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Editorial

IT would be going too far to say that the articles on "pH, Water Hardness and Fish Breeding" by Dr. F. N.

Ghadially published in this and in last month's issue of *The Aquarist*, show that water condition is not worth bothering about when the aquarist plans to obtain a spawning. The results given in the articles do, in fact, show quite the contrary, that in unsuitable water some fishes will never breed successfully, and that it is well worth while to try a change of source of water if failures in breeding are constantly obtained. It is preoccupation with rigid values for pH and water hardness, as if these were sole indexes to water suitability, against which our author has sounded warning. As yet we have little information about the harmful agents in some waters, that prevent not the spawning of fishes but the hatching of the eggs, and until we know something of their nature and why it is that eggs of some fishes are so much more susceptible to them than other species' eggs the best we can do is to follow those methods which give best results at the present time.

SUMMER is with us again and once more our capital city is without its own large-scale aquarists' show.

With the passing of the "National" a gap has been left in the calendar of annual events, for local shows cannot command the attention of the public in the way that an exhibition devoted solely to the hobby and held in the "centre of things" can do. Outside of London there is less to complain about, for a number of important shows identified with aquarists' societies of the larger towns and cities are kept going year after year. In the north, the British Aquarists' Festival is to be held, as usual, later in the year. Even those aquarists who do not participate in the competitive showing of fishes will realise the importance of these events to the hobby and give them full support.

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"Aquarium Ardent"

by V. P. UNDERWOOD

IN a prose-poem by the enigmatic French poet Rimbaud, occurs the expression: *tout es fit ombre et aquarium ardent*, which may be roughly translated: "everything turned to darkness and glowing aquarium."

This was probably written in or between the years 1872 and 1875 (scholars are not yet agreed on the latter limit), though not published till 1886 by friends who held his manuscripts (by then he was gun-running in Somaliland, and presumed in Paris to be dead). The phrase suggests that the author was acquainted with the lighting effect from an illuminated aquarium in a darkened room. Though at first sight not peculiarly English, it was probably inspired by something which at that period could only be seen in England, where Rimbaud stayed in 1872-3 and 1874, at the age of 18 to 20, writing parts of the book called *Illuminations* in which this phrase occurs.

In the first place, the aquarium craze (it could properly be called this in the second half of the nineteenth century) started in England with the work of Philip Gosse particularly. He was responsible for the first public aquarium in the world, the London Zoo "Fish House," opened in 1853. In 1854 he wrote *The Aquarium*, followed by other books, and popularised home aquaria. Soon large commercial ventures, financed by entrance money, were being opened in many large cities of Europe and America as well as this country. In this, a leading part was played by W. A. Lloyd, who was called in to construct several continental aquaria, beginning with those of the Paris Jardin d'Acclimatation (1859) and Hamburg (1864); he wrote several books and opened a specialist shop in London. These ventures answered to and fostered the Victorian public's enthusiasm for "modern science," at the same time providing serious naturalists with material and facilities for study.

By the time he reached London in September, 1872, Rimbaud could possibly have seen aquaria in Brussels or Paris, but had not been to any other place known to have possessed one. It seems certain that at that date, with one exception, they were lighted only by daylight, and that no artificial lighting system had been devised. The tanks were usually in rooms to which all light was admitted through windows above the surface of the water. This system was followed at the famous Naples Zoological Station, opened the next year. Some aquaria were even put underground, to facilitate the directional daylight lighting and equalise temperature, as in the one which was to be constructed later, in 1878, at the Trocadero, Paris, for the International Exhibition, and still exists.

First Artificially Lighted Aquarium

Now the words we are discussing convey the impression of a blaze or fiery glow which could hardly have been suggested by daylight. They do not seem likely therefore to have been inspired by any continental aquarium. An artificially lighted one in a darkened room is much more likely to have produced the expression *ombre et aquarium*

ardent. In 1872 and for at least two years after, the only artificially lighted aquarium in the world, as far as can be ascertained, was that of the Crystal Palace, Sydenham, of which Lloyd was superintendent. We know Rimbaud visited it, for his inseparable companion, Verlaine, still kept many years later a silhouette portrait executed there for sixpence, and a number of phrases in *Illuminations* probably derive from this glass-and-wrought-iron "wonder" and its park. Rimbaud, obsessed with "modernism," would not have missed any novelty of this kind.

The front-page advertisements of *The Times*, in the autumn of 1872, announced daily that the aquarium (opened in August, 1871) was illuminated from 3 p.m. The lighting system must have been devised since October, 1871, when Lloyd wrote in *Nature* that experiments were being made on the best mode of lighting, as it was not then known how "animals, a great number of which are nocturnal," would behave with "powerful artificial illumination." If any other aquarium had been artificially lighted, it is certain that Lloyd, a world authority, would have known of it and drawn on the experience, and would not have been obliged to experiment for months. Since incandescent electric globes were not invented till after 1878, the illuminant must have been gas. Bunsen burners and incandescent mantles date from 1885, so the burners were presumably fish-tails in rows or groups, as can still be seen in buildings preserving lighting systems of that period. They could have caused unwanted heating of the water and rooms, besides obtruding on the visitors' attention or causing difficulty in seeing.

According to the Official Handbook of the time, such problems were met by placing the burners (no doubt shielded with reflectors) so as to light the upper surface of the water at the angle of total reflection. This presumably means that, beside the direct lighting from gas-jets hidden from them, visitors saw the contents of the tanks beneath the shining mirror formed by the underside of the surface, well above eye level. In conditions of total reflection, nothing above it was visible: the fishes and their reflections would be seen in the yellowish glow produced by the flaring gas, with other colour effects from whatever vegetation and rockwork were present.

Novelty of Gas Lighting

The novelty seems to have suggested a picturesque expression to a certain French youth, a fanatical "modernist" like most 18-year-olds, who visited the Crystal Palace in the autumn of 1872 or spring of 1873. (Southport Aquarium, opened in September, 1874, seems to have been the second to have gas lighting, but it is unlikely that Rimbaud went there.)

This new *illumination*, on top of the more spectacular "*Illuminations*" (fireworks, etc.) which were staged at Sydenham every Thursday, may well have played a part in leading Rimbaud to call his whole book by this title, which, asserts Verlaine, was English and not French, though from the spelling it could be either.

Accustomed to the pleasing effect of electrically illuminated aquaria, not everyone nowadays would realise that the expression *aquarium ardent* must have seemed odd, if not incomprehensible, in the 1870's, to anyone who had not visited the Crystal Palace Aquarium. Even today, those who find surrealism and other "isms" in Rimbaud's writings may not welcome this fairly simple explanation of the phrase.

(The writer is indebted to Mr. G. F. Hervey for some historical data. Details of Rimbaud's stays in England and its influence on him are given by the author in the *Revue de Littérature comparée* of Jan.-March, 1955, and in another number to appear shortly.)

Fundamentals of Aquarium Heaters

by L. WARBURTON

THE two objects of this short article are firstly, to help dispel certain mistaken ideas which seem to be widely held regarding heaters, and secondly, to provide some useful data for calculating the actual power available from any particular heater.

The whole of the following observations apply only to totally immersed heaters, including those under the gravel, and do not apply to base heaters or other external application of heat. The writing of these notes has been prompted by certain queries which have from time to time been received, and which show a complete misunderstanding of the elementary principles involved in immersion heating. Typical of such queries are these two, which will suffice as examples for the present purpose:

"My supply is 200 volts, and I have to use a 150-watt, 240-volt heater to get the temperature high enough in a small tank. As this wastes current, can you tell me where to get a 200-volt, 100-watt heater?" "What power of heater would you recommend for such and such a tank (details given) for use on 200 to 250 volts?" We will deal with these two questions in turn, but first, a few general principles.

You Can't throw Current Away

When electric current is "used," it obeys a fundamental law of physics, known as the Law of Conservation of Energy, which we will call Law A, and which says, among other things, that electric current, which is one form of energy, can be changed only into another form of energy; and for everyday purposes, it can be changed only into chemical, mechanical or radiant energy. Heaters fall into the last category, and provided no visible light is produced, then 100 per cent. of the current consumed is changed into heat. This is not an approximate figure; it is a complete certainty that whatever the shape or form of the heater, whatever the wattage or voltage, and whatever it says on the label, the whole of the current consumed is converted directly into heat. In those cases where a glow is present (usually in the higher powers) less than one ten-thousandth part of the energy is likely to be accounted for by the red light produced.

The second general principle is known as Ohm's Law, and we will call this Law B. This says, briefly, that the current in any circuit, neglecting inductance and capacity, is directly proportional to the voltage, and inversely to the resistance. It is usually shown:

$$C = V/R$$

where C is the current in amps., V is the voltage and R the resistance in ohms. As regards immersion heaters of normal pattern, inductance and capacity are indeed negligible.

The third and last general principle we need consider is an application of Joule's Law, which is usually expressed:

$$\text{Cal.} = C^2 \cdot R \cdot T / 4.2$$

where Cal. is the heat produced in calories, C is current in amps., R is resistance in ohms and T the time in seconds. This is Law C.

Taking Law B, and squaring the quantities, we have

$$C^2 = V^2/R^2$$

and substituting in Law C we get:

$$V^2 T / 4.2 R$$

By interpretation of this, we find that the heat produced in a given time in any circuit of constant resistance (such as an immersion heater, the resistance of the nickel-chrome element of which shows negligible variation with temperature) is proportional to the square of the voltage.

So much for general principles, and we will now tackle the two queries above. In the first, we have a gentleman who obviously begrudges expending 150 watts of electrical energy and only getting the heating equivalent of about 100 watts. A very legitimate grouse, but quite groundless, as a consideration of our three laws will show.

Law A says that the whole current must be converted

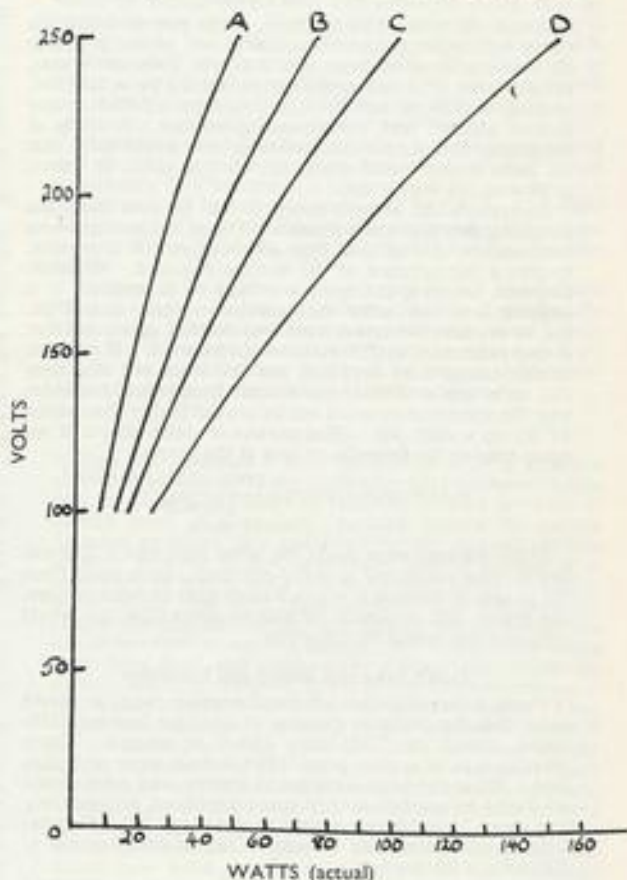


Fig. 1. Graph showing actual consumption of four heaters, A, B, C and D, rated at 50, 75, 100 and 150 watts respectively, all at 240 volts. Note the rapid fall in consumption as voltage decreases. These curves represent $W = V^2/K$, where with each the value of the constant K is inversely proportional to the nominal wattage of the heater.

into heat, and therefore whatever heat is produced can only use up the theoretically correct equivalent of current. In other words, if only 100 watts of heat is being produced, then only 100 watts of current is being used, in spite of what the heater label says. This is easily proved as follows. From Law A, the wattage consumed is proportional to the calories of heat produced, therefore wattage is proportional to $V^2T/4.2R$ and as T, R and 4.2 are constants, the wattage consumed is proportional to the square of the applied voltage.

Expressed as a formula, this is:

$$\frac{\text{Wattage at } V_1}{\text{Wattage at } V_2} = \frac{(V_1)^2}{(V_2)^2}$$

or

$$\text{True wattage} = \frac{LW \times AV \times AV}{LV \times LV}$$

where LW is the labelled wattage, LV the labelled voltage and AV the actual voltage used. Hence, with our friend's heater, we have

$$\text{True wattage} = \frac{150 \times 200 \times 200}{240 \times 240} = 104 \text{ watts.}$$

And this, in spite of all his fears, is the rate at which his meter will register current consumption, giving precisely the same amount of heat as a 200-volt, 104-watt heater, which in fact it is, and could quite correctly be so labelled. Indeed, within its safe limit, it could be labelled at any desired voltage, with corresponding wattage. A study of the graph, or a simple calculation or two would show that the same heater would consume: at 100 volts, 26 watts; at 50 volts, 6½ watts; etc.

As regards the second query, it will be seen from the foregoing that it is unanswerable. Given the average room temperature, size of tank, type of cover, etc., it is possible to give a fair estimate of the wattage required. Without, however, knowing the precise voltage to be applied, it is impossible to say what the nominal wattage should be. Let us say that 100 actual watts was decided upon, and that it was assumed that 250 volts would be used. If a heater of that rating were supplied, and it turned out that only 200 volts was available, our second friend would wonder why the temperature could not be coaxed higher than about 65° F. on a cold day. The answer is quite simple if we again employ the formula, or look at the graph.

$$\text{Actual consumption} = \frac{100 \times 200 \times 200}{250 \times 250} = 64 \text{ watts.}$$

If the mistake were made the other way, and a 200-volt heater were connected to a 250-volt main, quite apart from the danger in running it at much more than its rated voltage, the reader will no doubt be able to check that the actual consumption would be 156 watts.

Don't take the Label too Literally

From a consideration of the foregoing facts, it would seem that the common practice of labelling heaters "220-240v, 100w", or "200-250v, 150w" is absurd. Taken literally it is, of course, stupid, but there is more to it than that. What the label is meant to convey, and what would no doubt be printed on it, if space permitted, is something like this: "Useful heat output in the range 220-240 volts; latter is maximum safe voltage. Current consumption at 230 volts is 100 watts."

In most makes of heater, the stated wattage is consumed at a voltage midway in the nominal range, but unfortunately there appears to be no fixed convention in this. Out of many thousands of ratings checked by the writer, with accurate meters, about 60 per cent. were of nominal wattage at about the middle of the voltage range, some 30 per cent. were correct at the highest stated voltage, and the remaining

10 per cent. or so were hopelessly inaccurate at any part of the range, being more than 25 per cent. in error.

For those Small Tanks

The final point to be considered is the case of heaters connected in series. Many aquarists go in for fish breeding at certain times of the year, and when setting up small tanks, they have to look around for a few small-power heaters.

Those who have several spare heaters of larger wattages might like to consider what happens when two of these are connected in series, as in Fig. 2. For the first example,

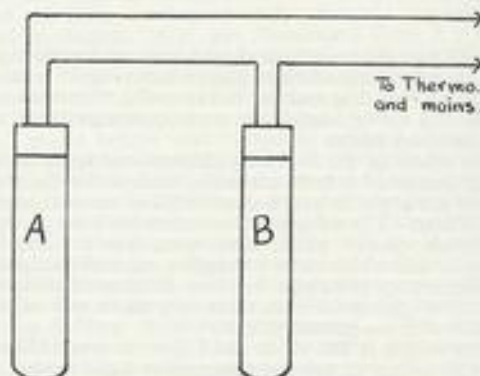


Fig. 2. Two heaters connected in series. When they are of different wattages a somewhat unexpected result is obtained

let us say that the heaters A and B are both rated at 100 watts, 240 volts, and are thus connected to 240-volt mains. Being identical, the voltage drop in the circuit will be constant, and each heater will actually receive 120 volts.

Applying our formula to this, we see that

$$\begin{aligned} \text{Consumption (of each)} &= \frac{WL \times AV \times AV}{VL \times VL} \\ &= \frac{100 \times 120 \times 120}{240 \times 240} \\ &= 25 \text{ watts each.} \end{aligned}$$

Thus a simple way of providing small-wattage heaters is available. If the tanks are of different sizes, or if different temperatures are desirable, two heaters of different wattage may be used, but here, one must be very careful, as it will be shown that the unexpected happens, and the smaller heater gives the greater production of heat.

Let heater A be rated at 120 watts, and heater B at 60 watts, both, say, 240 volts. The resistance of A is found from the formula $R = V^2/W$, i.e. $R = 57600/120 = 480$ ohms. Similarly, the resistance of B is:

$$R = 57600/60 = 960 \text{ ohms.}$$

As the heat generated in a resistance at constant current is directly proportional to the resistance, then in the above case, the 60-watt heater would generate twice as much heat as the 120-watt heater.

Calculation of actual consumption of any two heaters connected in series is made by using the formulae:

$$\text{Total consumption of the two} = \frac{WA \times WB}{WA + WB}$$

$$\text{Individual consumption of A} = \frac{WA \times WB^2}{(WA + WB)^2}$$

$$\text{Individual consumption of B} = \frac{WB \times WA^2}{(WA + WB)^2}$$

where WA and WB are the labelled wattages of heaters

(Continued on page 54)

pH, Water Hardness and Fish Breeding

by Dr. F. N. GHADIALLY

IN the first part of this article, published last month, results of experiments with the effect of water on the breeding of angel fish and lyretails were presented. It was concluded that the fishes will breed in a wide variety of water conditions.

Glowlights

This is one of the "problem fishes" of the German aquarists. A very apt name too, for it is certainly no mean feat to breed these fish. Some consider it is only a little less difficult to breed than neons.

I tried for a long time to breed these fish but without success. I adjusted the pH and hardness of the water to the recommended values but it made no difference. Indeed, numerous attempts in waters ranging in pH from 6.2 to 7.2 and hardness 0.5 to 3 degrees (German hardness) failed to produce the desired results over a period of about two years. Numerous pairs were used during that time to exclude the possibility that the fish were at fault.

There was never any difficulty in obtaining eggs; almost all the pairs laid large numbers of eggs within a few hours to a day of being brought together in the spawning tank, but none ever hatched. Various spawning set-ups, finely leaved plants or willow root being used, were tried but again with no avail. Nor did covering the tank up to exclude the light improve matters. As the crux of the whole trouble was that the eggs were going bad I added some acriflavine to the water just after the eggs were deposited, just as we add acriflavine or methylene blue when hatching out angel eggs. Only two youngsters developed from these spawnings.

I now thought it might be a good idea to add the acriflavine in advance so as to protect the eggs from the moment they were laid. I added enough acriflavine to attain a concentration of 1 milligram/gallon in a bare tank containing tap water (pH 6.8; 1.5 degrees German hardness). I let this stand for a couple of days and then added a portion of boiled willow root and introduced the pair into the tank. An hour or two later I was rather surprised to see that the water was crystal clear; all the yellow colour of the acriflavine had disappeared. I had not bargained for this, but there is, of course, no difficulty in explaining the phenomenon. The willow root had absorbed the dye.

I felt that the idea had failed, but I left the fish in the tank nevertheless and they spawned the next day. I removed the parents and excluded most of the light by covering up the tank with a towel which I keep in my fish room for wiping my hands. The next day I expected to find the usual chalky-white eggs, but when I did have a look I was pleasantly surprised. As I moved the towel aside, the cover glass moved and drops of condensed water fell into the tank. This was followed by a shower of glass-like splinters dropping from the willow root to the bottom of the tank. I had at last succeeded!

It was about three to four days before the fry became free swimming and there was no further trouble in rearing them in the usual way. Since then I have used this technique many times. Best results so far have been 120 fish

reared from a single spawning, though the average number obtained is quite low, only about 30. This is not really good enough as these fish often deposit 300-500 eggs. There are some aquarists who have reared over 300 fish from a single spawning without any acriflavine. Probably their water is more suitable to breeding this fish than that available in Sheffield. However, I am passing on the idea for the benefit of those who have failed to breed these fish by the conventional methods.

Many of my friends have now tried this "acriflavine-absorption technique" and succeeded. This must not be confused with the well-known technique of adding acriflavine or methylene blue to prevent eggs going mouldy. In the acriflavine-absorption technique there is no acriflavine in the water when the eggs are hatching; the water is crystal clear. How it acts is anybody's guess. One suggestion that can be made is that it probably "cleans" the water by killing off bacteria and Infusoria which may be harmful to the eggs. Having done this work, it in turn is got rid of by the willow root, leaving behind water which is fairly good for breeding glowlights. If nylon wool or nylon scouring pad is used as a spawning medium, it will not absorb the acriflavine. Spawnings with such in water containing acriflavine have yielded poor results.

I have now employed this technique with many characins and feel that it enhances one's chances of success. Since discovering this technique it has come to my notice that a similar method had already been used by Mr. D. L. Jacobs and described in an old issue of *The Aquarist*. He recommends this method not only for glowlights but also for neons.

Further, it is of interest to note that he has successfully bred glowlights in acid and alkaline, soft and moderately hard water. Once again we can conclude that water conditions are important but that the naive assumption that all can be put right and any fish bred by merely shifting the pH or hardness of the water is entirely erroneous.

Neons

Here the evidence I have to present is of a negative character, as nobody to my knowledge has bred neons in this country in large numbers as regularly as they are bred in certain parts of Germany. Articles written by various German aquarists and published in the journals of this country and the U.S.A. repeatedly inform us that it is important to spawn these fish in water of almost distilled-water purity (pH 6.5; hardness less than 0.5 degrees). Numerous first-class aquarists in Britain have followed this advice but without any real success. Of course, a few neons have been bred and occasionally a reasonable degree of success has been obtained, but this bears no comparison to the fantastic results achieved on the continent. They export many thousands of neons to us every year. Surely if the problem of breeding these fish could be solved by the simple adjustment of pH and hardness of the water many of us would have succeeded in breeding these fish long ago.

Further, it would appear that neons can be bred in hard alkaline water. This is shown by the report by Mr. W. Klaus in *Aquarium Highlights* by Innes. This aquarist added lime water and adjusted the pH to 7.2. One can safely assume that this must have made the water fairly hard. The genuineness of this report can hardly be doubted as W. T. Innes inspected the youngsters and photographed them.

Once again we see that even the fabulous neon can be bred in both acid and alkaline waters. I could go on like this for many other species, but it would serve no further

purpose. I think I have made my point. It is extremely naive to imagine that fishes which are difficult to breed will breed simply because they are provided with a concoction of peat and rain water to spawn in. Surely pH and hardness are just two of the many variable factors.

For instance, there are scores of chemical factors that could be considered and probably the type of bacteria and other organisms present could determine whether our efforts at breeding a fish are going to succeed or fail. Why pick on pH and hardness? Just because they are the easiest to measure?

Consider the problem from another point. All living creatures show considerable tolerance and adaptation towards their environment. Fishes continuously amaze us by their temperature tolerance, their powers to survive overcrowding, variations in diet, etc.; surely then it would be most unusual if it were true that a fish which will breed at, say, pH 6.8 will refuse to do so at pH 7.2. A sudden large change in pH can kill a fish, as can a sudden large change in temperature; that is quite true, and can be easily shown by a simple experiment, but that is a different problem. As far as breeding fishes is concerned, I can truthfully state that as yet I know of no fish which will breed in acid water that will not also breed in alkaline water and *vice versa*.

It is possible that this is in part at least due to adaptation by the fishes in our tanks to our varying water conditions over a period of years. Be that as it may, if progress is to be made we must first realise that pH and hardness are not in themselves the answer to all our fish-breeding problems, and then we must proceed to study more diligently the effect of other constituents in the water affecting fish breeding. Synthesis of water suitable for our needs from simple chemical substances might ultimately prove a sounder method of approach than hit-and-miss attempts with various concoctions that cannot be duplicated ever again by the aquarist or anybody else.

Fundamentals of Aquarium Heaters

(continued from page 52)

A and *B* respectively; the voltage does not enter into the calculations provided that the mains voltage used is the same as the rated voltage of both heaters. If the two heaters are rated at different voltages, we shall approach the realms of higher mathematics, and this would not be very acceptable in an article of this nature. It is therefore recommended that those readers who wish to try out the system of two heaters in series, should confine their efforts, and particularly their calculations, to heaters of the same voltage rating.

In a Nutshell

To summarise: (1) You can use any heater at any voltage below the stated maximum, but *never* at a higher voltage. (2) You can calculate, near enough, the actual current consumed by any heater by using the formula:

$$\text{Consumption} = \frac{WL \times AV \times AV}{VL \times VL}$$

where *WL* is the labelled wattage, *VL* is the labelled voltage at the middle of the stated range and *AV* is the voltage of your supply. (3) If you connect two dissimilar heaters in series, the greater amount of heat will be produced by the smaller-wattage heater. (4) You can be certain that whatever current flows to your heaters through your supply meter, and eventually appears on your electricity bill in terms of £ s. d., has been wholly converted into heat in your fish tanks. *You can't throw electricity away.*



Expansion of Fisheries Research in South Africa

A public aquarium costing £25,000 is being built in Durban and will form part of a marine biological station for fisheries research. The picture shows shuttering in position for the circular main tank of the aquarium; fishes will be viewed through the square windows in its walls. New building is also taking place at Sea Point Aquarium, Cape Town, as part of a programme for expansion of studies of marine life in connection with fisheries in the south Atlantic coastal waters.

Photo: "The Natal Mercury"

Orange Chromide

(*Etrophus maculatus*)

ORDER:—Percomorphi, from Greek *perke*—perch, and Greek *morphe*—shape.

FAMILY:—Cichlidae, from Greek *chile*—a kind of sea fish.

SPECIES:—*Etrophus*, from Greek *etron*—the abdomen, and Latin *maculatus*—spotted or variegated.

A NATIVE of India and Ceylon, the orange chromide is one of the smaller cichlids, seldom reaching more than three inches in length. For those aquarists who have no large tanks this is a recommendation in itself, for a single pair can live comfortably and happily for the whole of their lives in a 15-gallon aquarium. They are peaceable, moreover, and have been known to spawn in a community tank, so one-tank hobbyists need have no fears about obtaining one or two for their collections.

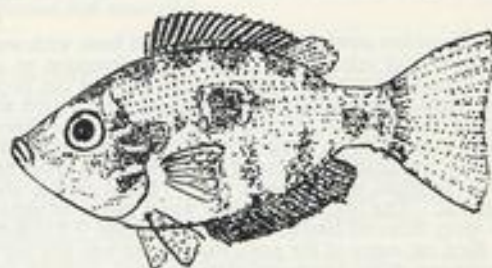
The popular name suggests the predominant colour of the fish, although this is not so intense in between spawning periods. The central body spot is very dark (almost black) and regular rows of red dots appear along the sides of the fish. A blue semicircle is apparent beneath the eye, and variable blackish pigmentation is present in the fins, particularly the anals and ventral. Colours are most intense within a temperature range of from 75° to 85° F., tending to fade from 70° to 75° F., or when the fish are out of condition.

To maintain and foster first-class condition fair quantities of live foods such as *Daphnia*, enchytrae, brine shrimps and *Cyclops* should be given—as often as they can be obtained. In addition, spinach, lettuce or duckweed is a help, and these are readily consumed. Some aquarists who appear to take very little, if any, trouble to provide textbook conditions for their fishes, report consistent success with spawning and raising chromides. Others who are more fussy about hygiene, temperature, etc., report that all their efforts appear in vain. Is there a moral in this?

While realising that anyone who has successfully spawned and raised these fishes has no incentive to experiment, I sometimes wonder what would be the outcome if one or two other set-ups were tried with the same pairs of fish. Would it be found that no matter what the conditions the fish would spawn, or that only one or two environments suited them? In other words, is it the fish or the conditions surrounding the fish that decide the success or failure of a spawning?

Innes states that eggs are laid on the underside of an arch or bridge. This is by no means invariably the case. Sometimes they are laid on the glass at the front or back of the aquarium, or on the exposed vertical side of a rock. Each egg has its own short attachment thread. After being attached it is fanned constantly by one or other of the parents.

In from two to three days, depending upon temperature of the water, the eggs hatch. One or other parent, or both, begins to scoop out "nursery pits" for reception of the fry. When ready the tiny creatures are plucked free from plant, rock or glass, and blown into one of the pits. Many a



Orange chromide

spectator has had his heart in his mouth while watching this, for it looks as though the parents are eating the fry. After a few hours in the pit, the fry are once more sucked into the mouths of their parents and shot into another pit.

Within a day or two, the fry are stronger and making obvious hopping movements in the nursery. The parents keep a constant vigil, and are very aggressive towards any other fish which dares to approach too near. It is far better for them to be on their own at this period.

At about ten days old the fry are free-swimming and swarm around their parents as they move round the aquarium. Stragglers are pursued and brought back to the flock by either mum or dad. Fed liberally with live food, the fry should be about half an inch in length by the time they are three to four weeks old.

Sometimes, when ready to spawn once more, the adult fish will attack and kill as many of their previous brood as possible. Maybe they wish to be relieved of any further responsibility for their well-being because of the imminence of a further host of youngsters needing full-time attention.

Once having spawned, the chromides are unable to stop, and further batches of eggs (not necessarily all fertile) will be laid at intervals of from two weeks to a month.

It is interesting to note, too, that more than one report has been received of these fish having fertile eggs when the two parents have been separated by a glass screen. It is obvious that the sperms do not necessarily have to be practically pushed on to the eggs in order to find them.

Cacti in the Fish House

IF you have any *Lithops* in the collection it will be necessary to cease watering these as soon as they have flowered and produced their seed pods. These plants are very attractive, resembling pebbles in shape and coloration. They are found in the Karoo and Little Namaqualand in South Africa. Among the 60 or more species can be found yellow and white flowers, but no other colour. If the flowers of the *Lithops* have been fertilised seed pods will form. These take months to ripen but when they do they are very interesting. The seed pod bears a close resemblance to a poppy seed-head, and when really dry is very hard indeed. It is very difficult to open these pods with finger pressure but, if a drop of water is allowed to fall on the top of the pod, valves operate and all the sections of the pod open up like a quartered orange, to disclose hundreds of tiny seeds. Once the pod dries again it closes tightly.

In the Water Garden in JUNE

by
ASTILBES

THE garden pond should now be at its best, with water lilies and other plants in flower. Attention to any pests present should be given before they can do too much harm. Sometimes certain flowers are infested with green or black fly, and this can spoil the look of the flowers. It is unwise and even dangerous to try to kill the aphides with any insecticide, as most of the present-day types have D.D.T. in them, which can be fatal to fishes even in small quantities. The best way to clear water plants of aphides is to spray them off into the water with a hose. The fishes may then eat many of the pests and at least you will not be harming any of the occupants of the pond.

Sometimes leeches are found under the leaves of water lilies. These are not likely to damage the leaves much but are more likely to injure the fishes. They can be picked off the leaves and destroyed, and if the pond appears to be badly infested with them it is a good plan to lower a piece of raw meat on a string into the pond at night. A rough wire cage should be placed around the meat to prevent the fishes from getting to it. When it is pulled out in the morning it is probable that some of the leeches will be sticking to the meat, and they can be destroyed.

There are certain moths which lay their eggs on the water-plant leaves which are above water level, and the caterpillars or grubs which emerge can do considerable damage to the leaves. If within reach they can be picked off by hand or flushed off into the water with the hose. Water snails can make holes in the leaves, and so the pond-keeper will have to think twice as to whether to introduce any snails into the pond or not. They can be dispensed with entirely, but if any are there they can do more harm than good. They can eat the water plants, the fishes' food and also their eggs when laid. They do supply a certain amount of fish food when small, but not enough in my opinion to warrant their inclusion in the pond. It is probable that the ramshorn type (*Planorbis*) does less damage than the common pond snail (*Lymnaea stagnalis*).

Watch the growth of the under-water oxygenating plants, as they can increase space at this time of the year. The types such as *Lagarosiphon major* and *Egeria densa* can grow so fast as to take up too much of the swimming space for fishes if left unpruned. When too much weed is present it is possible to cut a quantity of it away with a knife tied to a long pole. The weed can then be raked out of the pond. Any fresh subject to be planted in the pond should be dealt with carefully, as it must be realised that the other water plants will have their roots well into any mulch in the pond and the new plant may have difficulty in getting its roots to find sufficient nourishment. It is better to root each new plant in a separate container before the whole is lowered into the pond.

A small container can be made with a few bricks built on the bottom of a concrete pond in a rough square. Some soil can be placed in this and the plant set therein. Some large stones should then be placed on top of the soil so that it does not get washed out by the fishes. It is then possible to remove this structure if needed at any time when the pond is cleaned out. The large pots specially made for water plants can be used if obtainable, as they can always be removed from the pond when required.

Many ponds may have too much blanket weed growing at this time, but as the water plants gain strength they will tend to keep this growth down, and if much of the weed is pulled out about once a week it should not be difficult to keep it within bounds. Many pondkeepers forget that many fish are able to eat a good deal of this blanket weed, especially the soft type. They are not likely to do this if



Photo:

Laurence E. Perkins

they are fed artificially by you. In a well-established pond which has plenty of growing underwater plants it is possible that for the summer months little extra food need be given. It depends on the size of the pond and the number of fishes in it. If it is rather crowded with fishes then obviously some food will have to be given, but where the pond has only a few fishes it is possible for them to be able to find sufficient food to keep them healthy.

More trouble is caused by over-feeding the fishes in a pond than by anything else. The water gets impure and this tends to encourage the growth of algae, both free-floating and filamentous.

Any well-run pond should have a fair amount of natural food in it for the fishes during the warm weather. Garden worms can fall into the pond; there may have been frog tadpoles there; certain insects lay their eggs in or near the water, and the larvae will make good food for the fishes. All carp and goldfish types can eat a fair amount of vegetable matter, and will spend most of their time sucking at the sides of the pond or plants to get this soft vegetation away. The more food you give them the less are they likely to eat the algae, etc.

The pond may lose a little water at this time of the year and need topping up now and again. This may not be because there is a leak in the concrete. A certain amount will be lost through evaporation, and birds and other creatures may drink from it. If the pond is near a country district it is probable that hedgehogs will come to the pond to drink every night. Should they be in the vicinity of the pond they may be seen soon after dark, as after a warm day, one of the first things they do is to have a good drink. In such districts grass snakes may visit the pond. They are probably looking for frogs which like to be near the dampness, but they are capable of entering the water and eating fishes. Some pondkeepers have lost fishes from their ponds and never imagined that grass snakes may have been the culprits.

"Keeping 'em alive"

by L. R. BRIGHTWELL

THIS is not another attempt to deal with a subject which has already occupied a good deal of *The Aquarist* and is likely to continue to for some time. It refers to keeping alive the interest of that most subtle of animals—the human, as at present understood on this planet.

Under the East Sussex Further Education scheme I am now a fairly seasoned lecturer, and as such have to study my fellow humans as assiduously as I do the sea animals I show to them and expatiate upon for 40 minutes, and never a cough or foot shuffle must come my way. For such signs, dreaded by all lecturers, mean the audience is slipping. "Held" with anything like success it will rise to, and digest, a subject it would give scarcely a glance if put before it in book form. The film and television are doing much to lessen the reading public, for one cannot watch and read. The lecture, helped along with plenty of pictures—which serve also as handy cues to the lecturer, is an educational medium not to be taken lightly.

My first platform experience, 30 years ago, is still a vivid memory. It was Mudbeach on the Slush, the subject Trawler Trips, and the hall was bookable by the local Scientific and Literary Society for one hour only, then lights out, including, of course, lantern "juice."

I was sick with stage fright hours before the start, but I need not have worried. Our chairman was the local fishmonger, and what more natural than that the good man should say a few words about the trade and, of course, a closing paragraph concerning his splendid new premises, just opened and only two doors up the High Street. His

few words took just 50 minutes, allowing five minutes for me to do my stuff, and another five to cover the final scramble for coats and umbrellas.

Zoological "Hits"

One essential in lecturing is to avoid giving your audience too much in the limited time and so breeding mental indigestion. Plenty of good stories also help a lot. A film accompaniment is ideal, but film making is still an expensive game, and all premises do not have a film licence. Since I nowadays do as much photography as drawing, I shall incur no accusation of prejudice or professional jealousy when I say that a good drawing has the still photograph beaten to a frazzle every time.

A drawing, made by a capable artist, can put over something utterly impossible to the box of tricks in which the bulb-squeezer and trigger-pusher persistently puts such a pathetically child-like faith. The drawing can convey what the still photograph misses every time—life!

Out of the many thousands of kinds of animals thronging the English Channel, some are always sure of popularity—a few can be banked upon as hits. People like to hear about local whales. It is only lately we know the whale is, unlike all other mammals, born tail first—and why there are amusing lawsuit stories about beached whales, where on the whale is the whale meat we buy, how one can get machine oil *ad lib* from a fresh whale, the high quality of a whale's "giblets" and their immense size, the bulky and very human-looking brain, where whales mostly come ashore and which species most frequently, what one should do on finding a beached whale, why official records have been kept only since 1913. The royalty or otherwise of the whale is also news to an audience.

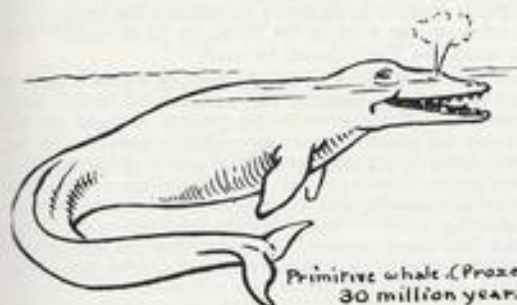
For the benefit of all spivs, adventurers and amateurs who now love to crowd in on every market and make things harder for the professional, let me assure all such parasites that lecturing, though paid, is not a "snip" or a "money-for-jam" job. With hell let loose you must still keep your dates. Let one of the "I could do that" school of thought have a go at reaching "Quagmire-under-the-Land-slide" in a tempest, and after struggling along muddy lanes in pitch darkness, work hard for an hour, and then face up to



Primitive carnivore. 46 million years ago



Hypothetical semi-aquatic stage. 40 million years ago?



Primitive whale (Prozeuglodon) 30 million years ago



A typical modern "toothed" whale

getting home again. To any amateurs tempted to "have a go," I wish them every disaster!

Another popular card is the hermit crab. His endless housing problem and extraordinary commensals and other hangers-on always win him some admirers, particularly garnished with slides of my unique glass whelk-shells. Quite lately a film of my hermits has been touring local picture houses, and it was interesting to see how, vastly enlarged, of course, upon the screen, it was easy to appreciate to what an extent the hermit is a plankton feeder. Minute food scraps magnified to the size of brick bats made a fine sight as the hermits' respiratory apparatus wafted them into that fearsome battery of saws, knives, combs and brushes that compose the crustacean's mouth.

The sea urchin, its round back covered with spines each mounted on a ball-and-socket base, its tube feet and amazing battery of pincer organs, never fails to impress an audience. On the whole, the further an audience is from the sea, the keener it is to hear about it. For six years I endeavoured to get a certain Brighton aquarists' society interested in marine life, and gave up. Perhaps the re-birth of Brighton Aquarium may do something. We shall see.

Tales of Whales

But whales went great guns lately with a packed house of R.N.V.R. cadets, and indeed the whale proves a public pet almost everywhere, especially as public sympathy is so easily and justly aroused at the plight of these huge and largely inoffensive creatures steadily being exploited by avaricious all-devouring commercial enterprise. Audiences as a rule do not get worked up on the subject of eugenics but the still most imperfectly known Cetacean family tree, and the story of the rascally "Dr." Koch's leviathan, never fails to hold hearers. Dangerous animals such as jellyfish also are a draw, but here, as in all matters, one must feel

the audience's pulse, a thing not always easy to do.

I must have told my Portuguese man o' war tale scores of times, and always got a big laugh. But it missed for once. I was working at Plymouth in 1954 when a small flotilla of *Physalia*, first seen for eight years, entered the Sound and a few were taken to the famous laboratory.

Now anything that happens at the "lab," whether as regards sea animals or the polyglot gathering of workers, is news. The local press just laps it up. So, when I reached my digs, in a tearing sou'wester, on the evening after the famed and deadly jellyfish had arrived, up piped my good landlady:

"Well, Mr. B., and what's the latest from the lab to-night?"

"Oh, I don't know," I said, a little absently, being much involved with a sodden mackintosh. "Let me see, ah! yes, of course; a couple of Portuguese men o' war arrived to-day."

"Well, well, well," said my hostess. "Now oughtn't that to do those poor public houses a bit of good on a terrible night like this!"

That tale was in all the West Country press, and soon after reached even London at almost radio speed. So, what more natural, and excusable I hope, than for a hard-worked lecturer to dish it up some months after for the edification of a fairly full house in the Assembly Hall at Little Fiddlington on the Marshes.

But, you know, even accompanied by a drawn-from-life portrait of *Physalia*, and a big effort to reproduce Mrs. . . . 's Devon burr, there was only a faint ripple of . . . something or other, and then a very chilly silence.

I realised too late I was trying to brighten the lives of a gathering of fervid, fanatical, dyed-in-the-wool total abstiners.

To "keep 'em alive" you can't study your audience too carefully. Would-be "lecturers"—you have been warned!

What's New on the Market

Hykro Sub-Gravel Filter

FOR some years a popular form of filter in the U.S.A. has been one which has been based upon filtration through the gravel bed of the aquarium. One or two hobbyists on this side of the Atlantic have evolved similar systems for their own use but it is only recently that this form of filtration has been put before the British aquarist as a commercial product. There are now several on the market, two of which I have seen in action. These are issued by Tachbrook Tropicals, the makers of the well-known Windmill filters, and by Høyrup Jessen of Denmark, who are the makers of the equally well-known Hykro products. Several enterprising dealers have set up show tanks in their shops equipped with these filters, and the prospective customer can see for himself how sparkingly clear these tanks remain week after week.

The one I have tried out myself is the Hykro Sub-gravel Filter, which is simplicity itself to install and operate and which is made entirely of plastic. It consists of a raised hollow base containing dozens of slots, which is placed upon the clean glass bottom of the tank, the gravel being then placed both around and on top of it so that it is completely hidden from view. The gravel used should be coarse enough not to pass through the slots in the base. From the base a wide and a narrow plastic tube lead upward. The narrow tube is attached to rubber tubing connected to the air pump; the wider tube allows the air bubbles to escape from below the base without disturbing the tank unduly. The narrow tube is liable to be bent out of position by the pull of the rubber tube connection, so plastic

clips are supplied to enable the wide and narrow tubes to be clamped together. When the air pump is connected it is best to regulate the air flow until the released bubbles come through separately at a distance of about one inch apart.

The effect is that water from the tank is continually being filtered through the gravel bed and the detritus is drawn down with it and retained there. Much of this is made use of by the plants and the constant aeration of the gravel prevents it turning black. The tank remains really sparkling and can be left more or less indefinitely. There is an added advantage in so far as there is no glass wool, carbon or other filtering medium to clean or renew and no unsightly outside or inside filter boxes on view. Tests with a piston pump at lower levels produced no running back. Each of these filters is about 6½ in. by 7½ in. and one has been found quite adequate for a 24 in. by 12 in. by 12 in. tank. For larger tanks two filters should be used.

This type of filter never needs cleaning where a tank is treated sensibly as regards the addition of dried food. However, it will not prevent the growth of algae on the tank sides, an aspect of cleaning which is always with us. It is advisable to stir the top layer of gravel occasionally to prevent caking after long use. The fishes ignore the filter in action completely, and there is no risk whatever of any fish injuring itself or being trapped in any way. This product has come to stay. I cannot for the life of me understand why it has taken so long for it to appear in Britain.

Raymond Yates

AQUARIST'S Notebook



by

RAYMOND YATES

I LIKE to see some form of rockwork in all furnished aquaria, but one is often disappointed. Natural rocks are far superior to the artificial effects in background affected by some hobbyists and it is worth-while thinking about just what you are going to use. The easiest place to pick up this sort of decoration is the sea shore, but much of what is available is deadly dull and very much the same shape.

In shows, a tendency of late has been to adopt warm, red-toned rocks. These look striking but are not very natural as far as most freshwater species are concerned. The sandstone type of rock found in Devon and Cheshire is not really worth using; it is rough and quickly covered with algae, and so soft that it appears to disintegrate in the tank. Millstone grit makes excellent rockery and its light-fawn colour is most attractive. For my own part I am not keen on the use of coal, which is not natural and looks like coal (and nothing else) in the aquarium. Limestone rocks are very unsatisfactory and should be avoided at all costs.

Perhaps the most attractive are the green and blue effects obtainable with the so-called Westmorland or Cumberland rock, or the green slate such as is found near Ingleton in the Pennines. I have found both these very pleasing. Hobbyists with a car can pick up just what they want if they keep their eyes open when they are in these areas, and some extras for fellow aquarists helps to make many friends. Even hikers with a rucksack can bring back a supply from their travels. I do not hold with the view that sharp edges and jagged rockery should never be used. Why not? For show purposes, no, but for all other purposes it can be very ornamental. There is little risk if you do not keep "scary" fish like angels, who could injure themselves in such circumstances. Few other tropicals tend to panic like the scalare. Heaters are best disguised behind rockwork effects; I prefer to lay the heater on a flat stone with another flat type of stone behind it to prevent it touching the aquarium back glass. The heater can then be successfully hidden by a suitably long piece of rockery placed in front of it without affecting the efficiency of the heater.

When you are in the country many good coldwater aquatic plants can be picked up and carried back in polythene bags. These are moisture proof and a boon to the aquarist who wants to get natural plants. Some time ago I had an old tank which had had its day, so I painted it and rigged it up in the garden in a shady spot away from the sun. I filled it with water and provided a gravel bed, and then I added about a dozen different plants picked up in out-of-the-way country spots. With the adequate light these all did very well, whereas in indoor aquaria such plants would probably decline. Garden plants such as mint and moneywort (creeping Jenny) can also be grown as cuttings. I found starwort, water cress, curly pond weed, moss, willow moss and *Hygrophila* very adaptable, as well as some lesser-known plants.

The beginner is always worried by the thought of the total loss of his fishes. There is little need to worry overmuch on this account, more particularly where a community tank is kept. It is very rarely indeed that an aquarist loses all his fishes, or a whole tankful of fishes, at one blow. It can happen, but the chances are slight. A fuse blow-out in mid-winter, a thermostat sticking, damage done by intruders, poisoning, accidental damage and disease all seem possible harbingers of trouble. In the event few people experience losses from the current being cut off, and even where the current has stayed on owing to a sticking thermostat some fishes (like anabantids) will

survive. Accidental damage is one of those things you really can't help, nor damage done by burglars, but this is a rare event. The bottoms don't usually fall out of well-set-up tanks on a good foundation, but if you must move tanks full of water—expect trouble. As for disease, it is true that one or two troubles can cause havoc, but even these usually fail to decimate the entire population of a mixed group of fishes. A rare case was reported to me of an outside filter which had proved faulty. This had been left on all night (a risky thing to do), and the bottom of the filter fell out. The filter continued to siphon, however, so that there was quite a flood, and the heater burned out when the water level fell below it. This is a chance in a million, but never leave any apparatus working when you are in bed or likely to be absent for some hours. You never know what might happen!

In common with almost all other zoological gardens in both Britain and Europe the attendance at the London Zoo for 1956 showed a decline over the previous year. The attendance of 1,948,046 was over 130,000 below the figures for 1955. This reduction was also seen in the numbers attending the Aquarium (337,659), roughly 21,000 fewer than the previous year. Approximately one in every six visitors to the gardens visits the Aquarium, and this ratio has been fairly constant for some years. Perhaps the depressing summer was to blame. Gate receipts increased, however, owing to an increase in admission charges (to 3s. for adults and 1s. 6d. for children, except Mondays at Regent's Park, when it is 2s. and 1s. respectively).

In 1955 the Aquarium paid its way quite handsomely, with an excess of income over expenditure of over £3,000, but fewer visitors during 1956 coupled with rising costs left only £435 as surplus. Expenditure on salaries, wages, exhibits, provisions, fuel, light and general maintenance came to close on £12,000, which gives some idea of the cost of running such a large public aquarium. The Aquarium roof is under reconstruction. An innovation is the institution of a course of instruction which will lead to a diploma in the care and management of menagerie animals, which is available to the staff and which will assist promotion and lead to increased salary.

Just over 100 fishes were presented to the Aquarium, including single specimens of bream, carp, trout, conger eel, wrasse, firemouth and tinsel barb, and several black mollies, blue acara, rudd and *Nothobranchius neumanni*. Other donations included 18 anemone-haunting coral fish from B.O.A.C., 10 salmon from Mr. George Camsdale, 50 Windermere char from the Freshwater Biological Association and five moray eels from the Bermuda Government Aquarium. Fishes added during the year which were new to the collection were the eagle ray, three-spot anostomus, *Leporinus friderici*, Chinese grass carp, Medaka rice fish, eel catfish and *Labeo bicolor*, the red-tailed black shark.

Fish "types" are supposed to go on for ever. There is no doubt that some of them do. William T. Innes in the U.S.A. is well over 80 and still going strong, although some months ago he retired from really active participation in his

publishing house. Another U.S.A. veteran still in the field is Mr. August M. Roth of Baltimore, who is now in his seventy-seventh year. Way back in 1914 he began publishing articles on the hobby and in 1917 he launched a magazine called *The Aquatic World*. In 1922 he bought another magazine, *Aquatic Life*, which he has published with one break ever since that date. This magazine runs to about 22 pages, with hardly any advertising matter, and consists of translations of articles from continental magazines together with numerous articles written by Mr. Roth himself under an assumed name. To-day after 43 years of helping to create interest in the hobby Mr. Roth actually publishes the magazine alone. This means that he does all the clerical and mechanical work necessary to the making of the magazine, including linotyping, presses and all other machine operations. The magnitude of this task is clear and Mr. Roth must indeed be one in a million. Let us hope he will long be spared to continue his enjoyment of the hobby of a lifetime and to keep up his wonderful publication record.

I was looking at a cartoon recently where the small boy points to one fish in a tank of 500, and fond mother remarks to the dealer: "Bless him, he knows what he wants!" I will remember as a boy once insisting on one special goldfish out of a huge tank containing many hundreds. The dealer was flabbergasted, but humoured the boy (me) until I pointed out the one my heart desired. This was a good fish with a Y-tail. He made some pert comment but I got the fish at last (for 6d.), and went home happy. It amazes me to find hobbyists who still buy fish haphazardly and leave it to the dealer. Fish worth having should be picked out individually. In any batch you will find the two or three outstanding fish, the weak coloured, the undersized, the runts, the deformed, the diseased and the old. If the dealer can't be bothered don't bother him with your custom any more. In fairness to most dealers I must say most are only too anxious to please. Also, never imagine the dealer doesn't know what he has in the tank. However many fishes they have most dealers know exactly what is in every tank, from runts to white spot. Be choosy, it will pay you in the long run.

Visitors to Devon this summer should make an effort to look in at the Paignton Zoological and Botanical Gardens, where they will find much of interest. The newly renovated and improved tropical house, aquarium and reptile house have now been amalgamated under one roof. This huge building was opened on Good Friday, the alterations having cost about £10,000. A large number of snakes are on view, including many poisonous varieties, and there is also a pond and beach, the lair of two Mississippi alligators. Other newcomers are skinks and a water dragon. The aquarium has some 36 tanks of tropicals, under the care of Mr. H. N. Allies, the largest fish being an electric eel. The botanical display is wonderful and aquarists will be particularly interested in the tropical-lily pool and its blue water lilies.

From time to time I have reviewed books and booklets issued by T.F.H. Publications of New Jersey, U.S.A. This is, of course, the firm with which Mr. Herbert Axelrod, the American hobbyist and publisher, is connected. For the convenience of aquarists in England this firm has now an English counterpart from whom any T. F. H. publications can be purchased or ordered. This is T. F. H. Publications (London) Ltd. (34, Nutley Lane, Reigate, Surrey) under the direction of Mr. K. D. Fawcett, a well-known southern aquarist. This particular firm has made a feature of issuing small booklets of roughly 20 pages on each of the more popular types of aquarium fishes. These give considerable information in little, are beautifully printed

with a fine-coloured cover and first-class photographs on almost every page. Recent titles include *Discus*, *Catfishes*, *Dwarf Cichlids*, *Panchax Groups*, *Barbs* and *Aquarium Plants*. The current list covers 22 fish booklets as well as many others on cats, most dog breeds, birds, hamsters, rabbits, turtles, monkeys and mice.

Owing to currency difficulties it is not easy to buy American aquarium gadgets but readers interested in U.S. magazines and books on the hobby have been able to obtain them through the agency of Peter Hobson of Exeter. At the end of August last year, however, things went haywire, and delay and dislocation took place. There was, of course, a perfectly reasonable explanation. On the last day of August Mr. Hobson was called up as a reservist and almost at once found himself in Cyprus, so it is hardly surprising that his agency routine suffered some setback. However, he is now back on the job again and tells me that he found the trip quite interesting, as he served in the Far East during the war, so that Cyprus was all new to him. He thought it was wonderful even if not quite a rest cure. Readers interested in subscriptions to U.S. magazines can now be sure of his personal attention.

The average fishmonger's shop is generally pretty dull, and dead fishes set out in rows for sale look very drab. One fishmonger in Stockport, Cheshire, however, seems to go out of his way to attract custom and to catch the eye. If any unusual fishes are about he has them on view in his shop, and they certainly make the passers-by stop and look. Of many exhibits two recent ones were a shark hung up outside the shop, so that its mouth was about human-eye level, and an angler fish. The latter was about three feet long with an enormous mouth. The rod was quite stiff and everybody felt it. I observed that several other small "rods" lie behind the main destruction lure.

The well-known firm of Hykro have recently put on the market a new product, dried tropical flies. These are intended for tropical or coldwater fishes, insectivorous birds or terrapins. These flies probably conjure up a picture of the sort of dead flies we find near our windows in England, but this is quite erroneous. The contents of the packet are green, brown and yellow, and no wings or legs are in evidence; in fact the contents resemble a very large variety of crushed shrimp more than anything. Caught by millions in the tropical swamps where they breed and feed on the luxuriant vegetation, the bodies contain rich oily matter which the fishes snap up with evident relish. I can recommend these to hobbyists wanting something different.

Talking of flies reminds me of the danger of leaving a tin of maggots until all have turned into real "bluebottles." Take off the lid and you are put right off your lunch. I well remember picking up such a forgotten tin and giving it a shake. A noise like angry bees filtered through the gauze top. I poured in a small quantity of methylated spirits and waited 10 minutes. Then I took off the lid. Almost all the flies were dead, but the sight was not pleasant as these newly hatched flies are a grey colour with still shrivelled wings, and they are certainly something you never want to see again.

Mr. F. G. Odams

WE regret to record the death of Mr. F. G. Odams, which occurred suddenly on 28th April. Mr. Odams was well known to many aquarists, in London in particular, as treasurer of the National Aquarists Society, an office he had held since 1948. He had been a member of the Society since its earliest days and was awarded a fellowship in 1953. His loss will be felt keenly by his Society and by the many aquarists to whom he was a familiar figure at the "National's" exhibitions.

Microscopy for the Aquarist—3 I by C. E. C. COLE

THIS is one of the best months for aquarists to go pond hunting. What a host of eggs, of young and of adult creatures can be found! What chances there are for us all (if we own a microscope) to while away many pleasant and instructive hours making closer acquaintance with the fascinating ugliness or beauty of small aquatic creatures. We can shudder or exclaim with delight just as often as we please while we gain new appreciation of the diversity of forms of life within the compass of the smallest quantity of water.

But I digress! Last month I left you halfway through a discussion on the means available for overcoming the adverse effects of slides with either too thick or too thin cover glasses. Besides adjustment of the draw tube there are two other ways: one necessitating special objectives and the other the purchase of a useful accessory.

The special objectives are fitted with what is called a Correction Collar. The movement of this, a rotation to either left or right, brings the various elements of the lens



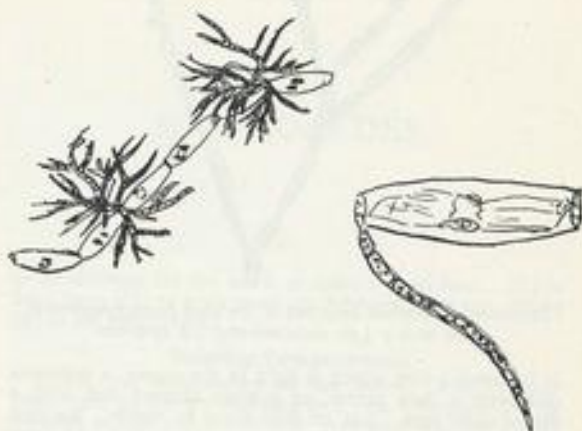
Tube-length corrector (W. Watson & Sons)

into different relationships to one another, and can, of course, be changed as often as the cover-glass thicknesses require.

What can be termed the ultimate so far discovered for correction of cover-glass differences is the Tube-Length Corrector of W. Watson & Sons, also called the Aplanatiser. It can be used with any objectives, being mounted in the nosepiece above them, and consists of an adjustable-lens system. It is expensive, costing about £17, but gives the same correction as would a tube closing to 100 mm., and extending to 300 mm. (a range covering anything we are ever likely to encounter).

Now we come to the point you must have been waiting for. How can the inexperienced or newcomers to microscopy tell whether the image they see is as good as they can secure? First thing to remember is that most objectives made by reputable firms are corrected for use with a tube length of 160 mm. and a cover-glass thickness (including mounting medium) of either 0.17 or 0.18 mm. It would seem then that all we have to worry about is manipulation of the tube length of about 10 mm. So far, so good!

Unfortunately, cover glasses are manufactured which vary in thickness from 0.15 to 0.3 mm. and, as far as I am aware, no manufacturer of slides specifies which thickness he uses. We have, perhaps, one consolation here. A slide with a cover-glass thickness over 0.2 mm. both looks and feels thick, and is often mounted on a thick slide as



Magnified views of the alga *Draperaldia*. Left, cells and branches ($\frac{1}{4}$ in. objective, $\times 8$ eyepiece); right, a single cell and branch ($\frac{1}{4}$ in. objective, $\times 8$ eyepiece)

well. These can be rejected immediately for examination with high-power objectives.

This still leaves us a range of 0.05 mm., however, representing a possible difference of 50 mm. (2 in.) in our setting of the tube and the correct one. To start with, however, set the tube length at the makers' ideal (160 mm.).

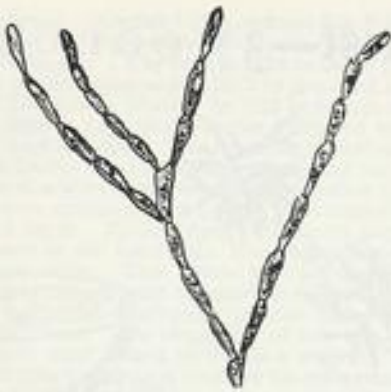
Having paid due attention to the correct focusing of the condenser upon the object, look at the image. Is it crystal clear; does it seem a little hazy; could we make it better? Only by experiment can we find out.

Move the slide around until a tiny detail, a mere speck, is found. This must not be a speck of dust on the surface of the cover glass, but in the same plane as the object, an opaque spot or tiny piece of foreign matter.

Move this spot to the centre of the field of view. Now rack the objective very slowly and gradually upwards, watching the image of the speck very closely. How does its appearance change? It will do so in one of three ways.



Portion of the alga *Batrochospermum* seen with a $\frac{1}{4}$ in. objective and $\times 8$ eyepiece



Structure of terminal branches of the alga *Batrachospermum* seen with a $\frac{1}{4}$ in. objective and $\times 8$ eyepiece

It becomes a ring which is light in the centre, a nebulous disk with a dark centre, or a mere blurred disk with a darker outer area. Let us take these in order. We rack upwards and there appears no. 1: a ring, dark and more or less sharp, and light in the centre. This is an indication that the cover glass is too thick. No. 2: a nebulous disk with darker inner area appears. This means that the cover glass is too thin. No. 3: a blurred disk with a darker outer circumference appears; the cover glass is correct.

To correct fault no. 1, push down the draw tube a little and look again. Continue until the dark and sharp ring fades to the faint ring with dark centre (no. 3). To correct fault no. 2, pull out the draw tube until the blurred disk with the dark centre changes to the lighter-centred disk with dark circumference.

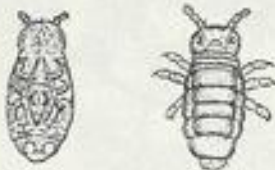
After the above adjustment refocus the object. A marked improvement in the clarity and detail revealed in the image will usually be immediately apparent. To check finally, rack down the tube for the same distance below the object as you previously did above it. The appearance of the dot should be the same.

You may not at first be successful in clearly seeing the changes in appearance of the image outlined above, but persevere, watching closely and concentrating only upon the tiniest opaque spot. You will soon know what to look for and be satisfied with the results obtained.

Culture Contaminants

Can you inform me whether the insects I am sending you are harmful to fishes or if they can be used as food for them? I found them in my culture of white worms. One hops about, the other resembles a mosquito.

The small blue-black creatures you sent for identification are a species of springtail (*Podura aquatica*). They are



Springtail (undersurface, left; top, right)

harmless to fishes, but move with such speed that it is extremely doubtful whether they ever fall victims to them. So as a live food they are useless. The spring is made by beating down upon the surface of the water with a pair of

what might be termed "false legs"—normally held close to the underside of the abdomen. Springtails are considered to be vegetable feeders, and their mouths seem to be adapted for sucking plant juices. The "mosquito" you sent with them is actually one of the midges (*Tanyptera*), the "spotted midge," which has aquatic larval and pupal stages. It is an excellent live food for tropicals.

FRIENDS & FOES

No. 57

Water Beetles (continued)



Magnified newly hatched larva of water beetle (*Hyphydrus ovatus*)

COLEOPTERA

FAMILY: Dytiscidae

GENUS: *Hyphydrus*, from Greek *hypo*—under or beneath, and Greek *hydatus*—water.

THIS genus of water beetles has only one British representative, *Hyphydrus ovatus*, at least as far as is known at present. The beetle is about one-fifth of an inch in length, and of a distinctive shade of brownish red. From the side it appears unusually deep in body.

I have seen it stated that *H. ovatus* is quite a common insect, but in all the years I have been interested in pond hunting I have found it only once, and that in my own small garden pond. On the same day I found eggs on the underside of a lily pad, eggs that were new to me. Kept for a few days these hatched into tiny larvae with very pronounced snouts. Unfortunately, I failed to raise them, but was able to identify them as *H. ovatus* larvae.

At first glance the larvae could easily be mistaken for those of the genus *Hydroporus*, but the "snouts" of the latter are shorter. *Hydroporus* frequent "blanket weed" and their diet consists of other larvae and slow-moving crustaceans like water lice (*Asellus*). After pupation they become brown-and-yellow beetles, often overlooked because they are small—yet there are at least 37 known species.

I have no evidence as to whether fishes will eat them, or whether they ever attack fish fry. As they are of "tit-bit" size, however, I would hazard a guess that more than one finds its way into the gullet of our fishes, especially those equipped to crush live foods.

C. E. C. Cole

Fancy Goldfish Breeding—5

IN the previous articles of this series spawning, hatching and feeding of the fry up to the age of 14 days has been dealt with, and the subsequent treatment will now be described. Once the first fortnight has been successfully passed there is less difficulty in feeding and protecting the fry from some of the diseases and pests which might have attacked them. They are no longer like small splinters but resemble real fish, even if still quite small.

The feeding with screened *Daphnia* can begin at 14 days. As *Daphnia* feed on tiny Infusoria it is essential that they are not introduced into the fry tank too soon, as they will then eat the small live food which should go to the fry. On the other hand they should not be withheld too long, as it is surprising how soon fry are able to take the smaller *Daphnia*, and there is no doubt that they thrive and grow on well on this diet at this stage. Great care must be taken when feeding these water fleas to fry, as if they were freshly caught from a pond it is possible that there may be some pests among them which could injure or even devour the fry. The catch should always be placed in a white washing-up or similar bowl so that the contents can be examined closely. Watch out for the larvae of dragon flies, water beetles and young water boatmen. All these can eat young fish when the pests grow a little. Water lice, *Asellus*, will also eat fry and so must be kept from the fry tank.

Daphnia Screening

Once the *Daphnia* have been sorted it is a good plan to sift them so that only the small ones are used for feeding at the moment. A series of tins with the bottoms cut out and covered with material will make good sieves. The material can vary from fine butter muslin or curtain net to the finest silk stocking. I use tins which I have cut and

5. Rearing the Fry

rejoined at the side so that the bottom, where the net fits, is smaller than the top of the tin. By this means it is possible to place three tins in one another, and have the one with the coarsest mesh at the top. When water containing *Daphnia* is poured into the top tin only the largest fleas will be held therein and the smaller ones will pass through to the lower tins, leaving the very smallest in the lowest one. These can be fed to the fry and the larger fleas either fed to larger fishes or put back in a small pond or tank where they may breed and be useful later on.

A very good point about feeding with water fleas is that they can live on in the water and so be available at all times of the day for food. Remember, however, that water fleas take oxygen from the water and so if too many are put into a fry tank at a time they may rob the fry of much necessary oxygen. Good aeration can help matters but this should not be used more than can be helped as long as the fry have plenty of space.

Once feeding with *Daphnia* has started it will be found that the fry grow apace, but that does not mean that no other food should be given. It is a good plan to feed once or twice a day with finely ground Bemax and dried shrimp. Fine packet foods can also be used, but make sure that they have been sifted so that the larger portions can be kept for later on when the fry are larger.

If *Daphnia* cannot be obtained there is no need to despair, mashed white worms or small garden worms will do as well. Brine shrimps could be fed if you have them large enough, but once the fry are over a fortnight old, freshly hatched

by A. BOARDER

brine shrimps are too small to make a good feed. If you have been able to grow some on, however, they can still be fed to the youngsters.

Rearing Temperatures

Watch the temperature of the water. This is most important, as the fry will feed at a rate depending on the warmth of the water. If it is very cool the fish cannot digest their food very quickly and then, of course, they do not want to eat as much or as often. The ambition of the aquarist should be to keep the fry growing without a check, as this has a great effect on the ultimate development of the fish. A temperature of about 70° F. is a very good one, but do not think that this has to be maintained day and night. It does the fish good to have a slightly changing temperature as they then keep more hardy.

Some might be inclined to think that it is unnatural to warm up the water for coldwater fish, but this is not so. Most coldwater fish spawn in warm shallow water, and in a good season an outdoor pond can be at this temperature for weeks at a time, and can get to the eighties. Do not try to keep the tank too warm, however, as it must be borne in mind that the warmer the water the less oxygen will it hold.

If any meaty foods are used such as lean beef, mutton or liver, great care must be taken to see that the water is not fouled. This fouling can soon occur and the results will resemble those when excess of dried egg powder has been used in the early days. The fish will develop a fungus-like substance on the gills and ends of the tails, and to cure this some salt must be added to the water, about a teaspoonful to each gallon. This water has a tendency to smell after a time and so most of it should be changed every second day.

Feed the fry as often as they will take food. Several times a day is the ideal, for if enough non-living food is put into a tank to last the fish all day some of it may start to go off before it is eaten, and it is a fact that freshly added food appears to encourage the fry to eat more readily.

From about the tenth day the fry should be watched to see that they are not attacked by flukes. These tiny pests can wipe out a whole spawning in a week or so. It is difficult to see them without a fairly strong magnifying glass, and the average person would not see them at all with the naked eye. It is the results of the attack which become apparent. The fry start to nose about at the surface of the water, they lose appetite and although they seem as if they are eating they only push the food about. They breathe more quickly and start to lose their bright colour. The dullness of the skin is sometimes an early sign, and then a slight white film may appear. The fish soon take on an emaciated look, the body gets thin and the fry appear to be all head. Later stages show small blood streaks or patches on the fins and body, and if not treated quickly the fry will not recover. It is curious how easily these pests are introduced into a tank, and it is probable that many such pests are brought into the tank with live foods such as *Daphnia*

and *Tubifex*. Freshly introduced snails can be a cause, and actually there is no place for any snails at all in the breeding tanks.

Treatment for Flukes

Fortunately there is a good treatment known for fluke infestation. This is to immerse the fry in a solution of a quarter teaspoonful of Dettol to a gallon of water. The fry can be left in this solution for 15 minutes. A stronger solution can be used for larger fish and then they do not have to be left in for so long, but for fry the above strength and time of immersion will suffice. If the fry look very distressed there is no need to worry, as once they are returned to fresh water they will soon recover. It is no use treating affected fry and then placing them back in the same tank with the other fry before the tank has been thoroughly sterilised. Many aquarists have successfully killed the flukes on fry only to expose them immediately afterwards to the same pests in the foul tank. It may be necessary to give the fry a further treatment after a week, but provided the fry are treated in time the cure should not fail to work.

Once the fry are four weeks old it is imperative that some sorting should be done. It will be found that a few fish have grown much larger than the others, and if these are not removed they can eat the smaller ones. It is not an uncommon sight to see a large youngster with a smaller one in its mouth tail first. A fresh tank should be prepared for these larger fish as once they get a little bigger than some of the others they will be able to take larger pieces of food and so grow more quickly than ever. It will be found

easier to catch these larger fish when it is dark; by using a torch they can be seen and caught with the least disturbance to the other occupants. If there is too much vegetation in the tank then it will have to be emptied and all the fish caught. Not only can the big ones be placed by themselves but any runts or badly shaped fish can be removed.

With some of the fancy goldfish it is possible to sort them out at an early age. I could tell all fantails in a brood which would never win a prize at six days old, but I could not actually pick out the winners until much later. Where double-tailed varieties are concerned the split tail can easily be seen when looked at from above when the fish is in a white bowl. All single-tailed and three-tailed fish can be discarded. Those which may have a fan-type tail, either divided or not, can be kept. It is not always easy to be sure whether a tail is divided when the fish is very young. The tail may be divided but the two sections may be carried so close together that the actual division is not visible. Later on the tail will grow and then a further sorting can be carried out.

If shubunkins are being bred it is fairly easy to sort out for colour at an early age, as they change colour far more quickly than the visibly scaled goldfish. Those fish which appear white or colourless are of no value. It will be found that the darker-coloured specimens will be the ones which get the best colour later on.

Sorting of shubunkins will be dealt with in the next article of the series, together with further advice on treatment of the growing fry.

OUR EXPERTS' ANSWERS TO TROPICAL AQUARIUM QUERIES

I have been told that the Germans were the pioneers of the tropical fish-keeping hobby, and that some of the most erudite books on tropical fishes have been written in the German language. Is this true?

The Germans did most to spread the tropical fish-keeping hobby before World War II. Fishes native to America used to be shipped to Germany by professional collectors, bred in that country, and the offspring sent back to America to be sold to aquarium enthusiasts over there who were unsuccessful in breeding the native species themselves. It has been said that a lot of the money used to finance Hitler's war machine was derived from the sale of tropical fishes abroad. Hamburg used to be a great centre of tropical fish breeders. A lot of the trade has now passed out of German hands into the hands of other countries. It is true that some of the best books on tropical fishes have been written in German. One of the finest works ever printed was *Fremdlandische Süßwasserfische* by Arnold and Ahl. This book, now unfortunately out-of-print, catalogues hundreds of fishes, many of them extremely rare even by present-day standards. It was published in Brunswick, Germany, sometime during the middle 1930's.

I have a large tropical aquarium set against an alcove in the wall. Last winter I found that I had to use a lot of electric current to keep this tank warm. Will you please tell me the best way to conserve the heat other than surrounding the tank in a wooden framework?

We suggest that you cut pieces of green felt to fit the two ends and back of the glass and neatly stick these to the edges of the glass panels where they join with the frame. You will find that a large amount of heat will be saved, instead of being dissipated into the room.

Are *Symphysodon discus* well-behaved enough to place in a tank containing angel fish? And do *S. discus* uproot plants, and live well in ordinary aquarium conditions?

Generally speaking, *S. discus* is a good-tempered species and can be kept with other fishes. It does not chew the

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.

plants to pieces or misbehave itself like most other cichlids. In fact, it is very much like the angel fish in character, though not so moody. The species usually settles down very well in a medium to large-sized aquarium.

My male Siamese fighting fish has been very quiet these last few days, and on closer inspection I have noticed that his scales seem to be raised from the body and present a roughened appearance, as though rubbed up the wrong way. The fish has gone off its food.

We think that your fish has contracted dropsy. This disease is characterised by a disinclination to take food, and raised scales. As the disease runs its course, the body becomes more and more bloated. There is not much one can do with bad cases of dropsy, and though tapping with a hollow needle is known to give temporary relief, and certain drugs may prove helpful, it is often kinder to put a dropsical fish out of its misery.

I have some angle brass, and wonder whether this would be suitable for constructing a small tropical aquarium?

We do not recommend the use of brass in the construction of an aquarium. Most metals are toxic to fishes, and brass is one of the most dangerous metals to use. A coating of hot paraffin-wax over the brass frame to render it waterproof before glazing might be worth trying, but we advise you not to place any expensive or favourite fishes in a brass-framed tank.

I wish to equip my decorative aquarium with overhead electric lighting, but cannot make up my mind whether to use ordinary

electric lamps in reflectors or fluorescent tubes. I have been told that a fluorescent-lighting system is cheaper to operate than ordinary electric illumination.

Fluorescent lighting is cheaper to run than ordinary electric strip lights or bulbs in reflectors, but you must choose the warm-white or yellow-tinted tubes rather than the white-light or daylight tubes. Plant life does not do at all well under the cold-looking white light emitted by some fluorescent tubes, and the fishes do not show their best colours under such illumination. But under a yellowish or pinkish light both plants and fishes appear to flourish very well. When choosing a fluorescent tube, procure one of about half the wattage you would need if ordinary electric bulbs were being used. In other words, a 40-watt fluorescent tube is equivalent to about 80-watts of ordinary electric light.

I have a community tank populated by about 15 different species of tropical fishes. A male fighting fish which I added a week or two ago has had its tail fin torn to shreds. I strongly suspect a male mollie to be the cause of the trouble. Are mollies untrustworthy in a community tank?

Generally speaking, mollies are among the most inoffensive of aquarium species and we would say that another species is to blame for your fighter's split fin. Fishes such as tiger barbs, wasp gobies, paradise fish, swordtails, American flag fish, black-widow fish and red tetras, all common in the community tank, are keen fin-nippers, and sometimes do quite a lot of damage after dark when fighting

fish are lying quiescent among plant life at the top of the water, or resting, as it were, on the compost in a corner.

Water Hardness

Can you give me some information on the different ways in which water hardness can be expressed?

Water hardness can be expressed as so many parts of solid per 100,000 or per 1 million parts of water. Hardness is caused by more than one type of solid in water supplies, but it is usual to give a figure that treats the hardness as if it were all due either to chalk (calcium carbonate) or to lime (calcium oxide). In this country 1 degree of hardness is that given by water behaving as if it had one part of chalk per million parts of water (1 p.p.m. as chalk). This is equivalent to 0.07 grams/gallon (0.056 grains/U.S. gallon). The "degree Clark" is 1 grain/gallon as chalk (equivalent to 14.3 p.p.m.). German degrees of hardness (D.H.) refer to parts per 100,000 as lime (equivalent to 17.8 p.p.m. as chalk or 1.24 grains/gallon). By the British system, natural water supplies having up to 100 p.p.m. are classed as "soft," between 100 and 350 p.p.m. as "hard" and above this range as "excessively hard."

COLDWATER FISH-KEEPING QUERIES answered by A. BOARDER

I have a pair of veiltails which I purchased not long ago. They have their dorsal fins lowered and spend most of the time at the top of the water. There are blood streaks in their fins. I thought it was due to low water temperature and installed a heater bringing the temperature up to 64° F., but the fish got worse. What can I do for them?

The fish were at the top because they were probably not getting enough oxygen. When you warmed the water up they would get less. These types of fish are often subject to fin congestion and this may be caused by a chill, by unhygienic conditions in the tank or by parasites on the fish. A salt bath might help, and if the fish do not improve, treat for flukes. Give the fish a bath in a half-teaspoonful of Dettol to a gallon of water and immerse the fish for five minutes, or until they turn over if this happens before five minutes is up. Place in fresh water and see that the tank is thoroughly sterilised.

I have a coldwater tank with a pair of bitterlings. The female appeared to be full of eggs and the ovipositor was developed. I sent for a couple of mussels, which seem all right in the tank as there is plenty of mud. The bitterling appeared very interested in the mussels but I have seen no sign of egg laying and the female is still apparently full of eggs. Where have I gone wrong?

It is possible that the mussels are not the right kind; they may be the swan mussel (*Anodonta cygnea*), whereas the bitterling mussel is the Painter's mussel, *Unio pictorum*. I do not think the bitterling will lay in the wrong mussel. A good description of the laying, etc., of the eggs of bitterling was given in *The Aquarist* for July, 1954.

I have obtained a half tub 30 in. in diameter and 15 in. deep and would like to grow some aquatics. Can you tell me: the best way to waterproof the tub; number and variety of plants to use; whether the fishes would survive the winter in it?

This container is too small to be of much use. Any fish therein would probably be killed in the winter, but would no doubt survive a winter no more severe than the last one we have had. You might be able to grow one of the pygmy water lilies, but it would not do to put in too many kinds of water plants as most of these grow rampantly and would

soon fill the water with growth. The tub should not need waterproofing if it was properly made. You say that you treated it with Cuprinol; this is a good wood preservative but if you did the inside of the tub with it you could kill any fishes placed in it.

I wish to build a small garden pond and would like to know how to make it and how much materials I should need?

It would take a small book to give you all the information you need to be successful with a garden pond. Many articles have been published in *The Aquarist* and you will find the book *Coldwater Fishkeeping*, obtainable from *The Aquarist*, will give you all the information you require.

I am about to occupy a house built in the grounds of a Victorian house and there is a large natural pond in the garden. The pond is surrounded by shrubs and trees and last summer it went dry because the pipe feeding it was blocked up. The whole of the bottom of the pond is covered with the roots of *Menyanthes trifoliata* and I am wondering if this will grow up through the water and choke up the whole pond. How can I deal with it? Must I clear it before stocking it with fishes; must I expect to spray the water to kill mosquito larvae and would the introduction of ornamental ducks be a good idea?

Menyanthes trifoliata, or bog bean, will grow up to the top of the water unless it is very deep, when plenty of it will be growing at the sides. Much of it could be dug out, but it will not be easy to eradicate altogether as the roots of water plants can get a deep hold in the clay bottom of a pond. It would be possible to cut many of the stems off with a chain knife held by you and a friend working one each side. The cut stems would float and could then be raked out. This procedure may have to be repeated but might eventually kill much of the plant in the deep part of the pond. You could stock with fishes once the water looks in good condition. There would be no need at all to spray against mosquito larvae as any fishes in the pond would soon put paid to them. As for ornamental ducks, this would be quite a good idea as long as the pond was large enough and you did not have too many. Where ducks are kept in a small pond they soon foul the water and it will smell very badly. This would not be so in a large pond or with a pair

or two. The ducks would eat some of the vegetation, but might also eat some of the fishes; so it is up to you!

Please could you tell me how to cure one of my goldfish? It has a white film all over the body but seems to be eating well.

I do not think that this is fungus, but what is called "velvet disease." This is caused by a tiny parasite and to cure it you can try phenoxetol, as advertised in *The Aquarist*. See that the instructions are carried out correctly and the fish should soon be all right. Keep the fish isolated from the others until it is cured.

I have a tank 36 in. by 12 in. by 12 in., with plants, gravel and fish. I have some veiltails and for a few weeks all the fish spent most of the time at the top of the water. Now the youngsters have died. The tank contains two rocks and two pieces of well-washed coal. There are lots of *Tubifex* worms at the bottom of the tank. I occasionally put some permanganate of potash and a teaspoonful of Epsom salts in the water. Why have the fish died?

I think that you have been over-feeding, as the presence of the *Tubifex* in numbers suggests this. Also the water must be foul or the fish would not be always at the surface. I should remove the coal, as it may contain something detrimental to the fish. Why do you keep adding permanganate of potash and Epsom salts to the water? This is quite unnecessary and would soon make the water quite poisonous to fish. Make a fresh start and then go easy with the feeding. If aquarists only would realise that it is not necessary to keep feeding fish all the time there would be less trouble with dying fish and cloudy tanks. Let the plants get well established before putting any fish in the tank and perhaps you will find that when the fish are introduced they will remain healthy.

I have a tank 24 in. by 12 in. by 15 in. and cannot get my plants to grow well in it. They seem to grow half way up the tank and then die back. The overhead lighting is by a fluorescent lamp. Why do the plants fail to grow?

There are several reasons why your plants do not grow. One is that they may not like the fluorescent lighting. I know more than one aquarist who has found this unsatisfactory and has had to revert to the ordinary lamps. It may be that there is not enough nourishment in the base of the tank for the plants. I believe that it is a good plan to place a little good nourishing soil at the bottom of the tank at the back under the ordinary compost. This enables the plants to get well established before there is a quantity of waste matter from the fishes for the plants to feed on.

I have recently bought a female shubunkin and intend to use it for breeding. It appears to be about 12 months old and the finnage has not fully developed. Would it be safe to breed from it?

I see no reason why you should not use the fish for breeding purposes. If it is developed enough it will have eggs inside it and can, of course, breed. If no roe has formed then it will not breed. You may be able to tell by the thickness of its body. The fact that some of the fins are not fully developed will make no difference whatever to the size or shape of the fins of any youngsters you get from it. The genes of inheritance are already there in the parent fish. I have bred with fantails 11 months old and have found no troubles to ensue.

I am unable to breed egg-layers, how can I soften the water?

It may not be because the water is not right that you cannot breed egg-layers. This is not the only thing which may have a bearing on success. Some parents do not agree when matched, or other conditions may not be right. Some aquarists can breed with acid soft water whereas others are equally successful with ordinary tap water which may be hard and limey. From all the evidence available it does not appear that the pH of the water is the only yard-



stick of comparison for differing waters, and for success with egg-layers.

My tank is always thick with green so that I can hardly see the fish. It is lighted by two 60 watt lamps. How can I get it to keep clear? If I change the water it soon turns green again.

It is possible that your tank is getting too much light. I use only two 25 watt lamps over my tanks (24 in. by 12 in. surface area) and everything goes well. Reduce the lighting and see that the tank is not getting too much ordinary light as well. Some shading on all the glass except the front may help a lot. Over-feeding with dried foods can encourage the growth of green algae. Do not feed the fish with any dried foods for about a fortnight and you will probably find a great improvement.

You often advise that it is not necessary to place gravel in the bottom of a pond. Would you advise me to remove the gravel from my pond, as the water does not keep clear?

It is rather difficult to advise as I do not know enough about the size of your pond and the depth of the gravel. There is no doubt that in a fairly small pond the gravel can become foul and cause the water to become impure. It is then difficult to improve matters, as any pond with soil or gravel in the bottom is so much more difficult to clean out. If you have a number of water plants which have their roots well established in the gravel it will be no easy task to remove it. You might empty the pond and remove as much as you can and then see if that makes any difference.

I have found one or two leeches in my pond. Will they harm the fish?

It is possible for leeches to harm your fish if they can attach themselves. Leeches can suck the blood from a fish and eventually could kill it. Catch all your fish if possible and examine them for the pests. Pick off any seen and kill them. The leeches may have laid eggs on plants or stones and then you may expect to find some more adults later on. With care it will be possible to clear your pond of them, as it is only a small one.

I am about to reglaze a tank 5 ft. by 17 in. by 17 in. with a proprietary bituminous preparation. I have received various opinions about whether I should immediately fill the tank with water or leave it for a few days before filling. Your advice would be appreciated.

With many types of glazing compounds it is advisable to fill the tank with water when the task has been completed; this enables the weight of water to press the glass well home whilst the putty or other material is still plastic. However, as your preparation contains bitumen, since this substance remains soft for a time, it is advisable to wait a few days before filling the tank with water so that the compound can stiffen up a little. After three or four days the compound will have become tough and leathery, when the tank can be filled. Do not forget to give the tank a wash out before finally setting it up.

our readers

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



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

Feeding with Daphnia

MY method of giving *Daphnia* to fishes may be of interest to other keepers of small aquaria. I found that *Daphnia* die off very quickly and, if introduced into the aquarium, the dead ones are easily overlooked by the fishes and so collect on the bottom. My method is to dip a $\frac{1}{2}$ in. diameter plastic tube into the container and trap in it a quantity of water plus *Daphnia* by placing my thumb over the end, taking care not to pick up the dead ones from the bottom. I discharge this water into a spoon, where I can examine the contents to make sure there is nothing that would harm the fishes. I then empty the spoon into a piece of an old handkerchief stretched over the top of a jam jar and held by a rubber band.

When I have collected sufficient *Daphnia* on the handkerchief it is a simple matter to pour the water from the jar without removing the handkerchief or the *Daphnia*, and then to release the latter into the fish tank simply by inverting the jar and dipping the top of it, together with the handkerchief and the fishes' banquet, into the water. The *Daphnia* then swim freely until caught and eaten by the fishes.

I feel that this method is much better than any contraption bought in a shop and certainly better than just tipping water, *Daphnia* (dead or alive) and everything else into the tank.

A. W. SHELLEY,
Sidcup, Kent.

Activities of an Association

I READ with interest the letter from Mr. H. J. Vosper, (*The Aquarist*, April) Publicity Officer of the A.S.L.A.B., and do agree with him that it is strange to find that free offers of assistance are not readily taken by many societies, who apparently struggle along trying to put on a programme.

This society, which is, of course, not an area group, provides lecturers, film shows, teams, etc., and has also made an offer in the pages of the aquatic press to compete at table shows (bringing along own tanks and stands) at no charge.

Again, to go further back, we have always sent teams of speakers instead of the one-speaker routine (*sic*) and, as far as I recall, we had three first-class talks in one night in the South London area.

Mr. Vosper makes an offer to exchange views and advice, etc., for our mutual benefit, and at the same time I have another letter before me from another society, which describes itself as a group of the real aquarists, membership only by recommendation, knowledge to be circulated between the group; in fact it tells the delighted recipient

that he or she has been chosen to join this fishy valhalla because they have made the grade (beginners are, of course, unmentionable and an unnecessary evil), and to wind up, has the added gem that the society is designed to end the futile politics of fishkeepers!

Oh! deary me, Mr. Vosper, I think the answer is not easy. But bat on, beginners, experts (including self-styled), for our mutual benefit, and, of course, don't forget the fishes.

B. CALROW,
Hendon and District
Aquatic Society

Aquarium Host

I WAS buying some tropical fishes in a pet store when a vicar came in to do the same, complete with carrying can. You can imagine the smiles and near laughter of the customers when, in quite a bold voice, he asked for four angels!

J. G. PUGH,
Cheshunt, Herts.



"Four angels, please"

Amateur Fishkeeper

WITH reference to Mr. Langton's article "The Amateur Tropical Fishkeeper" in your April edition, I beg to differ on some of the theories he has put forward to the future disillusionment of beginners and fellow amateurs of the hobby.

Mr. Langton, in bringing down the chopper on the 'baby' pump (as styled by yourself) you have obviously never had the privilege to own and respect the values of the type of pump I have found entirely satisfactory. It has operated two external filters to a good measure for considerable time.

I cut out the slight noise made by this pump by placing it inside a rubber-lined box, and I would not change it for anything no matter how much better the more expensive kinds are reputed to be. In any case, the majority of us are not subsidised for fish-keeping.

Secondly, why does a diffuser stone only last you three weeks? A good scrub occasionally soon cleans it up and mine have lasted me two and a half years so far, and are still going strong.

I fully appreciate that this article refers to your aquarium but since you have put it forward as a guide for amateurs to follow one gets the idea that the best way to keep an aquarium is to spend a lot of time stirring everything up and buying expensive pumps, filters, siphons and new diffuser stones, when none is really necessary if you have a balanced aquarium with the correct number of fishes and plants and do not overfeed your fishes.

Everyone to his own tastes Mr. Langton, but I am glad I am not a fish . . . in your aquarium!

P. W. WENT,
Sheffield 7.

Value of Screen Shows

I HAVE recently toured around many clubs to find out what sort of screen shows were available in order to arrange programmes.

I am convinced now that it is an over-rated medium, which would be better supplanted with good live lecturers. I heard one screen enthusiast tell his audience "This is what is needed to boost the hobby," and then he demonstrated some live illustrations in a home-made epidiascope of low power. I'll swear no one in the room saw a thing on the screen, and to think that it was being advocated for use at club meetings! No wonder people won't turn out at club meetings; what we want is more pep and bright talk on fishes.

What shocked me with this demonstration was the audience reaction! When told that there was a little time left, the operator of the machine muttered to the audience "Would you like some more on?" to which one bleary-eyed viewer said "Yes, please," and promptly went off to sleep again.

May I tactfully suggest to our programme planners, find some good old-fashioned live-wire talkers, and down with the candle lanterns!

B. CORVELLI,
London, W. 2.

Yellow Pearl Gourami

THE article by Pisces on pearl gouramies (*The Aquarist*, April), interested me very much, in that it solved a problem for me, concerning one of my pearl gouramies. I have four, all females, about two years old, in a community tank. About a fortnight ago, one of them developed a yellow tinge about the mouth, and this gradually deepened in colour. The colour then gradually spread back along the body until now about three-quarters of the body is yellow.

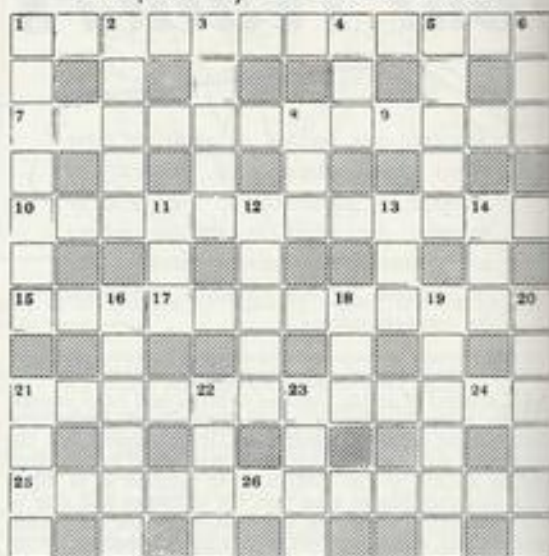
I was rather worried about this, as the characteristic black line has completely disappeared, and I wondered if the fish had caught some disease. It shows no sign of being ill, however, the fins are fully distended, and it swims and eats normally.

Should any reader possess a yellow male, and had some experience in breeding, I would be only too pleased to let him have my female and answer Pisces' query as to whether or not the colour is "fast."

P. PHIPPS,
Sunderland, Co. Durham.

The AQUARIST Crossword

Compiled by J. LAUGHLAND



CLUES ACROSS

- You are reds in a way (7)
- Of (2)
- Beginning of the theory (3)
- This journal is in your hands (8)
- Well, it is an unusual water supply for 7 Across (4)
- Briefly the Editor seems very fit and well advised (8)
- Heave the fifth letter out and you have it (4)
- The definite article (3)
- Most recently the French at head of the famous trout river (6)
- Also most of the sand (3)
- Be a little saint and there will be none better (4)
- Six keep the church from the Christian era for information (6)
- Neon loses its direction (2)
- The Iris is minus for belonging to them (4)
- Emit sap for fishkeeping, for example, shows a fair return (6)

CLUES DOWN

- Last ire of the fellow who faces this kind of water if they splash too much (3)
- A hollow of the sea-coast; a whirlpool (1,4)
- When roe gets mixed up with the best car it is a mistake (5)
- Most trout not in (3)
- The accountant gives spooze (5)
- Slippery fish (3)
- Female (3)
- Olive this for sardines (3)
- Paired for breeding (5)
- Even coldwater fans get into
- Front of an army or fleet (3)
- Sun sinks upset in rising Den (6)
- Snowshoe of fish skin (3)
- Spasm after the one-spot is acid (6)
- Such clumps of water plants provide dens (6)
- The angler wants this, but not on his hand (4)
- Pairs may lose their heads with graces (4)
- Small glass vessel or bottle (4)

PICK YOUR ANSWER

- Cyprinoma kinsleyae* was named after the famous author's: (a) daughter; (b) mother; (c) niece; (d) wife.
- The mud puffer is a common name of: (a) *Mellonina laevis*; (b) *M. latipunctata*; (c) *M. sphaerops*; (d) *M. velleira*.
- Which is the largest of the following species? (a) *Metynnis hypotaenichus*; (b) *Metynnis maculatus*; (c) *Metynnis rosaceus*; (d) *Metynnis schreini*.
- Aphyocypris poncei* differs from *Tanichthys albanus* in having: (a) an incomplete lateral line; (b) a larger dorsal fin; (c) a post-ventral keel; (d) a smaller mouth.
- The flowers of *Sriantares aloides* (water soldier) are: (a) blue; (b) red; (c) white; (d) yellow.
- The temperature range for *Azolla* (fairy moss) is: (a) 41 to 59° F.; (b) 50 to 68° F.; (c) 59 to 77° F.; (d) 68 to 86° F.

(Solutions on page 70)

G. F. H.

AMONG the activities of the **Walsall Aquarium and Pool Society** has been the installation of tanks in hospitals and homes. In the past three years tanks have been provided at the Manor and General Hospitals and two tanks have been handed over recently to Fred Evans' Old People's Home. The headquarters of this go-ahead Society is Walsall Central Hall, where members hold four shows yearly. There are regular monthly meetings which comprise lectures, socials and discussions. The chairman of the Society is Mr. W. L. Mandeville, a well-known figure in fishkeeping circles, and new members can be assured of a warm welcome.

THE monthly meeting of the **Ilford Aquarists' Society** was held at their headquarters, Newbury Hall, Perryman Farm Road, Newbury Park. A lecture was given by Mr. Leutscher on reptiles, and the table show of plants was won by Mr. Thomas.

Anyone interested in tropical or coldwater fishkeeping should contact the secretary, Mr. V. Price, 1a, Horace Road, Barkingside, or would be most welcome at their headquarters on the second Monday of every month.

THE **Willesden and District Aquarists' Club** held their annual dinner recently when the trophies won during the past year's showing were presented to the winners by the Mayor of Willesden. The club is now ten years old and plays its full part in the aquatic world, entering all available local and national competitions and maintaining hospital tanks. Winners during the past season were Mr. S. W. Atkins, Mr. P. W. Keen, Mr. C. A. T. Brown, Mr. E. Landau, Mr. J. J. White, Mr. B. Hawkins and Mr. S. G. Wingrove.

MEMBERS of the **Leeds and District Aquarists' Society** joined with members of the Yorkshire Naturalists Union in visiting local ponds and a number of specimens was examined. This year the annual show will be held from 18th to 21st September, and will be open. Entry forms can be obtained from G. Boothroyd, Show Secretary, 6, Wellhouse Drive, Leeds 8.

A COMPETITION was held recently by **Yeovil and District Aquarist Society** for the best coldwater fish among members. M. Enticott was the winner out of 19 entries. Recently the Society enjoyed a talk from Mr. Kingston of the F.B.A.S.

AT the last monthly meeting of the **Bath Aquarists' Society** a talk was given by Mr. V. Alder on Angling, and this brought forth many interesting points. During the meeting it was decided that another Annual Show should be held in order to maintain the interest, and it was hoped to improve on last year's show. The selected dates are the 23rd and 24th August and the venue is St. Mary's Church House, Grove Street, Bath. The show secretary is Mr. J. Wheeler, 53, Cameley Green, Twerton, Bath.

A "BREEDERS' CIRCLE" has been formed by **Chelsea Aquarium Society**. Recent talks have included the following subjects: Plants, Breeding Zebras, Livebearers and Breeding Cichlids. The third annual exhibition is being held at the headquarters at Chelsea Community Centre, 385, Kings Road, London, S.W.10, on the 14th and 15th June.

THE annual show of the **Walthamstow and District Aquarists' Society** will be held as usual this year and the venue is Hawthorn Road Hall, Walthamstow, London, E.17. The dates are the 30th and 31st August. Additional features and improvements are in hand and the Society is looking forward to an even more successful show than last year. The club meetings are now held at Forest Road School and the secretary is Mr. P. Whitworth, 2, Hawthorn Road, Buckhurst Hill, Essex.



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.

CHANGES in administration are announced by **Poole Aquarist Association**. The new secretary is Mr. H. J. Pearson, 42, Johnston Road, Oakdale, Poole, Dorset, and Mr. C. R. Macdonald, the previous secretary, takes over the job of show secretary. The chairman is Mr. R. Matley. Recent events have included a table show of Labyrinths, which was won by Mr. W. Walker, the second, third and fourth places being held by Mr. H. J. Pearson.

AN inter-club show, between the **Bridlington and District Aquarists' Society** and **Hull Pond and Aquarium Society**, resulted in a win for the visitors, this reversing the previous away success of Bridlington when they visited Hull in March.

THE winners of the **South-West Middlesex Aquarist Association** inter-society show, which was held in May, were Southall, Uxbridge being second with 16 points. There was a tie for third place between Middlessex and Slough with 18 points. Both the furnished aquaria events (tropical and coldwater) were won by West-Middlesex. In the other classes, Mr. Gillman had three firsts, a second and three thirds. Mr. Rundle had two firsts and two thirds.

THE **Shooter's Hill and District Aquarium and Pondkeepers' Society** recently celebrated its 21st anniversary, and also the winning of the South-East London and North Kent Aquarists' Shield. A founder-member of the F.B.A.S., this Society is still very active and has meetings with films, shows and lectures, every month at Christ Church Hall, Shooters Hill. Visitors are always welcomed and earlier members now out of the district are also invited to contact the secretary, Mr. W. G. Key, 8, Cleantus Road, Shooters Hill, London, S.E.18. Tel: WOO 6558.

THE May issue of the **Guppy Breeders Bulletin** records the untimely death of Mr. R. Danahay of the Eastern Counties Section of the F.G.B.S. Forthcoming show announcements are for Bristol and Bath section on the 22nd June, particulars of which have already been published and the Eastern Counties annual show on the 29th June, the venue being Altmore Avenue School, East Ham.

RECENT monthly meetings of the **Aylesbury Aquarist Association** have included a lecture on Cacti and Succulents by Mr. F. Stanley, and also a table show of tropicals. The hon. secretary is Mr. C. L. Stephens, 79, Abbey Road, Aylesbury.

THE winner of **Southport Aquarist Society** home aquaria competition was Miss K. Lester, Mrs. E. Williams and Mr. and Mrs. P. Parkinson being the runners-up. The trophies were presented to the above at the last meeting, a which Mr. W. Bailey, the well-known Liverpool aquarist, was also in attendance answering problems and giving advice.

AN interesting evening was provided by the **Exeter and District Aquarists' and Pondkeepers' Society** when members of the public were invited to attend a table show. Many additional exhibits were displayed and Mr. Parish, the Society's chairman, explained the correct method of planting and setting up a tank.

RECENT events in the **Riverside Aquarium Society** programme have included an inter-club show with Feltham A.S., for the "Diana Charles Trophy," the result being: Riverside A.S. 21 points, Feltham A.S. 16 points, and a table show for livebearers. Future events include a lecture, a visit to Whitwell & Smykala's, a table show for pairs, and a show for Anabantids.

THE third annual show of the **Corby and District Aquarists' Society** will be held on 8th, 9th and 10th August. The venue will be the Territorial Army Hall, Elizabeth Street, and is next to the market place in Corby's new town centre. This year the F.B.A.S. Diploma will come to Corby for competition in the Any Variety Catfish class. Show schedules can be obtained from the show secretary, Mr. D. Brent, 78, James Watt Avenue, Corby.



The Aquarist's Badge

PRODUCED in response to numerous requests from readers, this attractive silver, red and blue substantial metal emblem for the aquarist can now be obtained at cost price by all readers of *The Aquarist*. The design is pictured here (actual size). Two forms of the badge, one fitting the lapel button-hole and the other having a brooch-type fastening, are available.

To obtain your badge send a postal order for 2s. together with the **Aquarist's Badge Token cut from page ix**, to Aquarist's Badge, *The Aquarist*, The Butts, Half Acre, Brentford, Middlesex, and please specify which type of fitting you require.



A COMPETITION was held at a recent meeting of the Northampton and District Aquarists' Society among members for setting up a tank. The winners were: 1, Mr. N. E. Lyon; equal 2nd, Mr. W. H. Smedker and Mr. J. Menzies; 3, Mr. H. Platt.
Prize-winners in the table show for Live-bearers were: 1, Mr. W. H. Smedker; 2, Master T. Dascombe; 3, Mr. N. E. Lyon. Mr. D. E. Butlin was judge.

AT the May meeting of the Coventry Pool and Aquarium Society a lecture was given on "The Care and Breeding of Angel Fish." The speaker, Mr. Morton of Leamington, gave a most interesting talk in terms understood by everyone. The attendance was good and the "table show" fairly well supported.
The visit to the "Wild Fowl Trust" was thoroughly enjoyed by all.

OFFICERS elected at the annual general meeting of the Redhill and District Aquarists' Society were: Chairman, Mr. W. Williams; vice-chairman, Mr. R. Sheard; secretary, Mr. P. Keeley; treasurer, Mr. E. Sparrow; show secretary, Mr. L. Dickson. Trophy winners, 1956: Wilkins Cup (most points during the year), W. Leach. Junior points cup: I. Dickson. Williams Shield (furnished home aquaria), W. Leach.
The inter-club table show held recently at Redhill, between Redhill, Horley and Crawley clubs, was won by Horley. The judges were Mr. and Mrs. McNeil of A.S.L.A.S. The results were as follows: Tropicals—1st and 2nd, Mr. K. List (Horley), with two Ticto barbs. These were both outstanding fish with good colour and body shape; 3rd, Mr. D. Wadey (Crawley). Coldwater—1st, Mr. W. Leach (Redhill). The winning fish was a Bristol shubunkin, a very good specimen with good body shape and showy finnage; 2nd and 3rd, Miss D. Morris (Horley).

AT the May meeting of the Bristol Aquarists' Society, Mr. Bill Dallimore, a member, told of his theory that in-breeding, if taken too far, could produce mental deficiency in tropical fish.
He said Siamese fighters particularly seemed to have deteriorated in recent years and he spoke of males in his possession which appeared too stupid to pick up eggs after spawning, although the female apparently tried to show him what to do! Mr. Dallimore's theory startled his fellow-members and aroused a lively discussion.
The tropical table show was won by Mr. R. James (1st, 2nd, 3rd and 4th) and was judged by Mr. Victor Jones, the immediate past-president. The open show is to be held at Bishopston Parish Hall, Bristol. Entry forms can be obtained

from R. L. Vince, show secretary, 8, Vandyck Avenue, Keynham, Somerset.
The Keynham and District Branch of the Bristol Aquarists' Society in April heard a talk on Fish-feeding, by vice-president, Mr. H. C. B. Thomas. In May, the meeting was devoted to a study of aquatic life through a microscope. The discussion was led by Mr. R. James.

Marine Aquaria

MEMBERS of the Cambridge and District Aquarists' Society heard a most interesting talk on the keeping of marine aquaria, given by Mr. R. Cook recently. Mr. Cook, who has been a marine enthusiast for several years, brought along a collection of live marine animals which really amazed his audience. Among these exhibits were a live lobster, some two feet long. It was pointed out by Mr. Cook that the two claws of the lobster were different in construction—one being used for crushing, and the other for cutting. A similar animal—the Crayfish—was also shown, and whilst the lobster was slow and cumbersome in its movements, the crayfish, by means of a very powerful tail, was able to move about in the water much more quickly. Mr. Cook explained that when these animals were becoming too large for their shells, it was necessary for them to moult—or shed their shell. Having wriggled out of their rather tight waistcoat the animals absorbed large quantities of water and managed to increase their size by about a third before the lime in the water hardened their skin to form a new shell. This enabled them to have growing space in their new home.

A tank containing three hermit crabs was also shown. These creatures, having no armour plating of their own, take up residence in a whelk shell, in company with a worm which also inhabits whelk shells. To complete the communal home there were parasitic sea anemones adhering to the shell.
Other tanks contained star fish (which can, incidentally, grow a new leg if necessary, and a leg can even grow a new body), sea urchins, sea anemones, and several varieties of fish. Mr. Cook explained that whilst it was not really difficult to keep these animals in marine aquaria, one of the chief snags was in keeping the water cool in the summer months. There are possibilities in using artificial sea water, but the genuine article was much more satisfactory. This could be collected at the sea shore or purchased from Plymouth. It is found necessary to artificially aerate the water continuously.
At the conclusion of the evening, Mrs. Balsam presented the trophies to the winners of the last Members' Show.

Photograph taken at the presentation of the South-East London and North Kent Aquarists' Shield, to the Shooter's Hill and District Aquarium and Pondkeepers' Society. The society is celebrating its 21st anniversary

Aquarist's Calendar

14th-15th June: Chelsea Aquarium Society third annual exhibition at the Chelsea Community Centre, 385, Kings Road, London S.W.10.

22nd June: Bristol and Bath Section of the F.G.B.S. open show at Temple Colton School, Bristol. Entry forms for F.G.B.S. members are available from show secretary, Mr. J. Wheeler, 53, Cameley Green, Twerton, Bath.

29th June: Eastern Counties Section of the F.G.B.S. open guppy show at Almore Avenue School, East Ham, London, E.6. Show schedules are available from Mr. E. G. Wignall, 481, Roman Road, London, E.3.

12th-13th July: Macclesfield Aquarium Society exhibition in conjunction with the National Cactus and Succulent Society in the Brockleburn Memorial Hall, Queen Victoria Street, Macclesfield.

23rd-24th August: Bath Aquarists' Society annual open show at St. Mary's Church House, Grove Street, Bath. Details are available from show secretary, Mr. J. Wheeler, 53, Cameley Green, Twerton, Bath.

28th-31st August: Midland Aquarium and Pool Society annual show at Princes Hall, Broad Street, Birmingham.

30th-31st August: Walthamstow and District Aquarists' Society annual open show at Hawthorne Road Hall, Walthamstow, London, E.17. Details are available from show secretary Mr. D. E. Goodbody, 54, Somerset Road, Walthamstow, London E.17.

6th-7th September: Bethnal Green Aquatic Society annual show at the Men's Institute, 229, Bethnal Green Road, London, E.2.

7th-8th September: Chester and District Aquarist Society annual show in conjunction with the Cactus Show at St. Peter's Parish Hall, Hamilton Place, Chester.

1st-2nd November: Bristol Aquarists' Society annual open show at Bishopston Hall, Bristol.

Crossword Solution

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

PICK YOUR ANSWER (Solution)

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

THE AQUARIST