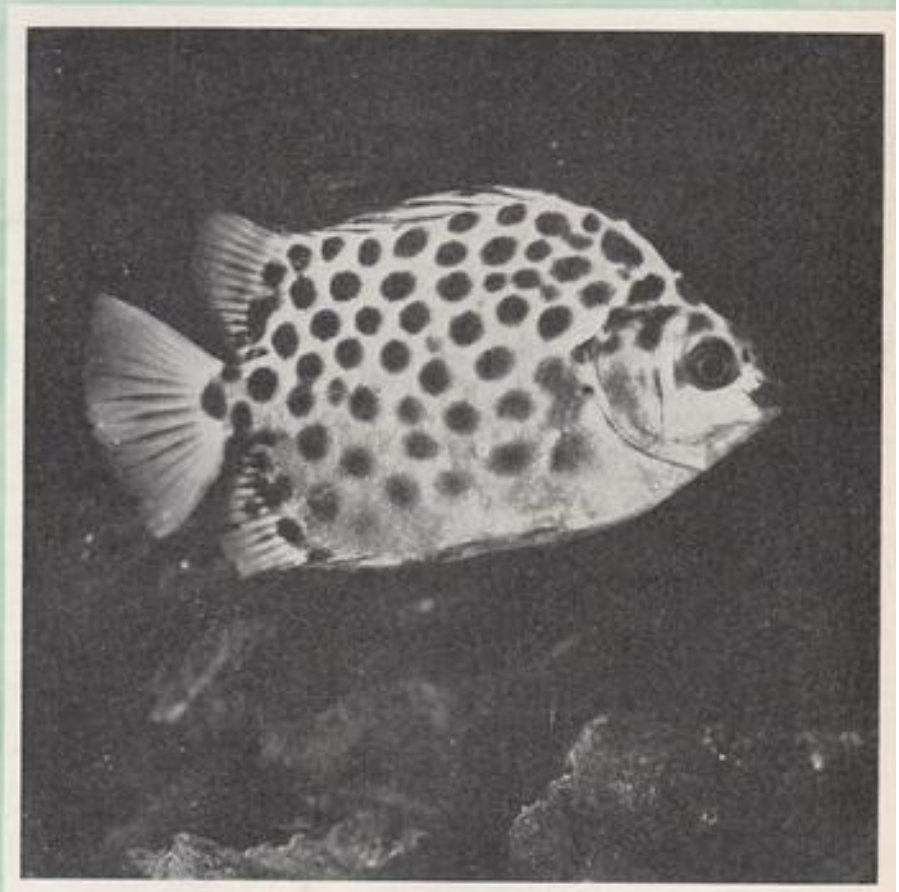
The aquarist

and Pondkeeper

OCTOBER 1964



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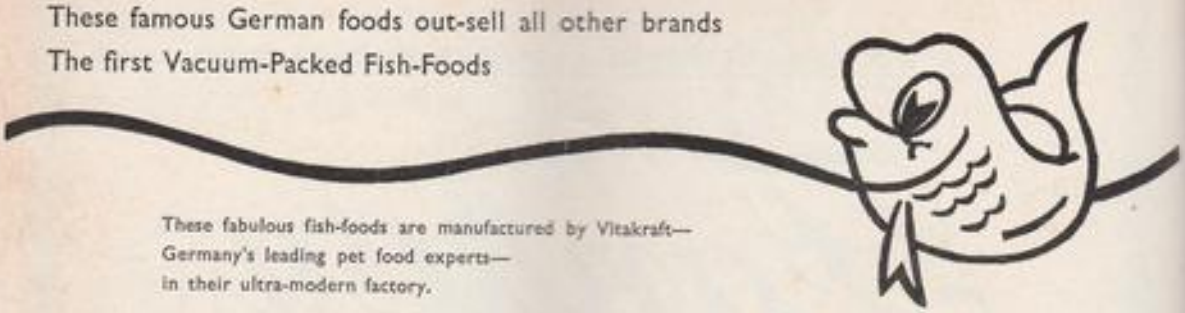

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(*see page x*)

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Contents

VOL. XXIX No. 7 1964

London Show in 1965?

READERS who have been following the correspondence on the subject of a national aquarium show for the south of England (published in our pages since Mr. T. H. Marshall first raised the topic in last January's issue of *The Aquarist*) are asked to give special attention to the letter from Hendon and District Aquatic Society on page 129. Hendon Society members expressed interest in supporting an open show on a national scale in a letter from the Society published in March, and in their current letter they have offered to use their meeting on 3rd December "for the purpose of hearing the views of representatives from other clubs in the Greater London area". The matter concerns all societies who participate in organised showing and who are interested in publicity for aquarium-keeping, so that it is hoped there will be a big response to this invitation.

Book Review

Freshwater Fishes of the World by Günther Sterba. Translation by Dr. D. W. Tucker. Vista Books, London. 70s.

ORIGINALLY published in German, this translation is a unique and most welcome addition to the books on fishes. It is unique because its concern is with all freshwater fishes, "coldwater" and "tropical", and it successfully brings about the marriage of the scientific aspects of identification and classification of fishes to the practical matters of their aquarium care. It is not a beginner's book, for it assumes previous knowledge of the basic techniques of aquarium-keeping, but the requirements of individual fishes that are of importance to the aquarist are in general adequately discussed. Its numerous illustrations, many in colour, are excellent, and the text is remarkably free from misprints (although in my copy pages 135 and 136 appear out of sequence). Dr. Tucker's translation makes enjoyable reading. Such is the rapidity with which "new" species are reaching us there are some recent aquarium subjects that are not included, but there can be doubt that the book will be a major text in its field for many years. The price makes it a real bargain for the aquarist's library.

Anthony Evans

Treatments for White-Spot Disease

by Dr. F. N. GHADIALLY

(Continued from the September issue)

IN the two previous articles the natural history of white-spot disease and its preventive and curative treatments were discussed. Details of treatments are given in this concluding article.

Quinine Treatment—A Paradox

Dozens of letters have appeared in aquatic journals on the effectiveness of quinine as a cure for white spot. Some report excellent results while others have found it useless. The drug has for a long time now been known to medical science as a protoplasmic poison. Though unicellular forms are particularly susceptible to its toxic action higher forms are by no means exempt. It is mainly a matter of dosage. This may be illustrated by the effect of quinine on a patient suffering from malaria. Suitable therapeutic doses of the drug can destroy the protozoan parasites which cause malaria without killing the individual, but toxic effects from the drug such as giddiness, ringing noises in the ear and a depression of heart function are by no means rare. Needless to say, large doses can kill the patient. The lethal action of quinine on unicellular forms such as spermatozoa has led to its use in the preparation of contraceptive pastes and pessaries. Thus it would appear that quinine is, broadly speaking, toxic to many forms of life, certain unicellular forms succumbing at lower doses than more highly evolved creatures such as fishes and man.

The importance of the optimum dosage is thus quite obvious, too much will kill the fish (and plants), too little may leave the white spot parasites unaffected. W. Jung, who first described the quinine treatment of white spot, used it in a concentration of 1 in 100,000. Later, however, Buschkiel proved that this is too low, and does not kill all the free-swimming parasites and leaves cysts unaffected.

A strength of 3 in 100,000 was, however, found to be effective against both free-swimming and cystic stages of the parasite. However, in a strength of 3 to 4 in 100,000 quinine salts will kill several varieties of plants (*Vallisneria spiralis* var. *torta* most susceptible, *Cryptocoryne* least) while at 5 to 6 in 100,000 many fishes will succumb from the toxic effects of the drug. Hence, you will see that if we are going to use this drug there is not a good margin of safety. To use the correct technical term, the drug has a low therapeutic index. Suppose in spite of this we decide to use the drug say at the 3 in 100,000 level, and we are prepared to lose a few plants; are there any other obstacles to overcome? Yes, for as you will remember, we need not only to produce this requisite concentration in the tank but also maintain it over the entire period of treatment. For if we can do this till all the spots on our fishes have ruptured, a cure would be at least a theoretical certainty.

However, factors are at play in the aquarium which makes the maintenance of an even, uniform concentration of the drug over a prolonged period of time well nigh impossible. Quinine is an unstable organic compound (alkaloid) which is fairly rapidly destroyed when in solution; light and heat hasten this deterioration. Besides this it attaches itself to dead organic matter and is also adsorbed on to rockwork, gravel etc., and is thus further lost from solution. As these conditions vary so much from one aquarium to another it becomes almost impossible to state the correct amount of drug that should be added per gallon of water in a given furnished aquarium to produce the final required concentration. No wonder then that the dose recommended for the treatment of white spot by various authors varies from one-half grain to four grains per gallon. Roughly speaking, the tank with less plants and organic debris etc., should need less drug. Also now we can realise why some aquarists get fine results with quinine while others fail hopelessly.

Let us face it, the treatment of infested fish in a furnished tank is a hit-or-miss method which will work many times but not always. Where is the point in accurately weighing out the drug, calculating the volume of water (some go so far as to calculate volume of sand and rockwork and allow for this) when we know that a large unknown quantity of the drug will be removed rapidly from the water, making a sheer mockery of all our calculations? Further, quinine is a colourless compound and gives no visual indication of the amount left behind in solution. The only reason why the treatment works at all in a furnished tank is because an excess of the drug is added so that even after some has been removed by the various means described sufficient remains in the water to kill the parasite. Truly, a hit-or-miss type of therapy if ever there was one and far from the 100 per cent ideal we are looking for.

Treatment with Acriflavine

Acriflavine or neutral acriflavine is a mixture of two complex organic dyes, diaminomethylacridinium chloride and diaminoacridine. It can be purchased either in tabloid form or preferably as a 1 in 1,000 solution; each millilitre (ml.) will then contain one milligram (mg.) of the drug. It is readily soluble in pure water but even fairly low concentrations of salt (sodium chloride) will throw the drug out of solution (salting out). Hence, it should not be used in a tank where salt has been previously added. Acriflavine is also readily adsorbed on to the aquarium gravel, sediment etc., which again, just as in the case of quinine, makes the maintenance of a uniform, known concentration of the drug over a prolonged period difficult. However, it colours the water yellow and hence gives a rough visual indication of the amount present in the water.

This is a great help, for as the drug disappears the aquarist can add more to bring back the colour intensity to the original level, and thus by repeated doses help to maintain roughly the required concentration during the course of the treatment. The dose commonly recommended is 2 mg. per gallon (though some have used a dose as high as 8 mg. per gallon) of water when used in a bare tank with clean water. In a planted tank add double the dose to begin with. Some of it will be quickly removed, and then add approximately 1 or 2 mg. per gallon every alternate day to maintain the concentration. All the time attention should be paid to the intensity of the colour, and the dose varied accordingly. Needless to say, only those with some experience with this drug can hope to get consistently satisfactory results. However, one thing that can be said in its favour is that it is kind to fishes and plants. Some plants and gravel are slightly stained, but when the water is changed after treatment this soon disappears and normal growth is

rapidly resumed. This, in my opinion, is not a drug for the beginner to play with as it is likely to prove unreliable.

Treatment with Mercurochrome

Mercurochrome is no doubt a highly efficient drug, guaranteed to kill the parasites when a dose of four drops of a 2 per cent solution per gallon is used in an average furnished aquarium. Some claim that even half this dose is adequate. I have only used it at the higher concentration and found that plants and gravel are badly stained, though in most cases the damage was not permanent. However, fishes do not appear happy in it; they swim about with closed fins listlessly through the water looking very sorry for themselves indeed. Losses of fishes both during, and weeks or even months after, treatment tend to occur. The toxic action of this poisonous drug on fish that are already diseased and debilitated no doubt accounts for some of these deaths.

The delayed deaths so often reported are probably due to the production of the well-known mercurial nephritis (kidney damage). It has also been reported that fishes may be completely sterilised or their fertility seriously impaired after this form of treatment. Recently, these statements have been "pooh-poohed" by some writers. However, it seems to me futile to refute that damage to health or life of the fish can and does at least sometimes occur. Years of medical experience and research have shown without a shadow of doubt how toxic mercury compounds can be to all forms of life, even in so-called small doses, for this is a cumulative poison. No doubt not all nor even many fishes are killed or sterilised, but there are lesser degrees of injury than this not so easily seen or detected that one must think of when using a drug containing so notorious a substance as mercury. All this need not be of any interest to the beginner or the man with one tank, but it is of prime importance to serious aquarists conditioning species that are difficult to breed.

Mercurochrome is not stable in solution above 70°F (21°C) and at 80° to 85°F (27-29°C; the temperature at which it should be used for the treatment of white spot) it is going to be even less stable. The breakdown products are likely to be more toxic than the drug itself. Do not store a solution of this drug in a warm place such as a fish house. The differing accounts of toxicity of this drug are perhaps at least partly due to the use of old solutions which are likely to be much more toxic. Once added to the aquarium it is almost impossible to rid the tank of all traces of mercury compounds, as these are very poorly soluble. There is therefore a real risk of a cumulative action when repeated doses are employed to treat numerous outbreaks of the disease over a period of time in the same furnished tank.

As mercurochrome, like the other drugs previously mentioned, also attaches itself to various objects and sediment in the aquarium and is hence lost from solution, in a dirty or heavily planted tank it may be necessary by about the second or third day to add another very small dose to restore the colour of the water to its original intensity.

In spite of all that has been said above this is the best and most fool-proof drug one can think of when one is forced to treat fishes in a furnished aquarium, but if facilities are available for treating fishes in a bare tank there is no justification whatsoever in using so toxic a drug when other harmless equally efficient drugs are available.

Treatment with Methylene Blue

The most noteworthy difference between this and all the other drugs so far mentioned is its almost complete lack of toxicity to fishes even at doses far above the effective dosage sufficient to kill the parasites. Indeed, it would be no great exaggeration to say that fishes are as happy in solutions of this dye as in plain water! They swim about merrily, feed well, and I have actually had a spawning and reared youngsters from tiger barbs that have been moved from methylene blue straight to the spawning tank. Live-bearers have been known to drop their young when under treatment for white spot with this drug, and neither the mother nor the babies have come to any immediate or ultimate harm. It will also be remembered that when breeding the angel fish this dye is used to protect the eggs from fungus.

If more proof were needed to show how harmless this drug is to higher forms of life let me state that fair quantities of this drug can and have been injected into the blood-stream of man and laboratory animals without producing any untoward results. Nevertheless, this drug is very lethal indeed to the white-spot parasite. Unfortunately, however, even in fairly weak concentrations it kills or at least seriously damages most plants. Its use in a furnished aquarium, in my opinion, is therefore unjustifiable.

In a dose weak enough not to hurt the plants seriously it constitutes a somewhat unreliable remedy for white spot. Failure to appreciate this has unfortunately given this first-class drug a bad reputation. This drug is readily absorbed and removed from the water during the course of treatment but this is of no practical importance as we can easily use a dose grossly in excess of that needed to kill the parasite without any fear of harming the fishes. Contrast this with quinine and mercurochrome where even a modest excess may injure or kill the fishes. The recommended dose (other authors) is two drops of a 5 per cent solution of methylene blue per gallon of water (approximately 6.6 mg. per gallon). This is probably adequate but for years now I have used a much larger dose administered in divided doses during the course of treatment, without ever losing anything more than an odd fish now and again which probably would have died anyway. I should like to describe in detail this treatment which has been so completely successful in my experience.

As soon as white spot is detected in a planted tank, the fishes are moved to a bare tank and 1.5 ml. of a 1 per cent solution of methylene blue per gallon is added to the water (this is equivalent to 15 mg. of methylene blue per gallon, or approximately 22 to 23 drops of a 1 per cent solution, or four to five drops of a 5 per cent solution). On the third day a further 0.5 ml. of the 1 per cent solution per gallon is added to restore the fading colour, and sometimes a further similar dose is added on about the fifth day if the colour has again faded noticeably. This brings the total up to 20 to 25 mg. per gallon during the course of treatment, i.e. roughly three to four times the commonly recommended dose. For the first few days, of course, fresh spots will keep on appearing on the fishes but by about the fifth or sixth day if the temperature has been maintained at 80°F (26°C) all spots will have disappeared.

I have little doubt that a mere fraction of this dose would be adequate. The philosophy behind these massive doses is just simply that the drug is cheap and harmless so why not add an excess to make doubly sure? On about the eighth to the tenth day I usually return the fishes from the methylene blue to their original tank. I have left fishes in methylene blue for 20 days just to see if it would hurt them in any way but it did not.

The planted tank in which the outbreak of disease occurred is not touched in any way, but the temperature is raised to 82° to 85°F (27° to 30°C) as soon as the fishes have been removed and is kept at that level until a few hours before the end of treatment, when the temperature is lowered to the usual 75° to 78°F (24° to 25°C). A re-currence of the disease because of this is so far unknown in my experience.

Methylene blue can be obtained in two forms, one for commercial use and the other for medicinal use. Do not, under any circumstances, use the former; it is likely to contain all sorts of impurities and I have heard reports that

some aquarists have actually lost fishes by using it. Let me repeat, it is the medicinal methylene blue which you must obtain. Incidentally, it is very cheap, much cheaper than any of the other drugs mentioned.

One may thus conclude that while mercurochrome constitutes the ideal form of treatment for the man with one tank, methylene blue offers a much more attractive and equally reliable form of therapy to the serious aquarist with many tanks who is not willing to take chances with a poisonous drug.

Treatment with Heat

Whatever drug is chosen for the treatment of white spot it is a good plan to raise the temperature to 80° to 82°F (26° to 27°C) at the same time, for increased temperature acts in two ways. Firstly, it hastens up the life cycle of the parasite so that the period of treatment is appreciably cut down, and secondly, as water holds less oxygen at higher temperatures and as the parasite is peculiarly susceptible to oxygen lack, its life processes are adversely affected and hence it falls a more ready victim to whatever drug is employed. But it must be borne in mind that at higher temperatures drugs disintegrate more rapidly, and if a very high temperature such as 90°F (32°C) is employed, fishes (except most labyrinths) will also suffer. If aeration is used the benefits will be felt by both fishes and parasite.

It has been claimed that heat on its own can cure white spot. If the temperature is maintained at 85° to 90°F (30° to 32°C) with no aeration, it is possible to kill the parasite on many, but not all, occasions. Many fishes, however, will not tolerate a temperature of 90°F (32°C) for such a prolonged period. I have tried 85° to 87°F (30° to 31°C) alone without any drug on one occasion and failed hopelessly to eradicate the disease from the tank, and hence I cannot recommend this form of treatment. In spite of what has been written by some aquarists, heat alone is *not* a reliable treatment for white spot.

With any of the other treatments, aeration may be employed but not filtration, as most of the drugs will be partially removed by the filter, particularly if charcoal is employed as a filter medium. As aeration helps to maintain an even temperature all over the tank by preventing stratification of colder layers of water at the bottom, with it we can carry out treatment confident that the entire tank contents are 80°F (26°C) or above and that no cold pockets exist where a cyst may lie dormant.

This then is, in some detail, the complicated story of white spot. I have tried to tell it in as simple a way as possible without omitting any important, known facts. If in some way this article helps to stop even a few of the many enthusiastic beginners who leave the hobby every year because of the disappointment caused through loss of fishes by this menace, the effort involved in writing it will have been more than amply repaid.

Breeding the Ember Barb

(Barbus melanamphyx)

by A. W. SKINNER

WE had been breeding several species of the barbs with reasonable success over the past couple of years, when we were offered six ember barbs (adults). We decided to purchase them and try to breed them.

Although hundreds of fishes have been transported by us without mishap, on this occasion the jar leaked and by the time we arrived home the fish were in the last inch of water. We were glad to see them safely settled in the tank!

It seemed as if we had three pairs but in a few days we could see there were four males and two females. The males' bodies are deep red and they have black fins, and while the females lack the body colour, they have more black markings.

Males and females were then separated and conditioned on white worms, *Daphnia*, roe, dried foods and greens. In fact they greedily ate anything offered them.

After conditioning the fish for 2 weeks, a tank was set up ready for spawning. We used an 18 in. by 10 in. by 10 in. tank. The bottom was covered with gravel and stones, then water was added to about 8 inches, this being half fresh tap water and half matured aquarium water. Fine-leaved plants and nylon yarn were then placed in as a spawning medium, the temperature was set at 80°F (27°C) and the tank was left to stand for 2 days.

One male and one female ember barb were introduced to the tank in the evening. Early next morning (around 6.00 a.m.) I arose and patiently watched for the fish to commence spawning. I think my wife had left strict instructions for them, as they were quite unco-operative until she had woken up (about 9.00 a.m.), cooked breakfast and cleared up; then she sat down in the fish house and said "they are spawning"!

The male drove the female into the plants and she expelled about six eggs and at the same time he fertilised them. This was great, being the usual barb procedure; but no, what was this? The female then gobbled the eggs up! This went on for a couple of hours, driving us both frantic. After this we removed the adult fish and peered anxiously to see if we could spot just one little egg that she might have missed. We could not see a thing but left the tank covered for a few days, with little hope. However, on the fourth day there were two precious fry on the back glass. Another couple of days and we had four baby embers swimming around. These were fed on egg infusion for 3 days, then on to brine shrimp and micro worms. They grew quite quickly but when we went to move them to a bigger tank, we could find only three.

Meanwhile we prepared a spawning tank again, but this time added more plants, hoping to foil the female ember. And to our joy, this did seem to help, although she still ate plenty of eggs; this time we actually raised 70-80 young. They are now 3 months old and rapidly dwindling in number. No! They are quite healthy, but are being taken away by aquarist friends who call and see the beauty of the adults that have now been placed in our barb show tank.

Pests of the Garden Pond

by A. BOARDER

MANY types of animal life may live in or enter the garden pond. Some of them may be dangerous and others rarely so. Some, probably the more dangerous ones, live mainly on fishes but a few of the others can do a lot of damage if they are not recognised and dealt with.

A possible danger is from cats. These can hook out a fish from near the surface of the water and even if the fish is not actually killed it can be badly damaged. The answer to this problem depends on the type of pond and to a certain extent its position. If it is an irregular shaped type with earth surrounding it, it is possible to construct a shallow trench all around so that there is water there all the time. Most cats do not like to get their feet in the water to get to the actual pond. If this method cannot be used wire-netting screens would have to be made to cover the pond. I have used this method for some years after having lost some good specimens. I made frames of 1 inch tile batten and covered them with wire netting. It is easy to remove these during the day time when one is present and replace them at night.

Another possible pest is the grass snake. This may only be a visitor in country districts but I have had a visit from one in a London suburb. A grass snake can eat quite a good sized fish. The one which I caught in my pond was only a medium sized snake, about 2 feet long, but it had swallowed a fully grown frog. The only way I know of keeping out such a pest is to construct a barrier round the pond. This could be in the shape of a small wall of concrete with a good outward curve.

The bird problem can also be acute, especially in rural areas in early mornings. Many birds can visit a pond and take fishes. The best known is probably the kingfisher. He is only a small bird but can take a fish 4 inches long and swallow it. Once a kingfisher visits a pond and gets a fish, it will return day after day until all the smaller fishes are eaten. If your pond is anywhere near a river, stream or large pond, it is possible that a kingfisher can visit it. There is not a lot that can be done to stop these visits except for the wire screens. However, it is well known that a kingfisher likes to have a perch over the water on which it can sit and watch for a fish. The absence of such a perch can deter a bird from staying long over a pond. Although this bird likes to perch in such a position it is not the only way it fishes. I have seen them hover over a river like a kestrel and then suddenly drop into the water to emerge later with a fish.

Photo: W. J. Howes

Not an uncommon predator of ponds, the grass snake is difficult to deal with

Another bird which can take good sized fishes is the barn owl. This bird seeks its prey at night and also likes a perch over a pond from which to operate. I lost several fishes to an owl, and this bird used to take one a night. Wire netting is again the answer. The heron is perhaps the worst offender where garden ponds are concerned. This bird can clear a pond of fishes in one visit. One point about the heron is that it usually likes to be able to walk into the water. If a concrete pond has fairly sharply sloped sides it is less likely to be visited by a heron than one with shallow easily accessible sides. To prevent such a bird from walking into a pond some fine black wire can be stranded round the pond about 6 inches high.

One or two other birds might also take a fish and the carrion crow must certainly not be left out of this category. With all the birds there is no doubt that the pond most likely to be visited is the one which is a long way from the house or in a rather hidden position. Proximity to open country does, of course, involve a greater risk.

Frogs and toads can be a problem, but I would not like to call them pests. Their presence is welcomed by some people. The tadpoles of frogs will form a welcome diet to most fishes, but there is a slight danger from unattached male frogs in the early part of the year. Male frogs or toads are often in the pond before the females. It is then that one might seize a fish with its forelimbs as it would a female frog and kill it. I have had at least a couple of dozen frogs visit my pond each year but I have only once found one grasping a fish, but I have seen three male frogs clasping each other on more than one occasion. If frogs or toads are not wanted in the pond it is of no use catching them and putting them in the garden as they would soon be back again. They would have to be taken quite a distance away, as a frog appears to return for breeding to the pond where it was born.

I have never found that frogs or toads eat under water and so there is little fear that they would eat any of the food given to the fishes. This cannot be said of newts. These will visit a pond for breeding early in the year, perhaps as early as late February. Two types are likely to come, but often one finds that only the one species will use a particular pond. My pond is used by the smaller smooth newt and I have never had a large newt or triton in my pond. Newts will eat worms and other forms of food in the pond and so their presence is not always desirable. Some people like to have newts in the pond, but, of course, the adults will always leave the water after spawning and will not return again until the following season. Frogs will leave the water after spawning also, but many may remain in or around the pond all the summer.

Pond Newts

I find the worst thing about the newts in my pond is that they lay their eggs in the water plants I have anchored at the side to take the fish eggs. When the bunch of weed is taken out for hatching, the newt tadpoles also hatch out. Although they appear very slow and sluggish at first they soon grow and become veritable tigers in the water. They lie in wait for anything moving and can move like lightning when disturbed or if after a small fish. I know I have lost many fry from this nuisance. If newts are not needed in the pond it is no easy task to get rid of them. One point is that they have no gills once they develop from the tadpole stage and so must come to the surface to breathe at regular intervals. One need only watch by the pond and catch them with a net when they break the surface. Another way to catch them is to tie a worm on a piece of cotton and lower it into the water. Your fishes might take it but no harm would be done, but if a newt swallows the worm a gradual pull up will bring the newt into your net.

For the specialist breeder who collects fish eggs from a pond I suggest that the best plan to adopt to rid the hatching tank of newt tadpoles is to catch up all the life in the tank and transfer it to a white washing-up bowl. The fish fry can then be caught (a tablespoon is useful for this), and the newt tadpoles can be destroyed. This action should be taken before the fry are 2 weeks old, as by then any newt tadpoles which have hatched out will be large enough to eat the fry.

Other visitors to the pond may not be as easy to locate and deal with. Some of these are the dragonflies, which lay their eggs in the water and from which hatch out larvae which can eat small fishes. Also some of the larger water beetles can do the same, and as they can fly quite strongly there is no knowing when one may enter a pond and deposit its eggs.

Other pests include leeches, water lice and fish lice, but these will be dealt with in a later article.

AQUARIUM EQUIPMENT

Lighting for t

THE obvious purpose in applying light to an aquarium is to allow the fishes to see and to be seen, but where the aquarium is planted, the way in which the light is applied will determine whether it develops into a healthy reproduction of the fishes' natural environment or deteriorates until it is just a container of water and nothing more. All fishes and plants kept by the aquarist need light in varying amounts to live and thrive, and it is therefore necessary, when creating an artificial habitat for our fishes, to provide the required amount of light and to apply it in the correct manner.

The main reasons for using artificial illumination are that, in the first place, natural sunlight is difficult to control and, secondly, it is not always possible to site the aquarium where it will receive daylight. Lastly, it is often required to illuminate the aquarium at times when it is dark outdoors.

Lighting of Planted Aquaria

Unfortunately, lighting a planted aquarium correctly demands a little more patience and experiment from the aquarist than most other aquatic matters and is therefore a common reason for the frequent failure aquarists seem to meet with when attempting to establish a clean, healthy aquarium. Even experienced aquarists often use the same bulb wattage-time combination every time they set up a certain sized aquarium, no matter what the contents are. In my opinion, it is impossible to lay down hard and fast rules on the subject because there are so many factors on which the amount of light required is dependent, and also because the time of day and length of time when the lamps are to be switched on will probably vary from one aquarist to another.

When starting a new aquarium it is a good thing to provide extra light for the first 2 or 3 weeks, to encourage the plants to establish themselves. Once the plants are growing, however, the correct value for the particular aquarium must be determined. If too much light is applied, green algae will grow on the glass, plants and even on the gravel. At the first signs of this, either cut down the amount of light or increase the number of plants in the aquarium. Owing to the comparatively high cost of aquatic plants most aquaria are notoriously understocked and this is one of the reasons for lighting troubles. Algae which is allowed to run riot in a tank will become thick and blue-green in colour. Usually, if left to reach this stage, it is very difficult to eradicate without stripping the aquarium down completely.

If the aquarium is not given enough light a brown algae usually develops on the glass. This can eventually poison the water if allowed to accumulate. The plants will not grow properly with insufficient light and the whole aquarium will gradually deteriorate.

The aquarist wishing to establish a healthy, planted aquarium, which will last and develop naturally for a long time, will find that he must be prepared for a little trial and error and must expect to 'nurse' the aquarium along from one stage of development to another. One acquaintance of mine started a 24 inch aquarium off with only one 40 watt bulb on for 8 hours daily, and 2 years later was

the Aquarium

A. JENNO

using two 100 watt bulbs for 12 hours daily on the same aquarium.

When planning a planted aquarium the aquarist should take into account the following factors.

(*a*) *Depth of the water.* In most cases it is recommended that several small lamps be used rather than one large one to ensure a more even spread of light over the entire water surface, but in cases where the aquarium is more than a foot deep it will be found that the light from low wattage bulbs may not penetrate to the required depth, so it will be better to use larger lamps over a deep tank, and a good reflector will then be necessary to spread the light.

(*b*) *Quantity and type of plants.* Obviously, a lot of plants require more light than only a few, but what is more important is that different types of plants require different amounts of light. This should be taken into account when laying out the aquarium and one of two methods may be used: either use only plants whose light requirements are more or less the same, or arrange the plants so that those requiring the most light shelter those which do not need so much. Where a particular plant is used as a centrepiece, one which needs more light than the rest of the aquarium, a higher wattage bulb can be situated directly above this, but this will require careful arranging. Generally speaking, the more plant life an aquarium holds the better, as far as the lighting system is concerned.

(*c*) *Natural daylight.* In my opinion, the best method of ensuring complete control over the situation is to place the aquarium where it will receive only a minimum of natural light, and certainly no direct sunlight. The aquarium will then rely almost entirely on artificial illumination and it will be up to the aquarist to control this satisfactorily. It is difficult to arrange an aquarium so that natural light is applied to the water surface and not through the glass walls, which is unnatural and often leads to the growth of unwanted green algae. Besides this, the strength of natural light fluctuates rapidly and the amount applied to the aquarium is therefore difficult to control.

(*d*) *Age of the aquarium.* Once an aquarium has been properly established, it will be found that it is more difficult to develop algal growths in it than in a new set-up. This is because the plants are now firmly rooted and growing and are able to absorb most of the light applied to the aquarium, without any excess being available for the growth of algae. It will be found that a steady increase in the amount of light applied will be advantageous, but this must be carried out in such a way as to correspond with, and encourage, an increase in the total plant life. A point will then eventually be reached where the plant life is at a maximum for the size of the aquarium, and if the lighting has been properly increased the aquarist will be surprised at how much light the aquarium is taking without showing any ill-effects.

Having once set up the planted aquarium there are two methods of varying the amount of light applied: (1) the power (wattage) of the lamps; (2) the length of time.

Depending on the size and depth of the aquarium a certain minimum wattage will be required for the light from each lamp to penetrate to the required depth, and a certain minimum number of lamps will be required to ensure that the whole of the aquarium receives the required amount of light. Therefore it is only possible to employ an increase in lamp wattage, as decreases will obviously not be beneficial once the required minimum has been determined. The main point, then, is to determine this minimum value early in the life of the aquarium and then to increase from this.

Having determined the power and number of the lamps required by an aquarium at a certain stage in its development, the length of time for which the lamps are on should be used, within limits, as the means of adjusting the amount of light. It is better if the lamps can be switched on to cover the same period of time daily. This period will, of course, depend on when the aquarist wants to see his fishes, but in most cases it is usually early afternoon to late evening. Where there is no-one at home to switch on the lights at the required time, the fitting of a time switch is recommended.

Lighting Equipment

There are only three items to be considered, these being the type of lamp, the reflector or hood and the time switch (where necessary).

Reflectors. The reflector is used to direct the light into the aquarium in the correct direction, to use economically as much of the light output from the lamps as possible, and to provide a tidy means of mounting and hiding the lamp and associated equipment and wiring.

To imitate natural conditions, reflectors are designed to fit on the top of the aquarium and to direct the light on to the water surface. Better reflectors direct the majority of the light diagonally from front to back, which shows off the colours of the fishes better and encourages the plants to grow toward the viewer.

Materials usually used in the construction of reflectors are sheet steel (painted), sheet aluminium and plastic.

Sheet steel makes a very strong reflector, but in large sizes is heavy. Unless the painting is properly done, and is maintained frequently, the hood will soon start to rust if subject to condensation. Most steel hoods sold are only given one or two thin coats of paint, and it is advisable to go over these before using the hood. If it is possible a cover glass should be fitted under the hood to stop condensation, but unfortunately the design of most hoods does not allow for this.

Aluminium hoods are usually purchased with a highly polished finish and are probably the best, both for appearance and reflecting power. Hoods made of impure aluminium sheet should be avoided owing to the fact that the impurities tend to leave the metal under the effect of condensation and may enter the aquarium water. Copper dissolved in aquarium water is particularly dangerous to aquatic life. This point should be noted by those making their own hoods from sheet aluminium.

Plastic hoods so far are only made in quantity for 18 and 24 inch aquaria. These are a one-piece pressing and are usually provided with ridges to run condensation back into the aquarium, clear of the top of the angle iron frame, which is a very commendable idea. The material used must, of course, be non-flammable and as rigid as possible. High powered lamps (such as those used for photography) should not be used in these hoods, as the heat produced will cause the plastic to soften and this will distort the hood. Plastic hoods are not really efficient reflectors as they are semi-transparent and a lot of the light goes straight through them instead of being reflected into the aquarium.

Most hoods, whatever the material, are improved by boring a row of holes along the back to let out the excess of heat produced by the lamps. If possible, cover glasses should be fitted to protect the hood and lighting fittings

from condensation, and it may be necessary to modify the hood to suit the type of lamps in use.

Lamps. There are two main forms of artificial illumination: tungsten lamps in various shapes and sizes, and fluorescent tubes.

Normal domestic tungsten bulbs are used by the majority of aquarists, and commercially produced hoods normally only provide fitting holes for this type of lamp. The trouble with the standard domestic bulb is that it is designed for use in the vertical hanging position and when used in other positions its life is usually shortened, as the filament is not properly supported. If the aquarist enquires, his local electrical supplier will be able to provide what are known as 'rough service' light bulbs. These are a little dearer and the range of available wattages is limited, but they are an industrial bulb with better filament supports and are intended for use in any position. Pearl bulbs are to be preferred to the clear type as the light is more evenly diffused.

Tungsten strip lamps are freely available nowadays and have the advantages of being designed for horizontal use, and, being thin, are easily hidden in small reflectors. Where the aquarist makes his own hoods, this type is recommended as they take up far less space than bulbs and their shape also helps to spread the light evenly over the water surface.

Fluorescent lighting has been the source of a lot of argument between aquarists over recent years. Plants need certain types of light in the correct combination to grow properly and because of this the 'warm-white' type of fluorescent tube is usually recommended as being nearest to the required standard.

Electrically, fluorescent lighting equipment is more complicated because, besides the lamp itself, one or two other components are required. In normal domestic applications, the complete lighting unit is supplied with these components already fitted, but in aquarium installations it is usually necessary to fit these away from the aquarium and this involves either a knowledge of electricity or the services of an electrician. Cost of the lamp and its equipment is high, but running costs are much cheaper than tungsten lamps. Each fluorescent tube must have its own mains switch because the current drawn on starting is high. Taking all these points into account, it is probably better to forget fluorescent lighting systems for aquatic purposes, unless one can afford to have them properly installed.

Time switches. It is often advantageous to switch the aquarium lighting automatically. This ensures constant daily lighting and relieves the aquarist of the need to remember to switch on and off at the correct times. In many homes no-one is available to switch the lamps on at the required time and so a time switch is most necessary in this case.

New time switches are fairly expensive, but there are several models available cheaply on the secondhand market. An adjustable type is to be preferred, to enable the time period to be altered as required. Some time switches are clockwork and require a weekly winding, while others are electrically powered and fully automatic.

Time switches are sometimes used to switch the aquarium pump as well as the lights when the aquarist wishes to aerate or filter only in the dark hours. It is necessary in this case to fit a condenser across the switch contacts to suppress the heavy spark caused by the electrical winding of the pump when it is first switched on. Advice about this should be obtained from the makers of the particular pump in use.

Electrical handymen can construct their own time switches quite easily. All that is required is a motor with a final drive speed of one revolution per 24 hours, a cam shaped to suit the number of hours the lamps are to be on for, and a leaf-type micro-switch, used in the 'normally closed' position. If the length of time needs to be altered with this type, the cam must be reshaped or a new one fitted.

The Perch that Climbs out of the Water

by JACK HEMS

ANABAS TESTUDINEUS, the climbing perch, is a very curious species which is commonly found in many of the ponds and lakes of India, Ceylon, Burma, Siam, the Malay Archipelago, southern China and the Philippines. In the wild it grows to a length of about 10 in. but in captivity it reaches only about half that size.

It is a sturdily built fish, with the anterior part of the body quite broad and the flanks compressed. The colour is variable, as is to be expected in a fish with such a wide range. Yet most specimens seen at dealers are greenish to brownish in hue, with a dark marking on the gill-covers and a similar marking close to the root of the tail. In young fish these markings are very prominent. Young fish also display shadowy bars and horizontal stripes on the sides. The underparts are silvery; the fins are clear brown to yellow.

The gill-covers are provided with spines, which, together with the strong and readily manoeuvrable pectoral fins, enable the fish to leave the water and wriggle over the ground. These journeys in search of food, insects and the like, are always undertaken during or just after a downpour of rain, or when the grass or other herbage is wet with dew. Breathing is accomplished by virtue of the accessory respiratory organ (the labyrinth) which lies on each side of the head: for the climbing perch, like its relatives the gouramies and paradise fish, is a member of the air-breathing family Anabantidae.

In the aquarium, which should be at least 24 in. long to accommodate a single specimen in comfort, it will accept almost any live or flesh food. It is extremely fond of earthworms, houseflies, pieces of red meat and strips of washed, raw liver. It is not particular about temperature, though rapid changes should be avoided. A range of 65°F (18°C) to 85°F (29°C) suits it very well, but a range of 72°F (23°C) to 75°F (24°C) is recommended for normal maintenance.

The aquarium into which the fish is introduced should not contain any other occupants, for *A. testudineus* soon grows into a greedy predator. Plenty of plants should be grouped at one end to form a retiring place. The other end should have some rockwork against which a piece of slate or crinkled-surfaced glass can be propped to make a sloping platform. The fish will soon learn to drag itself up this slope to grab at food placed above water level.

Sexing is not easy, but in mature fish the male's sides are

Please turn to page 124

Introducing the African Tiger Minnow

by D. C. SLATER

RECENTLY I was lucky enough to obtain some *Barbus bariloides*. To most readers this will be a new name; I have not found it in any of the books dealing with our hobby, not even the newest. But it is in the Rhodesian list of fishes. It is not fond of plant cover, but occurs very commonly in farm ponds and well-aerated streams of the Zambesi system and the Congo system.

Owing to the altitude, the temperatures of the region where this fish is found have a greater range than is normal for this latitude near the Equator, and the fish can tolerate a water temperature as low as 65°F (18°C) or as high as 80°F (26°C) quite happily. It is probably much hardier than one would expect a fish from Africa to be.

It appears to be a bottom fish and a shoal fish—appearing more at ease when in company. A shoal of them is quite beautiful; each fish moves along busily foraging, occassonally dipping its head to pick up some morsel. It is not choosey about food. I have given them meat (raw and cooked), white worms, boiled greens, crushed lettuce, fish, liver and some dried foods, but I noticed they wouldn't eat just any dried food; they were a little particular.

Slim-bodied Barbs

They are not deep-bodied barbs like the popular Asiatic species (tigers, niggers etc.) but are a little slimmer than cherry barbs, and grow up to 2½ inches in length. The female is orange-brown with pearly pink scales on the rear of the abdomen, and greenish near the small black blotch on the shoulders. She has a red dorsal, caudal and anal fin and a black spot over the vent. Along her sides are a number of beautiful vertical jet black stripes about 1 millimetre in width as though some artist had drawn them down her sides with a pen dipped in Indian ink. The number of stripes is variable, but the smallest number I have counted is 12, and the greatest is 16. Whether the number of stripes increases with age, I have yet to discover. The size of the female is about 2½ inches including the tail fin. It will be realised by the reader that the female of this species is very attractive, but, of course, the slimmer male is not to be outdone. He has the stripes just as crisp in outline as those of the female; he has the red fins perhaps a little deeper in colour; he lacks the pearly pink scales and the greenish colour on the shoulders. However, he makes up for this by having a gorgeous reddish pink body colour. When I first saw a male I realised that here was a real beauty to add to the list of aquarium fishes. I have wondered whether this was his breeding colour, but after keeping him for nearly 6 months with no fading of colour, I have ceased to wonder.

After a period of quarantine, I chose a well-coloured pair and put them in a 30 inch tank at school (I teach senior partially-sighted children, by the way), where they were gazed at through lenses and not allowed to settle down for a considerable time. However, this gave the mass of bladderwort I had selected as a spawning medium, a chance to grow. And grow it did! By Easter the tank was more than half full of lovely fine fresh green strands of the plant.

During the Easter break the fish were allowed to settle down peacefully and I paid them a visit every day to feed them on white worms and dried food. Towards the end of Easter week, I noticed the male was chasing the female, and on 4th April she looked decidedly slimmer.

No matter how hard I searched the plants, I could see no eggs. Sometimes I would fancy I could see one, but always it turned out to be a bladder of the bladderwort.

For the next 2 days I searched each time I visited the tank but it was not until Tuesday, 7th April, that I noticed free-swimming fry. I counted about a dozen in the part of the tank still free of bladderwort. Two 'Infusoria tablets' of a well-known make were crushed and put in the tank. Unfortunately I had neither net nor jar with which to remove the parent fish, so crossing my fingers I left them in after giving them a good feed of white worms.

Next day, somewhat apprehensively, I approached the tank expecting no fry at all, but imagine my delight when I counted over 20, all with bulging little abdomens full of food. The parents were probably to be trusted, and after feeding them well and adding another 'Infusoria tablet', I left them with their progeny.

On 11th April, brine shrimp was added to the fry diet and this they ate greedily. The first fine dried food was given on 16th April.

By now the fish were being regularly disturbed by partially-sighted scholars peering closely into the tank, for the holidays were over, and occasionally private competitions were held to see who could count most fry. The greatest figure was 40, which I verified during the dinner hour when I was on my own.

On Saturday, 18th April, I made a special trip to school to feed the fish and was surprised and delighted to count another 12 or so fry which had obviously just hatched. Most were still clinging to the sides of the aquarium, but a few were making efforts to swim. I couldn't believe my good fortune. In went the inevitable crushed tablet for the newcomers, followed by brine shrimp for their older brothers and sisters, followed by dried food and white worms for the parents.

Next day, 19th April, I noticed the new fry were eating brine shrimp. Obviously I could have started the first brood on this food much earlier than I had. No more tablets were added; in any case an examination of the tank sides with a powerful (10×) lens revealed ample Infusoria. During the next few weeks millions of brine shrimp nauplii were hatched and fed to the fry.

Not Egg-eaters

At no time have I removed the parents; they seem quite content to eat the diet I provide and never have they been seen to attack their youngsters in any way.

About the middle of May I took out all the bladderwort, apart from a small amount for the parents to hide in. With more room for swimming and as much food as they wanted the youngsters were soon growing well. Soon the tank was not large enough for all of them, and about half were netted and put into another tank. A variety of food stuffs was given from this time onwards, including white worms, Grindal worms, cooked liver, cooked meats, fish, shrimp

Continued overpage

Reflex Action in Fishes

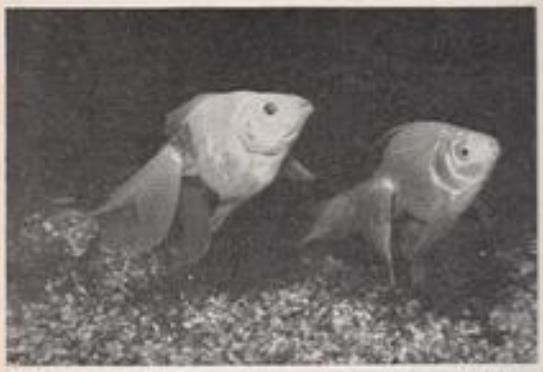


Photo: W. J. Howes

Recognition through the glass—or just a conditioned reflex?

by P. M. FULLER

PAVLOV'S famous experiments with dogs led (among other things) to an understanding of the psychological phenomenon known as the 'conditioned reflex'. Basically the theory of 'conditioned reflex' states that in a given set of circumstances an animal will react in a specific way if induced to do so by habit. Thus, dogs repeatedly fed simultaneously with the sounding of a buzzer eventually salivated merely at the sound of the buzzer, subconscious association having been established between the buzzer and the food. What Pavlov did not observe was that the same effect can readily be stimulated among fishes; in fact every aquarist probably has living examples in each of his tanks.

I remember, as a child, being fascinated by a pool of goldfish belonging to the Duke of Bedford in his estate at Woburn Abbey. The fish, at the sound of a bell, would rise to the surface and 'cruise' expectantly. The reflex reaction had developed over a period of time so that the sound of the bell now stimulated the reaction for food.

Owners of a goldfish in a small tank will probably be aware that their fish react to, for example, the shaking of the food tin, or even to a shadow falling across the water. The fish are, of course, unable consciously to realise that the sound of the shaking granules is in fact the sound of their food; they merely have developed a reflex action conditioned by a given sound, which has come to be associated with the arrival of food. It seems a pity to disillusion the dear old lady who approaches her single goldfish in its old-fashioned globe and on seeing its immediate excited reactions exclaims that it recognises her, but, of course, its actions are as involuntary as mouth-watering in human beings when confronted with food smells or an appetising visual display.

Readers of my article "Blind Fishes Available to the Aquarist" (*The Aquarist*, April, 1964), will be aware that I showed there that blind cave fish, because of their blindness, benefited from a high development of the other senses. Consequently they are particularly susceptible to non-visual reflex stimuli. It has been said by several educational authorities that most schoolchildren go through their daily routine almost entirely by reflex; certainly if fish are anything to go by, there may be something in what they say.

The routine for my tanks is as follows: in the morning, switch on the air pump; slide back the glass; shake in the food. In the evening, switch off the air pump; slide back the glass; shake in the food. As each of these actions is carried out, the fish become increasingly excited. Even if no food has been introduced they will search among the rocks looking for it, or 'cruise' at the surface hunting it out. Because they have no sight they are particularly susceptible to sound stimuli. In lighted tanks where the owner feeds at 'lights-on' or 'lights-off', the light itself will often become the stimulus for food reaction.

But not all reflexes concern feeding; breeders of Siamese fighting fish who wish to examine their animals in fighting form simply place a mirror against the side of the tank; the fish immediately goes into aggressive stance, and if the mirror was not rapidly removed would damage itself attacking its own image. Similar effects can be obtained with male sticklebacks in the breeding season. Certain fish will react to a given stimulus for spawning; some require a shower of rain. Of course, these aggressive and spawning reflexes are inherent, as opposed to the conditioned ones mentioned above.

An understanding of stimuli and fish reaction is not only useful in aquarium management, but also affords the aquarist much ground for original research.

The African Tiger Minnow

(continued from the preceding page)

and crushed dog biscuits—foods containing plenty of protein.

The youngsters are now nearly full-grown at 20 weeks, and I shall distribute some to my friends, hoping that they will breed them and distribute them in their turn and so help to introduce a new species to the aquarium hobby.

The common name of this fish in Northern Rhodesia is the tiger minnow, and certainly the name fits them in many ways, for they are as lithe as a tiger, as stripey as a tiger and the females have the colouring of a tiger—but they behave like lambs.

Perch that Climbs out of the Water

(continued from page 122)

flatter, and his dorsal and anal fins a trifle larger and more pointed than those of the female. The climbing perch has bred a few times since it was introduced to aquarists in 1891. No bubble nest is made, and after the large eggs have been extruded by the female, they rise in the water to float at the surface. From all accounts, the parent fish do not molest their eggs, which hatch out in about 2 days. Thenceforward the fry need Infusoria for about a week, followed by the usual small live food. It is interesting to note that, in its native haunts, the climbing perch is much relished as an item of diet by the local inhabitants.

The Common Sunfish

by B. FRY

THE common or pumpkinseed sunfish is formally referred to as *Lepomis* (*Eupomotis*) *gibbosus*. It is native to the U.S.A., from the Great Lakes to Texas and Florida, and in the wild can reach a length exceeding 7 in. and a weight of 9 oz. But aquarium specimens are smaller, reaching perhaps only 5 in. at most.

In young fish the sides are a sort of greyish green adorned with several pearly bars. In older, well-grown fish, the sides are green to greenish brown barred with blue. Red, pink, yellow, orange and blue markings ornament the shiny scales. The gill cover, too, has blue in it, as well as green and black and a bright red blotch in the tab-like hinder parts. Most of the throat and belly are red. The rest of the underparts are silvery. The black spotted dorsal fin and the plainer anal fin are long-based, spiny anteriorly and soft-rayed posteriorly. They are greenish yellow in hue, as are the ventral, pectoral, and dark spotted caudal fins.

Like most of the freshwater sunfishes (Centrarchidae), *L. gibbosus* is too much of a bully to share quarters with other coldwater fishes such as goldfish, say, or rudd. It needs a tank to itself, or, alternatively, plenty of swimming space in a thickly planted and rock-strewn aquarium in which to play tag or hide-and-seek with its own kind, or other centrarchids of a similar disposition and size. It is not faddy about temperature, so long as there are no sudden changes, but it must be protected from frost, and rapid depletion of oxygen from the water through overheating. Generally speaking, a temperature range of about 55°F (13°C) to 71°F (21°C) suits it very well.

L. gibbosus is carnivorous by nature, and a hearty eater, so live food such as small garden worms, anglers' maggots and *Daphnia* must feature prominently in its diet. Failing live food, such things as washed raw liver, scraped lean meat and pieces of shrimp or crab meat can be provided as substitutes. It is inordinately fond of water snails, which it will pull right out of their shells. It will seldom make a meal from dried food, or pick up food which has fallen to the bottom.

It can be bred, but not readily, in a large, well-lighted aquarium carpeted with a fairly thick covering of well-washed sand, or in a garden pond. As it will uproot plants in an aquarium preparatory to spawning, it is useless having any but tied and weighted bunches of *Elodea*, *Callitriche*, *Ceratophyllum* or *Myriophyllum* as furnishing. Alternatively, ordinary duckweed will give the fish a feeling of security, and dappled shade. Temperature for breeding should average around 72°F (22°C) to 75°F (24°C). The pair (both sexes assume bright colours, but the male dons his spawning garb first) dig and fan depressions in the soft bed. After visiting the depressions several times, and indulging in obvious courtship behaviour, they choose a depression to receive the eggs. These are sticky and are glued, so to speak, to the sand. As soon as spawning is over the female should be removed to another aquarium before the male's suspicious nature leads to an outbreak of fighting. The female removed, the male is now able to devote the whole of his attention to the eggs.

To keep them well oxygenated and free from settling he fans them with his strong pectoral fins for what seems like hours on end. By the end of a week the darkish fry should be out of the eggs and quivering like a mass of spilt jelly on the sand. And there they will stay, with, usually, the male in close attendance, for another 3 or 4 days, after which they will need food in the shape of Infusoria, micro worms, tiny *Daphnia* and the like.

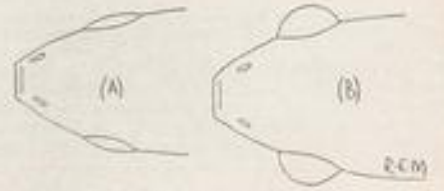
At this stage of their development, sometimes before, there is the danger (much more so in the aquarium than in the garden pond) that the male may turn cannibal and set to and eat all or most of the fry. So, to guard against any such thing happening, it is best to separate him from his offspring without delay.

With no overcrowding, and plenty of food, the baby sunfish will make amazing headway, and before 10 months are out should average around 2 in. in length.

Eye Protrusion

THE eyes of a healthy fish are raised just a little above the surface of the head and if they sink into the orbits (sockets) it can be presumed that the fish is in poor health. Eye protrusion (exophthalmos) is clearly distinguished from the normal appearance of healthy eyes by the exaggerated swelling that takes place. In a great number of cases the affected eye swells to such vast proportions that it is forced from the orbit and eventually lost. Sometimes the orbit heals after the ocular globe is lost, other times a secondary infection (e.g., fungus) occurs and the fish dies.

The cause of exophthalmos is something of a mystery, although in some cases it is found that eye protrusion may arise as a secondary effect of such diseases as dropsy or scale protrusion, both of which produce a watery exudation that induces swelling to take place. There appears to be



(A) *Normal*; (B) *exophthalmos*

no pathological change in the tissue of the eye or evidence to suggest an invasion by parasites. Little can be recommended for the treatment of this disease. Bathing the affected eye with a solution prepared by dissolving one-eighth of an ounce of boric acid crystals in a quarter of a pint of tepid water will help but may not actually bring about a cure.

R. E. Macdonald

OUR EXPERTS' ANSWERS TO TROPICAL AQUARIUM QUERIES

Many queries from readers of The Aquarist are answered by post each month, all aspects of the fancy being covered. Not all queries and answers can be published, and a stamped self-addressed envelope should be sent so that a direct reply can be given.

Can you recommend some plants that will grow well under a not too bright artificial light?

So long as the light is kept switched on for a least 8 hours every day the following plants should flourish: most *Cryptocoryne* spp., giant *Sagittaria*, *Najas microdon* and *Aponogeton elongatus*.

Going into our lounge the other night, I switched on the light over my aquarium and noticed several elongated cone-shaped snails of a greenish olive hue adhering to the sides. I imagine these molluscs were introduced into the tank on purchased plants. I have never seen snails anything like them before, and would be grateful for any information you can give me regarding the species technical name, its country of origin and its habits.

The snail which has turned up in your aquarium is almost certainly *Thiara tuberculata*, a live-bearing snail from Malaya. It avoids bright light by hiding away in the compost, but when darkness falls it crawls over everything in the aquarium. It is very valuable as a scavenger and eater of algae. Another useful service it performs is to keep the compost loosened around the roots of the plants by its burrowing activities. American aquarists sometimes refer to it as the horn of plenty snail.

***Tubifex* worms live in the muddy shallows of a local stream running across waste land. The water looks oily and dirty and no fish or plants live in it. Do you think worms obtained from such a source would be dangerous to feed to my fish?**

It is very easy to introduce disease into an aquarium by feeding live food obtained from a filthy pond or stream. If you are tempted to use the worms, it would be advisable to soak them first in several changes of clean water.

A filmy, easily-removed algae persists in growing on the compost in my aquarium, and then spreading on to the plants. Can you tell me any way of getting rid of it?

The best solution to your problem would be to employ the services of a couple or more of sucking loaches called *Gyrinocheilus aymonieri*. These fish live almost exclusively on algae, and will certainly work wonders in your tank.

My dealer has some fish called *Tilapia nilotica*, or Nile mouthbreeder. Is this species as easy to keep and breed as the ordinary Egyptian mouthbreeder (*Haplochromis multicolor*)?

Unfortunately *T. nilotica* is not very satisfactory as a home aquarium fish. Firstly, it grows to well over 12 in. in length, and thus needs plenty of swimming space in well-oxygenated water. Secondly, it is very destructive to plant life. Thirdly, it does not become sexually mature until it is almost herring-sized, and to spawn it in captivity an abnormally large aquarium is required.

I have been told that the club mosses which I have seen growing on heathlands and moors can be grown as submerged plants in the aquarium. Is this true?

The club mosses (*Lycopodium*) will not adapt themselves to aquatic life. They might stay firm and green for a time in very cold water, but they would deteriorate very rapidly under tropical conditions. People often confuse the club mosses with the true aquatic moss usually called by its generic name of *Fontinalis*.

I have a penguin fish which contracted disease and lost most of its caudal fin. Will this fin ever grow again?

Your penguin fish's caudal fin will grow again, but not as full in the lobes as it was before it rotted away.

I have a tank containing young firemouth cichlids, paradise fish, rosy barbs and lined panchax. Do you think that two young scats would settle down with the above as company?

We would not recommend scats for a tank housing so many potential bullies and fin-nippers. Scats need peace and quiet, and if they cannot be given a tank to themselves, they should be kept with docile fishes such as guppies or platys.

I have just set up a mechanically filtered and aerated tank in my living room, but every week my wife cleans the carpet in this room with a fairly strong solution of household ammonia; we also use an aerosol spray to kill flies. What I want to know is whether droplets of moisture from the fly spray, or fumes from the ammonia, will have any adverse effect on the fish?

You will be courting trouble unless you switch off the air-pump while carpet-cleaning and fly-spraying is in progress. Another thing, keep the aquarium tightly covered when ammonia is used to prevent the fumes contaminating the water.

Scat—a fish that prefers to be with its own kind or quiet fishes

My dealer could not tell me the name of an interesting-looking fish I have just bought. It is eel-like in shape, and has a long, black dorsal fin divided into numerous sail-like segments. The body is covered in a dark grey and ivory-white checkerboard pattern. The mouth is placed on the underside of the snout. Can you identify this fish for me, and tell me something about its character and requirements?

The fish you have is probably *Polypterus palmas*, a member of the family Polypteridae native to tropical Africa. *P. palmas* is a carnivorous night-prowler, and in its natural state feeds on tiny fishes, worms, small crustaceans and the like. In the aquarium it readily accepts all the regular live foods and pieces of meat. It can attain a length of about a foot and is not suited to community life. *Polypterus* spp. breathe atmospheric air as well as oxygen dissolved in the water, and have a temperature range of about 72°F (22°C) to 85°F (30°C).

Up till a few days ago I had a number of fishes living in a thickly planted and rock-strewn aquarium, the water of which had not been changed for several years. Then, thinking it looked too overgrown and muddy on the bottom, I decided to give this tank a thorough clean out. This I did, and refilled it with water which had stood for a few hours in clean enamelled buckets. You can imagine my dismay when, the following morning, I found most of the fish dead or dying in the tank. I can assure you that during the whole time cleaning operations were in progress the fish were not subjected to any change of temperature. Can you give me any idea what went wrong?

It is not unlikely that your fishes had become so used to their thickly planted surroundings, and their old water rich in dissolved salts and other matter leached out of such things as droppings, rockwork and stones, that the abrupt change to a vastly different environment proved too much of a shock. When a long-established aquarium is cleaned out it is always advisable to save a few gallons of the old water to mix with the new. This precludes the fish being subjected to any great change in the hardness or in the reaction (pH value) of the water.

COLDWATER FISH-KEEPING QUERIES answered by A. BOARDER

I have heard that if a little lime is mixed with water and poured round the edge of a garden pond, it will clear the pond of algae. Is this right, and can it harm the fishes?

I have had no experience with this method. As I have valuable fantails in my pond I would be reluctant to try it. I imagine that any concentration of lime strong enough to kill the algae would be enough to harm the fish. This is, of course, my personal opinion. I remember floating a cistern with cement and sand and whilst it was seasoning some rain water got in. A fully grown frog also entered the tank and the lime from the cement killed the frog in a short time.

I had a goldfish which would rub itself against the gravel and rocks and then swim about in a frantic manner. I added a pair of comets and they soon swam with drooping fins and died within a few days. Other fishes introduced have acted in a similar manner. What is the cause of this?

The actions of the goldfish could indicate that it was attacked by flukes, but this is not certain on the information given. The freshly added fish would not be likely to die from flukes in such a short time of being introduced to the tank. It may be that the fish were not healthy when they were added. It is a fact that many fish are kept in overcrowded conditions at some shops, and they then become weakened. There may, of course, be something wrong with the conditions in the tank and it would be safer to clean it out throughly before adding any more fish. Make sure that the water supply is pure: any copper piping can be dangerous to fish. Try to get a good planting of water plants growing well in the tank before adding any more fish and then everything should be all right.

What is the green fuzzy stuff around all the plants in my newly planted pool? It is up the stems of the water lily and also on the oxygenating plants. How can I get rid of it?

This is a form of filamentous algae and it usually thrives when a pond is freshly set up and before the water plants have a chance to get established. Once they are growing well it is probable that the algae will be choked out. In the meantime do not feed your fishes in any way. It is surprising how much of this algae will be eaten by goldfish and other types if they are given nothing else to eat.

I have recently installed a pond in my garden and stocked it with fish. I obtained some fish food from where I obtained the fish which require to be scalded before being fed to them. The fish appear to have done well but I have been unable to find any shop which can supply me with any more of the same food. Is it necessary to scald all fish food and where can I get the type I require?

It is not necessary to scald food for adult fishes. It is sometimes done for fry, so that the very fine particles can be strained off for them. Any dried food would soon become soaked in the water, when it would be eaten by the fishes. I do not know which kind of food you had but why not contact the firm from whom you obtained the fishes? I use a cat food which is a form of dehydrated meat and fish, and I scald this for fry. It may be that this is what you require.

I am having trouble keeping fancy goldfish, particularly lionheads and orandas. I thought they had white spot and treated them, but they seem listless and I think they will die. What is wrong?

It is always difficult to tell what is the trouble in a tank when all the details are unknown. There are several points which may be affecting the health of the fish. The water may be impure through over-feeding or there may be an excess of minerals in the water. Some of the water should be exchanged for fresh once a week; about one-sixth part is enough, as a rule. The fish may not be very strong. Many of these fancy goldfish are bred under almost tropical conditions and then when they are put into a cool tank they are soon in trouble. When purchasing fresh fancy goldfish one should always ask the dealer at what temperature they have been kept. Nothing upsets these fish more than a change from tropical conditions to cold ones.

Could you tell me if there is a coldwater fish which would eat *Hydra* in a tank? If not how can I clear them out?

There are a few tropical fishes which can eat the *Hydra*, such as the blue gourami, but I do not think many coldwater ones would. The green tench might do so if it had no other food given to it, especially if the fish was a small one. The best way to rid a tank of *Hydra* is to remove the fishes and raise the temperature of the water to about 90°F (32°C) and add 22 drops of ammonia to each gallon of water. Leave for half an hour and then empty, wash out well and refill with fresh water. Repeat in a week if any more *Hydra* are seen.

I am having trouble with my fish pond. A short time ago some sticklebacks were put in the pond by children, since when the fishes seem to sulk and have kept out of sight. I netted some and found that they were infested with fish lice. Must I empty the pond to get rid of the lice?

The sticklebacks were no doubt the cause of the introduction of the lice. It is usually when some fishes have been brought in from the wild that troubles occur. It is a very bad policy to put any fishes into an established pond before they have been examined carefully and quarantined. The best way of clearing the fishes of lice is to catch them and give them a bath in a Dettol solution, one-half teaspoonful to a gallon of water. Keep the fishes in a net whilst immersing them and leave them in the solution only for a few minutes and remove immediately if they turn over. The lice will leave the fishes as soon as they are immersed in the solution.

I have constructed a plastolene pool in the garden. Can I possibly keep newts happy and healthy there?

You can only keep newts in the pool for a few months of the spring. These amphibians live on land, usually in damp places or under stones. They go to the ponds to breed in the spring. As a rule few Februarys go by without at least a few newts entering the pond. They then change their skin and the males take on a very colourful dress.

Please turn to page 129

our readers write

Readers are invited to express their views and opinions on subjects of interest to aquarists. The Editor reserves the right to shorten letters when considered necessary and is not responsible for the opinions expressed by correspondents.

Address letters to The Editor, *The Aquarist*, The Butts, Half Acre, Brentford, Middlesex

A London Show

WITH reference to Mr. T. H. Marshall's letter in the August issue of *The Aquarist* and all the previous letters for and against the holding of a "National" style show.

We have followed the correspondence since its commencement and have contributed to it. It was proposed at our last Committee meeting that our Society should do something really constructive in finding out if such a show is really required.

Our Society is prepared to use one of its meetings (Thursday, 3rd December) for the purpose of hearing the views of representatives from other clubs in the Greater London area. By this means we shall have some idea whether there would be sufficient support for a co-operative effort from several clubs (not only limited to those suggested by Mr. Marshall).

The time between now and 3rd December can be used by clubs to become acquainted with the past correspondence on the subject and to talk it over at their own meetings and then come along to our proposed meeting and hear the views of others. Each club can help by finding out the cost of hiring per day of any of the large halls in London. Any other information (facts, not guesses) will obviously be useful.

In order that our Society can gain some idea whether the holding of such a meeting will be of any use would the secretaries of clubs interested in taking part in the discussion please write to me to let us know how many would attend, regardless of the fruitfulness of the meeting.

Hendon and District Aquatic Society holds its meetings at The Brotherhood Hall, The Broadway, West Hendon, N.W.9, and the proposed meeting would start at 8.15 p.m. The Hall is passed by several bus routes and there is an underground station a short bus-ride away.

A. E. STEVENS,
Secretary, Hendon and District Aquatic Society,
2, Dallas Road,
Hendon, N.W.4.

White Spot

IN an article on white spot disease in the August issue of *The Aquarist* it was stated that this disease may not occur in the wild in this country. You may therefore like to know that it is certainly to be found widespread in the River Exe here. Up till the time we moved here I had only been interested in collecting specimens for a pond-life tank (no plants etc. had been bought). This led me to collect minnows and loaches from the main river and at a later time, sticklebacks from a backwater. It was due to the appearance of white spot in the tanks that I consulted a dealer in Exeter and then became a correspondent and subscriber to your journal. Yesterday I was watching minnows in the River Lowman flicking about against the stones and I imagine there may be white spot in that river too. On the other hand, the disease seems to have cleared itself from the garden tank into which I put some diseased fish last year, as I have recovered some fish from there and no sign of white spot has appeared in them.

(MRS.) CHARLOTTE HARVEY,
Tiverton, Devon.

When is a Fish—?

AT the last table show of the Hounslow and District Aquarist Society the class was specified as coldwater and one of the exhibits was a crayfish. The members take it in turns to do the judging of novice shows and this is arranged as one experienced member and one not as experienced. It transpired to be my turn and the crayfish caused some problems.

The outcome was that we couldn't find it in any of the available books in our library and consequently we did not judge it. Needless to say when we announced our decision there were many comments passed by the meeting. My colleague and I pleaded that this was a crustacean; how could we award points for fins, was it a fish within the meaning of the class etc.?

Time was short but I would like your advice as to what the expert judge would have done and what is the class of fish into which this entry would have been accepted.

R. NELHAMS,
Feltham, Middlesex.

The judge of a class for coldwater fishes at an aquarium show should disqualify a crayfish as being ineligible for entry. His grounds would be that in the world of aquarium showing the word "fish" must be used in the proper zoological sense of applying only to those permanently aquatic gilled and finned scaly vertebrates that form the zoological Class FISHES. It is irrelevant that the popular name includes the word fish, because this word is often loosely applied—as for example in the name of those terrestrial invertebrates called "silver fish". And, after all, crayfish is a crustacean invertebrate and no more a fish than is a water flea, to which it is closely related. Would a judge have any doubts about a jar of Daphnia placed before him in a coldwater fish class? —EDITOR.

Tilapia Introduction

I WAS intrigued by J. T. Hardyman's article '"Dear Enemy"—the Tilapia of Lake Alaotra' (*The Aquarist*, June). I would have thought that *Tilapia melanopleura* was a risky species to introduce in any rice-growing area, even though the advantages of fish production may outweigh the disadvantages of rice destruction. A plankton-feeding species would have been preferable from this point of view, although availability of the plankton might be a controlling factor. Here in Malacca, where the fish are confined to ponds, we find *T. zillii* a more efficient controller of weeds than *T. melanopleura*, although the latter is still decidedly a weed and grass eater.

DR. G. A. PROWSE,
Director, Tropical Fish Culture Research Institute, Malacca.

Coldwater Fish-keeping Queries

(*continued from page 127*)

They may remain in the pond breeding until early May, but once their eggs are laid they leave the water until the next season. The newt tadpoles will take some weeks to grow to mature newts, when they, too, will leave the water.

I have a garden pond which has gone very cloudy and the fishes are rarely seen. I feed on egg-yolk, grated cheese and dried food. What can I add to the water to clear it?

It is not a safe plan to add anything to the pond to clear the water. Even a small amount of a chemical agent could be poisonous to fishes. For example it is said that one-fifth part copper (which can kill the algae causing cloudiness) to a million parts of water is fatal to most fishes. It appears to me that you have encouraged the formation of too much green algae and Infusoria by your method of feeding. Egg-yolk is only suitable for feeding to fry. Most adult fishes would ignore it in a pond and also too much dried food could also help to pollute the water. Few pondkeepers realise that there are usually plenty of natural foods in the ponds during the warmer months of the year and so if too much artificial food is given the fishes are unable to clear it up and it soon turns the water sour. Try withholding all artificial food for a week or two; I feel sure that the water will then clear.

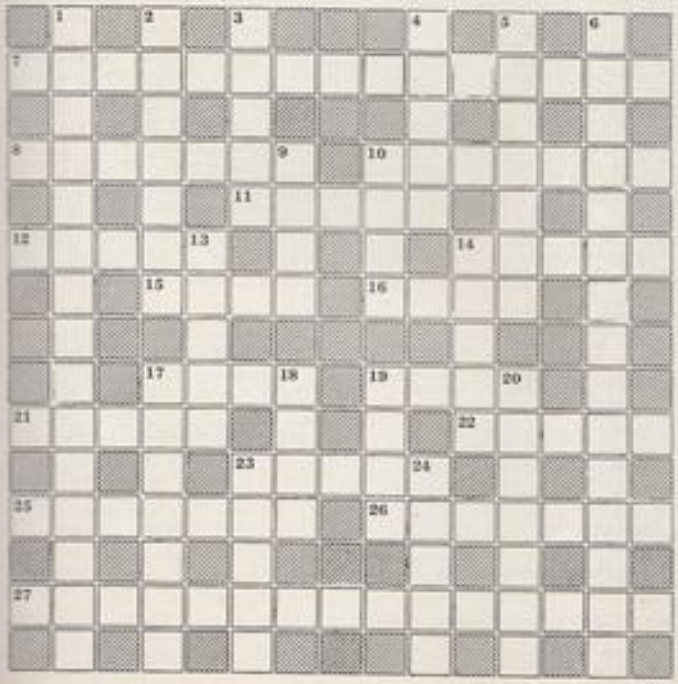
I have three veiltail goldfish in a large tank. They have spawned three times. Each time the fry have died at about a month of age. I feed them on Infusoria, egg yolk and a grain fry food. I use water from a trout stream. All the fry die when they are about half an inch long and I have never reared any over 3 months. Where am I going wrong?

It is quite probable that your fry die from an attack of flukes. These could be introduced from the trout stream. Use tap water in future, after it has been allowed to stand in the air for a day or two. I do not like to use egg yolk as I feel sure that it encourages the formation of fungus on the fry. The water soon gets polluted when feeding with this food unless one is very careful in adding it. I note that you have no sand or compost in your tank. This will mean that there are no healthy growing water plants there. I think that the fry would thrive better in a well planted tank.

The AQUARIST Crossword

Compiled by

L. BRADLEY



CLUES ACROSS

7. *Betta splendens* (7-8)
8. Secured (7)
10. The correct way results in fine healthy fishes (7)
11. Freshwater fish (5)
12. Twenty-two yards (5)
14. Can cause deaths when in contact with aquaria (5)
15. Breezy (4)
16. In which many a fish food is packed (4)
17. Fish that is ready to spawn (4)
19. Pledge (4)
21. System to which this planet belongs (5)
22. Home of the Eskimo (5)
23. Scavenger of the aquarium (5)
25. Brine variety are very good for live food (7)
26. Pit lice (anag. 3-4)
27. They are one variety of *Labistes reticulatus* (8-7)

CLUES DOWN

1. *Nymphaea stricta* (5-10)
2. *Limnophila* (7)
3. Is allowed to become surrounded by water (5)
4. Lesser white heron (5)
5. Sports ground by which Greeks measure (7)
6. *Erythus maculatus* (6-9)
9. Cart that backs into a yard (4)
10. Source of money provides fun to many (4)
13. Home of the lamp-eye (5)
14. Common ailment to goldfish, e.g. *Saprolegnia* (5)
17. Usually they are banked (7)
18. Do opposite points, assumes the result (4)
19. Manner of walking (4)
20. Prizes for winning layers ? (3-4)
23. Set to catch a mackerel (5)
24. Illuminated (3-2)

Solution on page 131

News from AQUARISTS' SOCIETIES

Monthly reports from Secretaries of aquarists' societies for inclusion on this page should reach the Editor by the 15th of the month preceding the month of publication.

AT the September meeting of **Coalville and District A.S.**, Mr. Harry Williams and Mr. Paul Stokes, who are both lecturers and judges for the Midland Association of Aquarist Societies, gave a talk on "Points to look for when showing fish". The speakers demonstrated their lecture with fish that had been brought for a table show, which was judged as the talk went along. It proved to be a very helpful and informative lecture and many questions were asked by members. The table show was held in five classes—Anabantids, Fighters, Cichlids, Guppies and A.O.V. not included in this and a previous show—and winners were Mr J. Beet, Mr. P. Stretton, Mr. J. A. Reed, Mr. J. H. Hemsley, Mr. A. Pickering, Mr. A. Taylor. Competition prizes, fish donated by the chairman, Mr. J. H. Hemsley, and an appropriately decorated cake donated by Mr. M. Maloney, a local baker who is a society member, were won by Mr. Maloney and Mr. P. Turner respectively. It was announced at the meeting that the chairman had offered to donate a trophy to the society for a home aquaria competition to be held in November. The society is now publishing a monthly newsletter and secretaries of societies wishing to receive a copy for inspection are invited to write to the secretary, Mr. J. A. Reed, 391, Ashby Road, Coalville, Leics.

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AT the August meeting of the **Thorne A.S.** Dr. Ghadially gave a lecture on live foods. The table show which was for the best female was won by Mr. M. Hobson with a Bronze catfish; 2, T. Dickins, Platy; 3, P. Powell, Leaf Fish.

At the September meeting where unfortunately the speaker was unable to attend there where three table shows first one being for Danios. 1, D. Machin, Giant Danio; 2, D. Machin, Giant Danio. Breeders egglayers: 1, D. Wells, Panchax Playfari; 2, G. Lowe, Panchax Playfari; 3, A. Landow, Leeri Gouramy. Breeders livebearers: 1, M. Hobson, Veil Tail Guppies; 2, B. Duffield, red eyed swords; 3, B. Duffield, lyre tail mollies. In their last two league matches Thorne beat Hull, 52 points to 25 points. Best fish of the show went to Hull.

Thorne v. Goole, Goole won by a very narrow points victory, with 39 points against Thorne's 38 points. Best fish of the show went to Mr. D. Machin with a Panchax Lineatus.

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PARTICULARS have been received from the **Stone A.S.**, which was founded six months ago, with about thirty regular members. The officials are as follows: Chairman, C. Brindley; vice-chairman, G. Leadley; hon. treasurer, L. Brough; hon. secretary, M. Hodson of 111, Lichfield Road, Stone, Staffs., from whom further particulars can be obtained. Meetings are held on the second and fourth Tuesday of each month at the Civil Defence Headquarters, Radford Street, Stone, Staffs., at 8 p.m.

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THE **Worksop Aquarist and Zoological Society** held their general meeting and table show at their headquarters, St. John's Ambulance Rooms, Central Avenue, Worksop, and once again the ladies' section showed their merits, Mr. M. Waplington taking first place, Mrs. J. Sibson second place, whilst Mr. J. Dernie had to be content with third place. A good number of the society's members travelled to Mansfield to take part in the third leg of the Inter-Society Competition between Mansfield, Sheffield, Chappletown and Worksop Societies. Ninety-eight fish were on show, two F.N.A.S. judges were engaged and the final result was a win for Worksop by one point. The placings in each section were: Characins: 1, Mrs. J. Sibson (Worksop); 2 and 3, Mr. J. Dernie (Worksop). Barbs: 1, Mr. Green (Sheffield); 2, Mr. J. Dernie (Worksop); 3, Mr. Watson (Sheffield). Catfish and Loaches: 1, Mr. Craver (Sheffield); 2, Mr. Hill (Mansfield); 3, Mr. Bradshaw (Mansfield). These results leave the Worksop Society just one point ahead of Sheffield, with Mansfield third and Chappletown in last place.

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THE **Hounslow and District A.S.** held their first open show at Chatsworth Schools the results being as follows: Platy: 1, Mr. B. F. Baker (Uxbridge A.S.); 2, Mr. and Mrs. Johnson (Riverside A.S.); 3, Mr. B. F. Baker (Uxbridge A.S.). Molly: 1, Mr. R. Mealand (Surrey Aquarists); 2, Mr. A. Notley (Chelsea A.S.); 3, Mr. A. Blyth (East Dulwich A.S.). Swordtail: 1, Mr. R. Luff (Hounslow A.S.); 2, Mr. B. F. Baker (Uxbridge A.S.); 3, Mr. B. F. Baker (Uxbridge A.S.). Guppy: 1, Mr. E. Baldwin (Surrey A.S.); 2, Mr. C. Smith (Hounslow A.S.); 3, Mr. B. C. Boult (Hounslow A.S.). Characins: 1, Mrs P. Bone (Chelsea A.S.); 2, Mr. B. C. Boult (Hounslow A. S.); 3, Master C. Smith (Hounslow A.S.). Barb: 1, Master C. Smith; 2, Mr. D. J. Woodward (Hounslow A.S.); 3, Mr. A. Notley (Chelsea A.S.). Labyrinth: 1, Mr. H. S. Pratt (Hounslow A.S.); 2, Mr. Richardson (Riverside A.S.); 3, Mr. R. Luff (Hounslow A.S.). Siamese Fighter: 1, Mr. D. J. Woodward; 2 and 3, Mr. H. Pratt. Cichlid: 1, Mrs. P. Bone (Chelsea A.S.); 2, Mr. J. Polley (Hounslow A.S.); 3, Mr. D. J. Woodward (Hounslow A.S.). Catfish and loach: 1, Mr. D. J. Woodward; 2, Mr. G. F. Greenhalf (Kingston A.S.); 3, Mr. M. Richardson (Riverside A.S.). Danio-Rasbora and W.C.M.M.: 1, Mrs. Castle (East Dulwich A.S.); 2, Master C. Smith; 3, Mr. Pearson (Hounslow A.S.). A.O.V. tropical fish: 1, Mr. A. Blyth (East Dulwich A.S.); 2, Mrs. P. Bone (Chelsea A.S.); 3, Mr. A. Notley (Chelsea A.S.). The best fish in show was a symphysodon discus owned by Mrs. P. Bone (Chelsea A.S.). The judges of the show were Mr. and Mrs. W. Meadows and Mr. H. Towell. The society meet fortnightly at the Territorial Army Drill Hall, Hanworth Road, Hounslow, Middx. and the secretary is Mr. D. J. Woodward, 16, Ellerdine Road, Hounslow.

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A TALK on unusual fishes was given to members of the **Halifax A.S.** by Mr. G. Holmes of Bradford, and provided an interesting evening. Results of members table shows are:—Characins: 1, Mr. Barlow; 2, Mr. Priestley; 3, Mr. Honour. Carps and minnows: 1, Mr. Wilkinson; 2, Mr. Barlow; 3, Mr. Wike. The new address of the secretary, Mr. D. Priestley, is 58, Ing Head Terrace, Denholme Gate Road, Shroll, Halifax.

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THE results of **Brighton and Southern A.S.** first open show, were as follows:—A.V. swordtail: 1, Simpson swordtail, Mrs. P. Bone (Chelsea A.S.); 2, Tuxedo swordtail, Mr. C. Druce (Bracknell A.S.); 3, Tuxedo swordtail, Mr. J. Stewart (London Transport). A.V. Platy: 1, Red Platy, Mr. J. Stewart (London Transport); 2, Yellow wagtail, Mr. D. W. Ellis (Kingston A.S.); 3, Blue Platy, Mr. R. A. Dove (Bracknell A.S.). A.V. male guppy: 1, Veiltail, Mr. T. D. Smith (Willesden A.S.); 2, Veiltail, Mr. R. A. Dove (Bracknell A.S.); 3, Veiltail, Mr. J. Kail (Brighton A.S.). A.V. female guppy: 1 and 2, W. R. Sherwin (Willesden A.S.); 3, C. Ward (Brighton A.S.). A.V. Mollie: 1, Black sailfin, Mrs. P. Bone (Chelsea A.S.); 2, Black mollie, Mr. J. Coleman (Brighton A.S.); 3, Velifera mollie, D. W. Ellis (Kingston A.S.). A.V. livebearer: 1, Mosquito fish, R. Keeping (Basingstoke A.S.). A.V. barb: 1, clown barb, R. Keeping (Basingstoke A.S.); 2, rosy barb, J. Kail (Brighton A.S.); 3, chequer barb, H. Armitage (Portsmouth A.S.). Corydoras catfish: 1, aeneus, C. Druce (Bracknell A.S.); 2, aeneus, C. Druce (Bracknell A.S.); 3, paleatus, N. Hurley (Brighton A.S.). A.O.V. tropical cats: 1, plecostomus, D. W. Ellis (Kingston A.S.); 2, upside down cat, N. Hurley (Brighton A.S.); 3, weather loach, J. E. Howe (Mitcham A.S.). A.O.V. tropical egglayer: 1, spiney eel, Mrs. P. Bone (Chelsea A.S.); 2, labeo bicolour, M. J. Coleman; 3, Spotted eel, T. D. Smith (Willesden A.S.). Breeders livebearers: 1, velifera mollies, J. Stewart (London Transport); 2, Mosquito fish, R. Keeping (Basingstoke A.S.) A.V. Siamese fighter: 1, J. E. Howe (Mitcham A.S.); 2, J. E. Howe (Mitcham A.S.); 3, J. Kail (Brighton A.S.). A.O.V. labyrinth: 1, Pearl gourami, H. Armitage (Portsmouth A.S.); 2, banded ctenopoma, N. Hurley (Brighton A.S.); 3, Kissing gourami, A. Low (Basingstoke A.S.). Dwarf cichlid: 1, pelmat kribensis, R. Keeping (Basingstoke A.S.); 2, pelmat kribensis, R. Browning (Brighton A.S.); 3, Nannacara, J. Smith (Brighton A.S.). A.O.V. cichlid: 1, Jack Dempsey, C. Ward (Brighton A.S.); 2, discus, J. Kail (Brighton A.S.); 3, Silver chromide, R. A. Dove (Bracknell A.S.) A.V. characins: 1, bleeding heart tetra, Mrs. P. Bone (Chelsea A.S.); 2, headstander, Mrs. P. Bone (Chelsea A.S.) 3 and 4, Copeina Arnoldi, Mr. D. W. Ellis (Kingston A.S.). Danios Carps minnows: 1, Danio devario, Mr. E. Leavey (Basingstoke A.S.); 2, pearl danio, Mr. R. Keeping (Basingstoke A.S.); 3, zebra danio, Mrs. V. Leavey (Basingstoke A.S.). Rasboras: 1, scissortail, Mr. R. Keeping (Basingstoke); 2, scissortail, Mr. R. Browning (Brighton A.S.); 3, scissortail, Mr. J. Coleman (Brighton A.S.). A.V. tooth carp: 1, panchax lineatus, Mrs. P. Bone (Chelsea A.S.); 2, aphyosemion Scheuzbi, D. W. Ellis (Kingston A.S.); 3, panchax lineatus, Mrs. P. Bone (Chelsea A.S.) Breeders eggslayers: 1, pelmat kribensis, R. A. Dove (Bracknell A.S.); 2, rosy barbs, H. Armitage (Portsmouth A.S.); 3, Neon tets, D. W. Ellis (Kingston A.S.). Common goldfish: 1, Miss W. G. Ryder (Portsmouth A.S.); 2, Mr. C. Druce (Bracknell A.S.). A.V. shubunkins: 1, Bristol shubunkin, W. T. Ryder (Portsmouth A.S.) Goldfish: 1, 2 and 3, R. Esson (Willesden A.S.). Best fish of the show, F.B.A.S. mixer trophy: Mr. C. Ward (Brighton A.S.), Jack Dempsey.

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THE **Independent A.S.** commenced a new session recently, and as in the past the programme for the coming quarter is made up of General Fishkeeping, Competitions, Outings and Tropical Lectures that appeal to all the members. This active North London club is a foremost member in the North West London Group of Aquarist Societies, and holds weekly meetings in a friendly atmosphere at the following address: Montem School (corner of Seven Sisters Road and Hornsey Road, N.7). Beginners and established fishkeepers will be cordially welcomed as new members on any club night (every Monday, 7.45 p.m.) for further details please phone, chairman, Mr. F. Tomkins, ARCh.way 0804 (evenings). Secretary, Mr. R. White, LEYtonstone 8288 (evenings).

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A TABLE show for livebearers was held by the **Tipton and District A.S.** The new secretary is Mr. B. Harris, 13, Middle Way Road, Stow Lawn Est., Bilston, Staffs.

THE **Portsmouth A.S.** held their 12th annual open show recently. Over 400 entries from all over the south were on view. There were a large number of interesting exhibits of reptiles and marine aquaria, also a water life show by Mr. Hunt of Portsmouth. The Portsmouth A.S. diploma for the best fish in the show was won by Mrs. G. Saurin, Portsmouth, for a common rudd. Portsmouth A.S. award of merit for the best tropical fish went to Mr. P. Hall for an *Abramites microcephalus*. The results were as follow: Club furnished aquaria: 1, Portsmouth A.S.; 2, Southampton A.S.; 3, Portsmouth A.S. Tropical—Club furnished aquaria (coldwater): 1, Carassius club; 2, Southampton A.S.; 3, Portsmouth A.S. Individual furnished aquaria (tropical): 1, B. H. Nunn; 2, H. Armitage; 3, M. Mason. Individual furnished aquaria (coldwater): 1, D. Hancock; 2, Mrs. G. Saurin; 3, Miss M. Nunn. Marine furnished aquaria: 1, S. Saurin; 2, C. Ward; 3, Miss Carpenter. Juvenile furnished aquaria (tropical): 1, A. Stillwell. Juvenile furnished aquaria (coldwater): 1, J. Spragg; 2, R. Saurin; 3, A. Stillwell. Common goldfish: 1, C. Druce; 2, Mrs. G. Saurin; 3, Mrs. Voysey. Brisnel shubunkin: 1, R. Bockett; 2, Mrs. G. Saurin, also 3rd and 4th, R. Bockett. London shubunkin: 1, G. Eastwood; 2 and 3, R. Bockett. Fantails: 1, D. E. Roberts; 2, E. Leavy; 3, D. E. Roberts. Veiltails: 1, Miss W. G. Ryder. A.O.V. fancy goldfish: 1, Mrs. G. Saurin; 2, G. Eastwood; 3, B. Herbert. Cultivated river and pond: 1, Mrs. G. Saurin; 2, C. Druce; 3, V. B. Hunt. A.O.V. river and pond: 1, Mrs. G. Saurin; 2 and 3, Mrs. G. Saurin. Novices (coldwater): 1, S. Saurin; 2, R. Saurin; 3, S. Saurin. Guppies (male): 1, Scott Morgan; 2, S. Greenslade; 3, Scott Morgan. Guppies (female): 1, C. Ward; 2, Scott Morgan; 3, D. E. Roberts. A.O.V. swordtail: 1, Scott Morgan; 2, R. A. Low; 3, Scott Morgan. A.O.V. platy: 1, C. Ward; 2, Miss E. Hancock; 3, Scott Morgan. A.V. molly: 1, Scott Morgan; 2, P. Wyllie; 3, H. G. Rundle. A.O.V. livebearer: 1, I. Goddard; 2, R. Keeping. Dwarf cichlids: 1 and 3, E. Warren; 2, M. Mason. Cichlid: 1, Mrs. V. Leavy; 2, Mrs. G. Saurin; 3, G. Ward. Barbs: E. Warren; 2, H. Armitage; 3, C. Ward. Rasboras: 1, Scott Morgan; 2, V. Voysey; 3, N. Franklin. Characins: 1, P. Hall; 2 and 3, Scott Morgan. Corydoras catfish: 1, Scott Morgan; 2, V. J. West; 3, C. Druce. A.O.V. catfish: 1, J. Stillwell; 2, Mrs. V. Hurley; 3, E. Warren. Egglaying toothcarps: 1, H. Armitage; 2, H. G. Rundle; 3, Mrs. V. Leavey. Danio carps and minnows: 1, R. Keeping; 2, F. Silver; 3, E. Leavey. Siamese fighters: 1, Scott Morgan; 2 and 3, P. Hall. A.O.V. labyrinth: 1, P. A. Low; 2, M. Hurley; 3, E. Warren. A.O.V. egglayer: 1, R. A. Dove; 2, R. Keeping; 3, E. Leavey. Novice (tropical): 1, N. Franklin; 2, E. Warren; 3, D. E. Roberts. Breeders (coldwater): 1 and 2, G. Eastwood; 3, D. E. Roberts. Breeders (livebearers): 1, R. Keeping; 2, Scott Morgan; 3, R. Keeping. Breeders egglayers: 1, V. J. West; 2, H. Armitage; 3, Scott Morgan. Breeders (guppies): 1, Scott Morgan; 2 and 3, D. E. Roberts. Rooted plant: 1, M. Mason; 2, J. Stillwell; 3, C. Ward. Cuttings: 1, R. A. Dove; 2, W. Ryder; 3, V. P. Voysey. Floating plant: 1, R. A. Dove; 2, V. P. Voysey. Furnished vivarium reptile: 1, Miss Carpenter; 2, P. G. Brown. Furnished vivarium amphibian: 1, Miss Carpenter; 2, Miss E. Hancock; 3, Miss Ryder.

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AT the September show of the **Llantwit Major A.S.** the Stampton Cup was won by Mr. J. Songhurst for best fish with his catfish. Other cup winners were Mrs. J. Amis (member of the year); Mr. D. Amis (breeders egglayers); Mr. R. Wigg (breeders livebearers); Mr. R. Wigg (points cup). Class results: A.V. egglayers (27 entries)—1, D. Songhurst; 2, R. Wigg; 3 and 4, K. Farrant. A.V. livebearers (28 entries)—1, D. Amis; 2, 3 and 4, R. Wigg. Breeders egglayers (6 entries)—1 and 2, D. Amis; 3, J. Amis. Breeders livebearers—1 and 3, R. Wigg; 2, A. Ibbertson. Mr. E. Jones of Bristol was the judge.

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MEMBERS of the **Loyne Aquarists** enjoyed an excellent talk given by Mrs. Smith of Morecambe on plants in the aquarium. She demonstrated her talk with plants and tanks showing the different arrangements that could be made, and pointed out that a tank with fish only did not attract attention, but a planted tank always caught the eye. Mrs. Smith also told members how coldwater plants could be acclimatised to tropical conditions but, in doing so the plants would become dwarfed and she demonstrated with two spatterdocks that had been taken from a local pond six years ago. They were fine plants but only one-and-a-half inches tall. After giving her talk Mrs. Smith went on to judge a table show of tropical fish together with Mr. T. Whalley. The results were as follow: Egglayers: 1, Mr. F. Aveyard with a pearl gourami; 2, R. Holmes (Australian rainbow); 3, D. Sowden (giant danio). Livebearers: 1, Mr. J. Goodger with a red swordtail; 2, J. Mills (green saffin mollie); 3, D. James (liberty mollie).

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THE September meeting of the **Bedford and District A.S.** was opened by Mr. W. Donnelly who read a report on the F.B.A.S. meeting he attended. He has been co-opted on the council of the F.B.A.S.

The table show for September was judged by Mrs. Meadows, and the Marston Trophy was won by Mr. J. N. Wells for the highest pointed tropical fish of the year. 1, Mr. J. Wells, 87 points (thick lip gourami); 2, Mr. A. Jeffs, 86 points (thick lip gourami); 3, Mr. A. Jeffs, 85 points (lace gourami); 4, Mrs. Bell, 83 points (lace gourami). A.O.V. catfish or loach: 1, Mr. A. Jeffs, 86 points (Armoured catfish); 2, Mr. A. Jeffs, 80 points (sucking loach); 3, Mr. Sanders, 79 points (sucking loach); 4, Mrs. Bell, 78 points (bumble bee).

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AT the annual general meeting of **Bury & Prestwich Aquarists,** the following officers were elected: Chairman, Mr. F. Cambell; secretary, Mr. F. Jennings, 11, Burswood Avenue, Bury, Lancs.; treasurer, Mr. T. Hardman; publicity officer, Mr. F. Taylor. Results of the table show for breeders was: 1, Mr. Willam, zebras; 2, Mr. Sherwood, rosy barbs; 3, Mr. Plantback, fighters.

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THE **Stone A.S.** held their first show at the Walton Community Centre recently, and the result was an outstanding success. A wide variety of fish, both tropical and coldwater were exhibited, including various species of swordtails, angel fish, Siamese fighters and goldfish. The stock, which had all been reared by members, was set out in ten display tanks, with a central display of fully furnished aquaria by Messrs. G. Leadley, C. Barlow and M. Frid.

There was a miniature tank made up by Ken Harvey, and a novelty tank depicting a sub-aquatic scene through a port-hole. Mr. C. G. Brindley had constructed a model garden pool which contained 480 gallons of water and was complete with fish, plants and a fountain. The secretary of the show, Mr. K. Harvey, together with members of the society, answered questions put by visitors, and several new members were enrolled.

Crossword Solution

■	G	■	A	■	I	■	■	■	E	■	S	■	O	■
S	I	A	M	E	S	E	F	I	G	H	T	E	R	S
■	A	■	B	■	L	■	■	■	R	■	A	■	A	■
E	N	S	U	R	E	D	■	F	E	E	D	I	N	G
■	T	■	L	■	T	R	O	U	T	■	I	■	G	■
C	H	A	I	N	■	A	■	N	■	F	U	M	E	S
■	Y	■	A	I	R	Y	■	D	R	U	M	■	C	■
■	G	■	■	G	■	■	■	■	■	N	■	■	H	■
■	R	■	S	E	E	D	■	G	A	G	E	■	R	■
S	O	L	A	R	■	O	■	A	■	I	G	L	O	O
■	P	■	V	■	S	N	A	I	L	■	G	■	M	■
S	H	R	I	M	P	S	■	T	I	E	C	L	I	P
■	I	■	N	■	R	■	■	■	T	■	U	■	D	■
F	L	A	G	T	A	I	L	G	U	P	P	I	E	S
■	A	■	S	■	T	■	■	■	P	■	S	■	S	■

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★ **Overcomes all previous objections to combined heater-thermostats.**

★ **A unique combination of efficiency and functional neatness.**

★ **Can be completely submersed. Therefore can be hidden behind rocks, etc.**

★ Price only **29s. 6d.**, 100w, 125w, 150w.

This Heater-Thermostat finds great favour among aquarists with decorative community tanks, since the instrument can be completely concealed. Aquarists with heated fish-houses find the instrument ideal for raising one particular aquarium above the fish-house temperature.

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THE INTER-PET SUPER HEATER. 75w. 100w. 125w. 150w. A rugged instrument for **10/8d.**

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Developments of the highly successful combined instrument.

for Fungus & Finrot LIQUITOX

THE PROVEN SPECIFIC

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★ Definite dosage given by ingenious chart.

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After Treatment

These photographs were taken by Professor Dr. A. Stolk of Amsterdam University, and show the remarkable effect of LIQUITOX.

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Black	5/- "
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Red Wagtail	3/6 "
Tuxedo	3/6 "
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Black Lyertail	5/ "
Black	3/- "
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Black Sailfin	3/6 "
Mosquito Fish	2/6 "

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Neon	six for 17/6
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Flame	2/6 "
Phantom	6/6 "
Cardinal	7/6 "
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Dawn	3/6 "
Diamond	3/6 "
Lorreto	7/6 "
Black Line	2/6 "
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Red Nose	8/- "
Silver	3/- "
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X-Ray Fish	2/6 "
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Swordtail Characin	4/- "
Black Widdows G.S.	2/6 "
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Copinis Arnaldi	7/- "
Copinis Guttarta	3/6 "
Annostomus Annostomus	25/- "

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Siamese Fighter (males)	10/- "
Siamese Fighter (females)	4/- "

Gourami

Thick Lip	3/- "
Dwarf	3/- "
Dwarf (adult)	5/- "
Three Spot	2/6 "
Opaline	3/6 "
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Kissing	5/- "

Microrasbora Rubescenc	2/6 each

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Tiger (large)	4/6 "
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Ticto	2/6 "
Nigger (adult)	6/- "
Cherry	3/- "
Cherry (adult full col.)	4/6 "
Cummingi (adult)	7/6 "
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Tinfoil (larger)	10/- "
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Golden	2/6 "
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Clown	5/6 "
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Hastatus (Red Eye)	5/- "
Arulius	4/- "
Filamentosus	7/6 "

CICHLIDS

Angels

Standard	3/- each
Larger	10/- "
Lace	3/6 "
Lace Veiltail	7/6 "
Veil	7/6 "
Black	6/6 "
Black Veil	10/- "
Jack Dempsey	3/6 "
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Silver Chromides G.S.	8/6 "

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Keyhole	5/6 "
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Festive	6/6 "
Marble	7/6 "
Firemouth	3/9 "
Orange Chromides G.S.	8/6 "

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Kribensis	10/- & 14/- "
Egyptian Mouthbreeder (adult)	4/6 "

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Agassizi	8/6 "
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Glass	3/6 "
Pearl	2/- "
Franki	2/6 "
Zebras	2/- "
Danio Davario	2/6 "
Danio Regina	2/6 "
Labuca Labuca	2/6 "

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Silver G.S.	21/- "
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AVAILABLE TO PERSONAL CALLERS ONLY

Honey	6/6 "
Paradise Fish (adult)	3/6 "
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Panchax

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Chaperi Orange Throat	4/- "
Playfairii	4/6 "

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Filamentosis	17/6 "

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Harlequins	2/6 each
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Rasbora Kalochroma	7/6 "
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Macropmalmus	10/- "
Auratus	8/6 "
Palatius	6/6 "
Aneus	4/6 "
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Melanistus	7/6 "
Talking Cats	5/6 "
Upside Down Cats	10/6 "
Glass Cats	5/- "
Celonese Weather Fish	7/6 "
Khuli Loach	2/6 "
Sucking Loach Aymoneri	5/6 "
Ossocinclus Affinis	9/6 "
Horse Face Loach	5/6 "
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Plecostomus Ltd.	10/6 "
Noemocheilus Striped Loach	3/- "
Botia Pulcrapinis G.S.	10/- "
Stripped Botia Hymonophesis	8/6 "
Corydoras Juli	10/6 "

VARIOUS OTHERS

Malayan Angels	10/6 "
Scats (small)	8/6 "
Scats (2 in.)	12/6 "
Bumble Bees	3/- "
Silver Fox	5/- "
Barlus Christy	7/6 "
American Flags	3/- "
Butterflys (adult)	12/6 "
Siamese Flying Fish	5/6 "
Leaf Fish	4/- "
Millosoma Durivensis	9/- "
Madagascar Rainbows	5/6 "
Australian Rainbows	3/- "
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PREPAID ADVERTISEMENTS—continued from page xviii

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continued on page xvii

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Other size tanks see fitting chart of filter box

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Shirley Aquatics Ltd.

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Stratford Road, Monkspath, Shirley, Solihull, Warwickshire

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Narrow Leaf Sword (grows to 15 in.) .. 7/6 ,,
Junior Sword (grows to 10 in.) .. .. 7/6 ,,
Melon Sword (grows to 18 in.) striking veins 25/– ,,

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C. Aponogetifolia 12/6
C. Beckettii (narrow) 5/–
C. Griffithii .. .. .. 7/6 } 1 of each for 30/–
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C. Willissii 5/–

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