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AQUARIST

AND PONDKEEPER

The Magazine for Fishkeepers



Coldwater issue

Colour in the garden pond (COLOUR FEATURE)

Goldfish varieties for the aquarium (Colour feature)



COVER STORY

The full scientific name of the Goldfish is *Carassius auratus auratus*. This means that it is a subspecies of the species *C. auratus*. There is a second subspecies, *C. auratus gibelio*, known as the Prussian or Gibel Carp (not the Crucian Carp, i.e. *Carassius carassius*). The Goldfish originated in China and parts of Siberia and is, therefore, the Asiatic representative of the species, while the Gibel/Prussian Carp is predominantly European in origin. Its natural distribution extends from Western Siberia into Eastern Europe, including the river basins around the Baltic and Black Seas. Although it is quite possible to distinguish between pure Goldfish and Gibel Carps in that the former grow to a smaller size, have a larger head and end up orange-red in colour (Gibels remain brownish), so much hybridization has taken place owing to introductions of Goldfish into European waters, that distinctions are usually blurred. This has, no doubt, contributed to the present state of nomenclature in which all "Goldfish" (but not the Crucian Carp with its distinctive characteristics) are commonly referred to scientifically simply as *Carassius auratus*.

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AQUARIST



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COMMENTARY

by
Roy Pinks



It is one thing to criticise bad practice but quite another to suggest alternatives. My most pointed barbs have always been directed against the advocates of mixing the wrong sort of fish together, and the most wrongly mixed fish is, of course, the angel. One cannot help accepting why this species is so popular: its shape, long and graceful finnage and stately bearing have immediate appeal, and it is a pity that so many aquarists are so misguided as to mix it with other fish. It is nearly always one of the founder members of the so-called community tank, sold as juvenile to take its place amongst guppies, mollies and tiger barbs. A motley and terrible assortment, guaranteed to disappoint.

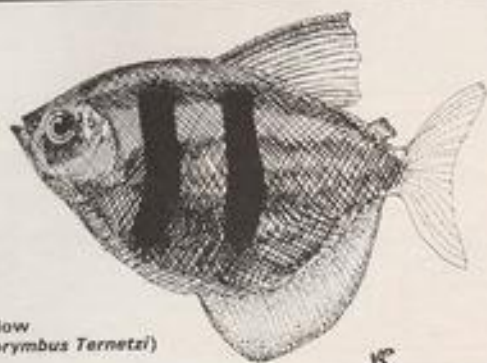
A not too knowledgeable visitor was looking over my tank of small tetras recently and remarked that the angels looked nice. Since I have no angels but share the general wish to include them, I was rather pleased that he had mistaken my Black Widows for them, as this was precisely why I had settled on this species as an angel-substitute. I think most aquarists, however determined they may be to keep what I would describe as disciplined collections, get a bit bored by the look of things when sameness sets in. This is understandable when the tank consists of all barbs or all tetras or all platies, for example, and just as soon as all seems to be going well an urge develops to introduce a pair of fish so different as to form an attractive contrast.

The contrast actually chosen may be based on colour, size or shape or a

combination of all, but in practice it is not too easy to settle on a single species which will mix with all temperaments in every sort of water. For this reason I can wholeheartedly recommend Black Widows (*Gymnocorymbus ternetzi*) as excellent partners for most small communities. They are not particular about water quality, their shape is very similar to that of the angel, and their markings resemble those of that species most noticeably. In contrast with angels they rarely exceed 2 in. in length and their finnage is never likely to attract fin nippers. They have robust appetites, fortunately not finicky ones, and if you have to rely on dry food as staple, this will suit the Black Widows admirably, though they certainly appreciate such live offerings as you can manage. Their temperament is similar to that of the angel: restful and graceful-swimmers, they station themselves in set positions long enough to be appreciated, unlike many other so-called contrast fish which are never still long enough to be noticed. If anything they are less tolerant of their own kind than of other fish, but this is not a serious snag because their disputes are never serious enough to cause us concern. I am referring in these notes to the type and not the man-made varieties which have been bred from it. This is a fish, rather like the angel, which breeders have experimented with, and whilst some of the long finned fish may be very fine as individuals, they are a complete muddle in the mass. The

man-made varieties fail because the long finnage attracts attacks from other species and because the black coloration—so vital in a contrast fish—tends to be less reliable than in the case of the type. Retention of the jet black colour is a characteristic to be sought after, and when selecting young specimens, always go for the darkest. It was said at one time that large fish do lose the black pigmentation and become more silvery, and whilst this may happen with some specimens, the fish will continue to attract if there are individuals of both sexes present. The mating display brings out the most intensely black coloration this side of the Black Molly, and these fish will show off consistently enough to keep them in the way of your eye.

A word of warning. Black Widows are not the most expensive of fish—about 60-80p is average, but do watch for quality. As mentioned above this has been interbred unmercifully and as a result there are some terrible looking specimens about. Refuse pale looking fish and decline long finnage, likewise any tendency to elongated body shape. The type is fundamentally roundish, and the sexes are abominably awkward to differentiate. The female is the rounder of the two, so it is said, but these are such worthwhile fish as a species that I would recommend four to six as the best sort of purchase, since this will solve the sex and the colour problem at the same time as providing you with a team which will do more than pull its weight.



Black Widow
(*Gymnocorymbus ternetzi*)

WHAT IS YOUR OPINION?



by B. Whiteside.

B.A., A.C.P.

'Photographs by the Author'

RECENTLY I noticed a poster on the door of a local supermarket advertising tropical and coldwater fishes and accessories. I noticed that the owners of the supermarket were called McGregor and went in to see what was on offer. As the supermarket is situated at the opposite side of the town in which I live it is a store that I have not visited before. On entering I was warmly greeted by a gentleman who said, "I've been waiting a long time for you to call," to which I responded with "You remember me?"

"Of course!" said the gentleman, whose name is Robert McGregor, and whom I taught a good many years ago, in my first English class, in the late Sixties. Robert told me that he'd always had an interest in tropical fish and had more recently decided to stock fishes, plants and accessories in a room at the rear of the supermarket operated by him and his father. People buying food in the supermarket tended to pass through to the aquarium section to buy fish; and some aquarists buying fish obviously bought groceries while passing through the food store.

I had an interesting chat with Robert, and his young assistant, Stephen, and I purchased seven barbs to stock one of my fishless tanks. I also bought a couple of good-quality, small airstones and found that one of

them, used to replace an old one in an outside bubble-up filter, greatly improved the filtration power of the filter. It's worth remembering that most air-operated filters that require an airstone will work better if the airstone is replaced at regular intervals—and the cost is a matter of pence. (Thank goodness the old *jp* has now passed away. It's New Year's Day as I begin this month's column.)

Just before Christmas I made a rare visit to Belfast and after a long wait in a queue I managed to obtain a parking space in a car park. As the car park was very close to the firm of Ulster Aquatics, I decided to drop in and buy a few neon tetras. I was pleased to see Mr. Larry Morris, the 'boss', because I purchased my first aquarium and tropical fishes from him—or, rather, my late father purchased them for me—several decades ago. I was sorry to learn that Mr. Morris had suffered a heart attack back in August 1984, and that the day of my visit was only his third full day back in the shop. I should like to wish him health and happiness in 1985—and hope that I may yet find time to research a *Meet the Aquarist* about him.

No readers had time to write letters to me at Christmas so I'm delving into my letter bag to use some of those that I received some time ago. Mr. R. H. Chaplin, O.B.E., B.Sc., is one of my oldest readers and contributors, and he resides at Street Farm Cottage, Park Street, Charlton, Malmesbury, Wiltshire. Mr. Chaplin wrote: "...

The pond my father built in the garden when I was a youngster suffered from the usual algae problem which rendered the fish invisible except when we fed them. Although, I regret to say, they were not fed regularly by us, they thrived, grew fat and even bred.

"In this pond there lived a terrapin—some 4 in. or 5 in. in diameter. We fed him large earthworms for which he would swim across the pond to us. On grabbing the worm the free end dangled down out of sight in the green water. Suddenly he would disappear from view as one of the invisible fishes caught hold of the free end of the worm and towed our little friend out of sight under water. In due course—perhaps a minute or so—he would reappear in quite a different position to where he submerged, usually still in possession of the worm—which, as often as not, involved him in another dive.

"An early failure of mine was an attempt to keep crayfish. There were virtually no books on aquarium management at that time, some 60 years ago. I now know that crayfish require strongly-oxygenated hard water—which of course they did not get. They were caught by a friend in the River Wey at Godalming in Surrey."

Master Kevin Robinson was 16 years old when he wrote to me from 52 Beach Road, Roffey, Horsham, West Sussex. "I am a very enthusiastic aquarist who owns three 24 in. x 12 in. x 15 in. aquariums, two of which are community tanks and the third a breeding and nursery tank.

Female guppy with coloured caudal and dorsal fins



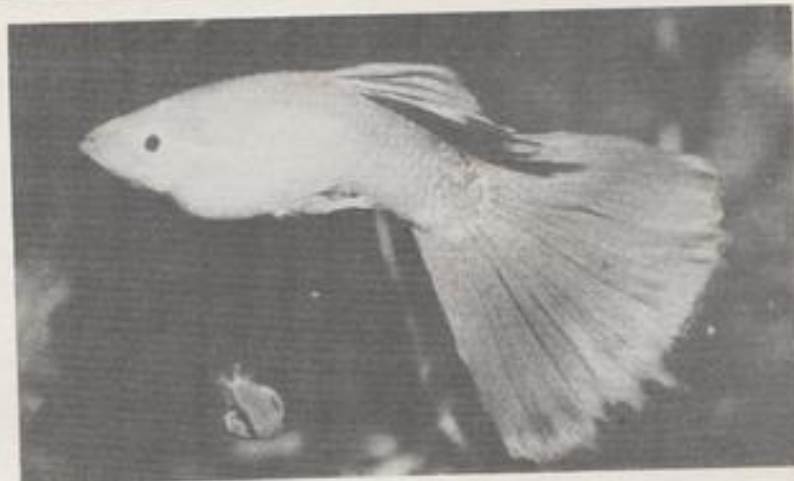
THE AQUARIST

"Almost a year ago I purchased my first guppies. It took me quite a while to find the type I was searching for. Finally I found a fine pair which started to spawn on introduction to the tank. It wasn't long before I had quite a few broods of fry which I brought up on a variety of foods. When the first brood became large enough I introduced them to one of my community tanks. In a few weeks the baby guppies had their full colours. I was surprised at some of the results I obtained. The guppies were superb. They were nothing like the dull guppies with triangular tails, which swim vertically, that are so often seen in aquarium shops.

"They were magnificently-coloured with rounded tails and very energetic, fast-swimming bodies. The female offspring were fully-coloured but with smaller tails than the males. One particular male caught my eye. It had a half-purple body with a bright orange dorsal fin and an orange-and-black tail. Its pectoral fins were violet and the fish had a silver and black head. I decided to cross this male with my best females—and the results have been outstanding. I would so much like to enter some of the offspring for competitions; but this seems to be impossible as there aren't any fish-keeping societies in Horsham. This seems pathetic because Horsham is well-stocked with aquarists.

"I also keep various other fish. Of these, platies and mollies have produced young, and angels have laid infertile eggs. I hope to study biology as one of my 'A' level subjects at college and go on to do a marine biology course at a university."

Photograph 1 shows a female guppy with attractive pink colours on the tail and the dorsal fin; while Photograph 2 shows one of the type of delta tail-heavy male guppies that Kevin says are "dull" and that "swim vertically". It's several years since my East End friend, Ron Baldry, kindly sent me some good-quality guppies. The quality of their surviving successors is not at all high because they were allowed to breed as they chose. Smaller-tailed males tend to be able



Heavy-tailed male Guppy

to mate with females more easily and, hence, cultivated varieties of guppies tend to revert to the wild type. A good example of this can be seen in some of the hothouse ponds at Kew Gardens. The guppies in such ponds appear to have reverted to small-finned, active males without a lot of colour, and drab females.

I hope your 'A' level biology studies are progressing well, Kevin. I used to be a teacher of biology.

Mr. Trevor Mitchell and his wife Susan live at 51 Glenroy Avenue, Colne, Lancs. He writes: "My wife and I are both regular readers of your magazine and have often thought about writing an article for *The Aquarist*. Now we put pen to paper. We have kept tropicals for about four years now and have kept and bred many varieties; but our happiest moment occurred only a few weeks ago. We have had a female *Tilapia mariae* for about two years now and on more than one occasion have thought of parting with her, beautiful as she is.

"Then one weekend, while out buying plants for our aquaria, I saw a large, male *Tilapia mariae* and was amazed that after all this time I should find a mate for my female. I would have paid any price asked for this fish—but fortunately it was rather inexpensive.

"We bought him and took him home and placed him in a tank next

to his intended. I must just add that over the period of time we have had her she has savaged several fish larger than herself; so she was in a tank of her own. Two days later we decided to place them together in a 36 in. tank keeping a watchful eye on them. We need not have worried: it was love at first sight; and they began showing off to each other straight away. It was fantastic to watch; and after only four days they spawned on the side of a rock, laying many very large eggs.

"About two-three days later they hatched and the young are alive and thriving as I write this letter. The adults were marvellous parents, as very protective—as a bruise on my wife's wrist shows from when the male nipped her while she was fixing the airline in the tank. Yesterday they spawned again. This *Tilapia* is not mouthbrooder—as others we have kept have been." Mr. Mitchell concludes by saying that he and his wife have tanks.

Mrs. Jacqueline McNeill resides at 31 Crusader Crescent, Stewarton, Kilmarnock, Ayrshire. She said: "I'm writing regarding your request for information about gouramies. I have been keeping tropical fish for over seven months but I have seen several gouramies and have noted differences in their mating and behaviour in an aquarium.

"I bought what I was told was a pair of opaline gouramies when t

were six months old. They turned out to be two females. One was more aggressive than the other, although both could be aggressive when annoyed. The larger one was the more aggressive and bullied the other one relentlessly. They often had fights with each other, grabbing each other's fins and pulling—although they never seriously damaged them. They also bullied a thick-lipped gourami and a pair of dwarf gouramis. I was eventually forced to give them away to let the other gouramis have some peace. I would never put another opaline gourami in my aquarium as I have found them to be very bad-tempered and aggressive towards each other and towards other species.

"One thing I found interesting was that the person I gave one of them to had a pair of lace gouramis and the opaline gourami happily followed the female gourami around the tank and never showed the least sign of aggression towards it. I don't know of any reason for this and it has puzzled me. The other opaline gourami formed a great friendship with a large, marble angelfish—also amazing.

"I have had a *Colisa labiosa* (thick-lipped gourami) since I set up my aquarium and have found it a very gentle and timid fish. It is a female and is now about one year old. It keeps to the back of the tank and stays well away from the other fish. It likes

most flaked food and will take dried *Tubifex* and white shrimps. It has a preference for large live food and some egg yolk. . . ."

I hope to use the remainder of Mrs. McNeill's letter in a future feature. I hope that other readers will write to me soon. Please send me your opinions on the following: (a) water wisteria—its cultivation; (b) breeding small cichlids; (c) cultivating live foods; (d) coldwater catfishes; and (e) garden ponds.

It's freezing cold outside today but my Christmas cactus carries its usual, annual crop of many dozens of beautiful flowers. I look forward to hearing from you. Good-bye until next month.

CROSSWORD *by Isis*



CLUES

Across:

1. A drain there for livebearers (11)
8. Water resort (3)
9. Ill at home? Then — — (4, 6)
11. Summits (3)
13. Accumulated or deposited upon (8)
15. Writing implement (4)
16. As particle in solution (3)
18. Different prefix in the one (6)
20. Facing winds to the east as might be seen in forecast (5, 1)
21. Tar as in gallery? (3)
23. (Semi) precious stone (4)
25. Race hot for microbes (8)
26. Male offspring (3)
28. Plant leaves (as e.g. in *Ceratopogon*) (4, 6)
29. Air meal (3)
31. I crush moren and find leaf-fish (11)

Down:

1. I heard the press, said bi-sexual fish (13)
2. Nasty hitch in mountain mallow (10)
3. May be eyed or nosed or lint, but always characin (3, 5)
4. Cell activity control centres (8)
5. Plant nutrient collector (6)
6. Arsenic? (2)
7. Star Wars ropes in bird-like fishes (5, 7)
10. Seal (from) (3)
12. Saw chip rep, was plumbers tool (4, 6)
14. Canine (3)
17. German collector of Heckel's fishes, a great talker? (8)
19. Globe, often applied to spiders (3)
22. Brown water acid (6)
24. Backward mammal, also as in *Le* (3)
27. As in bright tetra (4)
30. Morning? (1, 1)

Solution on page 67

Planting the coldwater aquarium

by Jack Hems

A LARGE number of submerged plants in a coldwater aquarium plays a major part in creating and maintaining a healthy environment for the fish. Moreover, for the beginner and experienced aquarist alike, the different shapes and sizes and various textures of evergreen foliage cannot do other than gladden the eye. There is, however, quite a diversity of opinion amongst aquarists as to what constitutes the best medium for cultivating underwater plants.

Practitioners of any art—and the tasteful planting of an aquarium is, in the view of all serious aquarists, an art—have their individual ways of achieving their objective. But when all this has been said and conceded the aquarium keeper can hardly improve on the rooting and growing qualities of a fine non-calcareous grit or small rounded gravel, enriched in due course by the nitrogenous and mineral elements excreted by the fish. (In parenthesis, it must be stated at once that the leaves of submerged plants also take in nourishment from nutrients dissolved in the water.)

Before spreading the compost to a depth of about 2½ in. to 3 in. over the base of the tank, it is absolutely necessary to wash it in a plastic bucket placed under a running mains tap until the water runs away sparkling clean. Also, any pieces of rock earmarked for inclusion in the set-up should, like the compost, be well scrubbed and free of calcium; for free lime seeping out of calcareous substances into the aquarium water renders it increasingly hard and alkaline: a state of affairs which, sooner or later, leads to ailing fish.

The position of the aquarium in a room and the vagaries of our weather (too many grey days and short and dark days) rule out natural light as a reliable source of illumination. That is for a decorative tank. Hence the substitution of electric light in place of natural light in all modern aquarium set-ups.

Ordinary tungsten lamps can be used to illuminate the aquarium; but fluorescent lighting is far less expensive to operate once the initial outlay on the required apparatus has been made. Remember, too, that tungsten lamps raise the temperature near and at the surface of the water. On the other hand, fluorescent lamps emit the minimum of heat. Also, a fluorescent lamp will function satisfactorily for 18 months or longer before a replacement lamp tube becomes necessary. Generally speaking, a tungsten lamp needs renewing every few months, or weeks. If, however, for some personal reason, tungsten lighting is adopted, the rule to follow is to allow one 40-watt lamp per foot-length of aquarium.

But back again to fluorescent lighting. A 20-watt lamp will give adequate light for a 2 ft. tank. A 3 ft. tank calls for a 30-watt lamp. The lamps or tubes (so called) should be housed in a whitened or silvered reflector (trough-shaped or rounded), placed no more than 6 in. above the glass or plastic cover. The light should be kept switched on for at least ten hours a day; and here it ought to be mentioned that, if the aquarium receives any direct sunlight for an hour or two (at any time of the year) the hours of artificial illumination may be cut out for about an equal period of time. To return for a moment or two to the subject of a reflector, cooking foil stuck to the inside of the reflector will increase the brightness directed into the aquarium.

Assuming that the tank has been filled to within an inch or so of the top, it is ready to receive the plants.

Eleocharis acicularis





ascending ribbons of the underwater grasses.

Chief among these distinctive plants is *Ludwigia natans*. This species, which occurs in the wild in southern North America through to Mexico is, under cultivation, popularly known as *Ludwigia sullerthii*—an erroneous botanical name. *L. natans* has leaves that may reach a length of about 1½ in. and roughly a quarter of this size across. They are lanceolate (broad or rather narrow) in outline and grow

in pairs (short stalked) up a branching stem. The leaves are apple green flushed with violet to rose on the top side; and sometimes, but not always, a rich purplish hue on the undersides. Bought stems may be naked of roots or already sprouting darkish thread-like roots.

Be this as it may, set the cut ends about an inch deep in the compost and when the plants are seen to be making progress, but not before, pinch away the growing tips. This

will promote the emergence of side shoots. These, too, should be shortened after about two months' growth. The result of all this pruning should be seen in a highly colourful bush-type plant. *L. arcuata* is, to some aquarist's eyes, even more ornamental than the foregoing member of its genus. It is found in the natural state over a large part of the south-eastern United States. It has red

Continued on page 51

Book Review



Vanishing Fishes of North America, by R. Dana Ono, James D. Williams and Anne Wagner. Published by Stone Wall Press, 1983. Price: \$29.95 plus £3.00 Surface Mail or £10.00 Air Mail. ISBN 0-913276-43-X. Available from Stone Wall Press, Inc., 1241 30th Street NW, Washington, D.C. 20007, U.S.A.

Alfred R. Wallace, the "co-creator" of the concept of Natural Selection (the other one being Charles Darwin), once wrote in defence of the need to protect every species of animal and plant, "... If this is not done, future ages will certainly look back upon us as a people so immersed in the pursuit of wealth as to be blind to higher considerations. They will charge us with having culpably allowed the destruction of some of those records of creation which we had it in our power to preserve..."

The year was 1863. Some might say that little has changed concerning our approach to conservation. Others (and I include myself among these) would argue that a great deal has been

and is being done, but not enough. The authors of this thorough, professional and, at times, highly disturbing book also share this somewhat qualified optimism.

It is indeed their positive outlook that helps lend strength to their arguments for, if they belonged to the "advocates-of-doom" camp, they might be thought by some to be overstating their case. It is, therefore, doubly sad to read how we, as a species, consistently and repeatedly find ourselves in the unenviable position of driving a constant trickle (extremists might say, flood) of fish species towards extinction.

Despite the fact that coverage is restricted to North American fishes, this book is of great relevance to all those who form part of that ever-expanding body of aquarists whose interest in fish stretches beyond the four glass walls of their aquaria.

In fact, some of the species discussed are not only of academic interest to several of our UK Specialist Societies, but are actually being kept and bred by members in this country (similar programmes are being implemented on the Continent and in The States). Encouragingly, this breadth of involvement is on the increase as the recent upsurge in interest in Darters, no doubt, indicates.

For the record, species mentioned in the book include Killifishes and Pupfishes, Darters, Livebearers, Trout, Suckers, Madtoms, Cavefishes, Shiners, Dace, Topminnows, Sunfishes, Sturgeons, Pike, Sticklebacks (the unarmoured subspecies), Catfish and others.

The habitat, requirements, present status (endangered, threatened or extinct), and nature of the threats to survival are all dealt with compre-

hensively in the text and summarised in one of the appendices. Details of Conservation Organizations, an extended list of references, a Glossary and a distribution map are also included.

The somewhat superfluous two diagrams showing "Parts of a Fish" are incorrectly labelled (but a separate sheet with the corrections is enclosed). It would also have been advantageous to illustrate every species mentioned (although there is a good selection)—this would not have been expensive if the illustrations were restricted to simple line drawings.

Despite these and a few other minor quibbles, "Vanishing Fishes" is a highly commendable book which should appeal not only to individuals interested in conservation, but also to those Societies which own their own library or aquarium literature. It may not be cheap and it may not be absolutely flawless (is there a flawless book?) but it certainly ranks among the best level-headed works on this highly emotional subject.

John A. Dawes

DISCOVER THE FISH

by Pisces—

- The First is in POND but not in WATER
- The Second is in SON but not in DAUGHTER
- The Third is in MONTH but not in YEAR
- The Fourth is in LISTEN but not in HEAR
- The Fifth is in LAWN but not in TURF
- The Sixth is in FOAM but not in SURF
- The Seventh is in DWELLING but not in HOUSE
- The Eighth is in ARGULUS but not in LOUSE
- The Ninth is in MARQUEE but not in TENT
- The Tenth is in SUSSEX but not in KENT
- The Eleventh is in FIBRES but not in ROOT
- The Twelfth is in LIZARD but not in NEWT

Answer on page 61

THE AQUARIST

The **GOLDFISH**

a coldwater jewel in the aquatic crown

FROM the beauty and grace of the Veiltail to the regal splendour of the Moor; from the jewelled slickness of the Shubunkin to the darting speed of the Comet. Who would have thought that so much beauty and such a variety of colour could be found from the simple Goldfish? A species which has in my opinion never received the respect it so richly deserves; the Goldfish is surely one of the jewels in the crown of the aquatic world.

To many people the Goldfish is merely a symbol of an evening's entertainment at the fairground, subsequently forced to live a torturous existence in an awful glass bowl! Hardly fitting for a fish which can be justly proud of its fine heritage.

It is as a Chinese species that the Goldfish first appears in recorded history. Goldfish were observed in natural waters, where it is believed that they were quite olive in colour (breeders of Goldfish will know that fry initially bear the dark colour of their ancestors).

There are many references to domesticated Goldfish of the Chinese in the Tang dynasty (618-907), but there is no proof that it was they who were the first to keep Goldfish as domestic pets. Before the end of the thirteenth century Goldfish of many types were bred and sold in some profitable numbers, with 'Chi' (goldfish) prized for keeping, and 'Li' (carp) coming next.

Approximately two centuries or so later the Goldfish found its way to neighbouring Japan and by the

by *Stephen J. Smith*
Photos by *John Moore*

end of the seventeenth century the Goldfish had become widespread across the East and was being introduced into England; to spread across Europe and reach Germany by the end of the eighteenth century. America began keeping Goldfish during the nineteenth century, and it is worth noting that a Goldfish farm had been established by 1889 in Maryland, so that by the beginning of the present century most of the popular fancy breeds of Goldfish were known to American aquarists.

Development of fancy breeds

The skills of responsible Goldfish breeders has produced scores of recognised varieties of fancy Goldfish. There have, unfortunately, occurred some rather bizarre mutants, but these serve only to denigrate the reputation of serious hobbyists.

The Goldfish as a species has four scale types; Metallic, Matt, Calico, and Nacreous. Many cold-water fishkeepers recognise only three; metallic, matt and nacreous, but I prefer to separate nacreous from calico.

Metallic: Goldfish of this type have reflective scales of red, orange, or yellow, or even no pigment—in

which case they appear to be silver. Young metallic Goldfish when they first scale are olive in colour. This darkens and becomes almost black. As the fish develops, the eventual colour becomes apparent as the black pigment recedes deep into the tissues. The last areas of the fish where this recession takes place are usually the dorsal and caudal regions. In some cases this attractive black margin lasts for quite some time, before disappearing completely.

Matt: These scales of the Goldfish show no reflective characteristics, and are usually found to be pink.

Nacreous: Goldfish with this scale type exhibit either a single colour or a number of colours, and a mixture of matt and metallic scales.

Calico: The term 'calico' is often confused with 'nacreous' and the difference is not always clear. The Goldfish Society of Great Britain uses the term to describe a fish which has three or more colours scattered haphazardly over the body, usually including blue.

The fancy breeds of Goldfish were developed simultaneously as the common Goldfish—and new breeds are always being introduced. As I have stated previously, there is no place for bizarre mutations—but that is my opinion and as always, fishkeeping is about what pleases the individual. The following examples are some of the most widely recognised varieties of Goldfish.



Above: The perfectly square-cut caudal fin on this Calico Veiltail has not yet fully developed. It is usual for the finnage not to bloom until the fish reaches maturity; young fish with long finnage will become over-finned and have difficulties with balance

Below: The Bristol Shubunkin differs from the London type, with longer finnage—the single caudal fin bearing rounded lobes



Below: This Western-type Lionhead displays perfectly the main features of this particular species; a smooth back, short fins and lack of dorsal fin, and the fascinating fleshy hood from which this goldfish derives its "lion-head" name



Above: The Oranda bears the hood of the Lionhead and the elegant finnage of the Veiltail. White scales or finnage is not usually desirable for the show bench, but nevertheless makes for a beautiful fish



Left: This Oranda has a well-formed rounded body which makes this splendid goldfish an excellent inhabitant for the aquarium, where it can be viewed from the side

Continued on page 38

The **GOLDFISH** a coldwater jewel in the aquatic crown

Continued from page 36

The Common Goldfish

Aquarists have a lot to be thankful for in this popular fish—I'm sure that for many of us our introduction to the hobby was with the acquisition of a Common Goldfish.

The scales of the Common Goldfish should be bright metallic, and preferably blood-orange in colour, although yellow or silver are fairly popular, as well as combinations of these colourings, and white goldfish can sometimes be found.

The Common Goldfish breeds true—that is to say that on the whole fry will almost always be identical to their parents. The depth of body should be just under half the length not including the tail (or caudal) fin which is single. All the fins are of moderate size, and the dorsal fin should commence at the highest point of the back—situated above the pelvic fins.

The Shubunkin

There are two distinct types of Shubunkin: the Bristol Shubunkin and the London Shubunkin. Both are colourful fish, and excellent for the pond or aquarium. The Bristol Shubunkin displays a long single caudal fin with large round lobes. The London Shubunkin has a finnage which is identical to the Common Goldfish, but has transparent scales which display several colours. These should ideally be patches of red, orange, yellow and brown on an all-over light blue background, with a black speckling over all, including the tail.

The Veiltail

Prized for its beautifully-formed long finnage, the Veiltail is a round-bodied fish which is well-suited to the aquarium—especially as its shape is best viewed from the side.

The dorsal fin should be held erect, and measure approximately equal to the depth of the body. The caudal fin should be fully divided to form a matching pair of long flowing folds, cut square along the lower edge. The anal fins should be paired and are sometimes almost as long as the caudal fin, adding to the fish's beauty. The pectoral and ventral fins are also well-formed, though not as spectacular as the caudal and dorsal finnage. Veiltails can be either metallic or nacreous.

The Moor

Often termed incorrectly 'Black Moor,' the Moor displays all the beauty and grace of the Veiltail, with the attraction of a pair of protruding 'telescope' eyes and an all-over jet black matt colouring. These features give the fish a 'regal splendour' whether in aquarium or pond.

The Fantail

In all respects except the finnage, the Fantail is identical to the Veiltail, and Fantail Moors also are found. The fins of the Fantail are less pronounced; the caudal fin being paired and of medium length, carried stiffly.

The Oranda

This should be identical in body and finnage to the Veiltail, although many fishkeepers enjoy fantailed Oranda. The distinguishing feature is the fascinating soft development around the head, termed the 'hood,' and the most desired aspect of the next species, the Lionhead. Colouring is usually metallic or nacreous, and a derivation, the Redcap, is an Oranda which has silver-pink metallic scales and an attractive scarlet patch within the topmost portion of the hood.

The Lionhead

A most prized Goldfish. The Lionhead is known as the 'Ranchu' in Japan and differs from the Western-type Lionhead in that it has a back which droops at the caudal peduncle (at the root of the

tail); whereas the Western Lionhead has only a slightly curved back. This completely lacks a dorsal fin and the caudal fin is short and divided, with paired anal fins and short ventral and pectoral fins.

The Lionhead is most prized for its well-developed hood, which is soft and fleshy, and grows in strawberry-like nodules across the top of the head, just forward of the gills and around the eyes. Colouring of the Lionhead is usually metallic orange, although silver and calico colouring is also common.

Finally, I should give a very brief word about keeping your first Goldfish. Far too many people have only a brief encounter with fishkeeping by purchasing a glass bowl and a couple of fish—only to find both occupants dead within weeks.

Remember, the natural habitat of the Goldfish was in the rivers of China, so whatever we provide can only ever be a compromise. Fancy Goldfish are bred for the aquarium or pond, and we are doing them a disservice if we do not pay attention to their basic needs, primarily:

Regular partial water changes

Removal of decaying matter

Regular and balanced feeding

Keeping Goldfish is a very straightforward and simple matter. There is no mystery behind fishkeeping, it is basically a matter of commonsense. Please, though, do treat your fish to an aquarium rather than a spherical torture chamber, and don't overstock. Goldfish enjoy plenty of room and just one or two good specimens, well kept, can give years of pleasure.

I hope to cover most aspects of coldwater fishkeeping in future articles. In the meantime, for those of you who had never seriously considered the Goldfish a 'valid' species, I hope I have been able to provide a brief insight, and some inspiration, into the elegance and beauty which makes the world of the Goldfish so fascinating and pleasurable.



Colour in the Garden Pond

by Laurence E. Perkins

THE garden pond has often been described as the focal point of the small garden but as such it needs to be an object worthy of attracting the viewer's attention. The belief held by some garden owners that an expanse of water requires less attention than the lawn and flower beds is soon exploded if the pond suffers neglect, which it may well do, after the autumnal leaf-fall and die-back of marginal foliage. When late autumn brings continuous rain supplanted by winter's severe cold, it is sometimes not until early in the succeeding year that the pond can be afforded the necessary clearing up process, and the sullen spectacle of decay on such occasions can be most disheartening. However, the job of removing dead marginal foliage and waterlogged water lily leaves, etc. must be carried out along with inspection of the fish and aquatic plants with a view to obtaining replacements and additions.

The main requirements of a garden pond is that it shall be ornamental and colourful and with this object in mind spring planning should involve careful listing of plant and fish needs for the coming summer.

Fish

Aside from the coldwater fish specialist whose interest lies in producing show specimens of Koi or fancy Goldfish varieties, there are pond owners whose main interest in fish is that they be visible and colourful and to meet this need there is no better fish than the common Goldfish. Whether depleted stock is being augmented or new stock acquired, fish should be obtained from a reputable supplier and of a size and in numbers to allow for growth with adequate *lebensraum*—i.e. small fish in small numbers. For variety multi-coloured Goldfish types (Shubunkins) and shoaling surface swimmers (Golden Orfe) may be included but those fish with exaggerated finnage (Veiltails, Fantails, Orandas, etc.) are best avoided by the non-specialist.

Popular pond fish are omnivorous and while a plethora of very good proprietary fish foods are available and relished by the fish, it should be borne in mind that fish in an outdoor pool are not likely to starve if not physically fed for a period by their owner. Apart from a variety of animal life forms which will appear in the pond (larvae of dragonfly, water beetle and mayfly,

frog and newt tadpoles, water slaters, etc.) the underwater foliage will afford sustenance and fish will browse off these submerged aquatics. Feeding the fish regularly from the same corner of the pond, however, will condition them to gather at that spot at the approach of their owner which makes for an on-going rapport but very moderate amounts of food should be dispensed, ensuring its complete consumption with no residue to rot and to foul the water.

Marginal plants

If the pond has shallow regions in the form of a shelf or, perhaps, at one end, marginal plants such as marsh marigolds, dwarf reed-maces (*Typha minima* and *T. angustifolia*) can be accommodated along with such colourful bloomers as *Iris kamperferi* and *I. laevigata*.

For shallow shelves, primulas are especially suitable such as *Primula denticulata* with its drumhead of lavender florets, *P. japonica* in shades of red and pink and *P. florindae*, the Giant Himalayan Cowslip which grows to two feet in height with rich yellow bell flowers.

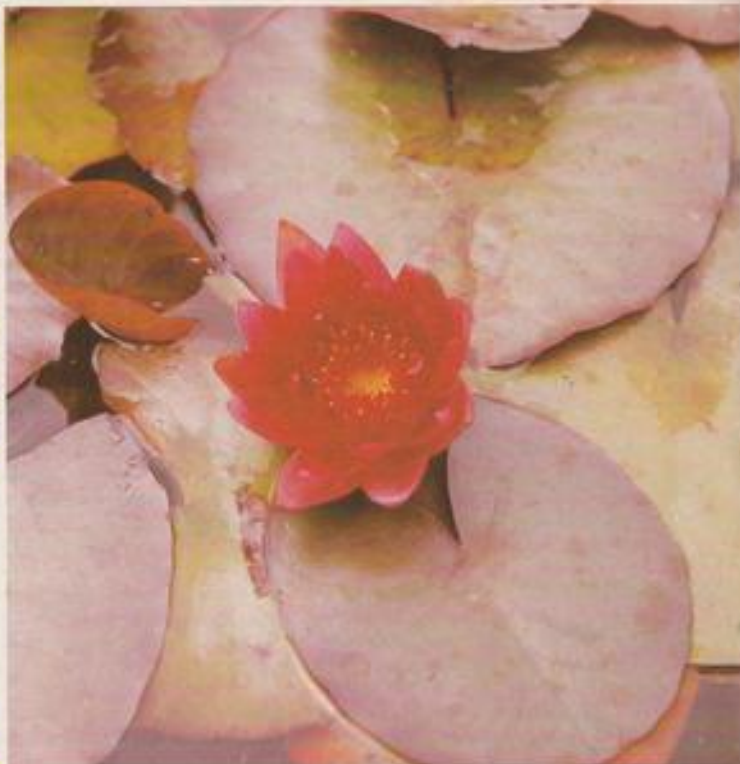


Poolside rockery providing backdrop for candelabra primulas (*P. japonica*)



Pickerel Weed (*Pontederia cordata*). Attractive in large ponds (or small pool if restrained)

Water lily 'Neptune' suitable for depths of 1 1/2 to 2 ft

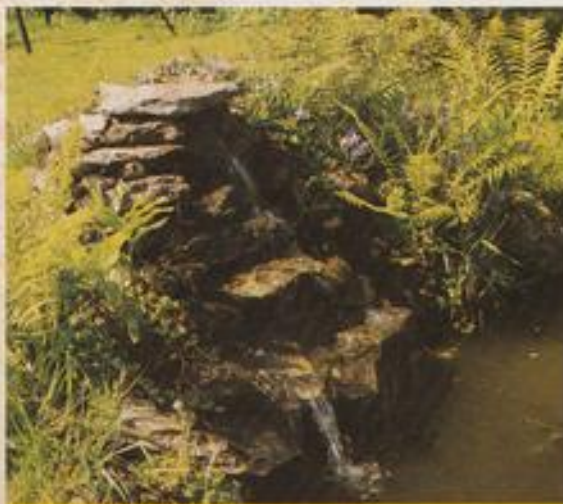




Golden Orfe. Colourful and lively shoaling fish for moderate sized ponds



Red saxifrage. One of many colourful plants for pondside rockery



Waterfall activated by submerged pump and built of local stone

Floating plants

The water surface provides another situation for colour but extreme care should be taken when planning for this area. While a good amount of surface shade is necessary both to afford cover for the fish and to limit the intrusion of sunlight, and thus excessive algal growth, we must ensure that floating foliage does not become too abundant and this is particularly important where water lily leaves are concerned. First, when obtaining water lilies, only really

reliable stockists should be approached most of which provide excellent colour-illustrated catalogues of all that is required for pond construction, equipping and stocking. However, it is so easy to be tempted to buy the wrong lily or lilies for one's particular pond—one that is too vigorous or needing greater depth of water than the pond can supply, so that it is advisable to consult the stockist and describe the pond for which the lily is intended. He will be able to supply you, whatever the size of your pond, as there are miniature lilies for the tiniest of pools and a range of increasing sizes to huge beauties for lakes. Water lilies are sold sometimes under the vague description of white, yellow, pink or red but these should be eschewed in favour of those labelled with specific names and planting depths.

One floating plant which would appeal to bird watchers is *Crassula recurva* which forms a tight mat of very fine short leaves and has minuscule white flowers. It is a spreader and must be kept within bounds but birds find it especially convenient for bathing when they settle on it and their weight depresses it sufficiently to partly immerse their bodies, and a succession of blackbirds, thrushes, chaffinches, goldfinches and blue-tits will entertain the pondside recliner in his deckchair. This plant also serves as a convenient escape route for froglets when they desert the water.

Submerged aquatics

For submerged plant life we have a wide range of oxygenators to choose from. A variety of attractive forms exist among these plants and one may be easily tempted to buy several diverse types but it is better that variety should be limited to two or three different species known for their oxygenation and lushness of growth such as Hornwort (*Ceratophyllum demersum*), Water milfoil (*Myriophyllum spicatum*), *Egeria densa* and *Lagarosiphon major*.

The owner of a small or modest sized pond is at great risk when let loose at a water garden centre for most of the plant goodies on display appear irresistible but some must be avoided in favour of others with less rampant propensities unless very stringent control over growth can be exercised. A small clump of water mint, for example, looks very attractive and can be so in small patches in the pond's shallows with its spherical heads of mauve blossom but it is a coloniser and will soon send forth runners, like garden mint, to all quarters of the pond, sometimes even appearing among the grass of the nearby lawn. This plant, like Pickerel Weed (*Pontederia cordata*) should be rejected, or restricted in a container which should be examined frequently so that wayward leaders may be cut away.

Waterfalls and fountains

While submerged plants do much to oxygenate the water, some artificial turbulence is to be recommended in the shape of a fountain or waterfall. Electric pumps of several types and sizes are available for powering either or both waterfalls and fountains. As well as providing the spectacle and sound of splashing water, their use during hot spells, and more especially, thundery weather, will do much to obviate fish mortality stemming from oxygen starvation.

A waterfall can be incorporated with a rockery which gives scope for more colour in the form of saxifrages, spring bulbs, Solomon's Seal, Fritillaries, Astilbes, Freesias and a little commoner called Creeping Jenny (*Lysimachia nummularia*). Dwarf conifers, and ferns like the Hart's Tongue, can be included for cover to provide hideaways for toads, frogs and newts, all of which assist in making the pond a place of interest.

Natural ponds in the wild can sometimes offer tempting prospects of obtaining submerged plants and possibly aquatic snails. Such temptation should be resisted most strongly as this is the ideal way of

introducing unwanted livestock to your pond and in particular leeches and fish lice, difficult to eradicate when once introduced.

Predators

Pond predators are few in types but those that pose a threat when present are most difficult to combat. The most ubiquitous and troublesome, as well as almost impossible to discourage, is the all too common domestic (and feral) cat and because of this animal's widespread popularity, methods of dealing with it are best left to the ingenuity of the pond owner. The worst natural predator is the heron and anyone troubled by this elegant angler will be well aware of its persistence in endeavouring to denude a pond of its fish. Netting the pond will discourage its attentions but will add nothing to the attractiveness of the scene, even when the almost invisible nylon netting supplied for the purpose is used, but this is sometimes the only solution. However, a strand of fine wire, if wound around foot high pea-sticks placed at intervals around the pond's periphery, does offer a deterrent to herons whose habit is to walk into the pond in order to fish but those fish foraging at the pond's edge will still be vulnerable. A third ploy recommended by some pond owners is to use a stone or plastic life-size model of a fishing heron which, they say, deters the heron which is, by preference, a loner.

Pond types

If a new pond is being planned, the initial decision will devolve upon its construction. Three choices are available: concrete, soft plastic liner, or moulded fibre-glass pond shell. Personal choice and the nature of the ground involved will guide the planner but the use of butyl rubber liners or fibre-glass moulded shapes are finding increasing favour and there is no doubting the time and labour saved by using these materials which are on display at water garden centres and aquatic shops.

Coldwater Jottings



by
**Stephen
J. Smith**

Why no plants or gravel in the aquarium? A question which I am often asked by visitors when they see the fish which I enjoy rearing and conditioning indoors; then with horror they realise that these beautiful fish are accommodated in a totally bare tank!

A true 'aquarist' would keep his or her aquarium as a complete exhibition of plant and piscine harmony. A true balance is struck creating a microcosm of supposed or imagined natural surroundings. For myself I am more interested in keeping and rearing fine quality coldwater fish. I find it more effective to keep the tank completely bare, having no plants or gravel at all. This provides plenty of room for the fish themselves; and tank maintenance is so much easier.

It is possible with a bare tank to remove every last trace of matter which could decay and pollute the water. The majority of coldwater aquarists will siphon any traces of uneaten food or mulm immediately it appears. By keeping a clean tank it becomes impossible to overfeed because one can see at a glance whether the fish have left any food, and thus regulate the quantity administered.

A golden-rule in keeping and rearing quality coldwater fish is: "Cleanliness is next to Godliness". Most of the ailments which afflict your fish (and isn't it always your favourite or best specimen which gets 'got') are caused by poor husbandry—causing stress in the fish and consequently lowering its resistance to disease.

Without the inclusion of plants and other ornaments it is also easier to clean the interior glass surfaces. I prefer to clear only the inside of the front

glass, leaving the sides, back and base of the tank to enable algae to grow.

If attention is paid to giving your fish a clean environment your fish-keeping will be that much more successful.

It is timely for a few points about choosing your fish for the coming season. This is the time of the year that many people are beginning to think about stocking or re-stocking the pond, and this is something which should be thought about very carefully. Now is the time to read up as much as possible about the types of fish most suited to your requirements—and to your pond. Make sure that you are thoroughly conversant with the fish's needs BEFORE actually going out and purchasing.

Many people on visits to garden centres or petshops happen to see an attractive fish, purchase it immediately and find that within a few weeks it is dead, probably diseased. They go back to the shop and complain and in fairness to the shopkeeper it is not really his fault. Stocking the pond should not in my opinion commence until after the Winter subsides. By this time you will have had time to clean the pond out, removing any casualties of the Winter and any decayed or decaying leaves or plant matter. (Most of the hard work will have been done during late Autumn, although the Winter seemed to catch me out this year!) Having refilled the pond with clean water this should be left to stand for a week or so to allow chlorine and other chemicals to dissipate and only then should one begin stocking with fish.

In doing so another important factor should be considered—especially when adding fish to a pond in which fish are already kept. Many coldwater species are imported. With imported fish comes the risk of imported disease. If you were to introduce your newly-acquired fish to the pond—and this fish harboured any disease—this would spread rapidly to other inhabitants; eventually, possibly, to wipe out your stock completely.

It is important when selecting fish to obtain only healthy-looking specimens; and even so to quarantine your purchase using a large glass aquarium

for about three weeks to give any incubating disease time to reveal itself, and to cure any which does occur, before introducing your fish to the pond.

Without any disrespect to those conscientious dealers, my personal advice is to buy only fish from recognised breeders or member colleagues of a coldwater society. An ideal source of inspiration when looking to purchase new stock is to attend one of the many open shows which are held throughout the year up and down the country by specialist coldwater societies.

The Goldfish Society of Great Britain, the Bristol Aquarist Society, the Northern Goldfish and Pondkeepers Society, and the South Park Aquatic Study Society are just a few of the several specialist groups throughout Great Britain which hold open shows and members of the public are made welcome. Many quality fish can be obtained this way. In the Midlands, the Association of Midland Goldfish Keepers holds members' shows throughout the year, and again, members of the public are always more than welcome at any of their meetings. If secretaries of coldwater societies would like to send me information about their show calendar I would be more than pleased to pass on this information through these pages.

APOLOGY

It was very touching to read the several tributes to my predecessor, the late Frank Orme, published in December. On behalf of the *Aquarist* I should like to apologise to the Association of Midland Goldfish Keepers for the unfortunate omission of their name from the foot of their own tribute to Frank, who was one of the founders of the AMGK.

As the AMGK enters its second decade, and with a lively and enthusiastic membership, it is looking forward to achieving Frank's aims and ideals in furthering the coldwater hobby and bringing closer together all who share in the pleasurable pursuit of fishkeeping.

It is well known that fish 'sleep', like bream near the bottom of a deep lake in midsummer. Many tropical fish like the famous African lung-fish in London Zoo aquarium aestivate through months when their water dries up in droughts. But do fish really hibernate in cold weather, like many mammals? A sleek, harmless basking shark trawled from deep water off the Isle of Man last December, is a summer sight in the Irish Sea from February to early autumn. Now tracked by satellite and a radio transmitter fixed to the shark's head by Aberdeen University biologists, its capture solves the mystery of where these sharks go in winter.

Far from being 'visitors' to the Irish Sea, these 'sunfish' as fishermen called them when seeing them basking, mouth-open, in summer, sifting their plankton-food at the surface even off Southport and Walney Island, are here all year. They spend the winter hibernating in deep water, as their absence of gill-rakers and cessation of 'basking' when plankton sink to lower water in winter indicate. Averaging 23 ft. in length, they are our biggest British fish.

Taking their temperature from the water, garden-pond goldfish lose their appetites in winter but they will sometimes take small garden earthworms, even when ice is on the water. Some fish-keepers insert a 100 or 150 watt fish-tank heater and switch on during frosty nights, to keep a small hole open to allow dangerous gases to escape and fresh oxygen to enter. At this time we no longer see the daily up and down feeding rhythm followed by roach and perch in summer.

It is a question of whether it's true hibernation or cessation of feeding with prolonged sleep to save oxygen-consuming energy, the way in which most English badgers, wood-mice and squirrels retreat for cold February days instead of hibernating like their species in northern Europe. True hibernators have a hibernation-gland, like the hedgehog, which enables them to store fat in autumn. At this moment, great shoals of basking sharks are waking from their winter torpor on the bottom

From a Naturalist's Notebook



by Eric Hardy

of the sea, to resume their surface gulping of nearly 1,400 tons of water an hour and straining it through their newly-grown gill-rakers for plankton, which surfaces again this month.

The respiration rate of fish is in relation to their varying oxygen-demand, and its varying content in reverse ratio to rising water-temperature. A trout has to pass 22 cc of water through its gills per minute in a water-temperature of 43°F, but if this rises to 60 degrees it has to double the water to 44 cc a minute, due to oxygen content shrinking to no more than 1% if freshwater, 0.8% if salt-water. The sluggish tench requires only about half as much oxygen as the active trout. The aquarist gives much attention to increasing the oxygen content to his tank. The value of some aerating submerged plants may be exaggerated compared with increasing the surface exposure to air, or reducing fish-numbers, for it depends upon sunlight. Cichlids burrow through and destroy most of them. You can see bubbles of oxygen rising from Potamogetons, etc., to break the surface. Providing it is not too small, a vibrator-

air-pump, or combined with a filter, effectively aerates the tank.

The more active a fish, the larger more numerous and more compact its gill-filaments through which more than a tenth of its exhausted blood with less than 15% oxygen is rushed in less than 2 seconds, leaving with at least 85% saturation with oxygen. If the blood-speed rather than gill-surface were increased, the faster flow would diffuse less oxygen. If the gill-filaments were merely increased without closer spacing, the fish would need a larger head, which would affect its streamline swimming. Of course, trout pump water through their gills faster than sluggish carp, and fast-swimmers like mackerel have their mouths open to reduce the energy-consuming use of respiratory muscles. Oxygen is so high in the cold, deep Atlantic troughs that fish there dispensed with red haemoglobin to transport it around their bodies. However, tank goldfish were shown to live apparently normally when their haemoglobin was poisoned by carbon monoxide. This is probably because it isn't so important in sluggish as active fish. Then why does the goldfish normally keep 1½ million of these red corpuscles in each cubic millimetre of blood?

A fish's gills also serve as a cooling system, losing the heat its blood acquires during circulation and returning it to its body at the same temperature as the water. The internal temperature of a fish may rise 10°C in hot summer water, making it eat more and swim faster. Normally its body-temperature is within a degree or so of the water-temperature, excepting for larger sharks and tunny which are normally some 10° warmer than the water they swim in and may exceed 30° in water at 20°C. This 'warm blooded' condition independent of external temperature is maintained by two capillary networks of blood-streams passing one another, the warm body-blood returning to the gills heating the colder blood returning to the body. This enables these migratory fish to swim through a wide range of water temperatures without losing their speed.



A-Z of the Aquarium

Undergravel filtration

ALTHOUGH it is not absolutely essential to filter aquarium water, it is highly desirable to do so for, without it, good water quality can be very difficult to establish and maintain.

The most controversial method of filtration is undergravel, largely because of some of the claims that have been made on its behalf. For example, it has been said that efficient undergravel filtration promotes healthy plant growth because it drags organic matter downwards into the spaces between the grains where roots can then extract essential growth substances. On the other side of the coin, the argument goes that the intergranular, oxygen-rich water current produced by undergravel filtration creates an unnatural environ-

ment around the roots which inhibits growth rather than enhancing it.

In some way, both arguments can be shown to be right. If the layer of gravel is thick enough, i.e. 3 inches (c. 8 cm.) or more, and if the flow of water is gentle, good plant growth can be achieved. If, however, the layer is thinner than this and the flow quite strong, then plant growth is generally weak.

What some arguments tend to overlook is that the primary aim of undergravel filtration is not the promotion or inhibition of plant growth. Its primary aim is to provide a medium which purifies aquarium water by biological means.

The starting point is the production of ammonia-rich waste products by the fish themselves. Ammonia is highly toxic, particularly to marine organisms, but it can be removed through absorption by a porous "chem-

ical" filter consisting of charcoal, zeolite (not in marine aquaria) or other similarly-acting substances. Alternatively, it can be removed by the direct action of certain bacteria, e.g. *Nitrosomonas*, which can grow on the surface of gravel grains. Therefore, by directing a water current through the gravel, either by "normal" or "reverse-flow" undergravel filtration, the ammonia in solution can be brought into direct contact with these bacteria. They convert it into nitrites which, themselves, are toxic. The next stage in the process is carried out by other bacteria, e.g. *Nitrobacter*, which convert the nitrites into nitrates. These are then available for use by plants, thus completing the nitrogen cycle.



Healthy plant growth can be achieved using undergravel filtration

Vertebrates

An invertebrate is an animal that possesses an internal skeleton and backbone. The latter characteristic distinguishes vertebrates from all other organisms that possess a skeleton. Many invertebrates, for example, have a skeleton but this is almost invariably external (see A-Z, Sept. 1984). Notable exceptions may be found in the Phylum Echinodermata, represented by animals such as Starfish, Sea Cucumbers and Urchins (see A-Z, Feb. 1984) which actually possess an internal calcareous skeleton covered by tissue of varying thickness, according to type. However, Echinoderms do not have the added characteristic of possessing a backbone and do not, therefore, qualify as vertebrates.

While the range of invertebrates found in aquaria is quite large, e.g. Molluscs, Echinoderms, Crustaceans, Worms, Sponges and Coelenterates, the opposite applies to vertebrates.

In fact, only three types are found with any regularity in the aquarium hobby (and this entails considering the hobby in its broadest sense): amphibians, reptiles and, of course, fish.



Fish constitute the largest group of aquatic vertebrates

Among the amphibians, we find the newts, salamanders, frogs and toads; while among the reptiles, the only 'aquatic' ones kept are terrapins, sea turtles and (rarely) crocodilians. Most of the above are, in reality, amphibious rather than aquatic vertebrates, i.e., they spend some of their lives in water and some on land. If we restrict our terms of reference to just those vertebrates that are wholly

or predominantly aquatic, we find that the variety is very small indeed.

Among the amphibians, about the only truly aquatic representatives found in aquaria are the various Clawed Toads, *Axolotl* spp. and the venerable, though somewhat sedentary, *Axolotl*, *Ambystoma mexicanum*. As far as reptiles are concerned, predominantly aquatic types are represented exclusively by terrapins and turtles. Although the total number of species may be quite large, the majority of these are only rarely kept. Among these are the Snapping Turtles, *Chelydra*, the Mud Turtles, *Kinosternon*, and the Mata-mata Turtle, *Chelys fimbriata*. The most popular semi-aquatic reptile is the beautiful Red-eared Terrapin, *Chrysemys scripta elegans*.

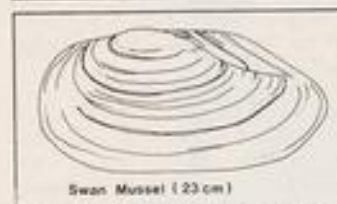
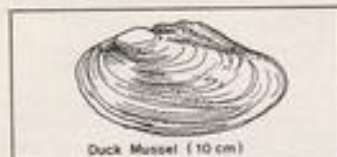
The aquatic vertebrates that outstrip all others in popularity are, of course, the numerous species of fish, even though only a relatively small percentage of the total number of known species (well over 20,000) is regularly kept by aquarists.

Unionidae

The Family Unionidae is commonly known as the Swan or Freshwater Mussels, famous among aquarists for their involvement in Bitterling reproduction. The Unionidae are bivalved molluscs—Class Bivalvia, Phylum Mollusca—and are, therefore, related to the Snails (Gastropoda) and the Squids, Cuttlefish and Octopuses (Cephalopoda). There are several genera of Mussel, e.g. *Anodonta*, *Elliptio*, *Lampilis*, *Simpsoniconcha* and *Unio*, the first and last being the best-known in the aquarium hobby.

Three species, in particular, find their way into wholesale and retail outlets: the "true" Swan Mussel, *Anodonta cygnea*, the slimmer, smaller and darker Duck Mussel, *A. anatina*, and the slenderer, thinner-shelled Painter's Mussel, *Unio pictorum*.

All species are filter feeders and can pose a problem in aquaria since fine suspended or liquid food needs to be provided in fairly substantial quantities if more than one specimen is being kept. A second disadvantage is that Swan



Three drawings of different freshwater mussels

Mussels require a fine, soft bottom medium in which to burrow, preferably mud. However, fine-grained media are not the best of choices for aquaria. A final, and significant, disadvantage is that a Swan Mussel can be dead for

several days before there are clear-cut signs and, by then, the water can have deteriorated sufficiently to kill off most of the other tank occupants.

On the positive side, Swan Mussels exhibit extremely interesting breeding habits. The eggs are fertilized internally by a sperm-bearing water current which enters the body via the inhalant siphon. The embryos are then incubated between the gill filaments and released into the water once they have completed their development. These glochidia, which can measure up to 0.5mm, are parasitic and can either swim in search of a fish host, or else lie on the bottom until they are picked up in the mouth by a passing fish. In either case, they attach themselves to the host whose tissues respond by growing around the individual glochidia, forming cysts. After several months of feeding on the host's blood, the glochidia complete their development, drop off and sink to the bottom where they burrow and commence their adult existence. This can last for many years as long as the level of water pollution is low and that of suspended food is high.

Viruses

DESPITE the fact that everyone knows about the existence of viruses, the mistake is often made of either confusing them with bacteria or lumping them together under one of several labels, e.g. micro-organisms.

If organisms as diverse as Water Lilies and Sharks were lumped together in this way, the association would be regarded ridiculous, since the only thing that they have in common is that they are both living things. When it comes to viruses, there is even considerable doubt and debate as to whether they are living things at all! Therefore, the case for grouping them with bacteria is virtually non-existent.

Viruses are even smaller than bacteria, the largest probably approximating the size of the smallest bacteria, i.e. often less than 1 micron (1 micron or micrometre = one-thousandth of a millimetre, or one millionth of a

metre). By any standard, viruses are very small particles indeed.

The word 'particles' is used here to distinguish viruses from organisms. Unlike living organisms, viruses are capable of existing in crystalline form indefinitely. However, when such a virus crystal, often containing many millions of individual viruses, finds a suitable host, it dissolves, releasing its contents and starting off an almost incredible sequence of events.

Individual host cells (these can be bacterial cells, as in the case of a group of viruses known as bacteriophages) are attacked by one or more viruses. These then release their genetic material which, up to this stage, has been carried inside a protein 'shell', into the living host cell. Part, or perhaps all, of the viral genetic material then latches on to the host's own genetic material which responds by 'manufacturing' new viruses. This process can take as little as 30 minutes in some cases. As a result, a viral infection can spread very fast indeed.

Some reactions cause the host cells to burst, thus releasing the newly-produced viruses (this is called lysis). In other cases, the cells are stimulated to enlarge, giving rise to tumour-like growths.

The two most common virus diseases found in aquarium and pond fish are Pox and Lymphocystis. Neither is usually fatal nor susceptible to treatment, but Pox can sometimes disappear spontaneously.



Fish Pox

Company Profile

Lotus Water Garden Products Ltd.



View of part of Lotus' nurseries and outdoor pond display area

ANYONE who owns a garden pond will almost certainly have bought at least one article supplied directly or indirectly by Lotus Water Garden Products Ltd., such is the extent and influence of this major company.

Based in Chesham (Bucks) and Burnley (Lancs), Lotus has over 3,000 outlets both in U.K. and abroad, and sells anything from the smallest fish to the largest pond liners. In fact, the 1984 Catalogue states that the "... range of products, (is) considered to be the most comprehensive of its kind in the world."

Last season was a particularly good one for Lotus. Demand for its products was so high during the peak summer months that it took all the considerable energy that its Managing Director, Joe Kindler, and his staff could muster to keep up with orders. The 'new season' range promises to be even more extensive.

One thing that was particularly pleasing during our visit was that, despite the company's reputation, there was no question of sitting back and reaping the rewards of this reputation. Instead, there were quite a few important new projects on the go, some of which we will undoubtedly become

well aware of during this year's pond season. Last year, for example, Lotus increased its range of fountains, lighting, accessories, ornaments and fish food. In addition, there was a newly designed model of the company's well-known and long-established Otter Submersible Pump.

On the pond front, Lotus offers three main choices: Liners, Glassfibre Pools and Semi-rigid Pools. It also offers the whole range of treatments for new and established concrete pools (names that our readers may be familiar with are Lotus Silglaze, Pondseal and Waterproofing Powder).

The range of liners is designed to meet a variety of needs and pockets. At the bottom end of the scale is Lotus Blue Polythene which is recommended for 'less permanent pools'. Moving up, is Juralene, which is tougher than Polythene but does not have the nylon reinforcement which is used in Flexilene, the next liner up. At the top end of the range is Lotylite Butyl which carries a guarantee of 15 years. Flexilene and Lotylite are available in any size (price on application for non-standard sizes).

For those prospective pondkeepers who are not too keen on carrying out

all the preparations necessary for a lined pond, there are glassfibre and semi-rigid pools, the latter being the cheaper alternative. There are more than 20 models to choose from which, added to the selection of artificial waterfalls and watercourses, offers extreme flexibility.

Instructions for the construction of the various types of ponds are described in the Lotus Catalogue and are also supplied with the liners (or ponds) on purchase.

In recent years, Lotus has moved into plants and fish to complement its range of products. Consequently, it owns its own Fish Farm, under the control of Steve Norris, the Fish Farm Manager, who handles the millions of coldwater fish, many of which are imported directly by the company. The range includes many varieties of Goldfish, Koi, Golden Orfe and Tench, the last being sold primarily as a scavenger in each of the 'Collections'. A typical collection for a pond having a surface area of around 15 sq. ft., would consist of 4 medium Common Goldfish, 4 medium Comets, 4 medium Golden Orfe and 1 Tench.

On the plant side, Lotus has its own extensive nurseries, run by Ray Davey, the Nursery Manager, a few miles from the main warehouse and on the same site as the Fish Farm.

A visit to these nurseries in season (March to September) is enough to convince even the non-committed aquarist to take up pondkeeping. All the plants are reared by Ray and his staff



One of Lotus' magnificent irises



A batch of Sarasa Comets from the Lotus Fish Farm

who have an all-year-round propagation programme, carried out in heated glasshouses during the winter months. After all, someone has to make sure that everything is just right and stocks are adequate to meet the sudden surge in demand that occurs every spring. As with the fish, the plants can either be bought singly or in 'Collections'. For example, an equivalent 15 sq. ft. plant collection to complement the fish collection mentioned above, could include 1 Water Lily, 2 Oxygenating Plants, 1 Deep Marginal, 2 Floating Plants and 6 Snails.

To round things off, Lotus offers professional written advice in the form of its own colourful and informative book (available in English and French) entitled *The Lotus Book of Water Gardening*.

Obviously, a short article such as this cannot hope to cover the complete Lotus range. Comprehensive details are, however, presented in the Catalogue obtainable from Lotus (check with the Main Office): Lotus Water Garden Products Ltd., 260-300 Berkhamsted Road, Chesham, Bucks. HP5 3EY. Tel: (0494) 774451.

Planting the coldwater aquarium

Continued from page 31

stems and narrow lanceolate (linear, strictly speaking) leaves growing in opposite pairs. The leaves are light green on the top side, paler on the bottom side. The plants tend to grow straight towards surface, and branching is not so frequent as in *L. natans*.

Hygrophila polysperma, quite widespread in India and the Malay peninsula, did not make its aquarium debut (in Europe, at any rate) until about 1947. Its pale green lanceolate leaves are carried in opposite pairs up thin but woody branching stems. Tip-nipping will encourage the production of side shoots. The species of *Ludwigia* and *Hygrophila* mentioned are ideally suited to growing to one side of rockwork, to complement rockwork (to give it aesthetic balance) or to mask the side glasses of a tank, that is towards the front. *Micranthemum micranthemoides* is a hard-to-come-by plant hailing from the U.S.A. It is sold primarily for the heated tank but a temperature in the low 60°F does it no harm. The bulk of its massed foliage remains near the floor of the aquarium. The elliptical leaves reach a length of about 1 in. and are darkish green in colour.

Hair Grass (*Eleocharis acicularis*) is an old favourite. Its filiform 'stalks



Ludwigia arcuata

of grass' arise from a running rootstock. The stalks may reach a length of 8 in. and above. The initial planting should be generous or else the grubbing fish will have the plant up before it has time to put down anchoring roots. It has a wide range of temperature, and does well in coldwater and heated aquariums alike. It makes a good shelter for fry and a good spawning grass for smaller barbs, goldfish and similarly frenzied driving fishes.

Potamogeton crispus is a gamble, but a gamble worth trying. It is native to our canals, lakes and streams and has wavy-edged leaves of an olive-green to brownish hue. They grow in pairs along brittle branching stems which produce white roots at the joints. If taken from the wild, wash

it well in several changes of water tinged with a crystal or two of permanganate of potash. Then anchor it in the compost. If the light it is given is sufficient for its needs it will grow well and look perfectly splendid against the other greens in the tank.

A plant little known to coldwater aquarists or pondkeepers of today is *Crassula intricata* (it goes under several other names and during the 1930s was generally known as *Tillaea recurva*). It is native to Australia, and the flattened needle-like leaves grow in pairs along branching stems. It starts off by growing upright and then, when it reaches the surface, pops its topmost growths above water level and, unless these are sheared off, will grow horizontally towards the rim of the tank and hang over the side—if it can. In a pond *C. intricata* will colonize moist ground around paving slabs and rockwork. It's a hardy plant and, in the submerged state, will come through most winters outdoors.

I have not included *Elodea canadensis*, *Egeria densa* (*Elodea densa*) or *Lagarosiphon major* in my list of plants for the coldwater aquarium; for though some old-time aquarists appear to think them obligatory, I am of the opinion that they turn out to be more nuisance than they are worth. They quickly smother other plants and exclude light entering the water with their flue-brush foliage. In a large tank, however, about a dozen stems of any one of them can be invaluable for spawning purposes and for providing extra oxygen.

ON THE TEST BENCH

by Ian Sellick

SICCE AQUAPURA

FIRST, let me say that I am not a great fan of hang-over-the-side external power filters in general, and this new model from Sicce, distributed by Thomas's (Petcraft) does nothing to change my personal opinion.

This is a compact unit, with box dimensions of 6½ in. x 2½ in. that will fit only those all-glass aquaria that have no struts along the sides. In common with other 'overflow' type models, this severely limits the number of aquaria where this filter will find application. The intake and outflow occupy over half the length of the filter, entailing some pretty hefty cutouts in any lid that may be fitted to the aquarium. The actual lid of the filter box only covers about two-thirds of the top of the filter: why? This lid has its flanges on the outside, and although it is very close fitting, any drips from condensation or splashing

Sicce Aquapura disassembled. Note unshrouded live electrical cable terminals



Sicce Ekto pump

that do escape do not go back into the filter but run down the outside. Here they, and any carelessly splashed water, will undoubtedly get into the motor unit which is clipped to the base of the filter and roughly secured by one self-tapping screw. This motor unit is not sealed, and has cooling slots in its base and one side through which water could splash. The electrical terminals to the magnetic coil are not even shrouded with plastic, but open. Nowadays, when most of this type of unit are epoxy-resin sealed, I don't know why Sicce didn't follow this route.

The pump is quite powerful (about 50 gallons/hour), and pumps water into the filter from the aquarium after the filter has been primed by filling the filter chamber with enough water to completely cover the impeller. From here it passes through a sheet of coarse urethane foam type medium sandwiched to a floss medium which performs the filtration in its ½ inch thick mass and passes out over the overflow weir. This pad is effective and easily changed without stopping the filter. It is

possible to increase the agitation and aeration of the water within the filter by fitting an air line to the spigot on top of the impeller housing, which sucks in air by a venturi effect. No hole in the lid is provided, however, to feed this airline out to atmosphere! This procedure does make the filter noisy though. Without the venturi it is remarkably silent; this and its power being its main benefits.

The instruction leaflet attempts to be comprehensive but is in places incomprehensible, due to rather a lot of annoying typos, and some interesting translation from the original Italian. Perhaps Thomas's will insert the necessary English instructions. At least the instructions stress the importance of the minute nylon washers on the impeller shaft; these are very easy to lose, and this pump, like all others that use them (Hagen, Interpet, etc.) does not run without them for long.

Finally, it is not entirely clear from the instructions where additional filter media are to be placed; whatever you may think the instructions say, do not place material in "position B" (the impeller chamber). If this additional media is, say, a nylon bag containing charcoal, the chamber blocks and the filter may overflow. If you place material in "Position A" however, no water will pass through it before going back into the tank. Most confusing.

Sometimes, Italian design is great. This looks like a filter put together by a committee. At under £15, however, it does represent extremely good value for money, with its very good silent turnover of water.

SICCE EKTO PUMP

A sure-fire winner, this small pump from Sicce is one of the most useful little items I have had in the fish house for some time. Encased in grey plastic is an epoxy-embedded coil driving a cylindrical impeller magnet and fixed blade impeller that delivers water through c. ½ in. tubing at a rate of 300 litres an hour. The intake is through a c. ½ in. spigot that may be connected to a hose, or used with the strainer/prefilter that is supplied with the pump. The impeller casing may be rotated slightly through some 15° to



Sicoe Aquapura complete

adjust the actual flow (a common feature of powerheads also, these days).

PRESS RELEASE

Fibromix Rein fibre in the construction of garden pools

CONSTRUCTING pools with a concrete base and block walls has many advantages, but problems arise due to the limitations of the cement mortar used to internally render and hopefully seal the pool.

Conventional Portland cement mortars, when used for rendering or screeding, are an unsatisfactory compromise. If an adequately cement rich mortar is used to produce an impermeable material this inevitably leads to cracks developing.

Conversely, lowering the cement content whilst reducing the tendency to cracking, has an adverse effect on all other qualities, producing a weak, porous material with inadequate adhesion to the background and inferior durability.

During the past 15 years very considerable advances have been made in producing special fibres which, when incorporated into a cement rich mortar, will prevent cracking. This enables mortars with the optimum level of 1 cement to 2 sand to be used, which produces a strong, impermeable, crack resistant coating, with excellent adhesion and exceptional durability.

The beauty of this pump is its 'go anywhere' character. It may be used submerged or outside the tank; to power filters, transfer water from aquarium to aquarium, circulate water or even act as a small fountain. A spray head and piping are even supplied for this latter function.

The pump doesn't have a great head, it struggles to pump water to a height of about 2½ feet, and retires gracefully when asked to lift to 3 feet, but is useful all the same.

The impeller chamber is easily cleaned by twisting and removing the housing, although again, care should be taken not to lose the little washers on the impeller shaft.

If always used submerged, the pre-filter will prevent the impeller getting too dirty in any case. The prefilter

comes apart easily itself for cleaning, and could actually be filled with a sponge filter if so desired (a D-I-Y job though), although this slightly diminishes output. As it is relatively small, this prefilter needs cleaning *often* if the pump is used as part of, say, a filtration system that must be kept at full flow all the time.

The fountain attachment may be useful in some vivaria and palladaria, and will no doubt find its way into garden pools although it is not really powerful enough to give a convincing display. Electrically, it is not suitable for outdoor use, and I feel this implied potential use is rather naughty.

Retailing at under £20, the Ekto is an extremely versatile, powerful, low wattage pump that should find a place in every fish room.



Where these cement rich mortars are kept damp, the continued hydration of the cement produces a totally impermeable and waterproof coating.

The latest generation of these special fibres, Fibromix Rein fibres, are completely free of any health hazard or liability to cause skin irritation. They mix easily into a cement mortar and are resistant to both physical damage during mixing and are inherently durable within a cement mortar.

Fibromix Rein fibres have dramatically altered the economics of fibre reinforced mortars to such an extent that the advantages in performance can be achieved with an overall saving in costs. This results from the lower quantity of materials required as,

because of the vastly improved performance, only one 5mm. thick coating is required which saves both material and, more importantly, labour costs.

In addition, because of the high cement content and special additives incorporated onto the Rein fibres, these mortars are exceptionally easy to apply, unlike harsh conventional mortars.

Fibromix Rein fibre reinforced cement mortars provide the ideal means of sealing concrete pools at an exceptional low cost and are very easy to use.

Fibromix Rein fibres are available throughout the U.K. and Europe, either through agents or direct from Fibromix Ltd., Clifton Hall, Ashbourne, Derbys. DE6 2GL. Tel. No. Ashbourne (0335) 42265.



SPOTLIGHT

THE ROUND-TAILED Paradise Fish

Macropodus chinensis comes from south-west, central and northern China, and also Korea. It lives in these areas in all kinds of waters and is found in both large and small watercourses.

Sexual differentiation is somewhat difficult in young fish, becoming easier in older specimens of the same age and in adult fish. The coloration of the males is usually darker than that of the females, the colour of the fins more intensive and the dorsal and anal fins are larger and often extend over the caudal fin, which itself is quite large. Compared with *Macropodus opercularis* and *concolor*, *chinensis* is peaceable and does not pose any difficulties. The species was imported for the first time from Hankau in 1914 by Siggelkow. It transpired that the fish could be kept at lowish temperatures without coming to any harm. Basically, they should not be kept at a temperature higher than 24°C for an extended period of time, especially when one is dealing with specimens caught in the wild. With fish bred in captivity the temperature does not have such an important part to play.

For a long time the species disappeared from the market because there were no official imports reaching us from China. In April 1983 the German hobbyist Haase, who was in China on official business, caught specimens of the species in a small lake near Hang-zou, about 120 kilometres west of Shanghai. On the following day it was cooler and rainy and the temperature had sunk to 19°C. According to Haase the average

By Arend van
den Nieuwenhuizen

summer temperature in this region is 28.7°C and the average in winter 3.8°C. During a visit in winter the water appeared to be completely frozen over. From this we may conclude that these fish can be kept very happily in an unheated aquarium in the living room. There are, in addition, no problems involved in keeping them in a community tank, for they are completely peaceable.

In the past it was recommended, for breeding the fish, that a tank should be used which had been set up a long time previously, containing a low water level of 5 to 10 cm. Further, that fish of as near the same age as possible should be used. As in the case of *M. opercularis* it is said that the bubble nest is not treated with the greatest of care. In this respect people's experience with this species varies, as it does with *M. chinensis* and as will be described in the course of this article. The species is supposedly not very productive, but here again results vary greatly.

When I read that this fish was again available in Europe my curiosity was awakened, especially as I have always had an interest in labyrinth fishes. So it came as a nice surprise when I received five specimens of *Macropodus chinensis* from Heinz Saddey. They had been bred in the aquarium and were about two centimetres long. I had never seen actual

specimens before and I put the fish in a tank measuring 50 x 30 x 30 cm and which contained a lot of vegetation in the form of Java moss and *Cryptocorynes*. The water temperature varied between 15 and 21°C, the water hardness was 5°DH, although the latter was probably of no great significance. I fed the fish with water-fleas, cyclops, mayfly larvae, white mosquito larvae and small beetles. My specimens of *M. chinensis*, however, accepted brine shrimp nauplii too, which I was feeding to some *Rasbora maculata* in the same tank. The labyrinth fish behaved peaceably towards their neighbours in the aquarium.

After a few weeks one specimen died without any obvious reason. In the meantime the fish had doubled in size and I assumed I had three males and a female, for one fish was smaller, had shorter dorsal and anal fins and its coloration was not as bright as the others. Because I was away from home a lot at that time and wanted to minimise any risks to the well-being of the fish I passed on the female and a male to a professional breeder I had become friends with. He was to rear the fish and breed them if possible.

In the meantime live food disappeared from local ponds and the fish were then given dried food, *Tubifex*, red mosquito larvae, brine shrimps and later deep-frozen Mysis and water-fleas, which they did not eat so readily. However, they grew very well and it seemed that I still had a pair. When the fish were bigger the sexes could be easily distinguished. The female had remained smaller and its mark-

ings were not as dark as the male's. In addition, the dorsal and anal fins of the male were plainly larger and extended back beyond the dorsal fin.

When the male was almost six centimetres long my friend, Hammer, put the fish together. The male displayed little aggression towards the female and after two days built a small bubble nest against the side of an unplanted aquarium. The depth of the water was 40 centimetres. The first result was hundreds of fry half of which, shortly before the free-swimming stage, mysteriously died.

Ten days later the pair spawned again, but once more some of the large number of young again died in the same way. Nevertheless, after the two spawnings, a large number of young remained. During the first few days the fish were fed with *infusoria* and then with the nauplii of small brine shrimps. They grew at a satisfactory rate and measured about a centimetre after four weeks.

Meanwhile I learnt that the two fish swimming in my tank were also a pair. As the male was eagerly building bubble nest amongst the dense vegetation at the water surface, I decided to become more involved and prepared a 50 x 40 x 40 centimetres large breeding tank. Along the cork-lined sides of the tank Java moss and Java fern were growing, on the tank bottom there were pieces of pine and amongst them Anubias. Floating at the water surface was an Echinodorus leaf. I retrieved the pair from my friend and introduced the fish at a water temperature of 27°C. Their behaviour was peaceful. The male quickly built a bubble nest and gently kept the female at a distance. His coloration became more intensive, somewhat darker in fact. In the case of the female the opposite occurs. She normally takes on a greyish-brown appearance and retains this until the male has completed his nest-building.

Chinensis females are, however,

lively and indeed temperamental creatures. It is a pleasure to watch the females shed their greyish-green costume and exchange it for a bright courtship outfit of delicate pastel colours. Whether they also put on a courtship display, as is the case with *Badis* females, I do not know. But the male is vigorously "kissed". In doing so the female swims quickly up to the male and with her mouth open nudges his gill cover, sides or the base of his tail. In short, wherever she happens to catch him. The female then swims quickly away as a result of the male's reaction. This consists of a courtship display in which the male spreads his fins wide and he may also adopt a 's' shaped body posture. If the female appears below the nest the male awaits her with his fins spread wide and makes curious and rapid to and fro movements by using his pectoral fins. From time to time he also interrupts this behaviour, changing the position of his body and folding his fins.

When the fish are almost ready to spawn the female nudges the male several times in rapid succession with her mouth, to which the male reacts by curving his body. If the female then remains in position a spawning embrace follows in which she appears to be almost captured by the male. It happens very quickly and both fish curve their bodies and press against the other. In doing so the female often tilts to one side, whilst the male encloses her with his long and tapering dorsal fin, so that the female is held with her head literally in his embrace. This stage in spawning always took place a few centimetres below or immediately above the nest. So far I have never seen the pair sink a few centimetres in the water, as is the case with other labyrinth fishes. As a rule the fish hover and then tip over so that the female is positioned at an angle with her tail pointing upwards. Her underside is uppermost and

she is again embraced vigorously by the male. If spawning takes place below the nest both fish push themselves upwards until they touch the underside of the nest. Immediately afterwards the eggs are extruded.

This happens in a manner which is quite different from *Colisa* species, for example. When the latter are spawning in earnest the female produces clouds of eggs, which remain suspended in the water, some of them scattered quite some distance. In the case of *M. chinensis* the eggs appear in a string and immediately float upwards. I would not like to hazard a guess as to how many eggs are produced at one pairing, for they appear extremely quickly. Afterwards the fish separate, usually quite quickly. As a result the eggs are sometimes driven away by the movement of the fins. Sometimes the fish spawn in close proximity to the nest. On such occasions the female helps in collecting the eggs and placing them in the nest. The pairings may last several hours. As the eggs are placed in the nest the latter becomes bigger and bigger.

According to the temperature the young, which have a dark pigmentation, hang for two to three days below the nest, which is carefully looked after by the male. I had hoped to take a photograph of this, but so far I have not succeeded. On one occasion the nest was moved beneath a leaf and to my surprise the male relocated the eggs. He built a new nest in a different place and put the eggs there. I have never seen such behaviour from any other bubble nest building labyrinth fish. I, too, experienced spawnings which produced a lot of eggs, from which a substantial proportion of the young died. When I controlled the development of the eggs, it appeared to me that the young emerged malformed from the egg. I assume that this was a result of the higher water temperature, but this did not happen with the other pair under the same conditions.



Helping Hand



by Nick Lushchan

A Message to George

The response to this Helping Hand series is very encouraging, both from Trade and Aquarists alike, but I must admit, one 'phone call caught me unawares...

My normal day starts with my wife taking the dog for a walk, leaving me exercising on the floor. On this occasion, George from Aberdeen 'phoned offering a Helping Hand to disabled aquarists in the Aberdeen area, but I was unable to reach pen and paper to write his address or 'phone number down. So, GEORGE, if you would be kind enough to drop me a line or 'phone me, it would be much appreciated.

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A word of warning

I have received a number of letters from disabled aquarists with a view on expanding their present set-up. However, a word of WARNING to the disabled who have this in mind.

Adding extra tanks to your present set-up might well overload the generosity of the person helping you with your everyday management. It is all too easy to say, "I shall add X number of tanks to the existing set-up", but a lot of thought must be given to this. Will increasing the number present a problem with water changes, cleaning filters, hoovering the bottom of the tanks, etc.? All these things may look small and trivial, but they are an essential part of fishkeeping. The thing to remember is: What happens if and when you are taken ill and are unable to look after your fish? By increasing the number of aquaria, you might jeopardise your daily help, so think and talk this out with your helper.

Designing for disabled aquarists

A young aquarist attending Radley College, Abingdon, Oxfordshire, has started experimenting with siphon systems. As the College has excellent workshops, he has offered to design something to aid the disabled aquarist. If I receive any further details, I will let you know.

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Just a few of the 361 Firemouth young which I raised while recovering from my third spinal operation. This is the sort of thing that helps one through when the going gets tough

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Trade Talk

The trade side of things is going quite well and, if this keeps up, I shall have to print a booklet containing details of shops and premises that are willing to cater for the disabled aquarist, including those that use the wheelchair logo in their advertising.

As we all know, Belle Vue was a big hit. Even the heavens opened up for the big Show, making things very difficult for wheelchairs, but I was pleased to see others wheeling around.

The day went well, chatting to a number of traders, trying to encourage them to advertise with the wheelchair logo. On the whole, the majority were very keen, but you always get

one... When I approached a particular stand, I spoke to a young man stating the campaign I was trying to run. When he found that I was not buying anything, I received a mouthful and was told where to go "...."

It is times like this that make my blood boil. The vast majority of traders are willing to listen to you even if they are unable to accommodate the disabled aquarist owing to the facilities they have, but this one was a well-known trader and the impression I got was, "If you are not buying, then I don't want to know". I wonder if his boss knows of his attitude. I don't think so.

If traders cater for the disabled aquarist and would like to use the wheelchair logo in advertising, please write to me so that I can include you in my WHEELCHAIR LOGO list.

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Hints and problems

If you have any problems regarding fishkeeping, I would like to hear from you. On the other hand, if you have a method that you have developed and think it might help disabled aquarists, please don't put it off—drop me a line or ring me. This way, you will be helping a number of disabled aquarists to increase their enjoyment of the fishkeeping hobby.

My home address for queries and replies is as follows:

27 Hungerford Road,
Rugby House,
Calne,
Wilts. SN11 9BH.
Tel. No. 0249-812828.

Please enclose a S.A.E.

Until next time, GOOD HEALTH AND HAPPY FISHKEEPING.

Tomorrow's AQUARIST



A visit to the Tropical Aquarium at Nancy

by Jonathan Moss

READERS of 'Tomorrow's Aquarist' will, no doubt, remember Jonathan's report on his visit to the Fishkeeping Exhibition held in June 1984 at Kempton Park. (We published his article in the September 1984 edition of T.A.). We have now received the following report from Jonathan concerning his visit to one of Europe's leading Aquaria, at the Zoological Museum, 34 Rue Ste-Catherine, Nancy, France.

If you find yourself anywhere near Nancy, take Jonathan's advice and visit the Aquarium—you will not be disappointed.

"During the summer holidays, in the sweltering French heat, I travelled to Nancy, the Capital of Lorraine, France. Nancy, very conveniently was half-way to our destination, so we stopped for lunch in this very historic town and wandered around. After seeing an advertisement for the world renowned Aquarium, I immediately decided to visit it.

The University houses the *Aquarium Tropical de Nancy*, which consists of 72 tanks which contain 50,000 litres of water.

The Aquarium is open every day from 2 p.m. to 6 p.m. during the school holidays. However, it is closed on Tuesdays during the scholastic term. The entrance fee for an adult is 10 francs (at present, just under £1.00), and 5 francs for a child (just under 50p). The Aquarium is situated on the ground-floor and is divided into two parts—the East and West Galleries.

The numerous tanks consist of the most strikingly coloured marine and tropical fish. The common household tropical fish—tetras, plants, etc., are displayed in beautifully furnished tanks. Amongst the lesser known fish, there

was the *Promicrops* which is the largest fish in the Aquarium, measuring 1.20m, and *Rhinopias frondosa*, the Scorpion Fish, which is the rarest fish in the Aquarium, and one of the rarest in the world. All the tanks are decorated with luxuriant vegetation which brings out the fish's natural and beautiful colours.

The fish that struck me as the most interesting were the four-eyed fish, whose eyes enable it to see above the water as well as below. These are from the South American Tropics.

As I approached one tank, there was no illumination at all, as there were in all the others, so I thought there must be no fish present in it. But, as I walked away, I noticed a blue flashing light like that of a police siren. These

strange, but remarkable fish come from Australia. (This was almost certainly one of the Flashlight or Lantern-eye Fishes — Family Anomalopidae — C.Ed.).

The *Aquarium Tropical de Nancy* gave me the chance to see a selection of aquatic beauties portrayed in their natural habitat. It was, for me, the highlight of my holiday. I would strongly recommend other British tourists to visit it.

A large amount of postcards and leaflets are available. The leaflets tell you the statistics of the Aquarium, and the postcards are of a large selection of the fish.

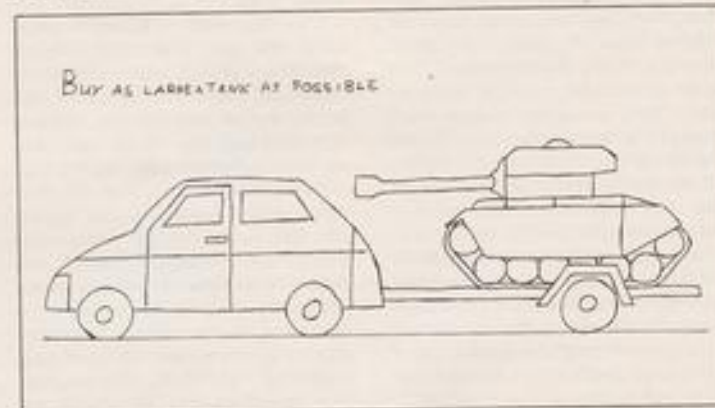
After an hour and a half, I had seen everything, and left the *Musee de l'Universite* very contented."



A NEW SLANT ON AN OLD RULE!

We have received the accompanying drawing and caption from Maurice Ballard (age 14) of Huggins Hall Cottage, Glassenbury Road, Cranbrook, Kent TN17 2QJ.

Maurice also sent us some highly original and funny questions and answers which we hope to publish at a future date. Thank you, Maurice. Let's have some more, please.



Press Release

The Cyprio BIOVAC filters are a range of vacuum-operated biological filters specifically developed for Koi ponds and large goldfish ponds. By utilizing the special filtration and biological purification properties of the Cyprio open-cell foam, they provide a compact, low-cost, low-maintenance alternative to other pond filtration systems.

Two basic designs are available, internal and external, both utilizing a combination of foam cartridges and particulate foam. In addition we also offer an economy internal model based on the use of sheet foam in lieu of cartridges.

All models can be used with an external vacuum pump which then doubles as a pond vacuum cleaning system. The BIOVAC filters are therefore ideally suitable for incorporation into existing ponds which do not have a bottom-drain facility, or can be built into new ponds when a bottom-drain is then not required. When the internal models are operated with a pond vacuum pump, holes in liners for pipework are totally unnecessary. This considerably reduces costs, eases construction, and improves the integrity of the pond in terms of leakage.

As an alternative to the external vacuum pump the internal models can be supplied directly coupled to one or more submersible pumps which can then be fitted with venturi-aeration attachments. This arrangement thus provides a completely internal filtration, biological purification and aeration system.

Concept

Conventional pond filters usually utilize a granular media for both the removal of fine solids (filtration) and the biological reduction of ammonia and nitrite (nitrification). Unlike water filters, pond filters are not equipped with backwashing facilities for the removal of filtered solids since this process removes the bacteria from the filter media. Gravel pond filters are

therefore built with a much larger surface area to allow prolonged operation without cleaning. Even so the gravel must eventually become blocked which can only be satisfactorily remedied by physical cleaning of the filter media, a laborious and time-consuming operation.

With gravel filters the filtration function always predominates over the biological treatment requirement, dictating the use of shallow beds of gravel (8 in.—12 in. thick) of large surface area (25—50% of pond surface area). Adequate biological treatment would normally be obtained from only 3 in.—4 in. of gravel. The extra depth is there only to provide greater storage of filtered solids within the filter to minimize cleaning.

Strictly speaking, in an ideal filter/biological purification system the filtration function dictates the surface area of the filter portion and the volume for biological treatment is related to the weight of bacteria held within the filter material.

Cyprio open-cell foam has several advantages over gravel both for filtration and biological treatment. The bulk of the volume in a gravel filter is gravel (40%—60%) and a reduced proportion of the filter bed is therefore available for the storage of filtered solids and bacteria. Cyprio foam is 98% voids and is therefore substantially superior in this respect. A clean gravel filter utilizing $\frac{1}{2}$ in. gravel will have a pore size of around $\frac{1}{2}$ in. which compares with $\frac{1}{30}$ in. with the standard Cyprio foam. The foam is therefore immediately capable of filtering out much finer solids than gravel, and therefore matures quicker.

However the main advantage lies in the ability to clean the filter foam easily, so the area of filter surface is then dictated only by the requirement of a sensible cleaning interval (3—6 weeks).

Due to the large storage capacity for filtered solids within the foam and the fact that it can be cleaned easily, foam used as a filter material is about 10 times

more effective than gravel. Also because of its ability to store large quantities of bacteria within its voids, the foam is up to 20 times more effective than gravel as a biological support material.

By using Cyprio foam in different forms it is possible to split the two purification functions of filtration and biological treatment within the same filter. This substantially reduces the size and cost of pond filtration systems.

Filtration is provided by using the foam in sheet or cartridge form as a pre-filter to biological treatment using particulate foam in a separate compartment of the same filter. Pre-filtration ensures long operation of the particulate section without blockage.

Construction

All constituent parts are of either plastic, fibreglass or stainless steel construction and therefore totally resistant to corrosion.

The filter material is Cyprio open-cell reticulated polyether foam which is non-toxic and non-biodegradable. Replacement foam is available separately.

For operational details, prices, etc., send s.a.e. to Cyprio Ltd., 133 Eastgate, Deeping, St. James, Peterborough.

NEXT MONTH Plant Features

Wild Bog Plants
(colour feature)

Planting the Tropical
Aquarium

The plant family
Hydrocharitaceae

SPOTLIGHT: The African
long-finned Characin

Answer to Discover The Fish

DOMINO DAMSEL

Your questions answered...

Having problems? Send your queries to our panel of experts who will be pleased to be of service. Every query receives a personal answer and, in addition, we will publish a selection of the most interesting questions and responses each month. Please indicate clearly on the top left hand corner of your envelope which department you wish your query to go to. All letters must be accompanied by a S.A.E. and addressed to:

Your Questions Answered, The Aquarist & Pondkeeper,
The Butts, Brentford, Middlesex TW8 8BN.

TROPICAL



Dr. C. Andrews

Tropical



uaru—the triangle cichlid...

Can you provide some information on *Uaru amphiacanthoides*, and tell me its common name?

This fish is known as the warou or the triangle cichlid. It originates from northern South America, and in captivity is best suited to a species tank. Since it may grow to 20-25 cm. in length, a 100 cm. tank is recommended. It likes soft, slightly acid water at around 28-30°C., and may require various kinds of live food to thrive. This fish can be spawned in the aquarium. The eggs are laid in a cave and are guarded by both parents.



An adult pair of *Uaru* showing well-marked triangles on the body

leaky tank...

My aquarium has started to leak in one corner. Can you offer me any advice on how to repair it?

You will have to totally strip the tank down, maintaining the fish and plants in another tank or (brewing) bucket for a day or two.

With the damaged tank empty, it should be thoroughly dried out and the inside 'seams' smeared with a

good layer of aquarium sealer (following the manufacturers instructions carefully). Do not use household sealer—only aquarium sealer.

This may be dry and be ready for refilling in a few hours. However, it is best to wait 24 hours and then refill the tank with tap water (to check for leaks), before filling the tank with the 'old' water (which you have saved, of course!) and refurbishing it.

silver dollars...

Can you give me some general information on silver dollars (*Mylodon*)?

Silver dollars are, in fact, relatives of the piranha, but feed to a large extent on vegetable matter. They can grow quite large, perhaps to 20 or 25 cm, and hence need a large tank. They are a shoaling fish and as you might expect as vegetarians, they are hard on plants. A vegetable based flaked food is an ideal diet for them. Although they are quite hardy fish, they do not seem to like unconditioned tap water.

brackish aquaria...

Can you give me some information on setting up and maintaining a brackish aquarium?

To begin with, you should have a look at *Brackish Aquariums* by M. Gos (T.F.H., 1979), which is (I believe) the only book available that is devoted to the subject. Fortunately it is reasonably priced at about £2.

A brackish aquarium can be as small or large as you wish. It should, however, be all glass with a glass or plastic cover, since (just as with

marine tanks) the saltwater in a brackish aquarium will cause corrosion problems if metal is used.

Use undergravel filtration, perhaps with cockleshell and coral sand as a substrate (as in a marine tank). The brackish aquarium must be well aerated, although generally speaking most of the fish which you are likely to keep are very hardy.

Use about 1-2 tablespoons of a marine salt mix for 10 litres of water to create the required slightly salty conditions.

Heat the tank to the mid to upper 20's°C. and provide lighting either just for viewing the fish or for growing plants as well (if they are going to be present).

Suitable fish include Malayan angels (*Monodactylus*), Scats (*Scatophagus*), various Mollies (*Poecilia*), certain rainbow fish (*Melanotaenia*) and Killifish, and Puffers (*Tetraodon*), whilst suitable plants include various *Vallisneria* species and *Sagittaria* species, *Hydrophila*, *Elodea* and *Ceratophyllum*.

Most brackish water fish will feed well on a diet of good quality marine flaked foods and tablet foods, and regularly, partial water changes, are also crucial to their well-being.

Brackish tanks are increasing in popularity, so is it not time that someone formed a specialist society on this branch of the hobby?

water chemistry...

Can you recommend a good, but easily understood, book on aquarium water chemistry?

I am not aware of such a book, but I think that the information sheets which I have sent will form the basis of an understanding of water chemistry.

COLDWATER

Arthur Boarder

PLANTS

Vivian De Thabrew

KOI

Hilda Allen

MARINE

Graham Cox

DISCUS

Eberhard Schulze

Water chemistry is important to fishkeepers, and I think that more and more hobbyists are realising this. The next thing which you should do is to purchase one or two test kits and measure the pH, hardness and nitrite/ammonia levels in aquarium water, tap water, rain water, etc., and then sit down and think about what the results mean. Reading about water chemistry is not enough, since you have got to put the theory into practice for a proper understanding.

Once you have grasped the basics, however, do have a look at *Water Quality in Warmwater Fish Ponds* by C. E. Boyd (Ruskin University, 1979).

C.A.

Coldwater**Keeping goldfish in bowls . . .**

How long can I keep a goldfish in a small bowl?

I suggest that as long as it takes to get the fish home and in a proper tank where it has space to swim around and obtain sufficient oxygen. I would like to see a law against the keeping of fishes in goldfish bowls. It is an offence to keep a bird in a cage which is not large enough for it to spread its wings properly. The accursed goldfish bowls are a death trap and very few fishes live for long in a small one, especially if they are fed on nothing except ants' eggs. Years ago it was the done thing to use these small bowls and to feed the fish on ants' eggs but I am sure that a penny packet would out-last the fish by many months.

sexing goldfish . . .

I have a number of Moors, Lionheads, Orandas and Fantails and would like to know a sure way of sexing them. I know about the tubercles on the male fish when in breeding condition, but my fishes are young ones and so do not show these signs.



White Tubercles on the gill covers and first ray of the pectoral fin identify this goldfish as a mature male in breeding condition

There is no way of sexing young goldfish varieties. As you state, it is only when they are adult and in breeding condition that it is possible. Even then I have known male goldfish to spawn and never show any of the known signs. You will have to be patient and wait until the fishes are older before you can make a certain assessment as to their sex.

sexing tench . . .

I have three green Tench, (*Tinca tinca*) in my pond and would like to know how to sex them?

Examine the pelvic fins of the fishes. That of the male has the outer edge much thickened and this gives the fin a spoon shape. That of the female is normal. The thickened fin of the male is used to nudge the female when spawning.

dividing lilies . . .

Is it possible to divide a water lily and if so at what time of the year?

Water lilies can be divided easily when they are about three years old or more. They make a strong root stock which can throw off side shoots. These can be removed and will usually have roots already formed. The plantlets can be set in a suitable container of fairly plain soil or old turf, if available. Do not add any fertilisers as the plant should be encouraged to send out roots searching for this. The container should have holes in sides for this purpose. When the young plant is introduced to the pond it must not be placed too deeply, but with the head of the plant just below the surface. The container can be on a brick or two so that as leaves are formed they can be removed to lower the plant deeper in the water. April is the best time of the year to divide or plant water lilies, unless the plant is delivered in a container, when any time of spring or summer is suitable.

tank temperature . . .

At what temperature should a tank of goldfish be kept? Mine is at 43 F., and I wonder if I should use a heater in the tank and if so, at what temperature should it be set?

Your tank must be in a very cold position and does not appear to be in the house. Goldfish can put up with this low temperature but they are not likely to eat well and thrive. These fishes start to eat less once the temperature falls below 50°F. I recommend

one of 60°F., for most of the time, but for breeding one of 70°F., is better. If you add a heater, the temperature can be set at 55-60°F., and the fishes should feed all right with this warmth. An overhead lamp will often give enough warmth if it is on for twelve hours a day.

A.B.

Koi



vacuum cleaner . . .

Having read the book "Nishikigoi" by Takahiko Tamaki I am interested in the vacuum cleaner shown on page 71 and would be interested to learn where one of these can be purchased.

There are many similar small pumps available in this country from suppliers of construction plant and equipment, so I suggest you look through your local "Yellow Pages" for names and addresses of firms who sell or hire pumps and hoses, etc.

An end fitting to the suction pipe can be made up in the shape of a fish-tail to give some protection not only to the pump but also any unseen fish nearby. A vacuum cleaner fitting may be adapted or one of the special swimming pool cleaner heads used to include a brush, particularly if yours is a lined pool. In some of the *Aquarist* publications, complete sets of vacuum cleaning are offered for sale.

However, those with a strainer between the suction head and the conventional type of pump are of doubtful value if used in well established ponds where the strainer would become blocked in about 10 seconds by the amount of settled algae each week. I have sent you details of one of the number of small industrial pumps available and specially designed to handle water with a solids content, ranging from fine particles to heavy contaminants, by means of an open vane trash type impeller set in a large chamber fitted with a non-return valve in the suction inlet; so that once filled with water the pump is self-priming. The inlet and outlet connections are 1 in. diameter, and the pump is rated at 2,000 gallons per hour maximum.

H.A.

Marine



problems with red algae . . .

Out of my four marine aquaria containing Angelfishes and Butterflyfishes, one aquarium persists in growing red algae. The tank measures 36 in. x 12 in. x 15 in. and is lit by one 'Gro-Lux' tube and one 'Sunglow' tube. Both tubes are on for 12 hours each day. I also do a 5 gallon (i.e. 25%) water change every 3 weeks. The tank is sited next to a large bay window.

On the coral-reef there is a pronounced zonation of algal growth with green algae occurring in the shallow, relatively warm water where the red frequencies of the white sunlight required by green algae can still penetrate. In moderate depth seawater the green algae are replaced by brown and yellow species which use the yellow and green frequencies of light to photosynthesise the plant's carbohydrate foods. In deeper, colder water only the blue/violet frequencies can penetrate and these are used by the red algae as the energy source to synthesise foods from water and carbon dioxide.

It follows from the above that the growth conditions preferred by red algae are:

- (i) Relatively low temperature and;
- (ii) Lighting biased towards the green/blue/violet end of the spectrum.

The maximum useful lifespan which you can obtain from most fluorescent tubes is about six months when the tube is lit for 12 hours each day. If your tubes are older than this changing them for new ones may solve the problem. Additionally, increasing the water temperature to 78°F-80°F frequently deters the red algae and encourages the green species if the lighting is correct.

moving to marines . . .

I have been keeping fish for about 4 years, and now would like to

move onto marines. The only tank I can have is a 24 x 12 x 12 in. I intend to use reverse-flow under-gravel filters with an air driven protein skimmer. What purpose does filter matting under the substrate of a reverse flow system serve? Is a Fluval 102 too powerful to power the reserve flow filters? Since I don't intend to keep invertebrates, is a 2 ft. Northlight adequate? I will do a 10% water change every week. Is this too much? How often do I check pH and nitrate levels and should I add any trace elements? Do common clownfish require anemones? If not, could I keep one in my tank with some yellow-tailed Damselfish. How often do I feed the fish each day?

The advice which I have always given beginners is never to attempt to create your first marine aquarium in any tank smaller than 3 ft. long—and a 36 x 12 x 15 in. at that. Obviously, there is no magical marine formula which guarantees a beginner success if he makes his first essay into marine aquatics with a 36 x 12 x 15 in. (20 gallons nett or 90 litres) or larger tank and which conversely, spells doom for all first attempts in smaller tanks. It is just that larger bodies of captive seawater tend to be more stable chemically than smaller ones and that, by the time you've got 1 in. of crushed cockle shell followed by an average depth of 2 in. of coralsand over your undergravel filter, you will only have about 7½ inches viewing depth of seawater left in a 12 in. tank, allowing at least 1 in. freeboard above the water's surface.

Filter matting: is only used as the first layer above the U/G filter to prevent the coralsand from clogging the slots in the filter plate. Coarse cockle shell does this more efficiently, can't clog and helps to buffer the seawater at the same time.

A Fluval 102 power-filter should operate your U/G filter in the reverse-flow mode perfectly well.

The *Common Clownfish* (*Amphiprion percula*) does need close association with a sea anemone if the species is to live a long, happy and contented life, and to that end I'm afraid I must

inform you that you will need at least two 24 in. fluorescent tubes in order to keep the anemone healthy and feeding. The best combination of tubes would be a 'Northlight' and a 'Grolux'.

Water Management: A 10% weekly water change would be ideal in view of the tank's small size. Nitrite testing is only necessary once every two weeks after the filtration system has bacterially matured, but the pH and nitrate levels should be checked at least once each week and the frequency/amounts of the partial water changes adjusted accordingly to these results. Supplementary trace elements should be added once weekly after the seawater is 6 weeks old.

Stocking and feeding: I strongly recommend that your stocking ratio should not exceed 1 in. of fish per each 4 gallons of seawater during the first 6 months in which you are mastering the skills of water management, feeding, disease recognition, etc. After that all-important 6 months apprenticeship is behind you, this ratio may be increased to 1 in. of fish per each 2 gallons of water. Now, making due allowance for the water displaced by the filter-bed, rocks and corals, you will have approximately 18 gallons. From the above, you will see that this leaves you space for exactly 4½ in. of fish. With such a small tank, my sincere advice would be to have only a male/female pair of Common Clowns, (—they are easily sexed by an experienced dealer), at 1½ in. long each, a beautiful white or pink *Radianthus* anemone and to use up the remaining 1½ in. on a Scooter Blenny to help ensure that no uneaten food lies on the filter bed.



The common clown always requires an anemone

If, after the initial 6 month period, you want to add just two more fishes, I would recommend a small Electric-blue Damsel and one small Saffron

blue Damsel. The latter fish must be from the Philippines as the very similar-looking Ceylonese Saffron blue Damsel is very aggressive and would probably kill off your Percula Clowns. It is very difficult to sex these damsel-fishes and two of the same sex would fight continually.

Feeding: should be miserly and once each day only for the fishes using fresh frozen fish foods as *Artemia*, *Mysis*, fish eggs, and finely-chopped shell-meat, cockles and squid. The anemone will require a garden pea-sized chunk of whole shrimp or lance fish once every 3 days. **Needless to say all these foods must be gamma-ray irradiated to prevent disease transmission.**

G.C.

Discus



discus & angels . . .

After about two years of community tank fishkeeping I have decided that I would like to specialise in Discus fish and have therefore purchased a 48 in. x 12 in. x 18 in. tank.

Would you please answer the following questions?

1. I would like to know how many Discus fish I could keep in this size aquarium.
2. What is the best proportion of males and females for breeding?
3. At what age are they mature enough for breeding?
4. What signs are there when they have a selected mate and are ready to spawn?
5. Is it beneficial to keep Angel fish with them?
6. What type of Angel fish goes with them best?
7. How many and of what gender of Angel will fit with the Discus in my tank?

I must say I am glad that you have decided to "join" the club of the Discus fishkeeper; it seems that an ever increasing number of hobbyists are willing to tackle what many still may consider to be the almost impossible. It would have been a wiser move, however, to purchase your

48 in. aquarium after having received your reply. I have now for a long time felt that the old imperial sizes of aquaria are a size of the past and only standard metric sizes ought to be purchased. The reason for this will become quite obvious a bit later on. A fully grown Discus fish will measure approx. 5 to 6 inches and it would have been much better if your aquarium could have been 15 in. instead of only 12 in.; or even more. If you ever were to give up Discus fishkeeping and start up again a community tank with plants and fish you will find that the output of your 3 ft. fluorescent tube would just not be good enough to grow any plants apart from a few needing very little light. A 53 in. aquarium would have taken a 4 ft. tube. But if one were to aim for the ideal size I would have said 39 in. x 18 in. x 18 in. It would hold even 10 more gallons of water.

In your aquarium you can keep about 10 babies (they do better in numbers) or five fully grown ones, if the filtration is right.

As Discus fish are almost impossible to sex you will have to wait and let them pair off themselves. Usually they pair for life and these pairs are often better breeders than 'forced' pairs.

With good maintenance and feeding Discus fish have reached maturity within seven months (females) and about 10 months for males.

Discus fish, as a member of the very large Cichlid family and true to form are also sometimes somewhat aggressive. You will always get a very dominant fish; not always the biggest male as is always thought. From my own experience I would in fact say that females are often more aggressive. When they are old enough and ready to mate you will find that they will become very gentle and stay together for a long time. They will still show their strength towards the others but I think their heart isn't really in it. What follows has been well documented and is worth watching.

As Angel fish are usually carriers of many parasitic diseases it would be wise to keep them away from a Discus fish set-up.

E.S.

Meet the Societies



NORTH AVON AQUARIST SOCIETY



The N.A.A.S. badge



A pair of Marbled Angels

The North Avon Aquarist Society was founded in October 1974 with the main aim of furthering interest in all forms of aquatic life. This same aim still applies today and is still accepted by the members who regularly attend the monthly meetings in substantial numbers.

N.A.A.S. has had various venues for its meetings over the years. The most recent one is excellent and is, therefore, likely to become permanent for the foreseeable future. Meetings start at 7.30 p.m. with about 30-minutes' worth of Club business followed by the main event of the evening. This can be one of many activities such as discussions, films, Table Shows, and lectures by members or visiting speakers. There is usually a break for coffee and biscuits as well as a raffle. On "special" nights, an extension allows for discussions to continue until 10.45 p.m., thus providing members with a very full evening's entertainment. The address of N.A.A.S.'s ultra-modern meeting place is the Hanham Folk Centre, High Street, Hanham, Bristol—everyone is welcome on any third Monday of the month.

In addition to the meetings, there are joint events with other Societies, visits to places of interest around the country (including major Festivals), an Annual Show, representation at other Societies' Shows, and so on.

The Society badge is unusual in that it was designed from suggestions submitted by members, reflecting the fact that they have a great deal to say concerning the way things are run.

The Society also has its own 'Club Shop' where a range of fish, plants and equipment can be obtained at considerable discounts. The monthly Newsletter includes, in addition to the usual essential bits of news, a free-to-enter sponsored Crossword Puzzle. Yet another free service offered to members (and now available to other Societies) is a Register of Society Secretaries. Any Society in the country can apply for inclusion in this Register which gives the name and address of each Secretary and dates of meetings and AGM's (contact N.A.A.S. for further details).

Subscription Rates:

Adults, £4.00; Families, £6.00; Juniors and O.A.P.'s, £2.00.

Apply to: Mr. R. (Bob) Cumins, 1 St. Anne's Close, Cadbury Heath, Bristol, BS15 5EH. Tel: (0272) 677898.

SANDGROUNDERS' AQUATIC SOCIETY



The S.A.S. badge



Hippocampus sp.

The Sandgrounders' Aquatic Society was formed in April 1971 by a small group of fishkeepers in Southport. Their aim was "to further the hobby for the mutual benefit of fishkeepers in the town while encouraging the showing of fish".

In the first three months of life, the Society had attracted sufficient members and funds to stage its first Open Show, something not previously seen in Southport. The Show was a success and, after 1972, had to move to a larger venue at Meols Cop School, where it has remained each year since then.

The schedule of Classes has been carefully expanded since 1971 to include all the popular additions to the hobby, such as Rift Valley Cichlids. Recently, two new Novice Classes have been added to encourage newcomers. In all, there are some 52 Classes each, with a perpetual trophy and prizes.

The Society, however, does more than just show fish. A full programme of subjects and events is planned for the fortnightly meetings which are designed to appeal to the fishkeeper. It consists of films and slide shows, talks by leading aquarists, Table Shows, demonstrations, quizzes, competitions, auctions of surplus fish, plants and equipment, discussions and social evenings.

Other activities include visits to Water Gardens, Aquaria and Aquatic Festivals. The Sandgrounders have supported the British Aquarist Festival with a tableau every year since it was formed. The Society show team support most of the northern Open Shows, gathering points for the F.N.A.S. Show League title which they have won many times.

The Sandgrounders' library boasts an excellent and comprehensive selection of aquatic books and is kept continually updated.

Meetings are held on alternate Thursday evenings in a private room upstairs at the Mount Pleasant Hotel, Manchester Road, Southport, starting at 8 p.m. Members are circulated with an Agenda in advance of each meeting and a Newsletter is issued frequently.

Subscription Rates:

Full membership, £1.50 per annum; Joint, £2.00; Juniors, 50p.

Apply to: Steve Hooton (Secretary), 81 Radnor Drive, Southport, PR9 9RS. Tel: Southport (0704) 24743.



From Aquarists' Societies

Dates for the diary

A monthly information column to keep you up to date on forthcoming events.

MARCH

3rd March: NORTH WEST GROUP, BRITISH KILLIFISH ASSOCIATION are holding their 4th show and auction at the Toot Hill, Siddowood Common, Leigh, Lancs. For further details contact Eddie Jones, 72 Orchard Lane, Leigh, Lancs. WN7 1NX.

10th March: HARINGEY A.S. open show at Highgate Wood Lower School Park Road, Hornsey, London N8. Details and Schedule from Adrian Dempsey, 135 Rutheale Gardens, Hornsey, London N8 9PH. Guest Speaker: Dr. Christopher Andrews from Tetra.

17th March: SKEGNESS & DISTRICT A.S. 8th open show at the Imperial Cafe, North Parade, Skegness. Bunching 12 noon-2 p.m. Judging 2.15 p.m. prompt. Entries 25p per entry. Auction 15% to S. & D.A.S. Refreshments, raffle, slide stalls. Judging will be to Y.A.A.S. standards.

23rd March: BRITISH AQUARISTS STUDY SOCIETY first Spring meeting at the Park Street School, Park Street, St. Albans, 2 p.m.-5 p.m. Speakers being arranged. All enquiries to Hon. Sec., Mrs. M. Williams, 95 Dorchester Road, Leicester LE3 0UJ. Both old and new members welcomed.

24th March: HALIFAX A.S. Spring auction at Forest Cottage Community Centre, Cozzin Lane, Ellingworth, Halifax. Details: ring David Shields, Halifax 60114.

24th March: LIVINGSTON A.S. open show to be held in the Dedridge Community Wing, Dedridge, Livingston, West Lothian. Details from Mrs. L. Southerton, 44 Falconer Rise, Dedridge, Livingston, West Lothian. Tel: Livingston 412147.

31st March: RUNCORN A.S. open show and auction. Schedules, details, etc. from R. Muckle, 23 Adala Road, Runcorn, Cheshire WA7 4TU. Tel: Runcorn 76999.

31st March: ROTHWELL & WAKEFIELD A.S. open show at the Blackburn Hall, Rothwell, Nr. Leeds. Booking in from 12 noon. Judging and auction start at 2.00 p.m. prompt. For further information contact P. Hewitt, Secretary, 31 Junction Lane, Ossett, W. Yorks WF5 0HP.

31st March: SUDBURY A.S. open show. Details and schedules from Mr. B. Winterside, 142 Hoel Street, Northwood, Middlesex HA6 1NL.

APRIL

7th April: OLDHAM & DISTRICT A.S. annual open show will be held at Werneth Park, Oldham. Further information and show schedules can be obtained from A. Chadwick, 9 Brownville Close, Chadderton, Oldham OL1 2R3; telephone 061-652 6207.

14th April: KING'S LYNN A.S. open show, Cove Hall, King's Lynn. Contact D. Rye, Field Road Close, King's Lynn, for details.

14th April: BISHOP AUCKLAND A.S. open show. For details regarding venue, etc. contact Show Secretary, R. Brogden, 44 Ridgeway, North Close, Spennymoor, Co. Durham. Tel: 0188-816666.

14th April: TAUNTON & DISTRICT A.S. open show at Youth and Community Centre, Langley, Taunton. Details and schedules from W. B. Grainger, 48 Richmond Road, Taunton, Somerset TA1 1EP. Tel: Taunton 99649.

14th April: PRESTON & DISTRICT A.S. auction, at Lancashire Polytechnic, Preston. Booking in from 12 noon. Auction to start at 1.30 p.m. Plenty of parking. A great opportunity to purchase fish, plants and equipment at bargain prices.

21st April: STANLEY A.S. will be holding their 11th open show at the Stanley Youth Centre, Tyne Road, Stanley.

21st April: EAST KENT AQUATIC STUDY GROUP will hold its open show at the Catholic Social Club Hall, Clarence Road, Herne Bay.

24th April: KIRKCALDY A.S. annual open show at Balweir High School, Balweir Gardens, Kirkcaldy. Fish auction, raffle and raffle prizes. Schedules from A. Little, 184 Elgin Drive, Glenrothes, Fife.

28th April: COWE & DISTRICT A.S. will hold their open show in the Mayfield Centre, St. Nisanian, Strlingshire.

29th April: The annual open show of the **MERSEYSIDE A.S.** will be held at the Rainhill Village Hall, Rainhill, Prescot, Lancs.

29th April: WILLENHALL AQUARIST GROUP'S open show to be held at Frank F. Harrison Community Centre, Wallis. Change of date.

MAY

3rd May: WALTHAMSTOW & DISTRICT A.S. are pleased to welcome Keith Dean of the B.K.S. who is giving a lecture on "Koi Keeping and Ponds", commencing at 8.00 p.m., at the Grange Hall, Fredric Street, off St. James Street, Walthamstow, E.17. Anyone interested is invited to come along.

8th May: L. & E. A.S. open show to be held at Monk's Dyke High School, Monk's Dyke Road, South Lincs. Bunching 11.45 to 13.45. Judging Y.A.A.S. standard.

8th May: STRET福德 & DISTRICT A.S. open show is to be held at Herford Community Centre, Canterbury Road, Devyholme, Manchester. Further details contact Mr. G. Cummins, 16 Royal Avenue, Urmston, Manchester; telephone 061-748 9973.

11th May: BRITISH AQUARISTS STUDY SOCIETY, second Spring meeting at the Park Street School, Park Street, St. Albans, 2 p.m. to 5 p.m. Programme to be arranged.

11th & 12th May: AQUARIAN FISH-KEEPING EXHIBITION Kington Park Racecourse. Details and Schedules from: The Secretary, The Association of Aquarists, 7 Wheeler Court, Plough Road, Battersea, London S.W.11.

12th May: BOURNEMOUTH A.S. annual open show will take place at Kinon Community Centre, Pelham Park, Bournemouth. Show schedules will be available after 1st April from the Show Secretary, Jack Jeffery, 13 Woodland Avenue, Bournemouth BH15 2DJ. S.A.E. would be appreciated.

18th & 19th May: SCOTTISH AQUARIST FESTIVAL Metherell Civic Centre, Scotland. Details and Schedules from W. Bennett, 15 Cosider Avenue, Coltness, Wishaw, Lanarkshire ML2 8S2.

19th May: ABERDARE A.S. 3rd open show at Aberaman Y.M.C.A. Schedules and further information available from Show Secretary, M. R. Williams, 298 Cardiff Road, Aberaman, Aberdare CF44 6UU. Tel: Aberdare 856604.

Monthly reports from Secretaries of aquarists societies for inclusion on this page should reach the Editor by 3rd of the month preceding the month of publication.

19th May: FOLKESTONE & DISTRICT A.S. open show at Capel Village Hall, Nr. Folkestone. Details and schedules from M. Keene, 77 Ashley Avenue, Folkestone, Kent.

19th May: LAKELAND A.S. 1st open show at Bryce Institute, Burneside, Kendal. Further details from Mrs. H. Jones, 10 Burton Road, Kendal LA9 7JA. Tel: 0539 26558.

23rd May: CORBY & DISTRICT A.S. open show, Corby Civic Centre.

JUNE

1st & 2nd June: MID-SUSSEX A.S. are holding a two day Exhibition and one day open show at 'The Martlets', Burgess Hill.

2nd June: REDCAR FISHERIES SOCIETY open show at Redcar Racecourse. Details and schedules from S. J. Ives, 21 Hurst Park, Redcar, Cleveland TS10 2JQ. Tel: (0662) 479112.

8th June: CANNOCK & DISTRICT A.S. open show at Avon Road Community Centre, Cannock, Staffs. Details and schedules from Mr. A. Potts, 25 Oaks Drive, Cannock, Staffs. WS11 1EU.

23rd June: THE BASINGSTOKE AND DISTRICT A.S. open show will be held at the Carnival Hall, Basingstoke. For further details please contact the show secretary, Chris Ralph, 325 Abbey Road, Popple 4, Basingstoke, Hants RG24 9DB, or telephone Basingstoke (0256) 477757.

23rd June: SKELMERSDALE & DISTRICT A.S. annual holding their first open show at Westbank High School, Skelmersdale.

28th June: NAILSEA & DISTRICT A.S. 12th open show to be held at Scotch Horn Centre, Nailsea, Near Bristol. Details available from Mrs. S. J. Kimwood, 11 Queen's Road, Tveddon, Avon BS21 7TD.

8th September: DARLINGTON A.S. 3rd open show, Eastbourne Comprehensive School, Darlington. Further details K. Kodway, Darlington 487581.

Discover the Fishes
Answer: DOMINO DAMSEL

CROSSWORD SOLUTION

Across	Down
1. <i>Heteranalia</i>	1. <i>Hermaphrodite</i>
8. <i>Spa</i>	2. <i>Tuniclelew</i>
9. <i>Zing Doctor</i>	3. <i>Red Tetra</i>
11. <i>Top</i>	4. <i>Nuclei</i>
13. <i>Accreted</i>	5. <i>Root</i>
15. <i>Bloo</i>	6. <i>As</i>
16. <i>Ion</i>	7. <i>Parrot Wrasses</i>
18. <i>Hetero</i>	10. <i>Rob</i>
20. <i>Gales W</i>	12. <i>Pipe Wrench</i>
21. <i>Art</i>	14. <i>Dog</i>
23. <i>Oxyx</i>	17. <i>Nattress</i>
25. <i>Bacteria</i>	19. <i>Orb</i>
26. <i>Son</i>	22. <i>Tannic</i>
28. <i>Fern Friends</i>	24. <i>Xed (Fox reversed)</i>
29. <i>Tea</i>	27. <i>Neon</i>
31. <i>Atenucirku</i>	30. <i>A.M.</i>

FRANCHISE/LEASE

Water Plants, Fish, etc.
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Please apply in writing to:
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