburn, Bt.

The fish caught for Logan House at irregular intervals by the local fishing fleet would not keep for long and this corner of Scotland was a long way from the sources of ice that supplied early 'freezer houses', such as Tugnet at the mouth of the River Spey. So, the pond made an ideal larder for fish 'on the hoof' (or 'on the fin!') which were simply dumped in, then taken out as required.

Nowadays, the pool is maintained solely as a tourist attraction, its relatively isolated setting ensuring that it's unlikely ever to get mobbed or over-commercialised.

Getting there

To find the location of the pool on an atlas of Britain, just run your finger back from the most southerly tip of Scotland (the Mull of Galloway) for a few miles along the west coast. The pool faces Port Logan village across a fine, broad, sandy bay, and is reached by a quarter of a mile of rough track off the road to Stranraer.

The deep basin of the pool is shielded from casual gaze by the keeper's house and an encircling wall whose base is piled up with spent limpet shells. These, together with the notice on the door, are the only clue of the activities inside.

The door opens onto the steps overlook-

ing the pool. Even from here, the dark-green waters betray no hint of what lurks within, but the fish have learned to associate the approach of visitors with the food brought by Mrs Roddy, their custodian, and quickly rise to the surface. (Incidentally, if you fancy some slate for your pool surround, Mrs Roddy's husband is a stone mason who

specialises in slate for such ornamental purposes.)

Cod aren't the only fish in the pool but, being easy to tame, they are the most numerous. There are presently also a couple of Ballan Wrasse, a few plaice, and — I am informed — deep down and well out of sight, two conger eels! Other fish over the years have included



Great expectations.



Even greater expectations.



JANE C. SMITH

Nearly there.



JANE C. SMITH

Success!



JOHN GARRETS

Hottentot Figs bring an unexpected splash of tropical colour to Logan Pool.

pollack, coalfish and sea perch; salmon and sea trout have also been tried, but they're not so easily reconciled to captivity.

The cod are actually all from the same batch, put in four years ago at the age of one. They're now about two feet long (60cm) and weigh 15 or so pounds (6.8kg). Next year, they'll be released and replaced as, being deep-sea fish, their eyes are particularly vulnerable to ultra-violet light. I saw two that already had white opaque eyes — presumably cataracts — a warning to the rest of us about the consequences of further depletion of our planet's protective ozone layer.

Pool maintenance

Daily maintenance of the pond is minimal, the main chore being provision of limpets or — in season — other delicacies like mackerel. Every two years or so, in April (at the lowest spring tides), the pool is pumped out completely and the fish replaced in a neighbouring small pool while it is cleaned.

Because the pond is open to the sea it is, unfortunately, at the mercy of anything nasty that is swilling about. In 1942, for example, a mine washed into the entrance resulted in its closure until 1955, while in more recent years, oil pollution has wreaked havoc, reducing fish numbers and cutting back the *Mesembryanthemum edule* (Hottentot Fig) that formerly trailed luxuriantly over the water.

A native of South Africa, you won't normally see *Mesembryanthemum edule* growing out of doors in Britain, but on the steep cliffs of this sheltered sun-trap it prospers.

Incidentally, a trip to Logan Gardens would also be well worthwhile, to see the fascinating selection of semi-tropical plants, like tree ferns, that flourish in the mild maritime climate here. As with several other public gardens in the vicinity, the water gardens are a prominent feature.

Opening times

The 'fish pond' is open from Easter to (generally) the end of September, from 12 noon until 8 pm, every day except Monday, and there is a £1 entrance charge. If you can, visit at low tide, since the walkway is then uncovered and the fish more accessible.

To finish — if you're not already thoroughly green with envy at this pondful of tame cod, I should mention another curiosity. Linked to the keeper's house by a bridge is a rather quaint stone building. Apparently, this used to be a changing hut with access to a secluded pool below which was used — in those days of greater modesty — by the ladies of the big house. A different kind of fish indeed!

Further information
For further details contact the owner of the pool, Sir Ninian Buchan-Hepburn at Logan House, Near Stranraer, Wigtownshire, Scotland, or the custodians, Mr and Mrs T Roddy, Logan Fishpond, Port Logan, Stranraer, Scotland.

PRODUCT ROUND-UP

BY DICK MILLS

ANGLO-AQUARIUM PLANT CO

Following up on their recent informative, fold-flat 'carry-packs', **ANGLO-AQUARIUM** have introduced pre-packed, ready-washed **POND GRAVEL**.

Of neutral biscuit-colour, the gravel is packed in strong bags with convenient carrying handle. Each pack contains sufficient material to top dress 8 lily pots or 16 marginals, and the product is intended to be used as a deterrent against foraging fishes by weighting the plants down in their containers. As with most Anglo-Aquarium products, full instructions are printed on the reverse side of the two-colour illustrated packing.

Details from: **ANGLO-AQUARIUM PLANT COMPANY LTD**, Strayfield Road, Enfield, Middlesex EN2 9JE (Tel: 081 363 8548 Fax: 081 363 8547)

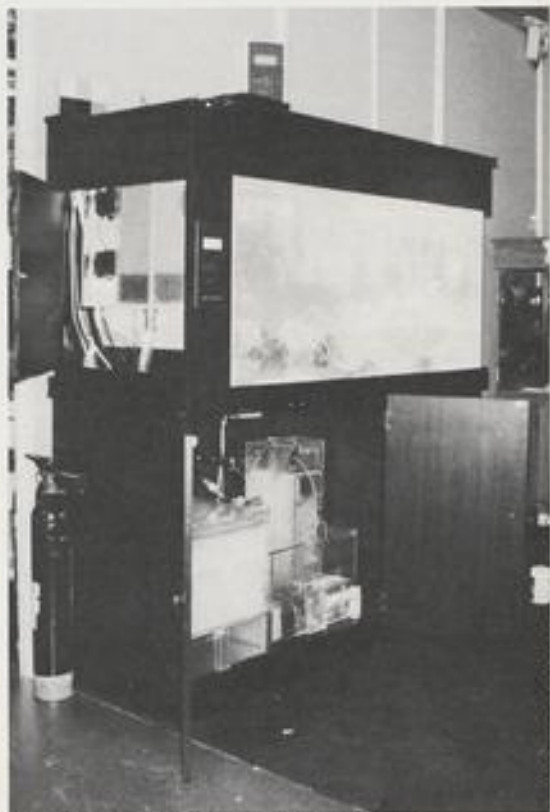


Anglo Aquarium's Pond Gravel — the ideal medium for lilies and marginals.

AQUARIUM LIFE SUPPORT SYSTEMS

If you sat down and listed all of the advantages and technical merits of your own aquarium, or even an ideal aquarium from one of your wildest dreams, it is doubtful if you would come up with a specification anywhere near to that of **AQUARIUM LIFE SUPPORT SYSTEMS' SYSTEM AQUARIUM**.

A swift estimate showed no less than 15 desirable qualities, including resin-sealed cabinet to prevent salt 'creep', no visible equipment, surface weir, easily-removed pre-filter foam block, low-maintenance ammonia tower, counter-current protein skimmer, automatic water level system, multi-connectors in one master electrical box, timing unit for independent control of up to six lamps, additional powerheads, monitoring equipment for pH, temperature, and redox potential.



Hi-tech aquarium designed to cater for every need.

Fortunately, you can build up to your ultimate aquarium (rather than in one expensive fell swoop) by adding to the basic system.

The craftsman-constructed cabinet is available in six different wood finishes.

The AMS 100 Aquarium Monitor constantly checks on temperature, pH, redox potential and water levels, giving visual and audible alarms when things get beyond their specified ranges. The AMS200 does just the same, but also a little more — it not only keeps an eye on things as previously described, but also adjusts them where necessary.

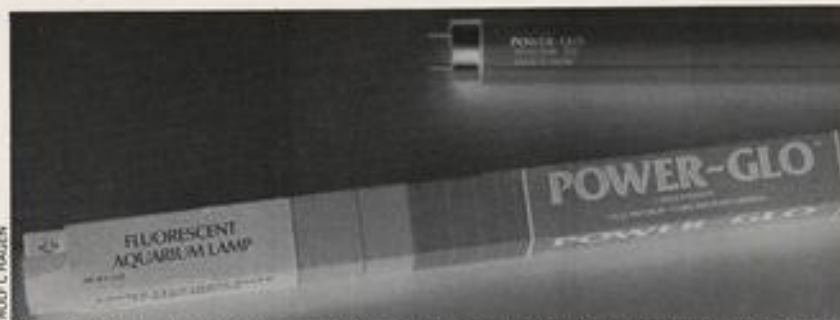
Details from: **AQUARIUM LIFE SUPPORT SYSTEMS**, Free Church Passage, St Ives, Cambridge PE17 6YA (Tel: 0480 68809).

ROLF C. HAGEN

The light over the aquarium is vital from several standpoints. It lets you see the fish, for a start, and, more importantly, it stimulates activity among them and enables plants to photosynthesise their food on one hand, and produce surplus oxygen while absorbing unwanted carbon dioxide on the other.

However, in order for light to do this service, it must be given the best conditions — crystal clear water will help enormously in this respect. The correct spectrum of light must also be chosen, not only to present the aquarium in the best attractive light possible (no pun intended!) but also so that adequate plant growth is encouraged.

HAGEN have researched



Hagen's high intensity light tubes provide the correct spectrum and light penetration for optimal plant growth.

these aspects of lighting thoroughly and their latest range of high-intensity fluorescent tubes, POWER GLO, will fulfill all these desirable parameters. An extra advantage claimed for these tubes is that they operate at 90% efficiency for a longer period than other, more conventional, tubes where there is a steady deterioration of lighting output during the whole lifetime of the tube.

Following research into the light levels actually reaching plants underwater, the Power Glo tubes have had three 'peaks' of light energy built into them; red and blue peaks supply the necessary light wavelengths for the plants, while the green peak helps to balance the appearance of the light to make it more pleasing to the human eye (otherwise the plants would have a rather washed-out colour). By boosting the red and blue parts of the spectrum, losses due to absorption of these bands by water depth, or even dissolved matter in the water, are overcome and plants from differing water depths in nature can be successfully kept in typical aquarium water depths.

Incidentally, in marine aquariums, it will be necessary to use two or three times the number of Power Glo tubes for successful invertebrate culture, especially those species which have symbiotic algae growing within their cells.

Details from: **ROLF C HAGEN (UK) LTD**, California Drive, Whitwood Industrial Estate, Castleford, West Yorkshire WF10 5QH (Tel: 0977 556622 Fax: 0977 513465).

OTTER CONTROLS LTD

If your fish-house is electrically space-heated, then the new E3B

ELECTRONIC VARIABLE THERMOSTAT from **OTTER** may be just the thing to save you money and keep things at the required temperature too.

Electrical interference is minimised by 'zero-voltage' switching, and the thermostat is



Variable electronic thermostatic control from Otter.

easily fixed to the heating appliance by a supplied bracket. The sensing probe can be remotely sited if required, or simply plugged into the printed circuit board.

Details from **OSBORNE PUBLICITY SERVICES LTD**, Hardwick Mount, Buxton, Derbyshire SK17 6PR (Tel: 0298 26224 Fax: 0298 24870).

TECHNICAL AQUATIC PRODUCTS

The range of high-quality remedies and treatments from **TAP** is well-known, but now they have apparently surpassed even their own high standards with the release of **MARINE MULTICARE 2**.

For exclusive use in marine aquariums, the remedy is extremely stable in such alkaline water conditions and — it

is stated — tests have shown that it out-performs all other marine remedies on the market. Retailing for £2.99, you will have no difficulty in spotting its bright red bottle on the dealers' shelves.

Free full-colour booklet from: **TECHNICAL AQUATIC PRODUCTS**, 542 Filton Avenue, Bristol BS7 0QG (Tel: 0272 692345/799852 Fax: 0272 236478).

TETRA

Although the RSPCA is continually telling us that "a puppy is for life, not just for Christmas", **TETRA** believe that the same applies to fish. They

would like to make the point that, once past the excitement and confusion of Christmas, an aquarium does indeed make the ideal collective gift (even for birthdays), throughout the year, when it will be far easier for the recipient to make the concerted effort required in a more relaxed atmosphere than first-thing Christmas morning!

It is suggested that all the members of the family, from Grandma downwards, can contribute an item — airpump, filter, lighting, food etc and, as spring approaches, a basic cold-water aquarium can be planned with every chance of success. Both the fun side and the more serious aspect of pet ownership can be introduced to youngsters for quite a reasonable outlay (say, around £30.00); the more 'fantastic' aquarium ornaments will look after the first, and growing awareness of caring for the fish (especially if they can be kept in the child's bedroom), will do the rest. To introduce young children into the world of underwater life, there is a **TRANSFER and COLOURING SET** available.

Details from **TETRA INFORMATION CENTRE**, Lambert Court, Chestnut Avenue, Eastleigh, Hants SO5 3ZQ (Tel: 0703 643339).



An aquarium represents the ideal year-round present.