The AQUARIST AND PONDKEEPER

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EDITORIAL

EVERY now and again we receive a letter from someone who has decided that breeding fishes is a nice easy way of making a living, or of supplementing his income, but quite obviously is completely ignorant of even the most elementary principles of fish-keeping. We are requested to supply him with the information that will transport him along this easy road to fortune. We do what we can, of course, for this journal exists for the purpose of disseminating knowledge, but we do not hold out too much encouragement and hope to such people. We have seen so many similar cases in the past, and have observed that those coming into fish-keeping from a purely mercenary motive seldom stay long ; the hobby gains nothing but is often worse off by their efforts, and the same can be said for them. Disillusioned and disgruntled, they drift away to seek some other El Dorado. On the face of it, of course, it looks easy. All one has to do is to persuade an expert to pass on the cream of the experience he has gained laboriously over many years, set up aquaria at a cost of, say, ten pounds, buy a pair of fishes at about two pounds, breed them, sell two hundred offspring at ten shillings (to undercut the original dealer) and decide what to do with the eighty-eight pounds profit.

In practice, things are very different. Successful breeders are those who begin keeping aquaria because they find them genuinely interesting for their own sake, and acquire knowledge and experience during the pursuit of an enjoyable and instructive hobby. The book which contains all the information necessary to enable a newcomer to become at once a complete aquarist has not been written, and, we think, never will be ; it would run to many volumes, and in any case our mercenary friends would be too impatient to read it. There is, in fact, no substitute for personal experience, and that must be obtained the hard way. Without that experience consistent success with fish-keeping is very improbable.

We have to-day a flourishing aquarium trade which is a great asset to the hobby ; we cannot do without the dealers on whom we rely for our equipment and accessories and who take the risks accompanying importations. Those who have survived from pre-war days and who are likely to survive in the future have businesses built on experience and a genuine interest in the hobby they serve. But few of them breed all the fishes they sell ; they must rely on what they receive from the surplus of the amateur breeders, and at the moment they are rather short of good stock. They will welcome the production of more good fishes just as much as we will, and they will get them as a result of the organised work now being carried on by real enthusiasts in the various

societies. We should be doing them a disservice to encourage people with no knowledge at all who seek to line their pockets at the expense of both hobby and established dealers. Fortunately, as we have intimated, such people are soon disillusioned.

Down here in the south, when we disagree with the views of a brother aquarist, we don't quarrel over it but indulge in a little leg-pulling which usually serves to settle the matter with less damage to the hobby as a whole. In our March issue we indulged in such a leg-pull, but it misfired somewhat. This was due to the deletion of part of the paragraph owing to lack of space, which necessitated the alteration of "group of aquarium clubs" to "an aquarium club" or "group of aquarists."

In consequence of this the Federation of Northern Aquarium Societies consider that the paragraph may be construed as implying that they have adopted old-fashioned goldfish standards, and we must agree that this impression may have been given. Therefore, we hasten to state that the F.N.A.S. have not so far considered the adoption of standards for goldfish or any other fish, and the paragraph as printed should not be taken as applying to them; we apologise for the careless slip that created this false idea.

Our remarks were based upon the report of a single society which stated quite clearly that the standards in question had been adopted. This report is still on our file. But we mentioned no names originally, and we still refrain from doing so. We framed our comments in a humorous vein, hoping that the shaft would go home without causing ill-feeling, and hope they will be accepted in that spirit.

Another correction to our March issue is in connection with the review of "A Study of Fishes," by Chapman Pincher, B.Sc. The author's name is unknown to ichthyologists, but familiar in journalism, and our reviewer (an ichthyologist) assumed that the book had been written in spare moments between the author's better known activities. Mr. Pincher asks us to state that this was not so, but that he wrote the book before he took up journalism and that it had been in the publishers' hands for a considerable time.

THE AQUARIST

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All communications for the Editor should be addressed: "The Editor, *The Aquarist*, The Buckley Press Ltd., The Butts, Half Acre, Brentford, Middx." In every case the name and address of the writer must be given.

The Editor welcomes the opportunity of considering original contributions on all branches of the hobby and its allied interests; authentic breeding records, personal experiences and photographs. Contributions should be typed or clearly written on one side of the paper only. MSS. or prints unaccompanied by a stamped, addressed envelope cannot be returned, and no responsibility is accepted for contributions submitted. Correspondence with intending contributors is welcomed.

The Editor accepts no responsibility for views expressed by contributors.

QUERIES

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W. Harold Cotton, 39, Brook Lane, Kings Heath, Birmingham, 14.

Specimens should be sent direct to Mr. Cotton, with full particulars of circumstances, and a fee of 2/6.

It is important that the following method of packing fish be adopted:—Wrap fish, very wet, and loosely in grease-proof paper, and then in wet cloth. Re-wrap in greaseproof or wax paper and pack around with cotton wool in tin box. Despatch as soon as possible after death, with brief history of aquarium or pond conditions.

Water samples should be sent in a large clean medicine bottle, and contain a little bottom sediment, and a stem or two of typical plant growth.

Pyrrhulina rachoviana Myers

By W. BAILEY

IN October of last year I purchased four young *Pyrrhulina rachoviana*, each nearly an inch long, and placed them in my community tank where they soon matured and turned out to be three males and one female.

The male fish, now 1¼ inches in length, is quite handsome in a subdued way; the general colour is a light brownish grey merging to almost white on the belly; the dorsal fin, set well back, is pale yellow at the base, the remainder of the fin being black except at the edges which are clear. The caudal fin is pale lemon with a bluish tinge at the edges, whilst the anal and pelvic fins, also a pale lemon, are edged with a thin brown line; on the young fish the most outstanding feature is a small glistening turquoise spot on the gill cover just behind the eyes, this spot becomes very subdued as the fish grow older.

A thin pale greenish line runs from just behind the head down the back to the base of the tail and a black line runs through the underlip and across each eye giving the fish a pugnacious look which it does not justify.

On the female fish, slightly smaller than the male, the black mark on the dorsal fin is much subdued and is more centrally situated and the dark line edging the anal and pelvic fins is almost, but not quite, absent. Altogether, an accommodating fish, not fussy as regards food, consuming both dried and live food impartially and pursuing a good neighbourly policy in the community aquarium, the male only becoming a nuisance at breeding time.

On February 12th last I placed all four fish in a newly set up tank, 24″×15″×12″, containing three large smooth stones at the rear and two *Sagittaria* plants; temperature was maintained at 78-80 degrees and mild aeration provided; water slightly acid (Ph 6.5) and the tank was lit by two 40 watt lamps. Two days later I noticed unusual activity in the tank, each male had chosen a spot on each stone and was busy fanning the position with the ventral fins, turning rapidly back and forth and darting at each other and generally behaving very excitedly.

The female meanwhile, noticably plumper, appeared to be taking no notice of the rival suitors and snapped up with relish all titbits offered; I therefore removed two of the males whereupon the remaining suitor became even more energetic, darting at the female and nudging her over on to her side quite often; however, it was not until the evening that spawning commenced.

The spot chosen by this male was on top of the stone only 2 inches below water level and directly beneath one of the lamps; the female having been coaxed to the spot appeared a little hesitant, and the male, very agitated, swam rapidly back and forth above the spot and when facing the front of the tank hovered tremblingly, whereupon the female swam rapidly down his left flank very closely, returned up the right flank and stopped so that both fish were level above the spot; the male then slowly fell on to his side at an angle of 45 degrees at the same time moving inwards closely to the female, the egg was deposited and fertilised. The female dashed away and the male swimming about the spot fanning the egg resumed his position facing front and the performance was repeated and continued for two hours, at the conclusion of which I removed the female. During this time I noticed that an irregular dark mark had appeared on the neck of the male just behind each gill cover and the whole colour of the fish had become very intense, and continued so for nearly a week. The eggs, a pale amber colour and about 60 in number, hatched during the night of February 14th-15th and the tiny fry clung to the sides of the tank at the top for three days when they became free-swimming; the male, dashing about looking for potential intruders was not observed to consume the young.

When the fry became free-swimming I removed thirty of them into a small tank containing watercress and a layer of pond sediment and under a glass they could be seen feeding upon the infusoria present; in ten days they readily took newly hatched brine shrimp and were ¼ inch in length and at the time of writing they are taking finely chopped white worm and powdered Bemax. Finally, may I note a number of points not mentioned in *Exotic Aquarium Fishes*, by Innes, regarding *Pyrrhulina rachoviana* and which caused me to doubt the identity of the fish supplied to me.

Firstly, the brilliant turquoise spot on the gill cover of the young fish, which is so outstanding, is not alluded to in Innes' work.

Secondly, at no time have I ever noticed "the rather clear saw-toothed band of blue-black traversing the entire length of the body," nor the red dots appearing in the V spaces in the upper half of this line. Thirdly, the edging of the anal and pelvic fins is a thin dark line, only on two of my male fish has the orange edging only recently become apparent and the dark line has not entirely disappeared from the edges. Fourthly, when the eggs hatched the fry remained suspended on the glass at the top of the tank and at no time disappeared to the bottom.

POND-HUNTING FOR BEGINNERS — 2.

AQUATIC PLANT LIFE

By ERIC HARDY, F.Z.S.

WHATEVER the aquatic plants may lack in colourful flowers they more than compensate in their fascinating adaptations and ways of life; but it is a mistake to think that they are all so uninteresting as the average school botany book led us to believe, with its dull catalogues of rushes and sedges written in such un-English botanical snobbery as to give one a pain in the neck! If we group our pond plants for convenience into the flowers—and these are especially the water-plantain group—the rushes, the sedges and the pondweeds, we shall enjoy their fascinating interests without the long faces and long words which took the enjoyment out of school botany.

(Photo: Ashford & Beddows)

The aerial leaves and flowers of the Arrowhead

The water-plantains, the Alismaceae, are so named from their plantain-like leaves, with long parallel veins like all the monocotyledons. In July or late summer the dykes and marshland waterways are resplendent with their beauty. The common water-plantain has its heads of fine delicate silky white flowers fertilised by the useful hoverflies; and the lesser water-plantain, with a single umbel of pale lilac flowers, has a stalk which sometimes bends over to root again at the tip. Arrowhead, with its glossy arrow-like leaves and waxy white whorls of flowers deeply purple in the centre, with purple anthers, is so rarely visited by insects that seeds are almost as seldom found on this plant as on sweet-flag, and it spreads by underground runners or, as on our local canal, by the passage of barges. The best of them all is the rose-pink umbel of the so-called flowering rush, growing tall and stately above the sides of the rivers and canals—an English flower I was delighted to find again on the banks of the river Barrada in Syria, above Damascus, and in the upper Jordan Valley in Palestine.

There are other pond and stream flowers to find. Look for the white water-crowfoot's two or three types of leaves, the three flower types on the tall spikes of purple loosestrife with the stigma above, or between or below the two sizes of anthers; and do not forget that this flower is no relation of the yellow loosestrife which is a primula, like the lovely lilac whorls of the so-called water-violet of the marshlands. Notice the stems of white and yellow water-lilies, buoyant like other aquatic plants from their fullness of air spaces, and see how the water-lily lengthens its stem as the water level rises, and kinks it when the level drops, in order to keep at the surface, and how its seeds, floating at first, eventually become waterlogged and finally sink safely distanced from the parent plants. Yellow as phodel is a golden yellow star-shaped marsh lily seeding with a bright red seed stalk—this is another water plant I also found in Palestine—and ragged robin is a pretty pink campion, a relative of the garden pinks with the characteristic swollen nodes of the stem by which its family (the *Caryop cyllaceae*) is known. Water-soldier, an erect plant with tufts of stalkless, long, narrow, sword-like leaves, edged with fine teeth, creeps along by an underwater rootstock. Its male flower is like a small edition of the white three-petalled frogbit flower, whereas the female flower is solitary and tubular. A true loosestrife is water-purslane with opposite leaves and small greenish-purple flowers in their axils, a plant that flowers all summer through, and like so many, is often self-

The Water-soldier

pollinated by the stamens bending over. Prettiest of all is the little chickweed called water-blinks, a glabrous green plant with tiny half-closed white flowers of five petals, the only British member of its genus *Montia*. Most fascinating, however, are the duckweeds, floating on the surface of the pond in their green flakes which sink for the winter in the form of resting winter buds. Duckweed rarely flowers in this country, except in very hot sunny summers.

Many lowly grass-like pondside plants are of endless interest and some find their way into our water gardens. The common rush is easily known with its tufts of slender cylindrical stems and the dense little brown flowers growing out of one side, a flower which opens early in the morning to hang out the female stigma, then a few hours later the stamens open and shed their golden pollen, and by evening the flower has closed for good. But there are many other rushes of great interest like the little toad rush, less than six inches, which, if not successfully pollinated by the wind, forms solitary flowers which never open but pollinate themselves. There is the pale brown heath-rush which forms the characteristic brown colour of acres of boggy moorland, and the jointed rush whose stem pith is so spaced as to give a pretty jointed appearance to the dried stem. The little wood-rushes of the damp fields, have their seeds, like those of violets, collected and dispersed by the ants. The rushes are all stiff plants with narrow, often cylindrical grass-like leaves, and small dry dense brown flowers with a calyx of six segments and six stamens: they look like little lilies excepting for the dry, regular flower of calyx and corolla persisting so long. There is a two-flowered form of the three-flowered rush. There are also the club rushes or *Cyperus* group with their flattened terminal spike of florets, and the cotton grasses whose tufted spikelets have long protruding silky hairs. Reed-maces (*Typha*) with their drum-stick-like heads of brown female flowers, and above them the slender yellow male flower spike which sheds its pollen and dies away, while the brown female spike ripens, are often miscalled " bulrushes " in confusion. The true bulrush is much rarer and is a Scirpus or club rush, tall, with numerous long hanging bristly spikelets.

The sedges are aquatic perennial grass-like plants usually with solid triangular stems and more greenish-purple flowers in early summer, often hanging gracefully, male and female flowers in separate glumes or spikelets, while the ovary is often in a bottle-shaped sac with its two or three-cleft style protruding. The small tufted flea-sedge with narrow 3 inch or 6 inch leaves is found in early summer on the moist fields; hairy sedge is known by its long flat hairy leaves, prickly sedge by its dense tufted foot-high stems, narrow leaves, and its flowers crowded into a terminal spike of an inch. Loveliest of all is the great pendulous sedge, three or five feet tall with many slender four inch or five inch drooping brownish spikelets, its long leaves often half-an-inch wide. The pink-leaved carnation sedge with its creeping runners, short erect flat glabrous leaves and brown glumes is another sedge we pass in the damp meadows on our way to the ponds. The flat leaves of the densely tufted yellow sedge which we find by the sandhill pools have yellow fruiting spikes, and by the moorland pools the green-ribbed sedge has a green midrib to its purple glumes.

Finally, those fascinating pondweeds, the potamogetons, pollinated by the wind when their green flower spikes are held up above their oval floating leaves; the curled pondweed with its wavy-edged leaves and fennel weed with its fine thread-like

(Photo: Ashford & Beddows)

Pondweed (Potamogeton crispum)

(Continued on page 50)

BREEDING THE SCALED FANTAIL

By A. BOARDER

(Continued from March issue)

IN my previous article I dealt with the spawning of the fish and the treatment of the eggs. I now propose to describe my methods from that stage. About a day after they have been laid the eggs will clearly show whether they are fertile or not. The unfertile ones turn white and soon become covered with fungus. At this time the fertile eggs hardly show up at all, and many breeders may think that every egg is useless. Do not, however, be in too much of a hurry to form an opinion as I have often had quite good hatchings from spawnings which appeared to contain nothing but unfertile eggs. After two or three days, according to the temperature of the water, the embryo fish can be seen clearly in the eggs, and about a day before they are due to hatch the young fish in the egg may be seen to move distinctly.

During the period of incubation I think that it is advisable to examine the water to see if it is in good condition. It may be beneficial to carefully change some of the water so that the oxygen content is improved. Aeration may be used although I have had very good hatchings without any form of artificial aeration. Breeders must realise that the eggs must have a supply of oxygen to enable them to develop properly, and I am sure that the lack of it often causes the complete failure of the incubation. It is well to remember that the warmer the water the less is the oxygen content of it. If you wish to prove this, place a few large healthy fish, tench will do, in a small tank and put them in the sun for an hour or two. The fish will soon die, and the larger and stronger the fish the sooner will they die. If you do warm the water up to about 80 degrees for your hatching, you must change some of the water fairly frequently otherwise there will not be sufficient oxygen in the water to keep the embryo fish alive. If you will be advised by me, however, do not warm up the water above 75 degrees as you will get nearly all runts if you do. I emphasised this in my previous article, but it is well worth repeating.

It is impossible to give all the reasons for poor hatchings. Over many years of breeding I find that I get many thousands of eggs but very few fish in relation to the number of eggs. In 1946 I raised twelve hundred fish, but in 1947, from twice the number of eggs, I only raised about seven hundred and fifty. I had increased my tanks and made every provision for a larger hatching but this did not materialise. I also had used artificial heaters to warm up the water for hatching, and so it can be clearly seen that the quicker hatching did not give me nearly as many fish as I had the previous year when no artificial heat was used. Last year we had a very hot summer, much better than the year before, and yet wherever I went I heard the same story of bad hatchings. I feel sure that the chief reason of the bad hatches was the fact that the warm weather, by raising the temperature of the water, lessened the oxygen content of the water and so prevented the embryo fish from getting enough oxygen. The heat however was not the only factor which caused failures as I placed some of the eggs in an outside tank in which to hatch and a sudden fall in the temperature to about 50 degrees meant another failure.

These failures were not due to unfertile eggs, as the majority were fertile but seemed to go wrong about a day before they were due to hatch when the young fish could be seen distinctly; well formed in the egg. Some beginners have very good luck with hatchings and then after a while they too experience difficulties. If the eggs are left in the pond where they have been laid, and are allowed to hatch on their own, the temperature of the water may be very much lowered by a change of the weather and failure result. Again when the adult fish are left with the spawn you will find that very many of the eggs are eaten before they get a chance to hatch.

Given the right treatment and a fair amount of luck, the young fish will emerge from the egg and anchor themselves to the sides of the tank, bowl, or to the water weed. At this stage they are very tiny and almost helpless. Do not disturb the container any more than you can help as the fish have a food sac to keep them going for a day or two, and any unnecessary movement will cause this to be used up too quickly. There is no need to provide any food at first and the nature of the resultant feeding is much a matter of individual taste. Once the fish are hatched I do not see any reason why the temperature of the water should not be stepped up a bit. If you have used a temperature of 70 degrees with which to hatch your fry, there is no reason why it should not be increased to up to 80 degrees once they are out of the egg. It is a fact that the warmer the water within reason, the quicker will the fish grow. I noticed last year that the fish in the warmer tanks were swimming about and were much more active than those in cooler water. They then grew more quickly as they were able to digest their food easier and so could take it more often.

I feel sure that the safest food for the first week or two is just green pond water. This contains plenty of algae which is sufficient food for the youngsters

at this early stage. I have tried infusoria but after experimenting with the different methods from hay, lettuce leaves, banana, etc., I find that I have more infusoria naturally forming in the pond than I can get to form artificially. Also the water in which I raise my cultures smells so foully that I am sure that it cannot be good for the fry. It must also be remembered that the water weed is usually teeming with a tiny population of its own which may be seen with a microscope. Therefore the amount of weed which your tank contains must make a great deal of difference to the amount of food present for the fry. This brings me to the most important direction as to raising healthy fry, and that is plenty of room. I cannot stress this point too strongly. It is absolutely impossible to raise a number of healthy fish unless you give them plenty of room. I will go so far as to say that if you place a large number of the fry in a small tank and feed them on what you like, I will guarantee to raise a very few fish in a large container without giving them any artificial food at all, and they will beat the fish which you have overcrowded.

I don't know who first recommended the rule of one gallon of water to every inch of fish, but it is as true to-day as when it was first suggested. Of all the don'ts which I could state the chief one would be over crowding. When the fry are only about a week old the fantail may be clearly seen. At this early stage it looks just like a small spear, but it is quite distinguishable from the single tail of the ordinary goldfish. Now is the time to start culling your fish, especially if you are limited for room.

You will not be able to raise a large number of healthy fry unless you have plenty of space. This is most important, and as you are concerned more with breeding for quality than for numbers, it is imperative that you do not waste time and labour with the throw outs. You will be very lucky if you do not get a good number of throw-outs and these can soon be seen. Spread the good fish out at an early date so that you can give them the maximum space and attention. I know that it is not much use me telling beginners to throw away all the runts and single tailed fish, as I know that they will hate to do so, but it is good policy where you have limited space to concentrate on the good fish only.

When the young fish are about a fortnight old and, provided the water has been warm enough, you may begin to give artificial food. Of course if you have been able to keep up a good supply of micro worms the fish will have made good progress, but if that has not been the case the rate of growth has been largely determined by the amount of space the fish have had together with the amount of fresh pond water which you have been able to supply. The first artificial food may be finely ground Bemax. This should have been well sifted so that only the powder is used. I strongly recommend scalding this food before using it as the fish will not be able to digest it well enough otherwise. I have tried dried egg and dried milk but unless these foods are scalded I am afraid that you will not be very successful. If unscalded foods are fed to these small fish I think that there is a strong tendency for fungus to appear on the gills and sometimes tails of the fish. I may be wrong, but I feel sure that many of the ills from which the fish suffer are caused by indigestion. This seems to affect the mucous covering of the fish and lessen its resistance to fungus. The amount of food will depend greatly upon the temperature of the water. The warmer the water the more food the fish will require. It may be given as often as every two hours all day, but only enough food for them to clear up at each meal should be given. From now on the fish will grow fast if they are fed right, and you can with advantage give something new in the way of food. If you are able to get some daphnia you will find that your feeding worries are now over. Unfortunately few of us are able to get enough daphnia with which to keep up an unlimited supply. It is of course a very safe food to use as it is almost impossible to overfeed with it. The uneaten food just lives on to be eaten later, whereas if you give too much artificial food at a time the extra food will very soon turn the water foul. I find that it is a very good policy to change a quantity of the water in the tanks each day. This gives a fresh supply of oxygen and also if the water is from the pond, a fresh supply of infusoria as well. I usually run off about a couple of gallons of water from each tank and then fill up with water from the pond. The pond is then refilled with tap water and by the next day it has become impregnated with more infusoria. The removing of part of the water from a tank may be rather difficult as the young fish may be caught up. I obviate this by using a large sieve which I made by nailing a piece of metal gauze on the base of the four sides of a box. This floats in the water and allows some of the water to be siphoned off or baled out without any of the fish being disturbed. The new pond water should be run into the fry tank through this same sieve to make sure that you are not introducing any pests into the tank.

When the fish are about a month old they may be fed with finely chopped earthworms. This is always a very good food for young and old, and a cheap food too. You can easily collect the worms by hunting for them at night with a torch. They come up at night and if you work very quietly you can grab them and gently draw them from the earth. If you want them by day just take a garden fork and work it into the garden or lawn. Push it well down into the earth and then wriggle it backwards and forwards and you will be surprised how many worms come rushing up out of the ground. The worms may think that a mole is after them, but, for whatever reason, you will find many come up sometimes as far as four feet or more away. This method is only successful when the soil is rather damp. Use the large worms for you breeding fish and only the small ones for the youngsters. Any kind of live food may be given to the fish from now on, and you may use dried foods in variety. Try to give the fish at least one live meal each day and you will soon see how well the young progress.

At this stage in the development of the fish you

(Continued on page 49)

MY AQUARIA

By——————A. E. RUSSELL

ALTHOUGH I have been a keeper of cold-water fish for many years I did not enter into the tropical field until nearly three years ago, and this is how it happened. Owing to increases in my own family, and a subsequent lack of living space, my favourite shubunkins had either to be relegated to the garden pond, or go into the cupboard.

Having installed the 2 ft.×1 ft.×1 ft. tank at the top of the cupboard I found that it was maintained at a fairly high temperature, too warm in fact for large shubunkins, so these fish went into other quarters and I bought myself some Guppies and Mosquito fish, which soon multiplied many times.

This encouraged me to bigger things, and my next purchase was two Angel fish. For these I made and installed the lower tank, which is 27"×12"×20" deep.

This tank soon became a community one, with

The cupboard aquaria, and a neat wall aquarium. Angel-fish can be seen in the lower tank

The mantelpiece aquarium. The top cover is held by supports on the wall, and when it is removed the lighting hood can be raised up upon the same supports to provide illumination when working. The dark rectangle seen above the tank is a mirror

many varieties. For a long time these two tanks were not fitted with heaters, and even now I do not use any thermostats but just switch on the heaters before going to bed if it is a cold night and switch them off again first thing in the morning. Of course the room is quite small and as I have four small children there is a fire all day long when necessary.

On Christmas Eve last I acquired another room and it was whilst sitting by the fire over the holidays, moping, because I had no fish to look at, that I designed the set-up in the photographs.

I had had the idea for a mantlepiece tank in mind for a long time but had thought it impracticable because of the fire, until I saw Mr. Harris's design in the December issue of the *Aquarist*.

Having decided to have a go it did not take long to carry out my plans. I had a tank in stock, 4 ft. 6 ins. long by 1ft. × 1 ft., as 12″ was too much of an overhang, I cut the frame down to 8″ wide and rebuilt it. Then I took down the mantle shelf and lowered it 4½″ fastening to some iron brackets which I built into the wall. The ends and top cover are made from sheet metal and painted the same colour as the side columns of the fireplace making it appear as one whole.

The dark rectangle above the tank is a mirror fitted flush on the wall.

The top cover when raised gives access to all electrical connections, aerator and thermostat, and to a corked hole in the lighting hood for feeding (an idea I borrowed from Mr. Harris, thank you). The top cover removed and the lighting hood raised on its supports allows access to the tank and provides a light to work with. All these operations take but a few seconds.

This tank has now been set up for a month and houses all my smaller fish, leaving the Angels in sole possession of the lower tank in the living room. These fish, which are now 5″ deep overall, spawned one Saturday, but by Sunday evening most eggs proved infertile, and were eaten by the parents.

I have never belonged to any club, but through the pages of our magazine feel that I am one of the fraternity, and follow the news of all clubs however remote.

I have my own circle of "fishy" friends and I'm sure they will now enjoy their visits much more as we can sit round the fire whilst discoursing on our favourite hobby.

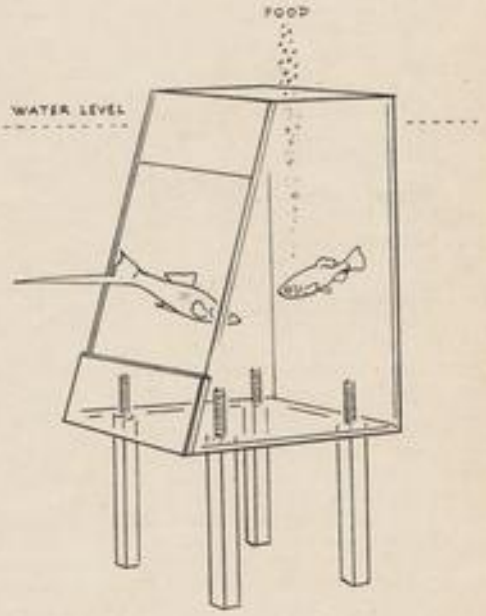
A PLASTIC FEEDING-BOX

By D. JOHNSON

IN a recent note published in the *Aquarist* it was suggested that plastics may be poisonous to fishes. The term "plastic" covers a very wide variety of products, and it is possible that some of them contain substances that can be dissolved out by acid water and be injurious to the inhabitants of the aquarium. On the other hand, appliances made of plastic materials have been used by aquarists for years without any harmful effects, and one of the most useful, perspex, is being used in America for the manufacture of aquaria themselves.

My own experience with perspex has been wholly satisfactory, and for some time I have been using a feeding box of my own invention which may interest others. The point about this is that it prevents the dispersal of food to all parts of the tank, with subsequent blackening of the sand if feeding is too heavy; and any food that is left over can be removed without difficulty.

As will be seen from the sketch, it is a simple box, the top of which is above water level. One side slopes outward to allow for spreading as the food sinks, and in this side is left a large opening through which the fishes swim in order to reach the food. Whatever is left stays on the floor of the box and can be removed either with a dip-tube or by lifting out the whole box. In this model there are four legs fitted to the base by means of screw threads, but these are not really necessary; the box can be made taller and stood on the sand.



Perspex is quite easily cut with an ordinary saw, and joined with a cement sold for the purpose; anyone should be able to make this box. Being transparent, it is not conspicuous when in the aquarium.

The "Balanced" Pond and Aquarium

EXPLAINED FOR BEGINNERS BY

JACK HEMS and GEORGE F. HERVEY

THE surface of our country is by no means flat, and one need not travel very far before meeting a natural hollow in the ground. "Mark what happens," T. H. Huxley writes in his *Physiography*, "when a heavy shower of rain falls upon dry ground. If the ground be formed of hard and solid rock, such as granite, the rain, after wetting the surface, runs off in all directions; some finding its way to the nearest streamlet, whence it flows sooner or later into a river, and some finding lodgement in little hollows of the rock, where it collects in pools, which are slowly dried up by wind and sunshine. But if the ground, instead of being hard like granite, is soft and porous like sand or chalk, the water will then sink into its substance, and may even pass out of sight without so much as wetting the surface of the thirsty soil. Rocks which thus allow water to filter through them are said to be permeable, while those which refuse to allow the water to soak in are described as impermeable: a bed of sand, for example, is permeable; a bed of clay impermeable." If, therefore, the bed of our natural hollow is of a clayey nature, and if there is no outlet for all the water, a pond will form.

At first no life exists in the water, for what vegetation existed in the hollow was terrestial and has been destroyed by being submerged. But the putrefying vegetation gives rise to bacteria (without which nothing can exist) and the pond receives its first inhabitants. As the bacteria increase in number the water becomes cloudy and exudes an unpleasant smell. The condition persists until all the decaying matter has been converted by the bacteria into nitrogenous (plant-feeding) material. But the conversion of decaying matter into nitrogenous material starves the bacteria of food, and, of course, as the bacteria are starved out the water clears and loses its unwholesome smell.

Meanwhile the spores of algae (minute and elementary forms of vegetable life) have been carried to the pond by the wind from other waters. More advanced aquatic vegetation is brought, in the form of seeds and broken stems, embedded in the mud on the feet and feathers of birds. The eggs of fishes and of water-snails are introduced in the same way. Dragon-flies and may-flies deposit their eggs in the water. Water beetles and water bugs make it their home. Frogs and newts visit the pond, find the surroundings congenial, and make it their breeding ground. Flowers spring up near the water; and, as the years roll on, trees and shrubs make their appearance on the banks.

At last the complete, self-contained, pond; all the inhabitants living in a state of interdependence, preying upon one another, so as to form a self-supporting colony (Fig. 1). All the time some creature is being eaten by another so that no species increases beyond its proper proportion. Local temperature, the mineral content of the water, and the nature of the subsoil, play their parts in dictating which plants shall flourish and which shall not. Nothing is wasted: even the dead leaves of the plants and the excrement of the fishes and snails are used up. Nature demands a purpose of everything.

But it is, perhaps, the aquatic plants that play the most wonderful part of all. For the representatives of the animal kingdom inhale oxygen and exhale carbon dioxide, and if there was no means of replacing the used oxygen, in the course of time all animal life would die; for no animal can live without oxygen. Nature, therefore, has provided a remedy, and, under the influence of light, the representatives of the vegetable kingdom take in carbon dioxide through their leaves (using the carbon to build up their green tissues and fibres) and liberate oxygen. In fine, the oxygen-breathing animals cannot live without the aquatic plants, the aquatic plants cannot flourish without the oxygen-breathing animals, and neither can live nor flourish without light. The process is known as photo-synthesis: it is of fundamental importance.

If a shoot of *Myriophyllum*, or of some other oxygenating aquatic plant, is placed in a jar of water and stood in the sunlight, it will not be long before little bubbles will be seen rising from the leaves of the plant to the surface of the water. It is not difficult to capture the bubbles and prove that they consist of oxygen; moreover, by counting the bubbles, and by using glass jars of different colours, it can be shown that the red, orange, and yellow rays are much more important than the blue and violet rays. The absorbtion of carbon dioxide, fixation of the carbon, and release of free oxygen, is the most characteristic work of green plants. The essence of what takes place is not known, but the conditions for the process known as photo-synthesis are thus

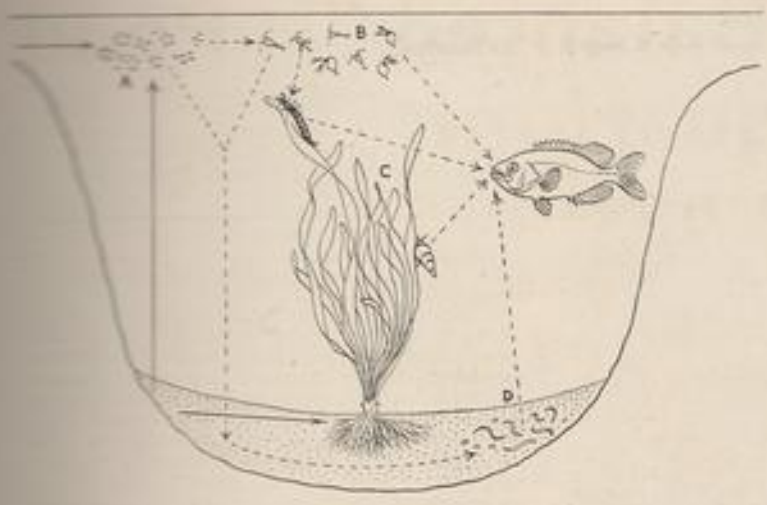


Fig. 1. The food-chain in natural waters—

A, Phytoplankton

B, Zooplankton

C, Weed-dwelling fauna

D, Bottom fauna

Continuous lines show course of inorganic salts, broken lines their course after they have been built into living matter.

summed up by F. O. Bower in the *Botany of the Living Plant*: Chlorophyll (the colouring matter of the green parts of plants) must be present in the cells which carry on the building-up process; carbon dioxide must be accessible to them; light must reach them, and in sufficient intensity; temperature must be within certain limits; and mineral salts must be available. If these five conditions are met "the constructive process," Bower writes, "consists in the absorption of carbon dioxide, fixation of the carbon, release of free oxygen, and the appearance in the active cells of material formed from the carbon which has been fixed."

Limnologists, very properly, point out that when aquarists speak of a "balanced" aquarium or pond they use the expression in a very loose sense; for it implies an aquarium or pond in which all the inhabitants are interdependent on each other, as they are in a natural stretch of water. But it requires very little thought to understand that in an aquarium or man-made garden pond this result cannot be achieved. In the first place, the balance is very delicate and does not take much to upset it. In the second place, within the compass of an aquarium or garden pond man cannot create the necessary conditions that will enable all the animals to find their food among their co-inhabitants. In the third place, it would be highly undesirable; for though at first sight a natural pond conveys an idea of stagnation, of things that are still and dormant, the very reverse is the case, and under the placid surface of the water animal ceaselessly preys on animal; there is, in fact, that constant struggle for existence which characterises nature in the wild; and no one would wish to reproduce this state of affairs in his house or garden.

In its strict sense, therefore, the "balanced" aquarium or pond of the aquarist is an unattainable ideal. In a wider sense, however, the "balanced" aquarium or pond is attainable; for by not overcrowding the aquarium or pond with animal life, by stocking the aquarium or pond with sufficient plant life, and by giving the aquarium or pond plenty of light, he can reach a close approximation to a natural stretch of water. But he can never obviate the necessity to feed the fish, and, moreover, he has to assist nature further by removing from time to time any excess of sediment that collects in the aquarium or pond, as well as uneaten particles of food and decaying plants. Apart from the necessity of maintaining the appearance of the aquarium or pond, it is, we repeat, impossible for man to recreate nature, and, at best, he can go only a short way towards imitating it.

But however many plants there may be in an aquarium or pond, they alone will not supply sufficient oxygen to support the animals, and oxygen must be drawn from the atmosphere which comes into contact with the surface of the water. In *Freshwater Aquaria*, G. C. Bateman records that he kept twenty-six minnows for a week in an ordinary soup plate, a little more than half full of water, and only one of the fish died. Yet one small minnow will soon die if it is placed in a narrow-necked bottle containing many times this amount of water. The reason is not far to seek. In the soup plate the surface of water exposed to the air is so great that the water is constantly being re-oxygenated; but in the bottle the surface of water exposed to the air is so small that the water cannot absorb sufficient oxygen to meet the requirement of the fish, which in consequence dies of suffocation.

From this it follows that the shape of the aquarium and pond in which fish are kept is a matter of very

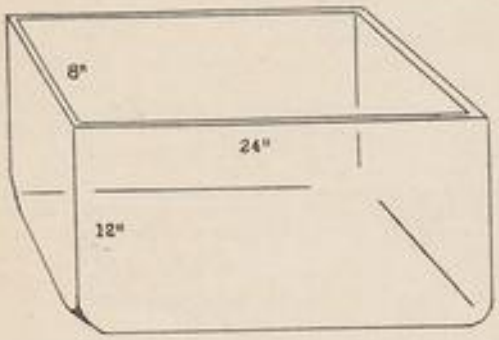


Fig. 2. The right shape for a tank

great importance to them. A glance at figures 2 and 3 shows that the two vessels illustrated are of equal volume, but whereas the vessel in figure 2 presents to the air only ninety-six square inches of water surface, the vessel in figure 3 presents to the air one hundred and ninety-two square inches of water surface. Thus, though the two vessels hold exactly the same amount of water, the vessel in figure 3, as an aquarium, is doubly to be preferred to the vessel in figure 2.

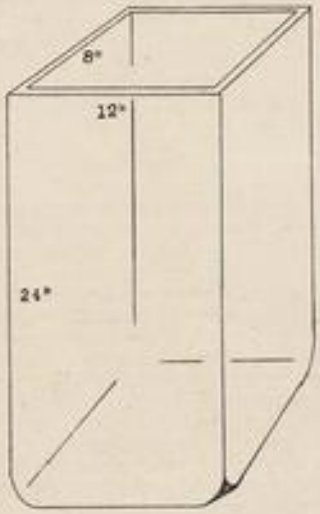


Fig. 3. A wrongly shaped tank

It is precisely the same with a pond. A pond constructed in the shape of a saucer will hold in comfort many more fish than one constructed in the shape of a cup, even though a pond constructed in the shape of a cup may contain four or five times more water than one constructed in the shape of a saucer. It must be pointed out, however, that fish in a pond are not so dependent on the surface area exposed to the air as are fish in an aquarium; for the water in a pond is kept almost constantly aerated by wind and refreshed by rain. Thus the re-oxygenation of a body of water outdoors is always more complete than of a body of water indoors.

The depth of the aquarium or pond is of no great importance, except that it should never be so shallow nor so deep that the aquatic plants will fail to grow properly. An aquarium may be anything from nine to fifteen inches deep, in proportion to its superficies. A pond should be about twenty-four inches deep at its deepest part; for it is unsafe to winter fish outdoors in less than eighteen inches of water (so twenty-four inches gives a margin of safety), and though few aquatic plants (except some of the water-lilies) flourish well in such deep water, arrangements can always be made to plant them at a depth to suit their individual requirements. There is little to be gained by constructing a pond deeper than twenty-four inches, at all events in a temperate climate.

A NOVEL WAY OF DESTROYING PESTS IN A POND

Dytiscus beetles and water boatmen are not welcome in a garden pond but are often difficult to net. Here is a novel way of destroying them which I find most effective. Obtain a piece of straight ½ in. metal tubing 4 ft. long. File the ends inside and out, and clean if necessary, thus making a blow-pipe. To use, collect a number of hips, seed heads, peas or whatever happens to be in season, insert one of these in the mouthpiece of the blowpipe, place tongue over end of pipe, take aim at foe, build up a pressure and suddenly withdraw the tongue. With a little practice the missile can be sent with sufficient force and accuracy to smash the crustiest old dytiscus and yet become spent within 4 ins. of water.

OLD SINKS FOR REARING FRY

Large old-fashioned scullery sinks are unbeatable for raising goldfish fry. They should be mounted on a brick heat box 1 foot high and heated with a lamp if needed. Cover with glass and smear this with white paint if the situation is sunny. A sink 48 × 24 × 4 ins. will hold 24 two-inch fish or 50 one-inch fry. They can also be used for spawning.

A. G. Field

"DECONTROLLED" SPAWNING OF THE ZEBRA FISH

By H. J. BROOKER

DURING October, 1947, I purchased two pairs of adult Zebra fish, hoping, like the majority of aquarists, when they buy fish, to breed from them. On their arrival home I had them put into a tank, 14"×10"×8" deep, the bottom of which was layered with stones, the size of marbles, and separated the sexes by means of a glass panel. Their food from then on consisted of Tubifex, finely chopped earthworms and occasionally Daphnia.

My first attempt at getting them to spawn was in January, as the females were "noticeably swollen with eggs," or so I thought. I removed the partition an hour before dusk one evening and awaited results. Chasing commenced after a few minutes fairly vigorously, and from appearances it looked as though everything was going according to plan. The fish were removed the following day at noon and the temperature raised fradually from 78 degrees F. to 85 degrees F. and kept constant for eight days. As nothing had happened by that time, I knew my first attempt had ended in failure.

I tried again in March using the same procedure with exactly the same results. During this attempt one of the females died. Its eyes had been picked out. Whether this occurred before or after death is unknown.

On March 6th I had the three Zebras transferred to a small community tank, 18"×10"×10", in my bedroom. This tank is planted normally with *Vallisneria*, *Cabomba* and *Egeria densa*, with *Riccia* floating at the surface, and situated in a window facing south. The side nearest the window and the two ends are shaded and the top partially so by a light shade which is never switched on during the hours of daylight. The thermostat is set at 70 degrees F. but with the sun on the tank the temperature rises to 80 degrees F. and over. No live food was fed to the fish. They existed on dried food alone.

The morning of April 22nd was dull and very close. I noticed rather more activity in the tank than usual. The three Zebras were swimming around the top of the tank fairly fast and appeared to be gulping in air. I accredited this to the closeness of the atmosphere as the tank is not overcrowded. A short time after, the female made rushes at each male in turn. These rushes were soon reversed and the two males began chasing the female, forcing her up through the *Riccia*, and, to my surprise, after my efforts at controlled breeding, now, with no preparation whatever, spawning was taking place. A cascade of eggs, looking like a bursting rocket on Guy Fawkes night, were gently falling to the bottom where the occupants were busy making short work of them. The temperature of the tank was 72 degrees F., rather low I thought, for spawning to take place. There were six batches of eggs released that I noticed, and the intervals between each irregular. The first occurred at 8.25 a.m., second at 9.20 a.m., third at 9.25 a.m., fourth at 9.59 a.m., fifth at 10.28 a.m., and the last at 11.08 a.m. It will be noted the spawning from start to finish only took 2 hours 43 minutes, and there was as much as 55 minutes between lots one and two and as little as five minutes between two and three. The number of eggs in each batch also varied. The average was probably from fifteen to thirty.

Favoured places in the tank for the release of eggs were :—

(a) in a corner, between the thermometer and end, the female forcing herself over the suction cap holding the thermometer which protruded just above the water.

(b) in the centre where the *Riccia* was thickest.

Each time the males were nudging the female near the vent as though to lift her out of the water. When the spawning had finished the female retired to a corner breathing heavily, while the two males continued rushing each other at the surface. This may have been caused through jealousy and they were fighting each other because their excitement had not died down.

At one time during the spawning I missed the female and could not see her anywhere in the tank. I thought she was hiding behind one of the rocks until I saw the white-worm basket doing the rhumba. She must have been pushed clear of the water and unluckily fell into the feeder.

Needless to say none of the eggs survived long enough to hatch. I could do nothing about saving them as I am an invalid confined to bed. For all that it was a thrilling morning and for that morning alone I would not have changed my place with any fit man. Illnesses do not seem so long when one's an aquarist. He has more time to study his fishy friends.

Zebra Fish (*Brachydonio rerio*). Female above

BEGINNER'S LUCK

By F. DENTON

THE purpose of this article is not to recount the results of exhaustive experiments by an expert, but merely to place on record the manner in which another family became devotees of that most fascinating hobby, the keeping of tropical fishes. The family consists of myself, my wife, and a lively seven-year-old daughter.

Our interest was aroused over a year ago as a result of seeing a nephew's tropical tank containing an assortment of brightly coloured "tiddlers." Very attractive it looked too! We immediately decided that in due course we would set up a tank of our own. Opportunity, in the shape of two rooms, with use of kitchen and all conveniences did eventually arise, and we started operations on January 17th of this year.

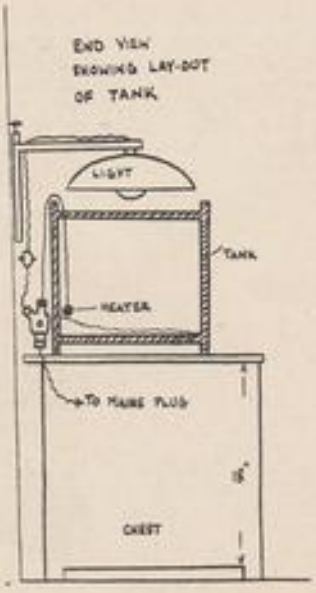
Backed by a lot of advice from the nephew, three back numbers of *The Aquarist* and a small booklet on the subject of aquarium management, I first bought a tank, size 24"×12"×12", cost—£2. The dealer called it a well seasoned aquarium. My wife described it as a dirty, filthy, second-hand article. However, by the time we had cleaned it, tested it for leaks and found none, and touched up the ironwork with green paint she took more kindly to it.

We decided that the side of the room opposite the fireplace would be the best place for our tank, so it was placed on an old chest, about eighteen inches in height, in a position well shielded from draughts. The room has a southerly aspect and the tank receives direct sunlight for a short period during the mornings only. For additional light I fixed a wall light with a circular metal shade so that the 60 watt pearl bulb was located centrally over and about 2 inches above the cover glass.

I washed and scalded eight pounds of aquarium gravel, laid it gently by the spoonful in the bottom of the tank, and carefully filled up with tap water to within two inches of the top. I planted six assorted grass-like plants in the back half of the tank. The water looked cloudy, the plants looked "seedy" and numerous tiny bubbles formed on the sides of the tank. For the next fortnight we watched the tank carefully. The water cleared and the bubbles disappeared. The plants did not thrive at all; on the contrary they looked more weary every day. To sustain interest we made regular examinations of water samples under a low power students' microscope. The first few samples revealed nothing. On the third day my wife observed a kidney shaped object running round in little circles. Excitement ran high at the sight of life in our aquarium! We deduced from the books that we had infusoria in our midst. From then on the samples showed an increasing number of these tiny creatures and by the end of January we could not wait any longer.

On the 31st January we all three went to town. First I bought an assortment of plugs, adaptors and flex, necessary to provide heat and light for the tank. I felt slightly self-conscious as I explained my circumstances and requirements to the expert in charge of our local aquarists' shop. He was not impressed by my microscopic discoveries, and implied that, without heat or fish, what could I expect but poor plants. Nevertheless he was very helpful indeed. He advised a 75 watt immersion heater and a selection of good plants and fish for beginners. We were enthralled by the array of specimens in his numerous brightly-lit tanks. My wife and daughter were specially thrilled by the tiny brilliant Neon Tetras, but at 70/- each we decided to leave them until another day. That same evening our infant inquired when we were likely

(Continued on page 48)



THE CRAYFISH

By F. W. WOOD

I HAVE been interested in aquarium keeping for a number of years. When I first started I could not afford a proper glass aquarium, so I asked the local builder if he could supply me with an old sink. He gave me one 3 ft. × 1 ft. 6 ins. × 5 ins., this I stocked with some fish and two crayfish. When I told my friends I had some crayfish, they asked what they were, and they soon became rather an attraction. Possibly many aquarists do not know of these interesting creatures, so here is a short account of them.

The crayfish is found in many parts of the world. Before the war many were exported from Canada in tins as a food. The crayfish is not so common in England as it used to be, but it is still to be found in rivers and canals in chalk and limestone districts. It spends most of the day in holes in the bank, but at night it moves abroad over the river bed looking for food.

The crayfish looks something like a lobster in miniature, the colour varying from a grey-brown to a red-brown. It is about five inches in length when fully grown, and lives about five years if it dies naturally. The continental species grows a little larger and it is slightly differently coloured. It possesses four pairs of walking legs, two pairs of antennae (a pair of ordinary antennae and a pair of antenules) and a pair of formidable pincers.

The crayfish can move in three different ways: walking, swimming and darting. In the first way the four pairs of walking legs are in contact with the river bed, and the pincers are held aloft, the antennae being in constant motion exploring the surroundings. It does not swim very often as the body is a little heavier than water, but it can swim short distances by the action of its legs and other parts of its body. The animal only darts as a means of escape, it does this by flexing the abdomen, with the tail-fan extended, this causes the body to jerk backwards through the water, during this operation the antennae are pointed towards the back of the animal to detect obstacles in the rear.

The animal feeds on practically anything living or dead, preferring worm and beetles, etc. The food is swallowed whole or (if it is too big) torn to pieces with its pincers. The food is then passed towards the mouth with the pincers, but as these cannot bend round to put the food in the mouth, this operation is performed by the front pairs of legs. The food is finely divided at the back of the mouth.

The Crayfish
(*Astacus fluviatilis*)

(Photo: W. S. Pitt)

As the animal is covered by a hard coat, growth is made by a series of steps. Two or three times a year the outside shell is cast off. When this is about to happen the crayfish retreats to a secluded spot, and agitates its body, as if in an attempt to loosen its old coat. The body is then bent and a crack in the shell occurs, when the anterior part of the shell is withdrawn, the antennae and other parts being withdrawn like a hand from a glove. The abdomen is then released, and with a spring the animal frees itself completely. The old legs and other limbs are freed by a longitudinal split down each limb. The new cover is lighter in colour and is softer than the old one, and it is during the next few days that growth takes place, calcareous deposits are laid down on the new cover causing it to harden.

During this change a leg might be broken off or the animal might lose a limb by an accident. Should this happen a new one will grow, though it is usually smaller than the original limb.

The only sure way of finding out whether a crayfish is male or female is to look at the pairs of appendages under the abdomen. Of the male the last pair are modified to form sex organs.

The mating season is in the late autumn and fertilisation of the eggs is external. The eggs are carried on the appendages under the abdomen of the female until spring when they are hatched. The newly hatched crayfish is a small edition of the parent. The young ones cling to the mother until the first moult.

The depth of water in the crayfish tank should never exceed six inches as they need a plentiful supply of oxygen. Weeds and stones should be provided for cover, but the crayfish will come out of hiding if a worm is put in its sight. Not more than two crayfish should be kept in one tank, but some fish may be kept with them as long as they are not too small.

If the crayfish is caught locally it is best to transport it in a box containing some damp moss. Crayfish can be brought from many pet shops and biological suppliers.

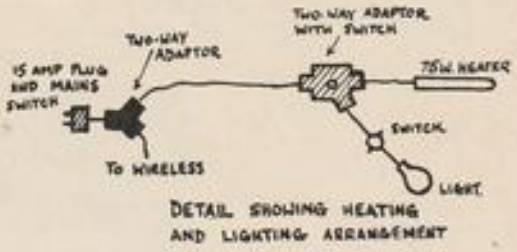
BEGINNER'S LUCK—(Continued from page 46)

to get some wire for Tetras. But we did become the proud owners of one pair of Green Swordtails, one pair of Zebras, one Red Platy and one Blue Platy.

Having installed our fishes in their new home we proceeded industriously to overfeed them. Soon the water became cloudy and the sand below the feeding ring turned a dirty grey. The bottom of the tank became covered with a grey woolley-looking substance.

Our expert was very sympathetic when he heard my sorry tale. Acting on his advice we emptied the tank completely. We washed the gravel and replaced it, together with another 4 lb. which enabled us to bank up the gravel towards the back of the tank. We put the same water back, filtering it through a kitchen sieve lined with cotton-wool. We threw away the first lot of plants and put back only the healthy looking specimens. Since then the tank has looked better every day. We now feed the fishes on the little and often principle. We have added a pair of Rosy Barbs, one Black Molly, and a pair of Red Swordtails to our community, and Mr. Green and Mrs. Red Swordtail have rewarded us by presenting us with a dozen or so babies, four of which were rescued before they were eaten and are now "doing fine" in a large jam jar suspended in the tank.

We are all well pleased with our tank which gives a touch of life and colour to our room which no other hobby could supply. We know all our fishes



DETAIL SHOWING HEATING AND LIGHTING ARRANGEMENT

as individuals, not as specimens. We love the lively playful Zebras, the boisterous hurrying Rosy Barbs, the rakish Swordtails and their harrassed females. We have a special liking for the amiable Platys and that most friendly little nosey-parker, the young Black Molly. A tap near the feeding ring brings them hurrying to see "what's cooking." We have already made up our minds that when we get a house we will have more tanks, but that will be another story. In the meantime we are proud of our one community tank. We have learned much from experience and from the books we have bought. The tank is an invaluable aid to education for our infant and the pleasure we all get from our pets is ample return for the five pounds odd it cost us to set up the tank.

ALDER-FLIES

By JOHN GRAHAM

THE Alder-Flies, of which there are two British species, are quite common insects and during the early summer may be noticed resting on bushes, rushes and fences near water. They have rather large wings for the size of their body yet instead of flying freely they seem to be almost too lazy to operate their fine wings and if disturbed just run away a short distance rather than fly beyond reach.

The forewings are rather darker in colour than the hind ones, the nervures are coarse and dark. They are folded over the body house-roof fashion, not folded flat like the house-fly. In general appearance these flies are so lacking in elegance that it is difficult to believe that they are related to the dainty May-fly and the gorgeous Dragon-fly !

The female lays her eggs upon any handy surface near the water's edge and the resultant larvae must find their own way to their future home beneath the surface. As their only guidance appears to be an instinct to go always down hill, a good many take the wrong road and meet a miserable end on dry land. The fortunate ones hide themselves as quickly as possible in the sheltering mud at the bottom.

They are predaceous creatures and will boldly attack creatures quite as big as themselves with their wickedly sharp jaws, which are long and curved. When fully grown the larvae are about an inch in length; they then burrow into the bank above water level and construct an oval cell in which they undergo their metamorphosis. The pupa is quiescent like that of butterflies and moths, not active and predatory like those of its relations the blue-fly and Dragon-fly. The legs and wings, however, are quite free, not merely marked out on the surface like those of the butterfly and moth.

An Alder-fly (*Sialis lutaria*) at rest and flying (enlarged). Below is the aquatic larva (more greatly enlarged).

BREEDING THE SCALED FANTAIL *(Continued from page 39)*

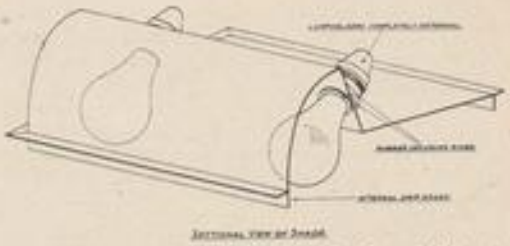
are sure to notice that a few fish will outgrow some of the others. I do not think that it matters what food you have been using. It always happens that some are more forward than others and after a time these larger fish by being able to eat all the larger portions of food run away from the others to such an extent that they may eat their brothers and sisters. When you find a fish growing too fast for the others you had better remove it to another tank and so try to keep all the fish in one tank at an equal size. I have often found this extraordinary growth of some youngsters in other fish besides fantails. I have bred a number of Green Tench and I find that one or two will outgrow the others considerably. As I write I can see a tench which I have in an indoor tank and although it is only nine months old it is already nearly five inches long overall and twice as big as another in the tank the same age. This fish is quite tame and will take a small worm from my fingers with great rapidity. What grand aquarium fish these tench are, no trouble and so handsome.

Having reached the stage when the fish are about a month old I think that it will be a good time to postpone my further comments on the subsequent treatment and culling of the young until a later article.

THE "HARKER" AQUARIUM COVER

AN entirely new style of combined Aquarium Cover and Light Shade must now have been seen by many aquarists ; quite a number of this noble band have already expressed their praises for its general appearance and pleasing contours. This, of course, is all very gratifying to me, but not many with whom I have conversed appear to be aware of the technical points incorporated. As I am responsible for its design, which to my way of thinking, is an approach to the ideal, no doubt many readers will be interested in the following description.

(1) No glass cover is required, thus eliminating a constant bugbear, and by its absence the experienced aquarist will agree, many obvious advantages are gained. (2) The inside of the shade is continued down to a depth of ½ inch inside the tank to form a drip edge so that all condensed water, etc., is returned direct. Thus the top of the tank frame remains dry and free from that rusty appearance with which we are all too familiar when the average tank has been in use for any considerable period. (3) The position of the lamps is so arranged that these are as far forward as possible to accommodate the ordinary bulb type up to 60 watt, and one fixing for approximately every 12 inches of tank length, which produces a strip light effect. By this method the light shines on the fishes and not through them, and the reflector is shaped to throw the light as far to the back of the tank as possible for the benefit of the plant life. (4) The hole for the lamp fixing allows the lamp socket to extend on the outer side, and the base of the bulb beds down into a soft rubber ring on the inside, and is secured with a stout rubber ring on the



outside. Thus, the whole of the lampholder is clear from any possibility of corrosion or electrical short circuits due to condensation. (5) There are no internal ledges on which some of the more enthusiastic occupants of the aquarium can be trapped.

The cover is made of stout gauge sheet metal, and is an easy drop-on fit. It can be readily raised at the front for feeding, and is also adaptable to any size of angle-iron or all glass aquaria, and lends itself suitably for cut-outs to accommodate the usual internal accessories. The outside can, of course, be painted to suit any existing colour scheme, and the writer finds two coats of white flatting under a coat of white marine enamel gives a good twelve months' service on the inside, to which at the end of this time, if necessary, a further coat can easily be applied.

From the foregoing, and the accompanying sketch, the pleasing contours already mentioned can be appreciated, as the apparent outcome of necessity in disguise.

STANLEY HARKER

AQUATIC PLANT LIFE

(Continued from page 37)

leaves. In many ponds we find hornwort whose whorls of leaves are much forked or branched and which flowers only in shallow waters, and then the pollen is distributed by the surface currents—you can demonstrate this by growing the plants in aquaria. More interesting is to find the very rare male plant of the common Elodea canadensis (known by its whorls of three small leaves), most of whose plants are females. Here the female flower lengthens its calyx tube to reach the water surface, but the male flower detaches itself and floats to the surface, there to burst and its pollen, floating on the surface, is drawn to the female stigma. We often see the oval floating leaves of frogbit in dykes and ditches, followed later by its pretty three-petalled white flowers visited by the bees. Like the hornwort the main plant dies off in winter and the terminal buds, formed in autumn, sink to the bottom, rest there for the winter, and rise up and produce the new plant the following year, all of which can be seen by keeping these plants in a few earthenware bowls or aquaria.

TIPS ABOUT FEEDING

Feeding fry is often a problem, and some readers may not know that the youngsters can be given raw meat if the following method is used. Do not cut the meat but scrape it, as this gets it into very small pieces ; then put the scrapings in a small jar of water and shake it up. Feed this water to the fry with a fountain pen filler or a drip-feed ; tiny pieces of meat will be floating in it, and the fry will eat these and thrive on them.

A fountain pen filler is also useful when feeding with Mikro. With the filler, run a little water over the surface of the culture and collect it in a corner of the container. Remove this water, which will now be full of Mikro, and place it in a small jar (such as those in which French mustard is sold). To this more water is added, as this spreads out the worms and the fry will not miss so many. This diluted culture can be given to the fish by means of the fountain pen filler.

F. M. WATSON.

OTHER MOLLIES by R. G. MEALAND

I FULLY share with Mr. J. W. Southwell of Enfield Aquarists the love of Mollies, which he expressed in an interesting article in the March issue. To me his writing inferred that there were only two types of Molly, i.e., Orange-margined Sphenops and Perma-Blacks. The orange edge to the caudal of some Sphenop Mollies is an interesting refinement but is not the more generally accepted variety, the latter being " entirely matt black." It seems that the Sphenops with orange on the caudal fin is rarely matt black—in fact I think much of the unwanted spangling and blue or gold sheen on the sides of the body is introduced through the promiscuous breeding of these two varieties of Sphenops. The one thing which makes the Molly outstanding is surely its sooty black appearance, which, so far as I know, does not occur in any other fish. The Latipinna Molly with the male proudly displaying a sailfin dorsal is certainly a beautiful sight, and makes me wonder why the devotees of the egg-laying species, with their families of fish, as like their parents as " Peas in a Pod," should presume to look down on the Live-bearers. The latter have individuality and charm and frequently mark a development in breeding over a long period. The best Black Mollies have also black eyes. The difference between Sphenops and Latipinna Mollies is too often overlooked. The dorsal fin is the most obvious point of difference, see pages 21, 22 and 23 of the F.B.A.S. Show Standards Book. The Perma-Blacks are quite a nice variety. They are born black and remain black, but sad to say, they also remain small. The Liberty Mollies are rarely seen nowadays ; the female was not outstanding but the active male, with his tri-coloured dorsal and caudal fins, was well worth attention.

Albino Mollies are to be had in America, and I believe they are attractive fishes ; I have not seen any, but presume, like all Albinos, they are inclined to be weak. Also, of the Mollies known to aquarists, mention must be made of the Wild Latipinna type which now is rarely seen. I am happy to say I have some of these and the beauty of the male is hard to describe. With a light falling on the front of an aquarium at about 45 degrees its colours are legion, from the rich yellow of the underparts, through blue and silver spangling over various shades of green as a background, overlaid with a fine tracery of brown network. This is truly a wonderful fish and when the long high dorsal is fully extended (all too rarely) the most blasé aquarist would be rejuvenated. Mollies will thrive under all average conditions, in a large aquarium in a bright position, so that plenty of algae are available at all times. I still adhere to my so-called dirty tanks ; it seems to me much more natural for all fishes, and unless the water has become foul no harm is likely from mulm. Anyone who has seen a tank of Mollies eagerly devouring the algae from the front glass of an aquarium in a sunny period following a dull spell should need no further proof of their liking for these conditions. Though the fishes normally are not always to the fore at these times, all can definitely be counted. They seem also to like *Tubifex* and whiteworms, though these should be given sparingly. Bemax, which is now easily obtainable, is a good food for Mollies, and also any reliable make of dry food. *Daphnia* is much appreciated, and I like to give plenty to growing females, as I think it helps with the delivery of the young (a very critical period with some female Mollies) since the young are so big at the time of birth. The advice not to *move* gravid Mollies should be taken to heart. If for any reason such a female must be moved, chase her into a large jar or tin of water, but do not let her lay in a net. I cannot make out why people lose their baby Mollies because of the mother remaining in a tank. I never worry about the young, for if the tank is well planted, including plenty of my favourite floating fern, and if the female is well fed and not disturbed, there should be no losses. Only this week I had from a dangerously heavy Molly, between thirty and forty young, and besides both parents, there were six adult livebearers in the same two foot tank. The Molly is definitely omnivorous, not of necessity, but by nature, as witness the shape of the mouth for browsing on algae. Those who know of the " innards " of Mollies tell us that the stomach and intestines are unlike those found in the carnivorous species. Any fishes will go for live food, even as a small boy will devour chocolate after a big meal, but even as our small boy would soon tire of a diet composed entirely of chocolate, so I think would Mollies sicken of an unmixed diet, and the meaty food would not supply all their needs. The ideal way to keep Mollies is to house them in a roomy tank, preferably with no fast swimming fishes, as in my view Mollies like to lead a quiet life—though when a net is produced they have a wonderful turn of speed and can also perform some gigantic leaps. They are the most well-behaved of livebearers and are content to mind their own business no matter what goes on around them. If you would keep Mollies feed them frequently but don't " muck them about."

NOTES AND NEWS

At their meeting on April 6th, members of the **Cambridge and District Aquarists' Society** found much interest and beauty in a display of submerged aquatic plants, comprising about 25 different species, effectively arranged in Kilner jars. The specimens had been donated by Messrs. Perry's of Enfield, the Cambridge Botanic Gardens, and Mr. S. A. Wright, a member of the Society. This generous help was greatly appreciated, and the Society desires to express public thanks for the display.

An innovation in the form of a " Quiz " proved an entertaining and instructive feature. The members were divided into two teams, and the questions covered all the essential principles of tropical aquaria, plants and feeding. Sound knowledge and keen competition on both sides resulted in a close finish. The Secretary will be pleased to send a copy of the " Quiz " to other Societies who might be interested.

Mr. W. G. Phillips visited the **West Middlesex Aquarists' Society** on April 16th, and gave an interesting talk on the Guppy, or Millions Fish (*Lebistes reticulatus*). He traced the history of our knowledge of the species from its discovery by Peters in 1859 to 1866, when the Rev. R. G. Lechmere Guppy sent specimens to the British Museum, and reminded the audience that it had been kept as an aquarium fish since 1909. The lecturer stated that there are 12 varieties in this country, of which nine have been standardised by the Guppy Breeders Society, named by the shape of the caudal fin ; while in the U.S.A. there are more than a dozen varieties named for their colour.

He advised his listeners not to breed from specimens less than six months old, to feed at least twice a day. If possible breeding should take place before March, as this leaves the longer days for the fish to feed and exercise, helping their growth and colouring. Artificial lighting will be of great benefit to fish and plants, and the temperature should be about 70 to 75 degrees. As soon as possible the fry should be sexed, and the sexes kept apart except when paired for breeding.

Mr. Phillips brought with him six tanks of fish to illustrate his talk, and was afterwards called upon to answer numerous questions. He was accorded a hearty vote of thanks. On May 3rd he delivered a similar lecture to the **Hertfordshire Aquarists' Society**, where it was equally appreciated.

The new specialists' Society for the Study of the Goldfish is now well established, but no fixed decision has yet been taken as to its title ; until this has been agreed it cannot be included in our Directory. The officers of the Society are as follows :—President, A. Fraser-Brunner ; Vice-Presidents, Messrs. W. J. Page, C. F. Whitehead ; Chairman, L. C. Betts ; Secretary, E. Cole ; Treasurer, S. J. Freeman. The Technical Officer is R. J. Affleck, B.Sc., who at the inaugural meeting gave a lucid outline of the research work which the Society will carry out in order to improve the goldfish stock of the country towards the standards set by the F.B.A.S.

The monthly meetings of the **East London Aquarists' and Pond-Keepers' Society** continue to maintain a high standard, and in addition a number of study-groups are now functioning, concerned with the special problems of fancy goldfish, live-bearers, labyrinth fishes, and microscopy, respectively. We have remarked in a previous issue upon the good work being done by the juvenile section, and it will be clear that this Society is one of the most active in the London area. This year's Barking Fish Exhibition is being held on May 21st and 22nd, unfortunately too late to be reviewed in this issue, but we shall include an account of the show next month.

Other forthcoming shows announced are :—**Watford Aquarists' Society**—second annual show on Saturday, August 28th, 1948, at Victoria Schools, Addiscombe Road, Watford.

THE ANNUAL SHOW AT IPSWICH

This year's show staged by the Suffolk Aquarists' and Pond-Keepers' Association was held on May 10-12th, and was notable for a more effective layout than hitherto, and a general improvement in the level of the exhibits.

As in previous years, the show was considered not only as a competition but as an instructive exhibition for the public, with the result that a large and varied assortment of species was included. The coldwater classes, as usual, contained a representative series of species, notably some fine specimens of common goldfish and shubunkins. A handsome pair of Rudd, in fine condition, were considered the best exhibit in this section. On the tropical side a wide variety of species were shown, and special interest attached to the breeders' class, in which all exhibits had been bred by members since last year's show.

Marine aquaria were represented by four interesting tanks shown by Mr. Claxton, and there were the usual classes for amphibia and reptiles which included most of the British species, though the palm went once more to Mr. Beaumont's lovely Diamond Python; the exhibition of this large and very tame snake year after year, in perfect condition, is a most creditable achievement.

An exhibit of a series of aquarium plants was a good idea, but most of the specimens were rather small, sickly examples; this feature would be well worth improving, and it might help to make it competitive, for plants seem not to be a strong point at Ipswich. Most of the tanks in the furnished aquaria class were too thinly planted, and the plants were of poor quality in comparison with London standards. The best of these tanks was a tropical one in which planting was adequate, though the centre-piece, a *Cryptocoryne*, was not well selected, many of its leaves appearing upside-down; the choice of fishes was of the "one of each" type, giving a confusing and fidgety effect. A cold-water tank showed an attempt at originality by presenting the effect of a cave, with stalactites and stalagmites; the conception, however, was scarcely suitable to the occasion, for plants do not grow in caves, where there is no light, and such ordinary fishes as Rudd are not likely to be found there.

An innovation this year was a Junior class, for members of the newly formed Junior Section, and the number of entries, coupled with the crowd of youthful enthusiasts studying them, demonstrated that the Society was justified in taking this step.

Considering that this show was confined to exhibits by members of the Society, its variety and quality were highly creditable. The results were as follows :—

COLDWATER

CLASS 1—COARSE FISH—(1) Mr. F. W. Brinkley, *Rudd*; (2) Mr. P. McGrail, *Golden Orfe*; (3) Mr. C. T. Nash, *Pike*.

CLASS 2—COMMON GOLDFISH—(1) Mr. R. F. Goldsmith; (2) Mr. W. F. Rowberry; (3) Mr. W. F. Rowberry.

CLASS 3—FANCY GOLDFISH—(1) Mr. A. Huson, *Shubunkins*; (2) Mr. A. Huson, *Shubunkins*; Mr. A. Huson, *Shubunkins*.

Lord Woodbridge Challenge Cup—Best Coldwater Fish—Mr. F. W. Brinkley, *Rudd*.

TROPICAL

CLASS 4—LIVEBEARERS—(1) Mr. C. T. Nash, *Red Swordtails*; (2) Mr. P. Clarke, *Red Swordtails*; Mr. D. Stiff, *Moon Platys*.

CLASS 5—EGG LAYERS—(1) Mr. A. Mather, *Dwarf Gouramis*; (2) Mr. C. W. Porter, *Tiger Barb*; (3) Mr. C. W. Porter, *Australian Rainbow*.

CLASS 6—ANY VARIETY BRED BY A MEMBER SINCE DATE OF LAST SHOW—C. W. Shute Challenge Cup—Mr. C. W. Porter, *Flame*; (2) Mr. C. W. Porter, *Beacon Fish*; (3) Mr. J. Shufflebotham, *Black Line Tetra*.

Clavering Fisson Challenge Cup—Best Tropical Fish—Mr. C. W. Porter, *Flame*.

MARINE

CLASS 7—MARINE—(1) Mr. A. J. Claxton; (2) Mr. A. J. Claxton; (3) Mr. A. J. Claxton.

REPTILES

CLASS 8—REPTILES—T. R. Parkington Challenge Cup—Mr. H. W. Beaumont, *Australian Diamond Python*; (2) Mr. H. W. Beaumont, *Greek Tortoise*; (3) Mr. E. Nash, *European Water Terrapin*.

AMPHIBIANS

CLASS 9—AMPHIBIANS—(1) Mr. E. Nash, *Black Axolotl*; (2) Mr. E. Nash, *Edible Frog*; (3) Mr. S. W. Ratcliffe, *Great Crested Newts*.

FURNISHED AQUARIA

CLASS 10—FURNISHED AQUARIA—P. Clarke Challenge Cup—Mr. C. W. Porter, *Tropical*; (2) Mr. E. Nash, *Cold Water*; (3) Mr. J. Shufflebotham, *Tropical*.

JUNIOR SECTION

FURNISHED AQUARIA—TROPICAL

(1) S. W. Ratcliffe, age 18; (2) L. G. Cox, age 14; (3) D. Artis, age 15.

FURNISHED AQUARIA—COLDWATER

(1) K. H. Cocker, age 15; (2) R. Lord, age 12; (3) D. Artis, age 15; V.H.C., Miss Ann Bexham, age 12; H.C., B. A. Borrett, age 11.

P. Clarke Challenge Cup—For Best Furnished Aquarium, Junior Section—S. W. Ratcliffe, age 18, Tropical.

NOTES AND NEWS—(*Contd.*)

West Surrey Pond-Keepers' and Aquarists' Club—first post-war show in conjunction with the Guildford District Allotment and Gardens Association, on August 2nd, 1948. This will not be an open show.

The **Southampton and District Aquatic Society** is now in full swing; at a recent meeting, Councillor R. J. Stranger, M.C., J.P., a well-known and much respected figure in Southampton, accepted the Presidency. The Society wishes to acknowledge and record thanks for the friendly help that has been accorded them by the Enterprise Aquatic Society.

That very progressive Club, the Nottingham Aquarists, publishes each month an excellent Bulletin to keep members acquainted with the various developments and fixtures, and to enable the more advanced members to supply information to the newcomers to the hobby. The Bulletin is well produced by means of a duplicator, and contains illustrations which are coloured (evidently with considerable labour) with crayons; the cover, however, is printed and carries local advertisements which presumably cover the cost.

This excellent idea has now been copied by the Southend, Leigh and District Aquarists' Society, from whom we have just received the first copy.

Other Societies might well do the same, for it is not possible for us to include in our pages the domestic details of the numerous clubs now existing, nor to devote too much of our space to elementary information given over and over again for beginners. On the other hand, of course, it would be a pity to allow matter of general value to appear only in a local journal, and we continue to invite observations and news that may interest people outside the club concerned.

Nottingham, incidentally, has recently commenced a Scientific Section, which will be concerned with placing the breeding of fishes upon a more methodical basis, in order to raise the standard of the more common types, and increase our knowledge of the rarer kinds. The results obtained by this section will be published in *The Aquarist* from time to time—commencing next month.

A SOCIETY AT WEMBLEY

An Aquarium Society to serve the interests of devotees living in Wembley and the surrounding district, including Alperton, Kingsbury and Sudbury, was inaugurated on May 11th, at a meeting at Park Lane School, Wembley.

PROPOSED SOCIETY FOR COVENTRY

Will aquarists in the Coventry district who would be interested in the formation of a society please get in touch with either A. E. Babington, 35, Court Leet Road, Cheylesmore, Coventry, or M. D. Bradbury, 163, Moseley Avenue, Radford, Coventry.

NATIONAL AQUARIUM AND WATER-GARDEN EXHIBITION

As we go to press we have received news of the above exhibition, to be held at the Royal Horticultural Hall, Vincent Square, London, S.W.1, on June 10-12th, 1948. It is being organised by the National Aquarists' Society.

We regret that space does not permit us to give full details, but these can be obtained from the Exhibition Secretary, Mr. L. B. Katterns, 115, Feltham Hill Road, Ashford, Middlesex.

WHERE GOLDFISH THRIVE —

A corner of the fish-house. Part of the staging is made from an old Morrison shelter

Mr. R. H. I. Read, F.Z.S., Secretary of South London Aquarists' Society, sends these photographs of his Goldfish breeding establishment.

The tanks shown are among 12 housed in a wooden shed, 8 ft. × 5 ft., with a sloping glass roof. They are supported, for the most part, on a steel framework made out of a Morrison shelter.

Heating is obtained by means of three tubular heaters with a total of 420 watts concealed from view underneath the staging. It is not overdone and the temperature in cold weather is never above 45 degs. to avoid coddling the fish. Aeration is obtained by a pump placed in the coolest position and capable of supplying each of the aquaria.

This fish house is only part of a much more extensive outfit which includes a number of ponds and some larger aquaria housed elsewhere.

During the first year, only old stock fish which had been carefully looked after during enforced absence owing to the war, could be used for breeding. Later, however, when it was decided to breed other varieties, some breeding stock of moors and calico veiltails, which were considered good enough for somewhat exacting requirements, were obtained as a result of a prolonged search amongst dealers and friends.

(Photos: G. T. C. Morris)

A pair of Moors in one of the tanks

In this fine spawning bed of giant *Elodea*, in a raised outdoor pool, many fish were bred during 1946 and 1947

Directory of Aquarium Societies

Federation of British Aquatic Societies
Secretary: R. O. B. List, 31, Coronation Court, 31, Willesden Lane, London, N.W.6.

Federation of Northern Aquarium Societies
Secretary: G. T. Iles, F.Z.S., Longsight Lodge, Redgate Lane, Manchester, 12.

Belle Vue (Manchester) Aquarium Society
Secretary: Gerald T. Iles, Longsight Lodge, Redgate Lane, Manchester, 12.
Meetings: Monthly at Belle Vue Zoological Gardens, Manchester, 12.

Benhurst Aquarium Society
Secretary: Mrs. R. Aldred, 30, Benhurst Avenue, Elm Park, Romford, Essex.
Meetings: First and third Tuesday in month, 8 p.m., at Benhurst School, Benhurst Avenue, Elm Park, Romford.

Blackburn and District Aquarists' Society
Secretary: J. P. Eldred, 47, Preston New Road, Blackburn.
Meetings: First Tuesday in month, 7.30 p.m., at the Reform Club, Victoria Street, Blackburn.

Blair Aquatic Club
Secretary: T. Wyber, 85, Richmond Avenue, London, N.1.
Meetings: Each Thursday evening at 7.30 p.m. at Blundell Street Men's Institute (entrance Brewery Road) Islington N.7

Bournemouth and District Aquarists' Society
Secretary: Vernon E. Poulton, 84, Shelly Road, Boscombe, Bournemouth.
Meetings: First Monday in month, 7.30 p.m. at Whitehall Hotel, Bournemouth.

Bradford and District Aquarist's Society
Secretary: R. E. Briggs, 18, Hill Crest Road, off Medway, Queensbury, Bradford.
Meetings: First Wednesday of each month.

Bristol Aquarists' Society
Secretary: H. C. B. Thomas, 46, Welseley Road, Bristol, 7.
Meetings: First Monday of each month at Crown and Dove Hotel, Horsefair, Bristol.

Cambridge and District Aquarists' Society
Secretary: R. I. McKay, 103, Cambridge Road, Great Shelford, Cambs.

Cardiff and District Aquarists' Society
Secretary: L. W. Kenyon, 21, Pum-Erw Road, Birchgrove, Cardiff.
Meetings: Y.M.C.A. Cardiff, 7.30 p.m.

Chelmsford District Aquarists' Society
Secretary: Mrs. C. R. Tappenden, 33, Prykes Drive, Chelmsford, Essex.

Cornish Aquarists' and Pondkeepers' Association
Secretary: Mrs. Howard Spring, The White Cottage, Fenwick Road, Falmouth, Cornwall.
Meetings: First Wednesday in month, 8 p.m., at Millicans Cafe, Market Strand, Falmouth.

Croydon Aquarists' Society
Secretary: G. S. O. Saunders, 5, Blenheim Gardens, Wallington, Surrey.
Meetings: First Thursday in month, 7.15 p.m., at Thornton Heath Public Library, Brigstock Road, Thornton Heath.

Dagenham Aquarists' Society
Secretary: D. F. Eyres, 83, Wren Road, Dagenham, Essex.
Meetings: First and third Monday of month, 7.30 p.m., at Dawson School, Ellerton Road, Becontree.

Derby and District Aquarists' Society
Secretary: T. S. White, F.Z.S., 25, Riddings Street, Derby.
Meetings: First Saturday evening in each month, at Prince Charlie Room, Derby Museum and Art Gallery, Wardwick, Derby.

East Lancashire Aquatic Society
Secretary: Harry Loder, 59, Standish Street, Burnley, Lancs.
Meetings: Last Wednesday of the month at 7 p.m., Church Institute, Manchester Road, Burnley.

East London Aquarists' and Pondkeepers' Association
Secretary: T. E. Butt, 25, Humberstone Road, Plaistow, E.13.
Meetings: First Thursday and third Tuesday in each month, 7.45 p.m., at St. Margaret's Hall, Ripple Road, Barking.

Enfield and District Aquarists' Society
Secretary: Mrs. Frances Perry, F.L.S., Bull's Cross Cottage, Enfield, Middx.
Meetings: Third Tuesday in each month, 7.30 p.m., at the Methodist Church Hall, Enfield.

Enterprise Aquatic Society
Secretary: H. R. Holland, 96, Ridgeview Road, Whetstone, N.20 ('Phone: HILLside 7123).
Meetings: Third Thursday in each month, 7.30 p.m., at Oakleigh Primary School, Oakleigh Road, Whetstone.

Grimsby and District Aquarists' Society
Secretary: A. J. Baskcomb, "Kilgerran," 59a, Bargate, Grimsby, Lincs.
Meetings: First Monday in month, 7.30 p.m., at Victoria Cafe, Victoria Street, Grimsby.

Guppy Breeders' Society
Secretary: Capt. B. T. Stacey, 20, Alverton Street, Deptford, S.E.8.
Meetings: Second Thursday in each month at 7.30 p.m. at the Club Room, Crown Hotel, Prince of Wales Road, Chalk Farm Road, N.W.4.

Halifax and District Aquarists' Society
Secretary: Frank M. Slater, 63, Green Park Road, Skircoat Green, Halifax, Yorks.
Meetings: First Monday in month at the Belle Vue Museum, Halifax.

Harrow Aquarists' Club
Secretary: S. Sanders, 52, Church Avenue, Pinner, Middx.
Meetings: Second Monday in each month, 7.30 p.m., at Roxeth Institute, South Harrow.

Havering Park Aquarists' and Pondkeepers' Association
Secretary: A. C. Edmonds, 257, Carter Drive, Romford, Essex.
Meetings: Clockhouse Lane School, Collier Row, alternate Mondays at 7.30 p.m.

Hertfordshire Aquarists' Society
Secretary: J. H. Gloyn, 14, Rooks Hill, Welwyn Garden City.
Meetings: First Monday in each month, 7.30 p.m., at 21, Roundwood Drive, Welwyn.

Hornchurch and District Aquarists' Society
Secretary: V. F. Swettenham, 5, Devonshire Road, Hornchurch, Essex.

Hornsey Aquatic Society
Secretary: T. W. Tiffany, 38, Talbot Road, Tottenham, N.15.
Meetings: First and third Wednesday of each month, 7.30 p.m., at "The Priory," Hornsey.

Ilford Aquarists' Society
Secretary: S. H. Carter, 13, Kenwood Gardens, Ilford.
Meetings: First Monday of each month, 8 p.m., at Essex House, High Road, Ilford.

Kingston and District Aquarists' Society
Secretary: R. E. Alderton, 25, Park Road West, Kingston-on-Thames.
Meetings: First Thursday in each month, 7.30 p.m., Alexander Hotel, Park Road, Kingston.

Leeds and District Aquarists' Society
Secretary: H. Charles, 113, Ring Road, Cross Gates, Leeds.
Meetings: Second Wednesday of each month at the Lecture Room, Belgrave Youth Club, New Briggate, Leeds.

Leicester Aquarist Society
Secretary: A. Wilson Smith, 56, Hillsborough Road, Blaby, Leics.
Meetings: First Thursday of each month at the Aylestone Road Methodist Church Rooms, Leicester.

Luton and District Pondkeepers' and Aquarists' Society
Secretary: Mrs. P. Saurley, 192a, Old Bedford Road, Luton. ('Phone 4986.)
Meetings: Third Tuesday in month, 7.30 p.m., at Luton Grammar School.

Merseyside Aquarists' Society
Secretary: Mrs. L. Plant, 66, Ferguson Road, Liverpool, 11.
Meetings: First and third Thursday in each month, 7.30 p.m., at Grenville Cafe, 16, Tithebarn Street, Liverpool.

Midland Aquarium and Pool Society
Secretary: D. E. H. Knights, 58, Frederick Road, Wylde Green, Sutton Coldfield, Warwickshire.
Meetings: First Tuesday in each month, 7 p.m., at Chamber of Commerce, Birmingham.

Mid-Somerset Aquarists' and Pondkeepers' Society
Secretary: D. H. Perrett, 15, Penel Orlieu, Bridgwater, Somerset.

National Aquarists' Society
Secretary: Kathleen Cooke, F.R.H.S., 28, Poulett Gardens, Twickenham, Middx.
Meetings: Caxton Hall, Westminster.

Newcastle-on-Tyne and District Aquarists' Society
Secretary: C. L. Crighton, 14, Middle Street, Walker, Newcastle.
Meetings: Y.M.C.A., Blackett Street, Newcastle.

Northampton Aquarists' Society
Secretary: Mrs. E. M. Hunt, 19, Windsor Crescent, St. James's, Northampton.

North Hertfordshire Aquarists' Society
Secretary: R. E. Thompson, 76, Strathmore Avenue, Hitchin, Herts.
Meetings: Fourth Wednesday of month, 7.30 p.m., at Hitchin Public Library.

North London Aquarists' Society
Secretary: J. Gregg, 15, Regent Square, Kings Cross, W.C.1.
Meetings: Every Wednesday, 7.30 p.m., at Holmes Road School, N.W.1.

North Staffordshire and District Aquarist Society
Secretary: G. R. Davies, "Cartrii," Westwood Park, Lock, Staffs.
Meetings: First Wednesday of each month at the Church Institute, Church Street, Stoke.

Nottingham and District Aquarists' Society
Secretary: S. H. Scott, 15, Tithby Drive, Sherwood Nottingham.
Meetings: Last Wednesday of month, 7.15 p.m., at People's Hall, Heathcoat Street, Nottingham.

Oxford and District Aquarists' Society
Secretary: F. Alderton, 35, Phipps Road, Cowley, Oxford.
Meetings: Third Monday of each month, 7.30 p.m., New Baptist Church, New Inn Hall Street, Oxford.

Potters Bar Aquarists' Society
Secretary: F. D. Willis, South Lodge, Cockfosters Road, Hadley Wood, Herts. (Phone: Barnet 3884)
Meetings: Third Monday in month, 7.30 p.m., Ladbrooke School, High Street, Potters Bar.

Preston and District Aquarists: Society
Secretary: M. H. Robinson, 16, Bank Place, Ashton, Preston.
Meetings: First Wednesday in month, 7.30 p.m., at Bennett Johnsons Restaurant, Fishergate, Preston.

Scottish Aquarium Society
Secretary: Strachan Kerr, 42, Aytoun Road, Glasgow, S.1.
Meetings: Christian Institute, 70, Bothwell Street, Glasgow, C.2 (as per syllabus).

Sheffield and District Aquarists' Society
Secretary: E. Chapman, 170, Gibraltar Street, Sheffield, 3.
Meetings: First Friday of month at Victoria Hall Institute (Chapel Walk entrance).

Shooters Hill and District Aquarium and Pondkeepers' Society
Secretary: N. L. G. Taylor, 89, Blackheath Hill, S.E.10.
Meetings: First Monday of month, 7.30 p.m., Trinity Church School Hall, Beresford Street, Woolwich, S.E.18.

Southampton and District Aquatic Society
Secretary: C. C. Parrott, 63, Upper Brownhill Road, Nursling, Southampton.
Meetings: Fourth Friday in each month month at St. Peters Hall, Commercial Road, Southampton, 7.30 p.m.

Southend, Leigh and District Aquarists' Society
Secretary: E. C. Day, 36, Bournemouth Park Road, Southend-on-Sea.
Meetings: First Wednesday of month, 8 p.m., Girl Guides Hall, Westborough Road, Westcliff.

South London Aquarists' Society
Secretary: R. H. I. Read, F.Z.S., "Beverley," Wilbury Avenue, Cheam, Surrey.
Meetings: First and third Wednesdays in month, 8 p.m., at Wimbledon Merton & Morden Ex-Service Men's Club Ltd., 241, The Broadway, Wimbledon, S.W.19.

South Ruislip Aquarists' Society
Secretary: W. Liley, 1, Ferrymead Gardens, Greenfoed, Middx. (Phone: WAX. 3066).
Meetings: Second Tuesday of month, 7.30 p.m., "Old Tauntonian Pavilion," Long Drive, South Ruislip.

South-West London Aquarists' Society
Secretary: Mrs. Bulmer, 6, Kelvin Court, Spencer Road, Chiswick, W.4.
Meetings: Second and fourth Wednesdays in month at 861-3, Fulham Road, Parsons Green, S.W.6., at 7.30 p.m.

Suffolk Aquarists' and Pondkeepers' Association
Secretary: F. Brinkley, 267, Colchester Road, Ipswich, Suffolk.
Meetings: First Wednesday in month, 7.30 p.m., at Lecture Room, Ipswich Museum.

Tottenham and District Aquatic Society
Secretary: T. W. Tiffany, 38, Talbot Road, Tottenham, N.15.
Meetings: Second and fourth Monday in each month, 7.30 p.m., at Rinkin House, West Green Road, N.15.

Tropicold Aquatic Society
Secretary: D. F. Kerrison, 26, Georgiana Street, Camden Town, N.W.1.
Meetings: Every other Tuesday, 7.30 p.m., at 29, McKerrell Road, Peckham, S.E.15.

The Twenty Club
Secretary: G. Frier, 29, Melrose Avenue, Wimbledon Park, S.W.19.
Meetings: Second and fourth Wednesday in month at 28, Redgrave Road, Putney, S.W.15.

Ulster Aquarium Society
Secretary: G. E. Crisp, 31, Lismoyne Park, Belfast.

Wallasey Aquarium Society
Secretary: K. Baird, 34, Montpelier Crescent, Wallasey, Cheshire.
Meetings: First and third Wednesdays in month, 7.30 p.m., at New Palace Aquarium, New Brighton.

Walsall and District Aquatic Society
Secretary: S. Millis-Clarke, 54, Walstead Road, Walsall, Staffs.
Meetings: Second Tuesday in each month, 7.30 p.m., at the Club Room, New Inns, Park Street, Walsall.

Watford Aquarists' Society
Secretary: C. J. Darby, 76, Fuller Road, Watford, Herts.
Meetings: Second and fourth Friday in month, 7.30 p.m., Watford Civic Centre, Watford Field House, Watford.

Welling and District Aquarists' and Pondkeepers' Club
Secretary: E. F. Starnes, 36, Cornwall Avenue, Welling, Kent.
Meetings: Third Monday in month, 8.15 p.m., at Falconwood Social Club, 1, Falconwood Avenue, Welling.

West Middlesex Aquarists' Society
Secretary: A. H. Charles, 91, Uxbridge Road, Hanwell, W.7 (Middx.).
Meetings: Second Tuesday in each month, 7.30 p.m., Methodist Church Hall, Windsor Road, Ealing, W.5.

West Surrey Pondkeepers' and Aquarists' Club
Secretary: R. FitzGerald, 8, Orchard Way, Aldershot.
Meetings: Second Wednesday in month, 7.30 p.m. ,Guildford House, 10a, High Street, Guildford.

Willesden Aquarists' Society
Secretary: R. O. B. List, 31, Coronation Court, 31, Willesden Lane, N.W.6 (Phone: MAIda Vale 8742).
Meetings: First and third Wednesday in month, 8 p.m., at Salusbury Road School, N.W.6.

Wolverhampton and District Aquarists' Society
Secretary: T. S. Pick, 44, Green Lane, Tettenhall, Wolverhampton, Staffs.
Meetings: First and third Fridays of each month, 7.30 p.m., Central Hall, School Street, Wolverhampton.

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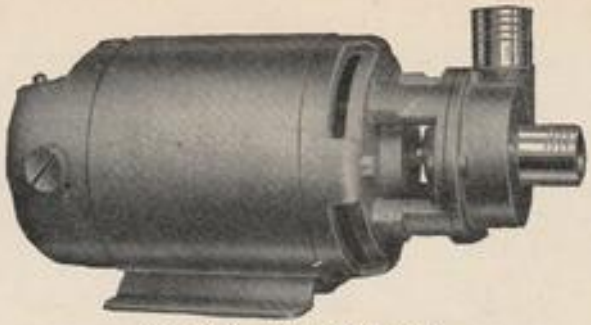

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