

The AQUARIST AND PONDKEEPER

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Ornamental garden with goldfish pool and fountain, designed by Mr. D. Watson, which made a striking show-piece at a recent exhibition of fishes staged by the Gainsborough (Lincs.) Aquarists' Society.

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Editorial

ONE argument that is sure to arise whenever the subject of furnishing an aquarium so that it resembles a natural underwater scene is under discussion, is that this will mean including in the set-up many objects better suited on a rubbish heap. Even in the ponds and streams least ornamented by discarded tins, tyres, bottles, bricks, boots and other scrap, say the exponents of this argument, Nature contributes her untidy load of dead leaves, animal bones and twigs and branches to the bottom scene. These, they say, can find no place in the well-appointed aquarium.

It is refreshing, therefore, to read about an experiment made with such unconventional furnishings which has shown that, far from being undesirable additions, these can be included to some advantage. Writing in a recent issue of *Animal Kingdom*, Mr. James W. Atz, of the New York Aquarium, described how the display of toadfish in a public aquarium was enhanced by placing in it "a tin can, a broken bottle or two and a pair of waterlogged shoes." Items like these are apparently commonplace in the North American habitat of this fish, and in them they take up residence. Before the inclusion of the garbage in the toadfish tank the fish nestled closely together and made a miserable display, giving little indication of their natural activities.

Given the paraphernalia they have pervertedly come to regard as necessary parts of their natural surroundings, the toadfish showed up in true form. Homes were made within the bizarre objects and were fought over and sought after as eagerly as flat-hunting humans seek quarters in an overcrowded city. From a relatively uninteresting spectacle the aquarium became a centre of attraction for staff and visitors alike. The moral of this is, of course, that it is as short-sighted to formulate rigid rules about the way an aquarium should be furnished as it would be to expect any one kind of furniture and decor to equip homes for all humans regardless of race, custom or personal choice. Aquarium furnishings are not merely a display background for the fish, they form important parts of their lives and should be selected to suit natural requirements.

From the Casebook of an Aquarium Sleuth

by CHARLES HAMMOND

RECENTLY the writer received a deceased guppy which had, apparently, departed this life due to the effects of a large swelling in the abdominal region. Unfortunately, owing to the advanced state of decomposition it was not possible to examine the fish thoroughly, but on opening the body a fine, healthy hydrachnid or water mite was found, in a cavity, in the ventral region of the alimentary canal. Rightly or wrongly, for lack of further evidence this was assumed to be the cause of death. How, then, did the mite get into the fish? No instance of the fish feeding on these insects was known and therefore some tests were indicated.

Accordingly, some guppies were set up in a small tank and not fed for several days, after which, believing them to be sufficiently hungry, a number of mites were introduced and reactions carefully watched. Apart from a cursory examination the guppies continued their domestic affairs with a complete disregard for the mites, giving good reason to presume that they did not consider them suitable meat, even when hungry.

Further Enquiries

This made the problem even more interesting. Here we had a death, the instrument by which it had been caused apparently had been found, but how had the instrument been administered? Our tests already made suggested that it was not self-administered, therefore suicide could be ruled out! Could it be murder, or man (fish)-slaughter? Now, further clues had to be sought before an arrest could be made, so enquiries were made as to the type and source of live foods which had been offered to the deceased for the past few months. These queries bore fruit, inasmuch as it was found that live food had been given regularly and was obtained from a local pond.

Immediately a watch was set and in the course of the

next few days a large number of arrests were made and subjected to a searching and microscopical examination. The case began to appear hopeless, as suspect after suspect was found to be innocent, when, suddenly, there in the line up, something different appeared. Was this the clue which, so far, had eluded all efforts to uncover it? The suspect, a *Daphnia*, was immediately isolated in a small cell and more closely examined. There it was, a definite clue at last, for a number of spots, not unlike cysts, were scattered about the body of the *Daphnia*. These were adhering to the animal's shell, ventrally, both inside and outside.

Arrest made

The suspect was at once removed and put into solitary confinement and a careful watch set upon it, after adjustments had been made to gradually increase the temperature in the hope that this would cause it to break down. After some days of this treatment the suspect was taken out and subjected to a further examination, when it was found that the spots or cysts had almost all disappeared; a thorough search of the cell in which it had been kept was made and a number of minute forms removed. On closer examination these were found to be hydrachnidae at the commencement of the free-swimming stage.

Here, then, was verification of what had been suspected. The fact that hydrachnidae were, in the early stages, parasitic and were to be found attached to suitable hosts was already known. Now, having found the host, it was reasonable to assume that the deceased could have swallowed the mite in its parasitic form with its normal food. With this in mind the verdict could only be "accidental death," with, however, the added rider, that more care should be taken, in future, to examine food from sources over which no control is possible, and thereby obviating such unfortunate occurrences.

One thought comes to mind, as the story ends: is this case an exception, just an isolated instance of a death by the accidental swallowing of a mite, or is this one of the reasons for those often inexplicable deaths among our most prized fish? It would be interesting to know.

FRIENDS & FOES No. 17

COLLEMBOLA

PHYLUM:—Arthropoda, from Greek *arthron*—joint, and *podos*—foot.

CLASS:—Hexapoda, from Greek *hex*—six, and *podos*—foot.

SPRING-tails are found abundantly almost everywhere where there is sheltered, stagnant water. So light and small are they that they can strike the meniscus of the water, with sufficient force to hurl themselves many times their own height into the air, without breaking it.

The larger of the two British species is *Pohora* (roughly "tail like a foot") which grows to a maximum of one-sixteenth of an inch, and is blackish in colour.

The species illustrated is *Isotoma palustris*, the smaller of the two species,



Isotoma palustris

hardly reaching one twenty-fifth of an inch when mature. It is creamy-brown in colour, and is content to walk upon the surface of the water until disturbed.

Beneath the body, between the third pair of legs, is a projection rather like the rounded top of a peg. This secures the "spring tail," which at rest appears like

a wishbone, with the peg top at the base of the V. When dead or dying the creature trails the spring behind it, with the two halves parallel.

Moist air, or water, is the first essential of springtails. Without it they rapidly become dehydrated. Eggs are laid and the young are perfect miniatures of their parents when hatched.

I think it very unlikely that these creatures can be considered an item in the diet of fishes. Their extreme agility and constant awareness renders them unlikely to be caught napping by a marauding fish. They can be caught in a net, but usually hop out again before one has a chance to transfer them to a stoppered container.

C. E. C. Cole

THE AQUARIST

Suspended Eggs from the Lamp-eyes

by EDWARD LEE

NEVER has a more apt popular name been applied to a fish than lamp-eyes, as applied to *Aplocheilichthys macrophthalmus*. Though not a very common fish it has an attraction all its own and a small shoal provides a lovely splash of colour to any tank. An active fish, growing to a length of about one inch and a half, its glowing eyes and unusual reproductive methods make it a grand little character to have around.

A member of the panchax group of cyprinodonts, the contours follow the pike-like lines common to the panchaxes, that is, pointed head and small dorsal fin well along the back towards the tail. The body is pale translucent green with only a faint dark line, very narrow and not always visible, along the centre of the sides at the forward end to relieve it. At first glance this line appears to extend as far as the base of the tail but actually it is the backbone that is seen.

The "works" of the fish are totally enclosed in a silvery sac which is plainly visible, taking up most of the forward half of the body. The fins are almost transparent and from a distance of a few feet are virtually invisible, whilst the pectorals are difficult to see even at close range. The pectorals are long and rather pointed, the dorsal and caudal fins, both small, are rounded and the anal fin quite deep at the leading edge tapering off to practically nothing at the base of the tail.

Glowing Blue Eyes

Now to the main feature—the eyes. These form the only decoration the fish possesses, and no bouncing baby boy ever had bluer eyes! The lovely glowing blue more than offsets the comparative plainness of the rest of the fish. To be seen at their best, lamp-eyes should be seen against a dark background with a good overhead light at the front of the tank.

Normally quite peaceful they have a tendency towards fin-nipping and should they be placed with other fish they should be carefully watched. Another tendency is that of leaping clear of the water so the tank must be closely covered at all times.

Whilst this is essentially a freshwater fish it does like a certain amount of salinity—say two teaspoonfuls of sea salt to a 24-inch tank. The sexes can be distinguished by the rounder body and slightly larger size of the female; on the male the anal fin is somewhat deeper. Some authorities suggest that the dorsal fin is pointed on the male but this does not always appear to be the case.

Live food is almost a necessity but dried food will be taken when nothing else offers. When dried food is used care is needed that only small amounts are put in the tank at a time. Lamp-eyes are not bottom feeders and once food touches bottom it is usually left to rot.

This summary of a spawning will show the peculiar breeding habits of this fish. A dozen fish were placed in a 24 ins. by 12 ins. by 12 ins. tank planted with *Cryptocoryne*, and containing nine inches of old water to which a trace of sea salt had been added. After being fed on *Daphnia* for a week it was possible to distinguish the sexes easily. A day or two later the females—there were six—began extruding



Lamp-eyes (*Aplocheilichthys macrophthalmus*)

the spawn, up to about a dozen eggs each. The spawn remained attached to the females in clusters round the vents. Looking like miniature bunches of grapes, the eggs were carried in this way for some hours.

When the spawn was seen several bunches of sea moss were placed in the tank and a thick covering of *Riccia* provided on the surface of the water. Immediately the females began to brush the spawn from their bodies on to the *Riccia*. Once the spawn was on the *Riccia* another bunch appeared on the females and the whole process was repeated several times during the spawning period.

No eggs were seen on the sea moss or the *Cryptocoryne* so it would seem that the *Riccia* is more suited to the fishes requirements. From the *Riccia* the eggs hung singly on minute threads, barely visible to the naked eye, varying in length up to five-eighths of an inch. The eggs, however, were easily seen, being slightly over one-sixteenth of an inch in diameter and hung well below the *Riccia*. In this way incubation took place and took as long as 14 days, though in some instances only 10 days.

By keeping a close watch one could see—with the aid of a magnifying glass—the development of the embryo within the egg. First two black specks appeared and later a third; sometimes, during the last day or two of incubation, the body of the embryo could be vaguely discerned, crescent-shaped. By this time the eggs had swollen to about half as large again as they were originally. During incubation the adult fish completely ignored the suspended eggs.

Rearing the Fry

On hatching, the fry were free-swimming—no dilly-dallying on the sides of the tank or on the plants—but kept close to the surface for the first few days. Though comparatively large the fry required *Infusoria* at this stage. The first fry appeared 10 days after the first eggs were "hung up" but had apparently been eaten by the following day. The adult fish were then removed, leaving the remainder of the fry to hatch in peace.

Seven weeks after the first fry hatched, the youngsters now number over 200, and they are thriving on microworm, fine dried foods and screened *Daphnia*. Already their eyes have that lovely fluorescent blue colour from which the

(Continued at foot of next page)

AQUARIUMS ON THE MAP:



THE Aquarium of the Bristol, Clifton and West of England Zoological Society, though a relatively young installation is, like everything else undertaken by this vigorous body founded in 1834, as good as local conditions can possibly allow. "Local conditions" count for much since Clifton's pure air, fruitful soil, and genial climate make this zoo, with the possible exception of Paignton, the most exotically flowerful and picturesque zoo in the country.

The aquarium is a more or less semi-circular building approached by a steep flight of steps, since it is placed beneath a large and dazzlingly colourful rockery near the elephant walk. Inside we find an outer row of large tanks, varying from nine to four feet in length, and an inner block of community "trop tanks." As in the grounds above vegetation is a veritable riot. Nowhere else have we seen such immense banks of willow moss, or vigorous and glitteringly verdant plants of the white water-lily. Giant catfish, orfe, tench, mirror carp, etc., make up the bulk of the freshwater species, and a specially constructed refrigerator plant keeps the water for trout and grayling below 61° F. in the exceedingly hot Bristol summers. But the high-spot of this section is the "shu" tank. Bristol must be this country's shubunkin factory. Any amateur, if a member of the Society, can raise shubunkins to marketable size in three months. The secret, of course, is food.

An outstanding feature of this picturesque and peacefully situated zoo, high up on the downs, is an expansive lake, varying in depth from two to five feet, with a concrete floor. There are no fishes, but a big population of ducks and pelicans. At one end of this lake is a drainage outflow from the restaurant, and a rich crop of tea-leaves results. Nearby

Suspended Eggs from the Lamp eyes

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species derives its popular name. Throughout, the temperature was kept to the middle 70's and the tank received only little daylight. Electric light was provided, 80 watts for about 12 hours each day. The pH of the water was eight; no hardness test was made.

The spawning period lasted just over two weeks, so naturally the fry hatched over the same length of time. This resulted in various sizes of fry from the same spawning, and called for longer Infusoria feeding than usual; the earlier hatched fry needed microworm long before the later ones had outgrown the Infusoria stage. After the spawning period the fish required a resting period before commencing to spawn again.

One question which remains to be answered is whether the spawn is fertilised whilst still being carried by the

A Visit to Clifton Zoo Aquarium

by L. R. BRIGHTWELL

is a little stone pier or landing-stage. Now watch, and see with me what happened only a few months ago, and still happens save in the very coldest weather.

An elderly gent, exercising the privileges of membership, passed a dip-net rhythmically through the water for some minutes. It came up with a good pint of *Daphnia* looking like iron rust, but very much alive. He parked this load on a canvas tray, one of 10 neatly arranged in tiers in a handy little cabinet. When the cabinet was full (15 minutes' work) he walked off, saying laconically: "Very good for shus, y'know. Brings 'em up to market size in three months. I'm going to try and dry this lot for winter feed, but I'm wondering . . . oven's doubtful, and you can't rely on our sun. It'll have to be the oven. I'll try it when she's out . . . but she always rumbles me. G'night."

One can only assume that at Bristol aquarist shows, zoo members exhibiting shubunkins are given a sufficiently heavy handicap.

Clifton's latest is two big sea-water tanks, each nine feet long, three feet six deep and about six from back to front. These were inaugurated in the spring of 1952 and may be called an heroic effort, for the water has to be brought in barrels from Blackpool. Bristol Channel water can be salt enough, but it is so heavily charged with fine mud that no filter can keep it out of the exhibition tanks. Even so there is a splendid assemblage of anemones, lobsters, crabs (these all bought at street stalls) and assorted fishes—plaice, bass, bream, gurnard, etc.

A crowd always blocks the windows of these tanks for there is no draw like a really good sea-water show. Something is always *happening*—not just swimming up and down.

Clifton's Aquarium is and should be a very happy one. Think of those water fleas!

females or when it is deposited on the floating plants. A great deal of patience will be needed to answer that, for the males seem to pay just as much attention to the females be they carrying spawn or not.

GOOD SHOW

KEIGHLEY Municipal Museum has for some time been the possessor of an aviary. Now its interests are to be extended to include a wide selection of tropical fish for public viewing. Altogether there will be seven tanks for the museum, and these will all be stocked, installed and serviced by members of the Keighley Aquarist Society. Six of these tanks will be located in the main hall, and the seventh in the entrance hall near the aviary. To help keep interest alive in the hobby the aquarist society is arranging that the various kinds and types of fish will be changed from time to time.

AQUARIST AT HOME:

Mr. W. Sharp and Mr. E. Sharp (BRADFORD)

Interviewed and photographed by JAS. STOTT

IT was in December, 1946, when Mr. W. Sharp and his son, Mr. E. Sharp, of Daisy Street, Great Horton, Bradford, decided to go into partnership with the hobby of fish-keeping. In all, seven years ago and those years have been well spent, a fact which should become obvious very quickly to anyone who pays a visit to their fishroom.

There is nothing spectacular to be seen unless it is the fishes, tiger barbs, in magnificent colour and condition. A closer inspection of the equipment in the fishroom, however, will reveal that here is a well thought-out installation, free of all unnecessary trimmings, an outfit planned and designed to do a certain job and that is the breeding, rearing and keeping of tiger barbs on specialised lines. Mr. Sharp and his son are specialists in the true sense of the term; they have kept and bred nothing else but the tiger barbs since 1949.

They have 14 tanks in all, ranging in size from 24 ins. by 12 ins. by 9 ins., which are used for breeding tanks, up to 48 ins. by 15 ins. by 18 ins. The tanks are mounted on substantial staging constructed of metal and part wood. Aeration is laid on to all tanks and immersion type heaters are used and, of course, are thermostatically controlled.

Their method of breeding the tiger barb is quite a straightforward procedure. First of all the conditioning, and for

Mr. W. Sharp (right) and his son, Mr. E. Sharp, specialist breeders of tiger barbs



this purpose live *Daphnia* is used entirely unless winter breeding is carried out, then, with *Daphnia* unobtainable, chopped earthworm is given. *Tubifex* is never used in this establishment for feeding.

The sexes are conditioned separately and when ready are introduced to the breeding tank, which is prepared by covering the base with approximately one inch diameter sandstone pebbles and placing three or four clumps of sea moss in the centre. Artificial top-lighting is used, but this is controlled by means of a mask which is placed between the source of light and the water surface. It has a hole about two inches in diameter cut out in the centre which permits the beam of light to be concentrated on to the bunches of sea moss. Mr. E. Sharp informed me that this helped to get the spawning concentrated to the centre of the tank and away from the cooler water of the tank sides.

The water used is tap water permitted to settle for 48 hours in the breeding tank and gradually heated to the required temperature (80° F.). The breeding pair is introduced to the tank in the evening and the light switched on early the following morning. If the spawning does not occur within the next 24 hours then the breeding pair is removed and given a further period of conditioning.

When the fry become free swimming Infusoria is provided, and this is prepared in the following manner. In an attempt to obtain a heavy culture of *Paramecium*, hay is used. It is not boiled but placed into cold water in an all glass tank and exposed to the air. It is allowed two weeks to develop. When fed to the fry drip feeding is not used. Instead a pound size jam jar is filled with solution and siphoned therefrom by a narrow bore rubber tube; this is moved evenly over the water surface whilst so doing in an attempt to get the Infusoria quickly spread throughout the tank. One jar-full is given per day and Infusoria is fed for three days, then replaced by brine shrimps. Depending upon rate of growth brine shrimps are given for about three weeks, then the youngsters are gradually introduced to sifted *Daphnia*.

The adult fishes are fed a varied diet, consisting of one dry feeding and one live feeding per day. For live food chopped earthworm, *Daphnia* and *Cyclops* are given freely. The sexes are kept separate in the stock tanks and separation is carried out at the earliest possible moment among the young, growing stock.

I was interested to hear these partners say that they feel all serious aquarists should eventually think in terms of specialisation because they are sure that increasing the ranks of specialist breeders is the only way whereby the quality of aquarium fishes can be improved. They would also like to see more species covered by national standards, and one set of national standards adopted as soon as possible. In

(Continued overpage)



Tiger barb breeding unit: large aquarium for final growing stages of young fish, intermediate stage rearing tanks below and three-tier breeding aquaria on right

Aquarium and Pond Goldfish Varieties

7. Veiltail Goldfish

BOTH the scaled and calico veiltail are recognised by the Federation of British Aquatic Societies. The former should have the colour of the common goldfish, that is a rich warm red, whilst the latter is like the calico fantail, i.e., a blue ground with black speckling, with mottlings of red, brown and violet. As a fancy fish the calico is to be preferred, as the necessary flowing fins seem to suit the soft texture of the skin much better than the hard brassy appearance of the scaled type.

The body of the veiltail should approach a sphere in shape, and the nearer to this almost round shape the better will the fish be for show purposes. The back should rise from the nose in a good sweep without any bad break and there should be no suggestion of a snout or humpy back. Many otherwise good fish are spoiled by a flat back, and although this may be a good feature for a prize cow, it is not desirable for this type of fish. Many fish are seen with the deep rounded belly but few are seen with the nice high rounded back. The iris of the eye should be coloured and the eye should be normal.

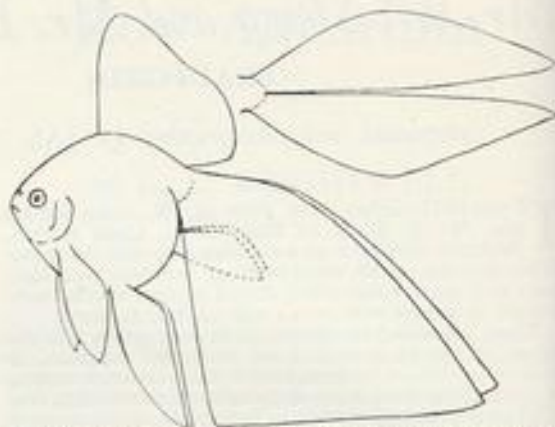
The dorsal fin should be full and large, three-quarters as high as the depth of the body, with the front edge vertical. The back of the fin should be well rounded and full. The caudal fin or tail should be completely divided and considerably greater in length than the body. It should be carried well spread with the outer edge as wide as the fin is long. The base of the fin should lie in a straight line parallel with the long axis of the body. It should not be forked, and this is where many fish fail at shows. The deep forking bears too much resemblance to the tail of the fantail, and this must not be.

The pectoral fins are broad and pointed and in length equal to that of the dorsal fin. The pelvic fins are similar to the pectorals but longer, as deep as the body. The anal fins are paired and completely separate, half as long as, but similar in shape to the pelvic fins. A single anal can bring disqualification at a show.

I consider that this fish is the favourite fancy goldfish, but it is not so suitable for the outdoor pond as the fantail. The extra and flowing finnage tend to encourage fin congestion, and fungus can also be a menace following a bad winter. Although it will do quite well in a fair-sized pond in the summer, I think that it is advisable to keep the fish under cover for the winter months. This is especially so with all show specimens. It is noticed that the extra short tubby body tends to make the fish more susceptible to the air bladder troubles which are often aggravated by sudden cold spells. The scaled types are more suitable for the pond than the calico fish, but I do not think that they are nearly as handsome as the others, and as it is more difficult to breed a near perfect calico than a scaled one, the former will usually beat the latter where other points are equal. It is important to see that the young fish have plenty of space in which to develop, as they will not grow at their maximum rate unless they have room.

It is well to breed this fish under controlled conditions, as very few good fish could be raised in a pond. The large tail of the fry is apt to get caught up in water weeds, especially blanket weed, and this can cause death, or at least damage to the tail. When rearing the fry it is essential that plenty of starchy foods are given and once the fry are three weeks old they should have a small portion of cooked oatmeal each day.

For show purposes it is imperative that the fish should have a good caudal fin, as this is the most important feature, and 35 points out of a possible 100 are allotted for the tail.



Veiltail goldfish outline showing on the right the tail seen from above. From "Show Standards for Cultivated Fishes" (F.B.A.S. 2s. 6d.)

The calico fish gets 20 points for colour against 10 for the scaled fish, and the difference is made up by the scaled fish getting 20 points for the body and the calico receiving 15. Both types get five points for condition and the same for department. The other fins of the calico are allotted slightly less than the scaled fish.

It is very rare that one sees a good veiltail of the calico type, for even if the caudal fin is excellent, the colour often lets the fish down. Many of these fish are difficult to judge as they will not move around to show their tail shape, and they are then sure to lose points not only for department but because it is almost impossible to judge such a specimen.

Adult veiltails should not be kept in a tank less than 24 ins. by 12 ins. by 12 ins. and there should be very little rockwork, if any, in the tank. Water plants should be well chosen as the large and flowing tail of the adult can easily be caught up in the wrong type of plant. I suggest that short pieces of twisted *Vallisneria spiralis torta* and the smaller willow moss (*Fontinalis gracilis*), could be used solely.

When choosing veiltails for a show it is imperative that the caudal fin is carefully examined, and although a fish may lose some points for the lack of conformity in other features, if the tail is extra good the fish can pick up enough points from this to be able to beat others in the class.

Food should be well varied and some Bemax, dried shrimp and earthworms can be the main diet. The food for prospective breeders should contain plenty of earthworms.

A. Boarder

Aquarist at Home

(Continued from the preceding page)

this respect they think the F.B.A.S. standards offer the best starting point.

They are members of the Bradford and Leeds Aquarists' Societies, in fact, Mr. W. Sharp is the president this year of the Bradford Society and his son is a committee member. At the present they hold two of the Bradford Society's silver trophies: the Whatmough trophy for furnished aquaria and the Gill trophy for barbs.

THE AQUARIST

My Experiences in Shubunkin Breeding

by JOHNSON H. HOOD

I FIND the articles which interest me most are the personal experiences, opinions, and methods given by the authors. In the hope of encouraging others to express their views freely on the keeping, breeding, feeding and exhibiting of goldfish varieties, I venture to offer the following contribution from my own experiences.

First a brief description of the facilities at my disposal for breeding shubunkins, which are my main interest. On the gable-end of the house I have a fish house 30 feet long and 5½ feet wide, of the lean-to variety, constructed of brick, having nine inch walls, and a glass roof. There are two tiers of tanks supported on "spikes" of angle-iron 2 ins. by ½ in., built directly into the outer nine inch wall at 18 inch intervals with no upright supports. The upper tier of tanks measures 3 ft. by 10 ins. by 9 ins. The lower tier comprises three tanks which average 6 ft. by 15 ins. by 15 ins. in measurement. Below the tanks is a pond or channel 19 ft. long, 2 ft. wide, and 1½ ft. deep.

Outside in the garden, there are two ponds each 8 ft. long, 5 ft wide and 2 ft deep, two old baths, and an oddment of old sinks and tubs—much to my wife's disgust! From an aquarist's point of view, these eye-sores are among my valued possessions because they yield many thousands of bloodworms each winter, to say nothing of *Daphnia*, which breeds fairly freely.

Early Breeding Preparations

Here is the broad outline of my breeding methods. When the winter frosts begin in earnest I bring into the fish-house the brood fish selected for spawning, place them in the indoor pond, and feed them very sparingly. It has often been stated that fish lose their appetite below 50° F. but be wary of such statements: I have seen my fish have a very good meal when the water temperature was in the region of 36°-38° F., especially of bloodworms or white-worms. This was in the days when I wanted to do my "best" for the fish. However, I would advise little or no food during December and January and you will find the fish will come into breeding condition much easier and respond to food much better than if they were well fed and in semi-condition over the winter.

In the middle of February, if the weather is at all reasonable, I inspect the local ponds for *Daphnia* or *Cyclops* (it is usually *Cyclops* I find) and when there are signs of their numbers returning, then—and then only—do I begin to condition the fish. I prepare the large tanks and place the males in one and females in another. In each tank after the fish are settled I put one 120 watt heater; as a result the temperature of the water rises to between 55°-60° F. in a 6 feet tank, and the fish are soon feeding heavily on a mixed diet of *Daphnia*, earthworms, white worms and bloodworms. The fish soon respond to this treatment. Tubercles appear on the males, and the females soon bulge. Incidentally, I find all my females always have a considerable amount of spawn in them over the winter, and find this spawn is never absorbed into their system as has often been suggested by various writers.

Within a month the fish are ready to spawn and so I supply a large amount of plants (generally water crowfoot



Photo: Laurence E. Perkins
Prize-winning shubunkin goldfish

which is plentiful and at its best in early spring) at one end of the tank, and place the fish together. I choose a Saturday morning when I am free and they generally spawn immediately; if not, they are almost certain to do so on the Sunday morning when I am still at hand. After spawning the fish are removed, another heater put into the tanks, and the temperature raised to 68°-72° F. giving a four to five days hatching. The fry are fed on Infusoria for five to six days after free swimming, and then weaned on to finely sifted *Daphnia* or *Cyclops*—preferably *Cyclops*. On this diet they make quick growth.

The plants are removed at the earliest possible moment after the fry are free-swimming and no sand is used at any time. After 12 to 14 days the young fish are given a complete change of water, and this stimulates their growth tremendously. As I never feed dry food to fry under 10 weeks old the tanks keep reasonably clean, but fairly frequent changes of water are made as I believe this promotes hardier fish and steadier growth. As they grow, the fry are spread over the three large tanks, reduced in temperature to about 55°-60° F., and culled for runts, etc. A small amount of aeration is supplied.

As soon as the weather permits they are placed in the outdoor ponds to grow on, and the spawning procedure repeated. I never attempt to rear a spawning after June as I believe all fry should be over two inches long by September if they are to be brought through the winter safely. The first spawning usually averages in size about three inches by September-October, and it is a fairly simple matter to choose the fish you wish to retain for breeding or show purposes, and the buyers of the rest receive good value for their money in size, if nothing else.

Colour Distribution

An interesting point about pairings is that I find a much higher percentage of good fish is produced by using an uncoloured (metallic) female of known parentage and a really good nacreous (mother of pearl scaling) male. From this cross the expectation is 50 per cent. metallics and 50 per cent. nacreous. The metallics can be culled within three weeks of hatching, and time, space, and food, can be devoted to the 50 per cent. nacreous. In the nacreous cross the expectation is 25 per cent. metallics, 50 per cent.

nacreous, and 25 per cent. matt, and as the matts are rarely any good you are faced with the problem of rearing 75 per cent. of the spawning instead of 50 per cent. This means 25 per cent. of the fish reared will give little or no reward for your labours as they are chiefly of the flesh-coloured type.

A few observations on shubunkins generally. It seems to me the trouble with most of the strains of shubunkins to-day is too much body bulk, due no doubt, to the mixed heritage and origin of the shubunkin. The remedy appears to rest in the hands of the breeders and (dare I whisper it?) in the hands of the judges on the show bench. By applying a rigid type test to all exhibits, and disqualifying all nymph types regardless of colour, a big step would have been taken in the right direction.

One of the most attractive features of the shubunkin is the endless colour patterns possible, and I feel sure that this is the mainspring that keeps the average breeder plodding on year after year with hope springing eternal with each new spawning. Indeed, has not the colour factor been the keystone of a lot of spawnings that should never have taken place? The beautifully-coloured, long-finned, but obese specimen has been the downfall of many a well-meaning amateur breeder seeking a short cut to glory! I know because I have been one of them! What sort of colour factors should we concentrate on? Personally, I favour the red-blue-black combination, and believe these catch the eye and arrest attention quicker than most other

combinations. Did I hear someone say red was not possible in the goldfish? I will compromise with deep orange if that is more acceptable! You may say the show standards call for yellows and browns—believe me, you will obtain all of these and more, when you try for the red—I beg your pardon—orange.

One final word on colour. Why do our cherished specimens look washed-out in the show tank, and under artificial light, when they looked so magnificent when first brought out of the pond? The answer to that one rests in the difference between nacreous and matt scaling. Nacreous scaling reflects the light, matt scaling does not. The moral of this is to breed fish with as much nacreous scaling as possible.

Here are a few odd hints that have occurred to me.

1. Do not let colour over-rule type when selecting breeders.
2. A meaty diet in the early stages helps to keep down body bulk. Remember, fish shape can be altered by a starchy diet or excessive feeding.
3. We rarely give our fish enough green food. Green food promotes healthy flesh without fat.
4. Two months without food in the winter does fish the world of good if they are in good condition prior to the fast.

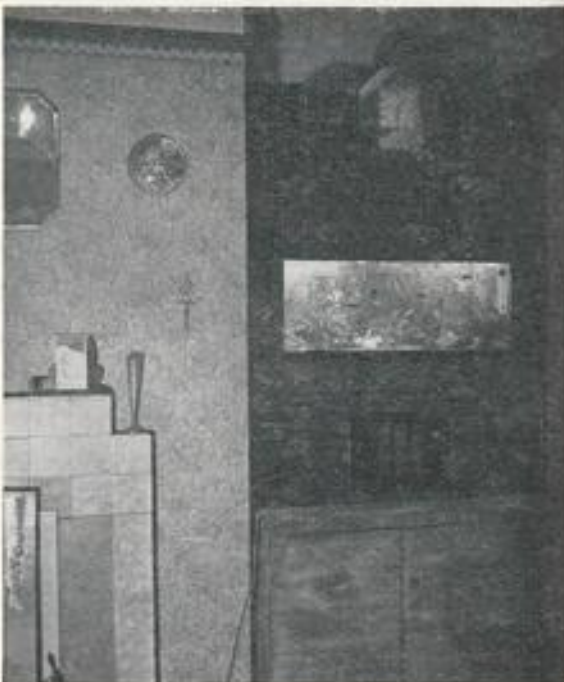
If the foregoing remarks have stimulated you adversely or otherwise, get out that pen and paper and air your views, then this article will have achieved its purpose. Goldfish breeders may be widely scattered but we have a common meeting ground in the columns of our magazine.

Making Use of the Odd Corner

THE advantages of "boxing-in" a tropical aquarium so as to make an attractive cabinet surround have often been listed, but there is an additional advantage which applies to some forms of aquarium cabinets that is less frequently described. When a tank or several tanks can be fitted into some odd alcove or corner of the home in such a way that this is utilised in a decorative manner and also made to provide extra cupboard room this is a plan which usually finds great favour with the "lady of the house"—an advantage indeed.

A corner of a hall which is badly lighted can be brightened up considerably by a triangular aquarium with overhead illumination in a frame built across the walls, for example, and the space by the chimney breast of a room is another favourite situation. In the accompanying photograph is shown such a fitted cabinet in the home of Mr. S. M. Davies of Wolverhampton. As well as useful cupboards at the bottom of the cabinet, Mr. Davies has built in a radio underneath his aquarium and incorporated a clock above the tank as a finish to the upper part.

The section of the frame surrounding the aquarium can be readily removed for servicing purposes, and all electric wiring and accessories are normally kept out of sight. There is obviously space for more than one aquarium to be



included in a design such as this, and it is an idea likely to appeal to the aquarist with a floor space problem. As shown by the picture giving a close-up view of Mr. Davies's aquarium, plants thrive under the overhead artificial lighting and their growth is vertical without the influence of side lighting.





*A page for
the beginner
contributed
by*

A. BOARDER

AT this time of the year your pond should be looking at its best, with water plants well established and the water lilies in flower. It is surprising how long these keep in bloom providing they receive the correct attention. All dead flowers should be removed, as they tend to decay very quickly and foul the water. You will probably find that as long as the pond is not over-stocked with fishes very little artificial feeding need be done. There is sure to be plenty of natural foods in the pond and if the fish are healthy they will be forever foraging about in search of food.

The indoor tank may need some special attention just now in addition to the weekly servicing. It will be found that some of the water plants have grown very "leggy" and have probably formed a mass at the surface of the water. Many of these long shoots should be removed, as it is not good to have most of the plant life at the surface. If this is the case much of the oxygen given off during the day may not benefit the lower strata of the water. If some of the long shoots are removed from a plant the shortened pieces will send off fresh shoots which will improve the look of the tank and tend to make a denser growth lower down. After a week or two the remaining long shoots can be taken off.

Feeding During Summer

Whilst the weather keeps warm it is surprising how much food goldfish can eat during a day, providing it is given in small quantities at frequent intervals. I have found that my own fish in tanks will take a fair amount of food every hour of the day, but I make sure that each feed given is completely cleared up within about five minutes. If the fish have plenty of room in their tank they will make good growth with such treatment, but it must be remembered that if the tank has been stocked to the maximum with fish in the first place, then extra growth must not be looked for. The safe rule is one inch of fish to each 24 square inches of surface, but naturally if the total amount of fish is already in the tank, fresh growth will not appear. If during thundery weather the fish are seen at the top of the water blowing bubbles, some water should be removed and fresh tap water introduced. Do not worry if this is cooler than the old, as it will benefit the fish, not harm them.

There is still time for the fish to spawn again in the open pond although such spawnings are not as easy to rear well as those from June or July. It is not at all impossible to rear such late fish and if some extra warmth can be provided after the middle of October, they may be grown on quite well. In the early part of the year many pondkeepers were very worried about the lack of spawnings and I met many worried aquarists who could not account for the fact. It is very difficult to say what does encourage the fish to start spawning and my account of the first spawning from my fantails in the open pond may give many cause to think. Over many years of breeding from my fish I have tried to fix some actual occurrence which has tended to start the fish spawning, but each year something different happens and I am left with the conclusion that the fish will spawn at their

own time and of their own free will when conditions best suit them.

I had intended this season to watch the barometer very closely to see if I could find out whether there was any truth in the statement that fish spawn best when there is a fast-rising barometer. I had found that as a general rule my fish had spawned at the commencement of a settled warm spell and this did tend to show that the barometer readings may have a very good chance of indicating to you when a spawning might be expected. This season has been the latest I have ever experienced, as my fantails did not spawn at all until 17th June. Last year the first spawning was on 15th May, at the beginning of a very warm spell.

This season my fish looked in prime condition, and in fact a couple of the females appeared so full of eggs that it was difficult for them to swim properly. I was away from home for a week in early May, but I do not think that the fish had spawned whilst I was absent. Why was it then that no eggs were laid until such a late date? The fish were healthy, they had had a medium winter, neither too severe nor too warm, they had been fed well with earthworms, frog tadpoles and a little dry brown bread, but still no signs of chasing. As week followed week and the middle of June had passed I tried to find some reason for the non-spawning. The only thing I could think of was the fact that the barometer had been fairly steady for a considerable time, with no rapid rise recorded.

When the fish did start spawning I inspected the barometer, expecting that at last I should be able to say definitely that this had some effect on the fish, but no such luck; the barometer stood at 29.62 inches and only showed a rise of 0.07 of an inch. This could not be called a rapid rise and was in fact not as much as had happened many times during the previous month. The spawning was small, but I expected that the following day would see the spawnings in full swing. I was not disappointed, as the fish were well at it when I first looked at 7 a.m., and continued up to mid-day. Very many eggs were laid and it was what I would describe as an ideal spawning. The barometer had certainly risen slightly, but only to 29.7 inches, and so from the 16th to the 18th, it had only moved from 29.55 to 29.7 inches, in my opinion not enough to suggest that it had much effect on the fishes.

Weather and Spawnings

The next question was, what about the weather? Well, it rained fairly frequently during the day on the 17th, but the 18th was decidedly better, there being only a few spots in the afternoon. On the morning of the 19th, some of the fish were still spawning and many eggs were laid on the fresh weeds placed in the pond. Strangely enough it was raining fast whilst they were still spawning, but there certainly was promise of better conditions later on as the air felt milder. The barometer had only moved to 29.72 inches, and so again it did not give a very good indication.

(Continued overpage)

IN THE Water Garden—by Dr. W. E. SHEWELL-COOPER

WELL over two years ago, at the request of readers, I dealt with the question of the propagation of rock plants, and once again this subject has come round, because there is no doubt that people are very keen to increase their own stock. Very large numbers of plants can be propagated by means of seeds, and those who are interested in this particular method should know that there are one or two seedsmen who specialise in providing seeds of both the usual and unusual kinds.

The great advantage of raising plants from seed is that they are extremely healthy and vigorous. They do far better on the whole, especially in the early stages, than the plants raised from cuttings, and incidentally it is one of the best ways of acclimatising the imported strains. Some have been able to raise new varieties this way, especially with aubrietia, and new colours here are always welcome. Those who are anxious to save their own seeds should try and gather them just as they become ripe, and therefore are ready to fall. Once gathered, they should be placed in a shallow receptacle—I use an aluminium tray for the purpose—so that the seeds can be baked in the sun for a fortnight or three weeks, before being put into packets and labelled. This thorough ripening off, or baking, is very important. One of the reasons why readers have failed when saving their own seeds is because they didn't realise that this baking process was an absolute necessity.

The actual seeds should be sown during late February or early March. The result is that the plants are quite big enough and strong enough to be put out into the positions where they are to grow early the following autumn. Those who have saved seeds of the earlier flowering kinds, and have seen that these are thoroughly baked, may make sowings at this time of the year, and in that case the plants will have to be overwintered in frames, and then will be ready to put out into the rock garden or among the crazy paving stones the following spring.

The seeds should be sown in a sheltered bed with a western aspect. Fork the soil over lightly and add fine sedge peat, at least a bucketful to the square yard, and if the soil is very heavy incorporate at the same time fine silver sand at half a bucketful to the square yard. See that there are no perennial weeds present, and when all is ready, tread the bed over to make it firm, and finally rake it lightly to produce a level surface and a fine tilth.

Drills should be drawn out very shallowly six inches apart, and the seeds should be sprinkled thinly in these. A simple way of making the drills is to press a fairly thick bamboo into the ground just to make a depression of the right depth and length. Any similar sized rod will do. On the whole this is a more satisfactory method than trying to scratch a very shallow straight drill with a hoe. Once the seed has been sown, sift a thin layer of sterilised soil over the top, or if this is not available use some ordinary soil mixed in equal parts with fine sedge peat.

Unfortunately, the seeds of most alpinines are very slow germinators indeed. Therefore it makes it very difficult to keep the strips of land in between the rows hoed, for one cannot see where they are until too late. I always sow some mustard seed in the rows and this comes up very quickly indeed. I can then tell within a fortnight or so where the lines are to start hoeing, and when the alpinines do come through, the mustard seedlings are very carefully pulled out.

For some reason or another slugs are very partial to alpine seedlings and in many gardens one has to be careful to put down a metaldehyde bait. This consists of a handful of breadcrumbs and a saltspoonful of powdered metaldehyde. Little heaps of this are put at two feet distances all

around the bed, and if possible a little slate or tile is put on top of each to act as a "roof" and so keep off the rain. If the weather is very dry it may be necessary to water thoroughly through the fine rose of a can until the plants really get going.

Those who only want to raise a few plants will find it easier to do this in trays. There are some excellent aluminium ones available to-day which are quite clean and which last for ever. They are far more hygienic than the old-fashioned wooden trays and I find they give better results. Fill the trays up with the John Innes Seed Compost after putting some crocks in the bottom over the drainage holes. Press this down level, so that it is within half an inch of the top. Those who do not want to bother to make up the J.I. Compost, and who cannot, or will not buy it, must use ordinary soil mixed with one part of sedge peat and one part of coarse silver sand, and when this compost is in the boxes boiling water should be poured over to help sterilise it.

The seeds can be sown very thinly indeed in little rows made two inches apart parallel to one another across the box. A little more of the sterilised compost is then sifted over them through a fine mesh sieve to cover. A sheet of glass should then be put over each tray and they should be stood in a frame or a cool greenhouse. Any watering that is necessary should be done by plunging the trays up to the rim in a bucket of water for a minute or so. This must be done very carefully and slowly or the earth can be disturbed. When the seeds have germinated the glass may be removed and then if the seedlings appear to be too close, they can be thinned out to at least an inch apart and the rest of the thinnings transplanted into other trays. It's great fun standing the trays out into the open in the autumn, and it's a good thing for the plants to be covered with snow. It doesn't matter if the seeds haven't germinated. The extremes of temperature will help. With alpinines I have known seeds take two years to come through!

Stepping Stones

(Continued from the preceding page)

Now what else was there from which I could draw any conclusions? The weather had been very bad for June, with a considerable amount of cold east and north winds. I had felt fairly certain that there would be no spawnings whilst the cold winds continued. I was quite right about that, as once the wind turned towards the west, although it brought some showers it also brought milder conditions. I have sometimes said that if the sun shines on the pond in the early morning the fish are often encouraged to spawn, and on the first morning of the spawnings the sun was very bright. This was not so on the second and third days, but I think that once the fish have started spawning they continue at least for another day as long as the wind does not swing to the east.

The temperature of the water on the first morning was 61° F. and it did not vary very much during the following three days. This is the average temperature for spawnings over many years but I have had them at as low as 50.5° and as high as 75°. There were 12 spawning goldfish (fantails) in the pond, but I cannot say for certain which ones spawned on each day, as different females may have followed on separate days. I must admit that I have been unable to draw any definite conclusions on this occasion as to what does affect the fish and cause them to commence breeding.

The Guppy

(*Lebistes reticulatus*)

ORDER:—Cyprinodontes—from Greek *kyprinos*—a kind of carp, and *odontos*—tooth.

FAMILY:—Poeciliidae—from *poikilos*—many coloured.

SPECIES:—*Lebistes reticulatus*—from Greek *lebistes*—a kind of fish, and *L. reticulatus*—like a net.

THE wild guppy was first discovered in the British West Indies and Dutch Guiana. It has been artificially introduced into many parts of the world since its discovery, and has benefited both man and beast by its ceaseless war against the larvae of disease-carrying mosquitoes.

The aquarist, however, while recognising and saluting the fine work of the guppy in this direction, keeps it in his tank because of the outstanding beauty of the male fish. Although seldom reaching a greater length than one and a quarter inches, these can justifiably be designated "living gems." Patches of all the colours of the rainbow, in an infinite variety of patterns, are scattered over the entire fish, including, in many cases, the delicate fins. Female guppies, by comparison, are almost drab, and the tyro can easily be forgiven if he or she refuses to believe they belong to the same species. Fully grown specimens are easily twice the size of the males, and an entirely different shape, as reference to the figure will show.

Drab though they may be to our eyes, a female guppy never lacks suitors. Usually, as she swims nonchalantly about, she is accompanied by several males, who swim round, over, and under her, spreading their fins, twisting their bodies into unusual shapes, darting towards and away from her, making, it seems, frantic endeavours to attract her attention, but without any noticeable success.

The modified anal fin of the male guppy is called a gonopodium, and through this organ, which is capable of being swivelled in any direction, he projects "sperm balls" towards the female. Some of the sperms enter her body and fertilise the ova they find. It is not the least interesting thing about these little fishes that after one fertilisation the female is able to develop and give birth to several successive broods of youngsters—even if she is isolated from all further contact with the males. Her body becomes very much swollen as the young fishes develop, and often the eyes of the embryos can be faintly made out through the semi-transparent puberty spot. The time taken for the young to develop depends to a great extent on the temperature of the water. Thus at 65° F. it may be three months before the mother drops them, but at 75° F. they will emerge every four weeks—sometimes even less.

At birth there may be only a few, or as many as a hundred. Usually the fry are capable of looking after themselves immediately. Nothing gives greater delight to a newcomer to the hobby than the birth of a family of youngsters. I have known man and wife (sober, sensible people normally) join hands and dance round the room at the sight of their first school of babies. To save the fry from being devoured by the mother fish it is necessary to provide at least one thicket of plants into which they can dive at her too near approach. Should she elect to pursue them into the thicket



Photo:

Male and female guppies

W. S. Piet

it is as well to ensure that it is thick enough to impede her movements. An alternative is to use a trap, which, while retaining the female, permits the fry—each about one-third of an inch in length—to escape.

Feeding and raising guppies presents little difficulty. To ensure maximum size and the maintenance of first-class condition, however, live food should be given whenever available. *Cyclops* nauplii, baby *Daphnia*, gnat larvae (newly hatched), will be eagerly snapped up, as indeed will any live food sufficiently small for the tiny mouths to seize. In the absence of live foods many of the advertised dry foods are relished. Particular care must be taken to feed only medium or fine grades of dried food. Some aquarists advise soaking food before dropping it into the aquarium. It certainly swells considerably if soaked, but the majority of fishes seem to get on quite well without their meals receiving this preliminary treatment.

No article on the guppy can be written without mention of the Guppy Breeders' Society, which has devoted many years to patient and careful line-breeding. The result of this work has been the establishment of many beautiful strains of quite distinct finnage, and outstanding size. It is almost entirely due to the pioneers of this Society that the guppy holds an unprecedented position in the British aquarist's world to-day. Nor have our brother aquarists in America been idle. Within the last three years several particularly beautiful strains have been received from there.

Although *Lebistes reticulatus* will live amicably with fishes of other species, they deserve an aquarium of their own. Some of their beauty seems to be lost when kept with larger and more solidly coloured fishes.

Post-Mortem Examination of Fishes:

W. Harold Cotton, F.R.M.S., P.Z.S. 39, Brook Lane, King's Heath, Birmingham, 14. (Phone: Highbury 1693)

Specimens should be sent direct to Mr. Cotton with full particulars of circumstances, and a fee of 3s.

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 grease proof 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.

AQUARIST'S Notebook



by
RAYMOND YATES

DUCKWEED (*Lemna*) is probably the commonest aquatic plant found in Britain, and there is hardly a pond or ditch in which it cannot be found in summer. Many aquarists keep it in their tanks and it grows rapidly, if provided with a good top light, and soon covers the top of the water with a green mat. This is certainly attractive and provides some food for those fish which like to nibble at the young roots, and it also provides shade from the glare of the lamps. The dense surface mat does not inconvenience labyrinth fish and the surface intake of oxygen is unaffected.

Young fish like to browse under this plant and some of them bite the rather long single root which can attain half to three-quarters of an inch in length. These severed rootlets turn white and float about the tank, and an inexperienced fishkeeper might take them for *Hydra*. It is unwise to collect this plant from a wild source as one is almost certain to introduce pests with it such as parasitic worms, *Hydra* and, in my opinion, planarians. So many aquarists keep it and it grows so rapidly that they are constantly thinning it out and will be only too glad to give some away. As a rule it is not stocked by dealers. Duckweed not only gives a tank a natural, finished look, but seems to assist in keeping the water clear. It only decays when the light is insufficient and when this occurs the leaves turn white and should be removed. Chemical treatments of tank water have no effect on it except methylene blue.

Helxine, sometimes known as "baby's tears" is a delightful plant seen all too rarely in furnished aquaria. Although not strictly speaking an aquatic it grows very well in an average tank in reasonable light, and the single shoots grow vertically to the surface, and can attain a length of two feet or more. This plant is at its best when planted in groups of six or eight. Another plant which is still rather uncommon is water clover (*Marsilea*) and this is surprising because it is easy to grow, not being fussy about having a flood of light. It increases by runners and a fresh clover stem and leaf grows up from the runner at intervals of an inch.

A short time ago I had occasion to walk along the towpath of a canal which has been in disuse for well over 30 years. This canal is particularly interesting because in it a keen aquarist planted many aquatics roughly 40 years ago. My walk along the towpath extended for about three miles and I was interested in observing how these plants had survived the years. *Vallisneria*, which 20 years ago covered areas of 300 square feet at a time, had vanished. True, this plant died down every winter and in summer the long leaves (two feet) were invariably coated with a rusty algae, but I had not anticipated its complete disappearance.

Frogbit, once a tangled mass, was still in evidence but in short supply. Willow moss, once growing in massed banks many yards long was barely discernible. *Elodea* at one time had threatened all the other plants with its rapid growth but was now reduced to a single area a few feet square. Hornwort was not quite so badly affected but was nevertheless reduced in quantity. *Heteranthera* only grew in one spot, and it still dominated this part although I cannot understand why this should be so. Of *Nitella* there was no sign and starwort was represented by half-a-dozen clumps at most. The barest traces remained of water violet, water crowfoot and curly pond weed although these too had flourished at one time.

More interesting still was the fact that those plants which survived were all widely separated from each other, by as much as a quarter of a mile or more. Here and there were traces of floating plants including duckweed, ivy leaf duckweed, *Riccia*, bladderwort and frogbit as mentioned

previously. However, the canal was not short of plant life because a few varieties had practically run riot and choked large areas. These were *Potamogeton* species, which appeared everywhere in huge numbers, Cape fragrant water lily which likewise occupied vast areas, covering the surface with its brown leaves, arrowhead (*Sagittaria*) and the encroachment from the sides of bog plants such as water mint, common rush, flag iris and, surprisingly enough, ordinary grass.

Freshwater shrimps (*Gammarus*) are excellent food for the larger tropicals and they are most frequently found in fairly quick flowing streams, particularly in limestone areas. To obtain a supply pull up a large clump of the water plants and shake these out over a newspaper. You will be surprised how many shrimps you can obtain this way. They are supposed to be difficult to keep in captivity but recently a friend of mine found some in a bunch of watercress. These were transferred to an aquarium which contained no fish and they survived for five weeks, only to be accidentally lost when the tank was cleaned out by a youth who did not know of their existence.

Where tanks stand on a table or piece of furniture it is preferable to have a piece of American cloth or similar material underneath the tank so that the furniture is saved from water stains and rust marks. If the cloth is painted with some form of liquid linoleum paint the effect is enhanced and no rust marks show where the tank bottom meets the cloth, particularly if the colour used is a red, as for example, tile red. A word of warning is necessary, however, because I know from bitter experience that the fumes of linoleum paint will kill fish. It is wiser to remove fish until the paint is dry or, failing that precaution, to have no aerator running. The fumes of any paint or even burnt paint are fatal to fish. They do not usually die immediately but within about 24 hours the effect is felt and they gasp at the surface, turn over and die.

Some public aquaria now have a few tanks in which the back and sides are made of porcelain. These are mainly for the more translucent types of fish such as *Pristella*, flame fish, bloodfins, etc. The effect is excellent, and they are easily cleaned with a scraper as algae and the like is more obvious. The best effect is where the porcelain is not white but with a slight bluish tinge.

Another idea from public aquaria is to have aeration provided by a strong water jet from the surface, which prevents the disturbance of sediment which can be so annoying with the ordinary method. Unfortunately, this method is impossible for the average hobbyist. Still another idea is having a sheet of glass about two inches in front of the front of the tank on view. Visitors can then knock on the glass to their heart's content without disturbing the fish.

The report of the Zoological Society for the year 1952 has some interesting points for aquarists. In the first place it is surprising to note that the increase in visitors to the aquarium was only one per cent. over the figures for 1951. Aquarists generally have prided themselves that the numerous shows of the last few years have made the general

public much more aquarium-minded but when one sees that only one visitor in every six who visit the London Zoo bothers to go through the aquarium it seems that there are still a great many unconverted.

Visitors to the aquarium in 1952 numbered 322,902 as against 1,970,050 visitors to the zoo in general. The figures for 1951 were 319,291 and 1,968,576 respectively. It is true that there is an extra charge for the aquarium but when one considers that this is the finest in Britain it is hard to understand the public attitude. This year the aquarium celebrates its centenary, the first public aquarium in the world. The cost of running the aquarium in 1952 was £9,005, a decrease of £1,704 on the previous year whilst the income amounted to £11,700, an increase of £381 on 1951.

Although a large number of animals were given to the zoo, including a tiger, very few fish were donated as will be seen from the following list:—4 rainbow characins, 12 white cloud mountain minnows, 8 catfish, 7 goldfish, some harlequins, African lung fish, 7 barbs, and a carp which weighed 44 lbs. These eight donations of fish represented

about three per cent. of the total donations. Forty-one new varieties of fish were added to the aquarium collection since the last recording and four books on aquatic matters were presented to the library at Regent's Park.

A friend of mine has had some difficulty in feeding micro worm to young black mollies. He finds that the tiny fish keep near the surface, and as the micro quickly sinks most of it is lost to the mollies. Now he puts the micro in the water immediately over the heater. He says that any that sink are brought back to the surface by the upward current of water when the heater is turned on by the thermostat.

The small pointed sticks sold in bundles of 50 by chain stores are intended to be used for marking and naming plants and seedlings. They are about half-an-inch wide and five inches long, and a bundle costs about threepence. These are excellent for obtaining cleaned micro worms. The sticks can be either stood upright in the oatmeal or built up crosswise in a shallow dish. When necessary they can be boiled and last indefinitely.

Making a Simple Aquarium Cover Shade

A CHEAP and efficient all-over aquarium shade can easily be made by the aquarist handyman and the design is equally suitable for the one-tank set-up or a complete fish-house. The shade described here is to completely cover a 24 ins. by 12 ins. tank; the sizes can be adapted to suit a larger tank or to make a half or three-quarter shade.

The cost is a few shillings and the materials required are: one sheet of 18 or 20 S.W.G. aluminium sheet, size 24 ins. by 16½ ins.; one piece of ½ in. or ¾ in. thick planed timber, size 4½ ins. by 20 ins.; 12 one-inch wire nails. The tools required are few and usually form part of the home tool outfit. These are:—tenon saw or fretsaw, hammer, mallet or beater, carpenter's or engineer's vice (a resourceful person can manage without this item), a medium sized screwdriver, a hand drill and bit, and glasspaper.

The two wood ends are carefully marked out and cut to the dimensions shown and the saw burrs removed with glasspaper. The metal sheet is then marked out and the holes for the nails or screws are best marked out now, as shown, before the sheet is bent to shape. If nails are used the holes may be made with a nail slightly larger than that

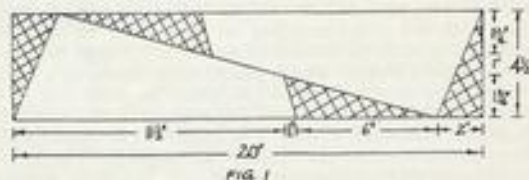


FIG. 1

actually to be used. Bending the sheet is best effected by securing it in a vice between boards with their edges placed at the bending mark. The sheet can then be bent to the required angle by means of a little persuasion with a mallet or plumber's beater.

The sheet is then nailed or screwed to the wood ends and is complete except for the provision of lighting equipment and decorating. One or two lamps can either be mounted on the rear of the sheet or on the ends of the shade. To mount on the rear of the sheet one inch diameter holes should be made to accommodate ordinary lampholders. This is easily done by drilling a number of small holes on the circumference of the perforation for the lampholders and smoothing the edges with a file. If lamps are to be mounted on the ends, batten-type lampholders will have to be used and screwed to the wood ends in the normal way. When two or more lamps are used, they should be wired in parallel and you will find it very convenient if a switch is inserted in the circuit. The cover described has the switch mounted on one end.

You may wish to leave the aluminium sheet in its original condition and polish it with metal polish. In this case it is better to use chromium-plated round-headed screws in lieu of nails. If painted or enamelled, choose your colours to tone with existing decorations.

Will condensation dripping from the aluminium shade harm the fishes? As far as the writer has been able to ascertain, the toxic effect of the metal in this position is relatively small. This shade has been used continuously for over two years without any ill effects being noticed. The shade described, equipped and wired with all fittings for three lamps was constructed at a cost of about nine shillings and was completed and painted in under two hours.

Roy Whitehead

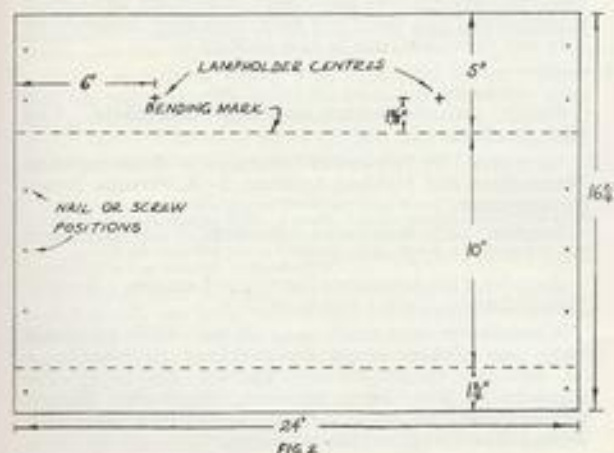


FIG. 2

Breeding the Australian Rainbow Fish

by R. A. LAWN

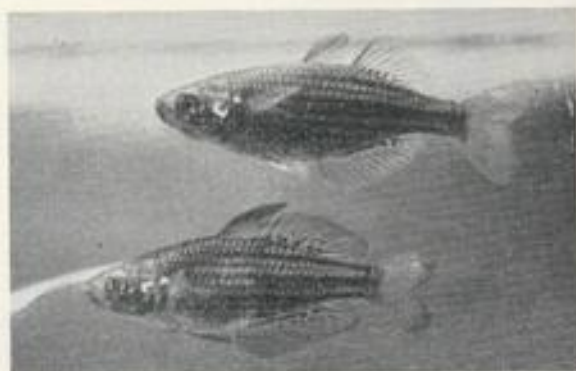
IN aquarium breeding, the greatest difficulty we encounter is cannibalism, the eating by the parent fish of both eggs and fry. It is a pleasure, therefore, to be able to describe the enchanting ways of a species which cannot be accused of this aggravating habit—the Australian rainbow fish.

There are actually two species, *Melanotaenia nigrans*, and *M. maccullochi*. The former appears to have given way in popularity to the smaller *M. maccullochi*, and perhaps this is a sign of the increasing cry (unhappily) for smaller types of fishes. I do not associate myself with such a retrograde step, but in this particular instance my preference is for the smaller fishes.

M. maccullochi are beautiful fish, which can grow in good conditions to a length of three inches. They have striking reddish-brown and yellow stripes on the sides of their bodies, with red dots extending on to the anal fin and the dorsal fins. I refer to the dorsal fins in the plural, because here we have a feature which places these fishes in a class of their own; they have what can fairly be described as a double dorsal fin. The forward fin, when standing erect, is an excellent indication of sex. The male's fin is topped with a sharp point, whereas the female's is rounded. There has been considerable controversy about this, and some writers state that they have never actually seen the point.

The explanation, I believe, is that the Australian rainbow fish will not, unless in the conditions he cares for, show his beautiful finnage to the greatest advantage. At his best, he flaunts his "flags" proudly as a peacock, spreading them wide for all to see. In the accompanying photograph, the sex characteristic of the dorsal fin is adequately demonstrated, as the male has been caught by the lens with the point on his dorsal clearly showing. Another method of sexing these fishes by their fins is also possible, this time by a point at the end of the male's anal fin. This, however, is very slight, and needs a very sharp eye indeed to see it. Breeding time brings out this point particularly.

Breeding these fishes is simple enough to recommend the species as being ideal for the beginner. I have bred them at practically every temperature between 70° F. and 82° F. and in only one instance did the parents fail to spawn.



That was when I placed them in a tank with no artificial lighting and near a north window with no sunshine. The two fishes moped, hiding miserably among the plants at the back of the aquarium, and two sorry fishes they looked.

Transferred to a tank with plenty of plants, in strong daylight and as much sunshine as the weather allowed, the fishes were transformed into a glory of colour and wide-spread fins, and within a couple of days I could see the large, yellowish eggs hanging from the plants. Two or three days later I saw that rare sight—fry hanging from the plants and on the sides of the aquarium with father and mother minding their own business of spawning and letting the little ones live in peace. Only a few eggs are laid every day.

This is not one solitary instance—not a fluke. Australian rainbows will spawn, the young will hatch and grow up with their parents, as I have proved on numerous occasions, and it is unnecessary to confine the breeders to just one pair, for several grown specimens will reproduce simultaneously. One must guard against over-production, because rainbows need plenty of room to grow and with this provision borne in mind, the youngsters will thrive on Infusoria or any of the proprietary fry foods, micro worms or grindal worms, with a feed of small Bemax once a day. (Small Bemax can be sifted by passing it through fine mesh material, or even a tea strainer.)

Altogether, a fish to cause little trouble and much enjoyment, easy going in its water requirements, easy to feed, hardy and beautiful. A well-planted tank, light, and normal temperatures, and there you have Australian rainbows for ever and ever. Yes, just as easy as that!

The Aquarist's Lectures

NEXT month a unique opportunity arises for British aquarists to meet Dr. Myron Gordon, distinguished geneticist and world authority on inheritance in fishes, who is visiting Britain to make a lecture tour. This has been organised by *The Aquarist*, and the six centres selected for the lectures and details for obtaining tickets in advance are given below. The meetings will also include a "Brains Trust," for which questions can be sent in advance to the Editor.

Tuesday, 8th September (evening): **Glasgow**. Christian Institute, 70, Bothwell Street, Glasgow, C.2.

Thursday, 10th September (evening): **Newcastle**. Y.M.C.A. Hall, Blackett Street, Newcastle upon Tyne.

Friday, 11th September (evening): **Sheffield**. City Hall, Sheffield.

Saturday, 12th September (afternoon): **Birmingham**. Birmingham and Midland Institute, 1-18, Paradise Street, Birmingham.

Sunday, 13th September (afternoon): **Manchester**. Free Trade Hall, Manchester.

Tuesday, 15th September (evening): **London**. Friends' House, Euston Road, London, N.W.1.

Admission is open to all aquarists but will be by ticket only, and tickets must be obtained in advance—1s. 6d. each person—from "Lecture Bookings," *The Aquarist*, 24, Wood Lane, Isleworth, Middlesex. Tickets are available now, and early application is advised since seating capacity in the halls is limited.

OUR EXPERTS' ANSWERS TO READERS' QUERIES

I have four aquaria artificially aerated and maintained at a temperature of 80° F. Every week I add a half-teaspoonful of household salt and a pinch of Epsom salts to the water. Yet with the exception of mollies and guppies my other fishes die soon after purchase. Can you tell me what is wrong?

You are adding too much salt to the water. Mollies and guppies can stand briny conditions, but some other species soon die if kept in salt water for long. Every time you add salt to your aquariums you are building up the salinity of the water. As the mollies and guppies seem to be doing well, we advise you to leave them as they are. But it would be wise to empty the other aquaria, and start again with well-washed compost and boiled tapwater allowed to stand for a few days before introducing any fish.

Can you please tell me the best way to clean *Tubifex* worms?

Place the *Tubifex* in a clean bucket stood under running water. Stir gently. This will get rid of mud and other unwanted matter. After this initial cleansing, place the worms in a muslin bag and suspend it so that its bottom just touches a basin of water. The worms will wriggle through the muslin and fall to the bottom of the vessel where they will form into a round, closely woven ball. You can hurry them through the fabric by fixing an electric light bulb just above the muslin bag.

I have read that acriflavine may be used for the treatment of white spot disease. Can you tell me the correct quantity to use?

Dissolve one tablet (0.46 grains) in 80 drops of water. Add five drops of this solution to every gallon of water to be treated. Repeat the treatment after a lapse of about seven days. Give a little extra heat, and keep the bottom well siphoned to get rid of dirt which helps to encourage disease.

I am troubled with excess algae which coats the leaves of the plants and discolours the water. I have tried emptying some of the water away, and refilling with fresh from the tap. But still the algae persists. Can you suggest anything to keep it down or get rid of it?

Algae is encouraged by excessive light, natural or artificial. It will also flourish in alkaline water. We advise you to try filtering your water through scalded peat. Peat acidifies the water; and acid conditions do not suit algae growths. In the meantime, scrape it off the sides of the aquarium, and from the plant life. If the plants are badly coated, it is best to destroy them. Some fishes, such as mollies, gouramis and guppies, like to eat algae and will help to keep the soft growths under control.

Sometime ago I bought a pair of tiger barbs. These fish often adopt a head-down position in the water. They seem healthy enough, but I am puzzled by the frequently practised downward slant. Can you tell me what is wrong with them?

There is nothing wrong with your tiger barbs. When they are not swimming about the aquarium, these fish often stay in a head-down position for seconds on end. You will notice that the moment any food falls into the water, they will adopt an even keel and swim rapidly after it.

I have a tank of mixed species including some young angel fish and a female paradise fish. Lately, I have noticed that the ends of the angel fish fins are very tattered looking, and they do not look so well as they did when I first bought them. Please can you say what is the matter with them?

We think your paradise fish is to blame for the trouble. Paradise fish are great bullies and fin-nippers. They are not ideally suited to life in a community aquarium. But we advise you to keep a close watch on the other species, for some barbs and characins often tear the fins of fishes. If the fins of the angel fish shows signs of fungus disease, we advise you to give the fish a bath in water made slightly saline by the addition of common kitchen salt to the water.

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

The fishes in my community aquarium contracted a mild attack of white spot disease, which I checked and cured by dosing the tank with quinine sulphate. Now I wonder whether I should have emptied all the water away and set up the tank afresh. Will you give me your opinion?

As you say the fish are cured of the disease we advise you to leave well alone. Chasing the fish with a net and lifting them out of the water is not the best way to hasten full recovery. But we do advise you to keep the bottom of the aquarium perfectly clean. That is, do not allow any uneaten food to stay on the bottom, and siphon some of the water from the bottom every other day for about a week. Top up with boiled water allowed to cool to the same temperature as the aquarium.

One of my angel fish has developed fungus disease. The heater went off for a while on two occasions, and I wonder whether this caused the trouble.

If the heat was off for a good time, the temperature of the water would sink several degrees and this would not do your fish any good. Some species succumb to a drop in the temperature more quickly than others. Angel fish usually contract some illness if the temperature goes lower than 70° F. We advise swabbing the diseased parts of the body with a piece of cotton wool soaked in a salt solution. Keeping the fish in water made slightly saline would help recovery. By slightly saline, we mean about a teaspoonful of common household salt to every gallon of water.

Please can you give me some information on breeding of paradise fish?

Paradise fish are not difficult to breed. Place the fish in a well planted aquarium, for the male is a great bully and sometimes kills the female if she cannot hide away from him. The male will build a bubble nest at the surface of the water, and coax the female to swim beneath it. Then he wraps his body round hers and they embrace for a few moments. During the embrace, the female releases some of her eggs. These are gathered together by both fish and spat into the frothy nest. Egg-laying may go on for several hours. After the eggs have been laid, the male guards them until they hatch out, this happening in about two or three days at a temperature of 78° F.

I have two cherry barbs and would very much like to breed them. But I do not know whether I have a pair. How does one tell the sexes apart?

The male cherry barb is more richly coloured than the female, and much slimmer in body outline. When the female is in breeding condition, her sides bulge with eggs. This fish does best in a high temperature.

I am a novice fishkeeper and would be grateful for your advice. My newly set-up tank has become very cloudy, and although I have taken some of the water out and refilled the aquarium with fresh it still looks cloudy. How can I get it crystal clear?

Newly set-up aquaria often look cloudy until a balance has been reached between fishes and plant life. Every time you drain some of the water away and top up with fresh you only prolong the condition. The best thing you can do is to be careful with food, especially dried food, and see that plenty of strong-growing plant life shields the interior of the

aquarium from too much bright light. If most of the light enters the aquarium from the top, mat the surface with floating vegetation such as duckweed, *Salvinia* or floating fern. Straining the water through scalded peat will help to acidify the aquarium, and also to check the multiplication of lower plant life—underwater mosses and free-swimming algae growths.

I have a pair of half-grown mouthbreeders (*Haplochromis multicolor*). The female is full of eggs, but the male treats her most cruelly. How can I get them to get on well together and breed?

Separate the fish for a week or two, and during this time, feed them well with live food or finely minced lean red meat or offal. Then, gradually increase the temperature, and place the fish together again. Make sure that the temperature is kept fairly constant and high after the fish have been placed in each other's company. If they still disagree, separate them and repeat the performance a second time or even a third time or until they become interested in family life.

COLDWATER FISHKEEPING QUERIES *answered by* A. BOARDER

I am considering making a pond in the garden. The site when clear will have a solid base of clay which will hold water; shall I allow the clay to form the base of the pond or must I concrete it?

The clay may hold water but where it meets the ordinary loam you are sure to get leaks. Also in very dry seasons the surrounding clay will contract and again cause leaks. If you leave the clay at the bottom and then concrete the sides you will be unable to make the join waterproof. The safest plan is to well hammer the clay and then concrete all over with a coarse mix, finishing with a strong coating of say, three parts sharp sand to one part cement. This must be well mixed, and see that there are no lumps of sand included. This coat should be floated on without a long pause, for once the cement starts to go off, the next lot will not join up well.

I have recently made and stocked a pond and find that the top of the water has become covered with a green scum. I believe that *Daphnia* will clear this up but I do not know how to recognise them, and do not know where to buy them. Can you help?

The green scum is a form of algae, encouraged by the sun and the fact that the other water plants have not had a chance to grow up and become well established. Most ponds go through this process and eventually clear once the other plants start growing. *Daphnia* or water fleas can be recognised in a pond as a small cloud of reddish colour. Individually they bear a striking resemblance to an ordinary flea, but perhaps you have not been in the Army! You should be able to get some water fleas from dealers in your district. It would, however, be of no use putting the *Daphnia* in the pond with the fish as they would soon be eaten.

I suggest that you net off as much of the scum as possible and withhold all food from the fish for a time. Some fish when hungry will eat some of the scum and fry generally do so. Among the stock for your pond you mention six mussels. These may have added to the cause of the trouble. It is useless placing mussels in a new concrete pond. These shell fish can only move about, eat and thrive in thick mud or muck. There being none in a new pond the mussels would soon die and nothing smells worse than a dead mussel; this turns the water foul in a short time.

I have a pond partly shaded by a willow tree, and the water lilies in the pond do not seem to be thriving. This year they sent up leaves which have died down and the stems were covered with a sort of scum. What do you suggest?

The tree shading part of the pond may be the trouble but

I am worried because the water in our district is very acid. Will it have an adverse effect on the fish?

We doubt it. Most aquarists try to achieve an acid condition in their aquariums because most fishes thrive best in it. In fact, disease is less likely to attack fish kept in acid water than when they are kept in alkaline water. But so long as your fish eat well, swim well and seem well, why worry about the condition of the water?

I have just installed a community aquarium in my lounge. It is lighted by electricity, and I have an aerator. Up till now the fish seem quite healthy, but I am wondering how much aeration I should give them, and is it better to give them aeration after the top light is switched off, or when it is on?

So long as the tank is not overstocked with fishes, a few hours' aeration every day is enough to keep the water in a healthy condition. As light helps the plants to grow and give off oxygen, we think it would be best to give the fishes aeration after dark. But really the time of the day, and the amount of aeration that should be given is largely a matter of experiment.

It may be that the water lilies have not had any special attention for some years. These are like perennial plants in the garden. The old root stock gets very woody and the centre hardens so much that new growth is retarded. I advise that you cut a new crown from the outside of a lily and plant it in some good loam in a separate flower pot. Place this in the pond and see if fresh new leaves are sent up. Water lilies are usually very hardy, but some types are not as sturdy and may require a little extra care and nourishment occasionally.

My invalid friend wants to keep some goldfish in a galvanised horse trough. Should the trough be coated with anything to make it safe for fish?

I think that it will be safer to coat the inside of the trough with a thin coating of cement. Either use it neat or add equal parts of fine sand. Float it on with a trowel or an old brush. Once it has set it must be well washed out to remove any free lime. It will be quite safe after that. I have had such tanks in use for many years. I do know of aquarists who use galvanised tanks for some kinds of fish and they seem to be successful without going to the trouble of coating the tanks. On the other hand I have had experience of the tanks killing fish. Just because one or two get away with something, it does not signify that you may be as lucky. Some bitumastic paints have been used for the purpose but I have always done better with the cement.

I would be grateful if you can tell me how to feed some three month old sticklebacks?

Sticklebacks are very fond of any types of live foods small enough for them to eat. You can choose from the following: *Daphnia*, enchytrae (white worms), *Tubifex*, mosquito larvae or crushed earth worms. Some may be taught to take Bemax and dried shrimp.

I have had two goldfish in a 12-gallon tank for three years. Now one of them looks as if it is going to spawn. Should I separate the fish, and have I any chance of rearing the fry?

Your fish may not be a pair, but if they are you must not separate them before they have spawned. The eggs of goldfish are not fertilised whilst in the body of the fish. As the eggs are laid so the male fish releases the milt or soft roe, which fertilises the eggs in the water. You would never get a fertile egg unless the male was present when the eggs were laid. As to rearing them I do not hold out much hope of doing so in the tank with the parent fish; you may be lucky and rear a few, but most of them would be eaten

by the older fish. You must divide the parents from some of the eggs once they are laid and then you have a good chance of rearing the fry. I have dealt with the procedure for breeding goldfish in issues of *The Aquarist* this year, and if you refer to them you should find all you need in the way of instruction.

We have an aquarists' society at our school and wish to get some lecturers. Where can we apply for them?

Most societies of any standing are affiliated to the Federation of British Aquatic Societies and get their lecturers through this body. If your society is a small one it may not be possible to become affiliated but you could write to Mr. R. O. B. List, 1, Coronation Court, Willesden Lane, London, N.W.10. He might be able to suggest a lecturer. A lecturer on the panel receives a fee of 15s. plus his expenses for a lecture, but it is possible that there is an aquarist club in your district which could supply a lecturer from among its members who would give a talk free of charge.

Can you advise me on the following queries concerning willow root for spawning purposes? Is there any special time to gather it? Is there any special colour it should be? How long should it be boiled to make it safe?

The best willow root for your purpose is that which is gathered from a tree growing at the water's edge, and which has run a good mass of fine roots into the water. These will be clean, especially if the water is running, as in a stream. It will be a pale yellow colour and there is no special time to gather it. The idea of boiling it is to sterilise it and so destroy any pests which may be on it. If the roots are dropped into a saucepan of boiling water for a few minutes, this will be enough.

We have a mill dam, 50 yards by 20 yards, and from one to three feet in depth. Our water lilies are not doing too well but there is a good crop of anacharis. We have many fish therein but they do not seem to breed. We put 12 catfish in, one of which died after a year and had grown from two to six inches. Is it true that golden orfe do not breed until they are very large? The water goes green; can we treat it with permanganate of potash and if so how much should we use?

You have stocked your pond rather too much to expect many fish to breed. I am no lover of catfish in a breeding pond. They can grow too large and eat other fish. As the water plants get established you may have more success with the breeding of some of them. Your conditions are as for a natural pond, and with one of this size it is almost certain that many fish will be bred each year. Golden orfe do not breed as a rule until they are a fair size, but in a pond as large as yours they should soon grow large enough to spawn. Your pond will get the usual visitations from pests, insect, animal and bird, and so you must expect some losses. I do not think for one moment that it would be of any value to try to clear the green from the water with potassium permanganate; it would take a great deal to be effective, and at the same time you might kill some of the small fry which may already be there. Most ponds go through this greening-up process each spring and the colour will normally disappear as soon as the other water plants grow stronger. The water lilies may not do well if they were planted too deeply. In time they may do better as they become more established.

Can you please tell me how to feed young water snails?

The best food for the young of water snails is lettuce leaves. Do not put too many in the tank at a time as they soon go foul and decay. You may find that Infusoria will breed in the water and if it becomes smelly change it fairly frequently. Most snails like a pure water and are often the first inmates of a foul tank to die.

I have in my pond three goldfish, two orfe and three rudd. Will they inter-breed?

You need have no fear that the fishes in your pond will

inter-breed. They are too far distantly related for there to be any fear of that. All types of goldfish will breed together but they will not pair with orfe. The rudd would probably cross with roach, dace, bream and bleak, but not with the fishes you have. Several hybrids of the latter fish have been found in native waters, but it is unusual for even these types to breed together.

I have a calico shubunkin with a pair of anal fins lying side by side. I thought that it was only veiltail types which had two anal fins. The fish appears healthy; why has it the extra fin?

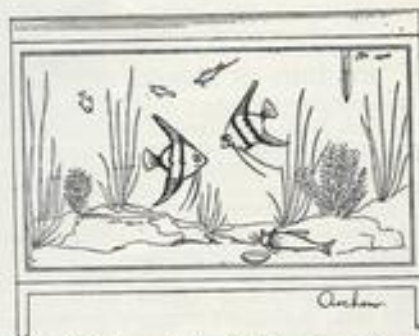
The reason why your shubunkin has paired anal fins is that it was probably bred from double-tailed fish at some time or other. All the double-tailed fish, such as fantails, veiltails, moors, orandas, lionheads and celestials should have paired anals. This is not always so, as sometimes they may have a single anal and I have bred some with no anals at all. Among a spawning of fish from any type of double-tailed goldfish there are often a few with single tails. You may have one of these. The fish with single tails from a double-tailed strain may carry the paired anals. It is not at all unusual, and is becoming more common because so many aquarists do not take any trouble to keep strains pure; they cross breed their fish so much that in time most fish will have all types in the strain and so can throw almost any shapes. If your fish were used for breeding, and I do not recommend that it should be, it is quite possible that some of the fry would have double tails.

I have several minnows in a community tank with one female which appears likely to breed. How can I breed from them without running water?

You may be able to breed from the minnows, but not in a community tank. You must keep them to themselves and as large a tank as possible should be used, but it need not be deep. Minnows usually spawn from May to July and congregate in large numbers for the purpose. The female lays about a thousand eggs on shallow sandy banks or gravel. The males usually show white tubercles on the head when in breeding condition. There is no need to have running water but an aerator would help. The eggs are small and adhesive, and it would be safer to remove the parents once the eggs are laid.

Are sun bass bullies to other fish?

Sun bass can grow to quite a fair size where aquarium coldwater fish are concerned, and I do not think that they mix well with fancy goldfish. Any fish which is much larger than the other inmates of a tank can become a bully. I always like to keep fishes of somewhere near the same size in any tank no larger than 24 ins. by 12 ins. by 12 ins.



"My dear, will you put the cat out?"

Ephippicharax orbicularis

THIS uncommon characin from northern Brazil, Guiana, and the Amazon basin, is not unlike the well-known silver tetra (*Gtenobrycon spilargenteus*) in general appearance. That is to say, the body is deep and laterally compressed—almost diamond-shaped—and the scales are small and silvery.

As the fish swims before or beneath a bright top light, the side flashes with several metallic tints such as lavender, green, gold, pink and blue. The black eye is large and rimmed with silver. The fins, particularly the dark-edged dorsal, are faintly tinged with brown. A broad black band extends down the anterior rays of the anal fin; a shadowy line or horizontal stripe shows on the body between the gill-plates and the root of the tail, where it divides into a fork-shaped marking, each prong dwindling away into the lobes of the caudal fin. Both sexes look very much alike. But this is nothing unusual in characins. According to John Paul Arnold, the erudite German authority, the species reaches a length of about four inches.

E. orbicularis is a most attractive fish to keep by itself or in the company of other fishes of about its own size, for it does not interfere with other species, though it will, of course, eat the young of livebearers. But then most fishes, even the most well-behaved, cannot resist making a meal of such small fry. Besides a partiality for livebearer fry, *E. orbicularis* will eat almost anything living or dead or manufactured in the laboratory. But it likes to take its food before it reaches the bottom of the water. In plainer words, it seldom takes anything from the floor of the aquarium. And this even goes for live food. When live food is given, see that it is small enough to be swallowed. *Enchytraea* can be swallowed at a single gulp, but *Tubifex* are best cut into small pieces.

It is a hardy fish and has a temperature range of from about 60° to 90° F. But it is not wise to keep it for any length of time in either cool water or very warm water. In fact, a temperature of about 72° F. seems to suit it best.

Like most of the flat-sided characins, *E. orbicularis* will hold a position for minutes on end, but it is extremely alert to everything going on around it. For this reason alone, it often gets all the tit-bits dropped into the aquarium long before the other fishes become aware that food, like manna, has fallen among them. And if you would wish to see an amazing display of agility and speed, just try and catch it in a small net. It can streak from one end to the other of a good sized aquarium more quickly, I fancy, than the fleetest-finned zebra fish; and that is saying something.

Although I imagine it breeds in the typical characin manner, I can find no records of its having spawned in captivity. This is a pity, for it deserves to be more widely known than it is at the time of writing.

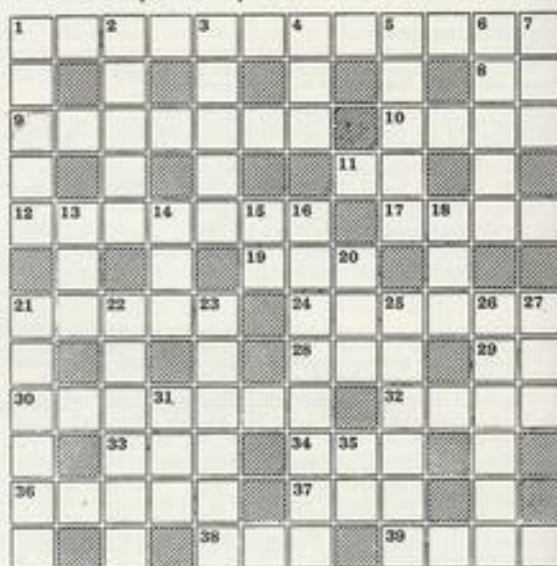
J. Hems

STUDIES IN SYMBIOTICS

THE Department of Zoology of the University of the Orange Free State is to conduct scientific research on rare fish. The aim of the research is to study the symbiotic adaptation of certain kinds of fish that lay their eggs in fresh water mussels. In connection with these studies a consignment of rare fish from China has arrived at Bloemfontein University. The University has been helped by the Council for Scientific and Industrial Research in purchase of its equipment, while the Department of Scientific Co-operation of Unesco in Manila helped to obtain the fish. A shipping company transported them free. Further consignments of similar fish are expected from Tokio.

The AQUARIST Crossword

Compiled by J. LAUGHLAND



CLUES ACROSS

- Water polo or fish freak? (7-5)
- Cry from hooked fish (2)
- The hors d'oeuvres fish (7)
- Position of tail (4)
- Alternative to A.C. (1, 1)
- This accessory increases the fish capacity of a tank (7)
- Laughing sound (3-2)
- Pole for perch, perhaps (3)
- Black or merry is she (5)
- Small British fish (6)
- A danio holds her (3)
- Chromatophore ends in the army (1, 1)
- Pax line to make clear (7)
- Natterjack, perhaps (4)
- No clue (3)
- 'Tis for this (3)
- It will do this (5)
- Water at less than 52° F. (3)
- Bag in sack (3)
- This is actually true in the *sculare*, always (4)

CLUES DOWN

- A.A. Car (anagram) (5)
- Lucre upset for fish ailment (5)
- Sporting fish (5)
- Some fish are shy like this (3)
- Does this fish roost? (5)
- O; char? In a way (5)
- Rot returns (3)
- Greek prefix meaning upon, frequently used in natural history (3)
- A dolphin starts with a disturbance (3)
- Alternative head of 26 (2)
- Cat on rim upset. How sentimental! (8)
- Neither Crocian nor mirror carp for this girl (3)
- Dad (3)
- Fish with dangerous spines (6)
- Lungfishes (6)
- Great mammals often mis-called fishes (6)
- To prattle like this with Jack would produce a toad (6)
- Fancy goldfish (6)
- Paired, in a way (2)
- Cover (3)
- Alternative type of current from 11 (1, 1)

PICK YOUR ANSWER

- The "rivulus spot" is absent from the female of: (a) *Rivulus cylindricus*, (b) *Rivulus dors*, (c) *Rivulus ocellatus*, (d) *Rivulus tent*.
- The female of *Rivulus maculatus* may be identified by two spots: (a) At the base of the anal fin, (b) On the caudal peduncle, (c) On the gill plate, (d) At the base of the dorsal fin.
- Aplochelichthys schoelleri* is native to: (a) Abyssinia, (b) Egypt, (c) Morocco, (d) Nigeria.
- Swamp barb is the popular name of: (a) *Barbus callensis*, (b) *Barbus chola*, (c) *Barbus scintillans*, (d) *Barbus sophore*.
- The genus *Nitella* is represented by: (a) 37 species, (b) 57 species, (c) 77 species, (d) 97 species.
- Nitella* is popularly known as: (a) American frogbit, (b) Brooklime, (c) Cape pondweed, (d) Crystalwort.

(Solutions on page 108)

G. F. H.

MUCH work has been involved in the transformation of a room in the 13th century Old Hall at Gainsborough into an aquarium by members of the Gainsborough Aquarists' Society. All the tanks were made by one member and the lighting was the work of another; the ornamental garden picture on page 89 of this issue was made with real bricks and wooden imitation coping stones. It is made in the bay of a stained glass window.

FIFTY entries were made for a table show of cichlids, guppies, moors and a.o.v. fancy goldfish put on by the Kingston and District Aquarist Society. At the July meeting members heard a talk on livebearers by Mr. A. Straford, who also gave some of his experiences with egg-layer breeding.

REPORTING a talk given by Mr. W. Webley at a monthly meeting in the Bulletin of the Nottingham and District Aquarists' Society it is said that live food must be used to rear top line fish, and not dried food alone. *Daphnia*, the water flea, is a recommended live food and one that should be sorted into sizes according to the size of the fish. Good original stock, plenty of room and good feeding were Mr. Webley's rules for pursuing his policy of better quality and less quantity in breeding.

NOTIFICATION has been received by the Aquatic Traders Association from the Customs and Excise Commissioners that purchase tax "on aquaria not exceeding 36 ins. in length will apply whether or not the aquaria are partially opaque and irrespective of the description under which they are sold, e.g. as 'culture tanks'." This removes an anomaly exposed by the A.T.A. under which some tanks were being given a green wash over the glass and sold free of purchase tax as "culture tanks" by unscrupulous traders to the detriment of those traders who obeyed strictly the letter of the law. Suggestions made following an examination of the present state of the aquatic trade at the last meeting of the A.T.A. were (1) a publicity campaign and possibly a public relations officer for the Association; (2) diplomas for capable and efficient traders; (3) a trade show and a display week and a display shop.

OVER 200 fishes were on show at the tropical fish exhibition staged by the Hampstead Aquatic Society last month, and these were

News

from AQUARISTS' SOCIETIES

Monthly reports from Secretaries of aquarists' societies for inclusion on this page should reach the Editor by the 5th of the month preceding the month of publication.

A copy of *The Aquarist's Directory of Aquarium Societies* will be sent free to any reader on receipt of a stamped, self-addressed envelope.

all from members' stocks. All the aquaria were fully furnished and club members conducted visitors around the exhibition.

A DISPLAY of eight aquaria was made by the Southall Aquarist Society at the A.E.C. Ltd. gala sports day last month. A cup presented by the company for the best furnished tank was won by Mr. A. Hastings. For obtaining the highest number of points at table shows held by the society during the past six months Mr. R. Savage has been presented with a cup and plaque.

AT the table show held in competition between Willesden and District Aquarists' Club and Harrow Aquarists' Club at Harrow in July, Willesden gained 26 points to Harrow's 14 points for cichlids, danios, labyrinth fish and barbs. Mrs. T. Lynch was awarded a cup for the best tropical fish in the Coronation show staged by the Willesden club and Mr. A. Wingrove was awarded a cup for the best cold-water fish exhibited.

MR. N. TAYLOR gave a talk on reptiles to the Birkenhead and District Aquarium and Herpetological Society last month, and showed many specimens of reptiles and amphibians from his collection to members at the meeting.

THIRTY-TWO members of the Nuneaton Pool and Aquarium Society attended the July meeting at which delegates from the Hinckley Society were present. The speaker was Mr. C. Mandeville, who outlined the

history of fish and spoke about rearing fry. Mr. Mandeville answered a great number of questions put to him by his listeners.

OVER 2,500 visitors attended the first annual show to be held by the Kettering and District Aquarists' Society this year. A local natural history society staged an exhibition of water plants and a representative collection of cold-water fish was provided by the Nene Catchment Board. Seven societies competed at the show and Kettering narrowly defeated Leicester by 290 points to 276 to win the inter-society trophy. Hand painted engraved plaques were given as prizes to winners in the classes.

FRESHWATER biology was the subject of the talk given by Mr. E. J. Druce to the Burton and District Aquarists' Society, which he illustrated with a micro-projector and film strips depicting aquatic organisms and plant life. Mr. Druce is a member of the lecturers' panel of the Midland Association of Aquarists' Societies to which the Burton society is affiliated.

Aquarist on Holiday

INVITATIONS have been sent for readers of *The Aquarist* holidaying in the areas of the following aquarists' societies to meet their members at society meetings:

Brighton: Meetings of the Southern Amateur Aquarists are held fortnightly on Mondays, 8 p.m., at Fabian House, Richmond Place, Brighton, Sussex. Secretary: Mr. H. M. Wright, 2, Rotherfield Crescent, Brighton 6.

Dublin: Society of Aquarists holds monthly meetings and visitors should obtain details from secretary, Mrs. E. Spurling Jewell, 69, Walkinstown Road, Crumlin, Dublin.

Folkestone: Aquarist Society members meet on the first and third Thursdays of each month, 7.45 p.m., at Folkestone Public Library. Secretary: Mr. C. A. White, South Point, Limes Road, Folkestone.

Hastings and St. Leonards: Aquarist Society meetings are held on alternate Wednesdays, 7.30 p.m., at the Cinema Cafe, Norman Road, Hastings. Secretary: Mr. J. P. Brown, 47, Pevensey Road, St. Leonards-on-Sea, Sussex.

Ryde: Aquarist Society meets on the fourth Wednesday of each month, 8 p.m., at the School of Art, George Street, Ryde. Secretary: Mr. C. G. Penny, 27, Arundel Road, Ryde, Isle of Wight.

Torquay and District: Aquatic and Pondkeepers' Society meetings are held on the second and fourth Mondays each month at Belgravia Club, St. Marychurch Road, Torquay. Secretary: Mrs. J. Brooking, The Westbury, Belgrave Road, Torquay.



Photo:

John P. Wallace

This furnished tropical aquarium gained second award for Mr. J. W. Young at the Edinburgh and East of Scotland Aquarium Society's four day show. It features artificial red rockwork made by the process suggested by an article in "The Aquarist"

New Societies

Llanwit Major, Glamorgan fish-keepers are invited to contact Mr. R. S. Wigg, 17, Ham Lane South, Llanwit Major, who is endeavouring to form an aquarists' society for the area.

Pakistan Aquarium Society. Secretary: S. Masood-ul-Hasan, Asst. Horticulturist, Gandhi Gardens, Karachi, Pakistan.

Wisbech and District Aquarists' Society. Secretary: D. A. Eagle, 8, Beechwood Road, Wisbech, Cambs.

Yiewsley and West Drayton Community Association Aquarists' Section. Acting Secretary: J. A. Macdonald, Community Centre, Bentinck Road, Yiewsley, Middlesex.

Secretary Changes

CHANGES of secretaries and addresses have been reported from the following societies:

Brighton and Hove Aquarists' Society (Mr. R. V. Cheal, 32, Park Crescent, Brighton, Sussex); **Deal and District Aquarist Society** (Mrs. M. E. Baker, 13, Downs Road, Walmer, Kent); **Epsom and District Aquarist Society** (Mr. P. L. Pennell, 12, Worples Road, Epsom, Surrey); **Hastings and St. Leonards Aquarists' Society** (Mr. D. F. G. Kennard, c/o 25, Caribrooke Road, St. Leonards-on-Sea, Sussex); **Merseside Aquarists' Society** (Mr. S. Messinger, 14, Aconbury Place, Liverpool 11); **Norfolk and Norwich Aquarist Club** (Mr. R. D. Aldridge, 4, Taylor Road, West Earlham, Norwich); **North Birmingham Pond and Aquarium Society** (Mr. T. H. S. Walkinshaw, 24, Salisbury Road, Handsworth, Birmingham 19); **North Bucks Aquarist Society** (Mr. K. C. Speaks, 11, Marina Drive, Wolverton, Bucks); **North of Scotland Aquarist Society** (Mr. T. McKobb, 20, Seamount Place, Aberdeen, Scotland); **Reading and District Aquarist Society** (Mr. J. S. Bird, 277, Gosbrook Road, Caversham, Reading); **Southern Amateur Aquarists** (Mr. H. M. Wright, 2, Rotherfield Crescent, Brighton 6); **Walworth Aquarist Club** (Mr. F. L. Howe, 9, Hazle Road, Hampstead, London, N.W.3).

Aquarist's Calendar

1st-3rd August: Southall Aquarist Society annual show at the Southall Borough show. Details from Mr. R. Savage, 87, Mariborough Road, Southall, Middlesex.

1st-3rd August: Hull and District Pond and Aquarium Society exhibition. Details from Mr. A. T. Rimington, 57, Lincoln Street, Hull.

1st-8th August: Taunton and District Aquarists' Society exhibition of aquaria at Vivary Park, Taunton, Somerset.

3rd-8th August: Hendon and District Aquatic Society annual open show of fishes and aquaria. Schedules available from Mr. B. Calrow, 6, Axholme Avenue, Edgware.

6th-9th August: Portsmouth Aquarists' Club annual show at R.E. Drill Hall, Portsmouth. Schedules and information from Mr. G. P. Elverston, 24, Bertie Road, Milton, Portsmouth.

12th-16th August: Blackburn and District Aquarists' Society annual show at Jubilee Hall, Market Hall, Blackburn, Lancs. Details from Mr. J. W. Sharples, 12, Higher Witton Road, Blackburn.

14th-16th August: International Congress of Aquarists at Haarlem. Details from Mr. N. G. Michielssen, Voorduinstraat 20, Haarlem, Holland.

20th-22nd August: Romford Aquarist Society annual show at The Lambourne Hall, Western Road, Romford, Essex. Schedules and

Wear this badge



on your holiday

CORRESPONDENCE has shown that many readers are meeting new friends by wearing the badge of the aquarist. While you are on holiday this year this attractive silver, red and blue metal design (actual size, above) can introduce you to other aquarists; two forms of the badge, one fitting the lapel button-hole and the other having a brooch-type fastening are available. Send a postal order for 1s. 9d. together with the Aquarist's Badge Token cut from page xii, to Aquarist's Badge, The Aquarist, The Batts, Half Acre, Brentford, Middlesex, and please specify which type of fitting you require.

information from Mr. A. E. Falkus, 37a, Wallenger Avenue, Gidea Park, Romford, Essex.

27th-29th August: Midland Aquarium and Pool Society. Open show of coldwater and tropical fishes at the Minor Hall, Bingley Hall, Birmingham. Details from Mr. T. L. Dodge, 48, Danmore Road, Hall Green, Birmingham 28. Entry closing date 10th August.

27th-29th August: Leicester Aquarist Society annual exhibition at St. Mark's Church Schoolroom, Belgrave Road, Leicester.

2nd-5th September: Kingston and District Aquarist Society annual show at the Y.M.C.A. Hall, Eden Street, Kingston, Surrey. Show secretary, Mr. A. Beckett, 13, Plough Road, West Ewell, Surrey.

3rd-5th September: Southampton and District Aquarists' Society annual open show. Show secretary: Mr. E. C. Colesworth, Westways, Ramsey Road, Nursling, Southampton.

3rd-6th September: Accrington and District Aquarist Society. Fourth annual open show of furnished aquaria at the Town Hall, Accrington. Show secretary: Mr. S. Ratcliffe, 4, Rutland Street, Accrington, Lancs.

3rd-12th September: Nottingham and District Aquarists' Society annual show and exhibition at the Albert Hall Institute, Derby Road, Nottingham.

8th September: Glasgow—Lecture by Dr. Myron Gordon (for details please see page 102).

10th September: Newcastle—Lecture by Dr. Myron Gordon (for details please see page 102).

10th-12th September: Coventry Pool and Aquarium Society show and exhibition of tropical and coldwater fishes at Queen's Road Baptist Church Hall, Coventry. (Revised announcement.)

11th September: Sheffield—Lecture by Dr. Myron Gordon (for details please see page 102).

11th-12th September: Bethnal Green Aquatic Society fourth annual show with open classes and the London area fighter championship open class. 11th, 7 p.m. to 10 p.m.; 12th, 2 p.m. to 8.30 p.m. at the Bethnal Green Institute, 229, Bethnal Green Road, London, E.2. Schedules obtainable from Mr. W. Richardson, 98, Warner Place, Bethnal Green, London, E.2. Closing date 14th August.

12th September: Birmingham—Lecture by Dr. Myron Gordon (for details please see page 102).

13th September: Manchester—Lecture by

Dr. Myron Gordon (for details please see page 102).

14th-19th September: Blackpool and Fylde Aquatic Society annual show with open classes. Schedules and full details from Mr. W. Robinson, 3, Denwood Bank, Warton, Preston, Lancs.

15th September: London—Lecture by Dr. Myron Gordon (for details please see page 102).

18th September: British Herpetological Society London Group meeting "Young and home bred reptiles and amphibians," 7 p.m., at Linnean Society's Rooms, Burlington House, Piccadilly, London, W.1.

19th September: Federation of Guppy Breeders' Societies annual show at St. Martin's School of Art, Charing Cross Road, London. Schedules from Mr. W. Howe, 24, Kerfield Crescent, Grove Lane, London, S.E.5. Closing date: 5th September.

23rd-26th September: Oldham and District Aquarist Society third annual show at Regent Street School, Regent Street, Oldham, Lancs. Show secretary, Mrs. Vera Tripp, 187, King Street, Oldham, Lancs.

24th-26th September: Banbury and District Aquaria Society annual show at Banbury Town Hall. Schedules and details from Mr. R. A. Butler, 225, Warwick Road, Banbury, Oxon.

24th-26th September: East London Aquarists' and Pondkeepers' Association "coming of age" exhibition. Open classes—Club furnished aquaria for Coronation Trophy (to be won outright). Senior and junior individual furnished aquaria for the Essex championships. Full particulars from show secretary, Mr. F. A. Petto, 52, Humberstone Road, London, E.13.

26th September: Federation of British Aquatic Societies general assembly, 2.30 p.m. at Friends' House, Euston Road, London, N.W.1.

26th September-3rd October: Huddersfield and District Aquarists' Society annual show at Parochial Hall, Springwood Street, Huddersfield, Yorks.

2nd-3rd October: Bristol Aquarists' Society. 1953 Coronation Open Show at the Y.M.C.A. Hall, Bristol. Schedules obtainable from Mr. R. Woodbine, 18, Grantham Road, Kingswood, Bristol.

October Lectures

A SERIES of lectures on aquarium-keeping to be given by Mr. A. Boarder has been arranged by the Borough of Wandsworth at the following libraries in the Borough on the dates given: 2nd October: West Hill; 6th October: Balham; 15th October: Tooting; 22nd October: Clapham; 29th October: Streatham.

Crossword Solution

A	Q	U	A	T	I	C	S	P	O	R	T
C	L	R	O	E	O	O					
A	N	C	H	O	V	Y	R	E	A	R	
R	E	U	D	C	C						
A	E	R	A	T	O	R	H	A	H	A	
P	D	R	O	D	N						
W	I	D	O	W	M	I	N	N	O	W	
E	I	H	A	D	A	R	E				
E	X	P	L	A	I	N	T	O	A	D	
V	N	I	L	T	A	T	I	N			
E	R	O	D	E	I	C	E	D			
R	I	S	A	C	R	E	A	L			

PICK YOUR ANSWER (Solution)

1 (b). 2 (a). 3 (b). 4 (b). 5 (c). 6 (d).

★ **Wings Day** Give for those who Gave ★
SEPT 19