The AQUARIST
AND PONDKEEPER

Founded in 1924 as "The Amateur Aquarist"

THE BUTTS, HALF ACRE BRENTFORD, MIDDLESEX

Telephone: EALing 4703

PUBLISHED MONTHLY

SUBSCRIPTION RATES

The Aquarist will be sent post free for one year to any address for 19/6. Half-yearly 9/9. Canada and U.S.A. $3.00 yearly; $1.75 half-yearly.

QUERIES

Postal replies are made to all specialised queries accompanied by a stamped, addressed envelope. *This privilege is afforded only to registered readers and direct subscribers.* Subscription forms can be obtained on application. In all cases letters should be addressed to the Editor.

Correspondence with intending contributors is welcomed.

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VOL. XXII No. 2 1957

Editorial

WE have in recent issues published some letters from readers who have been rather critical of the services offered by aquarium suppliers. That the writers of the letters have had cause to complain there is no doubt, but this must not lead us to assume that all traders are guilty of discourtesy to customers, neglectful of orders by post, careless about the health and display of fishes, unreasonable over the prices they charge or are devoid of interest in the hobby. There is room for improvement in the relations between dealers and customers in general, but the fault does not always rest solely with the dealer. Some customers are unmindful of the difficulties involved in attempting to maintain representative stocks of fishes, plants and apparatus, expect the dealer to give unlimited "after-sales service" in the way of advice and demonstration after a single three-and-sixpenny purchase, make no allowance for their own mismanagement of purchased stock when deaths or breakages occur, or become annoyed when the dealer says that he cannot buy their unwanted hordes of very young livebearers from them. It is a human failing that we are all prone to be quick to complain about faults but slow to applaud good service, and it is because of this that we are pleased to include this month a letter in which one of our advertisers receives high praise. The total number of complaints we receive about traders is small and it is hoped that publication of this letter will show that this is not a case of 'all kicks and no ha'pence' for the traders.

"BIG fishes eat small fishes, and prey on them and bite 'em; small fishes eat smaller fishes, and so on, *ad infinitum*." The truth of this is soon learnt by the fish breeder, but what causes some fish in a brood to become bigger than their brothers and sisters, so that even if they do not actually eat their companions they starve them to death by obtaining the lion's share of the food? In the article by Mr. P. Scholes in this issue this problem is discussed and analysed with reference to Siamese fighting-fish fry.

pH, Water Hardness and Fish Breeding

by Dr. F. N. GHADIALLY

AQUARISTS have been conscious of pH and hardness for a long time now. As you know, the stress today is on soft acid water. Just turn up some past issues of this or any other aquatic journal and you will see what I mean. A maddening pre-occupation with the pH and hardness of water will be evident at even a casual glance.

How did it all start? How important really is the pH and hardness of the water for fish-keeping and fish breeding? These and similar questions have been puzzling me for some time. I began to worry seriously about these problems as personal experience in fish breeding and the collected experience of many of my friends began to contradict the commonly accepted doctrines that soft acid water is essential, nay, "absolutely necessary," for the propagation of certain plants and fishes.

I therefore began by searching old aquarium journals to trace the history of this subject to find out how it all started. The first amazing but nevertheless amusing fact that came to my attention was that long before the soft acid craze started there was a time when hard alkaline water enjoyed considerable popularity. In those days nothing did well in acid waters, in fact at that time, aquarists were very concerned about harmful acids developing in the tank and insisted that all forms of life, fishes and plants included, thrived best in alkaline waters. Some even advised placing bits of marble or plaster of Paris in the tanks, to counteract these mysterious harmful acids. From what one can gather those fishes certainly lived and, as far as one can judge, thrived in very hard alkaline water.

Some fishes, however, presented difficulty in breeding. At that time for instance, few had bred the angel fish. At this stage Mr. Chambers experimented with the idea of acidifying the water with phosphoric acid and succeeded in breeding these fish. He described his experiences in *The Aquarium* (September, 1932 and September, 1952) and stated that the optimum pH for breeding the angel fish was pH 6.8. The idea caught on and people began to acidify the water in their tanks. In time, as was inevitable, many more succeeded in breeding angels. The acid-water idea was now well and truly launched.

The next main boost for the acid-water idea came from the Continent, mainly in the writings of German authors, who claimed that for breeding what they termed "the problem fishes" soft acid water was absolutely essential. They introduced the idea of using peat to acidify the water. By "problem fishes," these authors meant neons, glowlights, harlequins and *Hyphessobrycon rosaceus*, but gradually the list began to grow and one by one new species were added to the list of those that need soft acid water for their maintenance and propagation. Thus almost all the characins, including the *Nannostomus* group and many members of the egg-laying tooth-carps such as lyretails were included in the ever-growing list. Today it would be easier to list fishes that can be bred in hard alkaline water than to try and list every fish that is supposed to need soft acid water. Catfish and mollies are about the only well-known fishes that I can think of that are supposed to do well in hard alkaline waters. This then is a brief history of the soft acid-water mania and how aquarists became pH-and-water-hardness conscious.

Now let us examine some fish-breeding experiences and see how far facts support the theory. I have bred a large number of species myself and, what is even more important, during my visits to various aquarists' societies up and down the country, I have met numerous fish breeders. I have visited their fish houses, seen what they have been breeding, the degree of success they have attained in breeding a given species and, when necessary, have taken away samples of their tank water and analysed them myself. Excluding neon tetras, which neither I nor my friends have bred successfully in large numbers, and some varieties that have not yet been bred in captivity, I think a very large number and variety of fishes ("problem" or otherwise) has been covered by our joint experiences.

I would like to place these facts which I have been collecting before you, and you can judge for yourselves whether soft acid water is really as important to fish breeding as it is made out by some people.

Angel Fish

As I have already mentioned, it has been assumed for a long time now that fairly soft water of about pH 6.5-6.8 is essential for breeding angels. Now, like many other aquarists, I have always wanted to breed angels. In fact, within a week of starting to keep tropical fishes I promised myself that one day I would breed those fish. However, approximately eight years had to pass before I realised my dream. Sheffield tap water, which I use for breeding fishes, has a pH of 6.8-7 and is very soft (1.5 degrees German hardness); one would think this would be just the job for breeding angels.

For the last three years I have seriously tried to breed these fish but with no success until quite recently. Nor, let me add, had any member of the Sheffield Society had any real success with this species. I have heard of only one occasion, where 22 semi-defective fish were produced by a leading fish dealer in this city. Why, one may ask, have we in Sheffield had such poor luck with angels? From the pH and water hardness aspect it would appear that we have the ideal water for breeding these fish.

Let us leave this problem for a moment and let me tell you about an aquarist in Oakham whom I have known for many years and visited on many occasions. On one occasion when I went to his place he had nearly a thousand angels on the premises, ranging in size from tiny little fish just beginning to get the flat angel shape to shoals of fish of about one inch body size. I was indeed amazed to see this, as the water in Oakham is very hard and alkaline. Naturally, I thought he must have added rain water or distilled water to his aquarium water to soften it and then acidified it by mineral acids or peat before breeding the angels. But on questioning him he told me that he had not bothered at all and that his angels had just bred in ordinary old mature tap water in his tank. I took some fish and samples of water back with me.

On analysing the water I found a pH reading of 7.8 and a hardness reading of 12 degrees German hardness. Very hard and alkaline indeed. At this stage, my ideas about pH, hardness and fish breeding had not crystallised and I blush to remember that I gave this aquarist a long talk on how to alter his water conditions for the benefit of his poor fish. I brought home about 100 angel fish; I kept about 20 for myself and distributed the rest to various members of our Society. I placed mine in a very old-established tank which contained fairly hard alkaline water, so as not

to subject the fish to too sudden a change of water conditions.

After they had settled down I started adding phosphoric acid (peat for acidifying water had not come into fashion at that time), and distilled water in small doses until at the end of a week the water was down to pH 6.8. A day or two later the fins of my angels began to rot and drop off in large chunks. I, phoned up one of my friends to find out how his angels were faring and I learnt that they were in perfect condition. I knew then that acidifying the water was not doing my angels much good and I rapidly began changing the water and shifting the pH back to the alkaline side. Luckily no permanent damage was done and they regenerated their fins and ultimately made fine fish.

Since that day when I learnt that angels can live, thrive and multiply in hard alkaline water I have met aquarists who have bred them in all sorts of conditions, hard and soft, acid and alkaline waters. I have seen beginners who have never bred anything else breed angels like guppies without any special knowledge or effort and I have seen experienced aquarists well versed in all the elaborate techniques of fish breeding fail to bring about the desired result. Indeed, you do not have to take my word for it, just turn over the pages of old issues of this journal and other aquatic journals and you will see reports of angels being bred in community tanks by people who had never heard about pH or hardness. Similar reports may also be found in *Aquarium Highlights* by Innes.

Now let me tell you how I ultimately succeeded in breeding angels in large numbers. The problem revolved round hatching the eggs and getting the fry free swimming. There was never any reluctance on the part of the angels to spawn, hence there was no difficulty in obtaining eggs. The trouble was that the eggs, whether left with the parents or separated from them, rarely hatched. When they did hatch the fry died off within a few days; not once did a youngster become truly free swimming. Various pH values from 6.2 to 7.8, and hardness values from 0.5 to 8 degrees, were tried but results did not improve. Aeration, methylene blue, acriflavine, all were tried but results were no better. An impasse was reached, and for a time I was completely baffled.

After much thought, however, I felt that there must be something positively wrong with Sheffield tap water as far as angel eggs and fry were concerned. Instead of trying to track down the cause of this trouble, I decided to leave Sheffield water aside and make some "synthetic tap water." I took some distilled water and added various salts in approximately correct proportions to make up something resembling tap water. The essential difference between this mixture and Sheffield tap water was that while I was uncertain as to all the things Sheffield tap water contained I knew definitely what my mixture contained, as I had used very pure chemicals to make up the sample of water.

When the angels spawned (in mature Sheffield tap water) I removed the leaf bearing the eggs as soon as they stopped spawning and transferred it to my synthetic tap water, to which was added a trace of acriflavine. Eight eggs went chalky but hundreds hatched out. The fry became free swimming and 323 fish were successfully reared to approximately half an inch in size, when heater failure killed them off. Anyway, the angels went on spawning every week with clockwork precision.

As I did not want all the eggs they laid, I performed numerous experiments, placing half the eggs in tap water, half in synthetic water, hatching with aeration, without aeration; with acriflavine, without acriflavine; and so on. Results showed that not a single fish was successfully reared from eggs kept in tank water in which the angels spawned or in 48 hours mature Sheffield tap water, whereas highly successful results were invariably obtained in my synthetic tap water. Fairly good hatchings could be obtained without acriflavine or methylene blue but the addition of either agent prevented the formation of mould on infertile eggs, and hence seemed to enhance the chances of success. Aeration did not appear to make any difference in the final results; that was perhaps because I used very shallow water for hatching the eggs.

Another striking evidence of toxicity of tank water in which the fish were spawning was brought home by the fact that any delay in removing the eggs after spawning did irreparable damage, as evidenced by the fact that they did not hatch out in the synthetic tap water. Thus on one occasion a pair spawned on two adjacent leaves of an Amazon sword plant. One leaf bearing some eggs was transferred immediately to synthetic tap water while the other was removed an hour later to synthetic tap water. Almost every egg hatched from the leaf that was removed early whereas none hatched from the leaf that was removed an hour later. Analysis of this tank water has failed to reveal any toxic concentration of copper and to this date I am quite ignorant as to what the lethal agent is.

No doubt some of you are now waiting to hear exactly how this synthetic tap water is made up, but you will see in a moment this is not very important. One day the angels spawned again, and when I looked at my bottle in which I stored my synthetic water I found that there was none left. There were only two sorts of water available to me at that moment, Sheffield tap water and distilled water. Distilled water, as it contains none of the salts essential for health and well-being of fish and eggs, is generally regarded as entirely useless for fish-keeping and breeding. It is said that it should never be used without the addition of some sea salt or tap water. There is no doubt some truth in this, at least as far as fishes are concerned. Nevertheless, I placed a leaf carrying the eggs in distilled water to which a small amount of acriflavine was added (I add enough acriflavine to attain a final concentration of 0.5 to 1 milligram/gallon of water).

Surprising as it might seem, this idea worked well and almost all the eggs hatched out, and since then I have always hatched out angel eggs in distilled water alone or in distilled water plus acriflavine. I prefer the latter mixture because it discourages the growth of fungus on the few infertile eggs that are invariably present. When the fry become free swimming they are fed on newly hatched brine shrimps, and three days later small quantities of mature Sheffield tap water is added to the tank containing the fry. At the end of a week they were transferred to a large clean tank containing mature (two to three days' old) Sheffield tap water.

Having now reviewed the relation of pH and hardness of water to angel breeding I think we can conclude that as angels have been bred over a wide range of pH and hardness values, undue importance cannot be placed on these factors. However, my experiments with distilled water show that other water conditions do play an important part. The fact that successful results were obtained with distilled water proves conclusively that it was not the lack of some substance or substances in Sheffield tap water that was responsible for the death of eggs and fry but that Sheffield tap water contains some factor or factors, chemical or biological, which is lethal to angel eggs and fry.

Lyretails (*Aphyosemion australe*)

The lyretail is a fish that we are told is very choosey about water conditions. For instance, Innes in his *Exotic Aquarium Fishes* states about this fish: "what it is most particular about is old water, preferably a little acid about pH 6.8." Combing through the past records I found that everybody insists on this old water. One writer goes so far as to say that water a month old is just beginning to be right for this fish; anything less than that, and trouble can

be expected. Opinion is unanimous that this fish must have some peat at the bottom of the tank and moderate to fairly strongly acid conditions, pH 6 to 6.8. Some advocate the addition of a small quantity of sea salt to the water. German authors recommend that the water should be not only acid but also soft. Breeding these fish is supposed to be quite difficult, and indeed the high price that they still fetch would appear to be a mute testimony to that fact.

Now let me relate my experience with this fish. On three separate occasions I acquired specimens and followed as many of the instructions given as possible. Nevertheless, on the first two occasions I lost them within a few days of acquiring them. On the next occasion I was so frightened of putting them in my tank that I kept the fish in the half-gallon jar I brought them home in and added small quantities of mature water acidified with peat so as not to produce a sudden change of water conditions. Finally, I gave them a tank all to themselves and made numerous attempts to breed them.

There are two recognised methods of doing this; one is to spawn the fish on the rootlets of floating plants, the other is to let them spawn in a thin layer of peat at the bottom of the tank. After numerous attempts I did succeed in producing three youngsters. At this stage I lost the male. It jumped out of the net as I was transferring him from the spawning tank to the main tank.

It was two years later that I was really to succeed in breeding these fish. While on a visit to my friend Mr. Manchester, a well-known amateur fish breeder who resides in Melton Mowbray, I heard that he and various aquarists in that area had bred so many lyretails that nobody wanted them any more. Of course, as soon as I heard this, I began to investigate this strange feat which these aquarists had accomplished. He took me around to meet the various members of his Society and, as I listened, my amazement increased; even the junior members and beginners had bred lyretails apparently without much trouble.

It appears that at first they were very careful with the lyretails; they kept them and bred them in soft acid water (mainly rainwater plus peat), but as the numbers of lyretails increased, naturally they took greater liberties with the water conditions, until finally they were keeping and breeding them in ordinary mature tap water. The water in those parts is very hard and alkaline. Some added peat to this, others did not even bother to do this. The fish spawned for them in the mulm at the bottom of the tank. I was presented with a pair which I was told would breed right away. This seemed rather unlikely, as the female was only three-quarters of an inch long, and the male measured one inch.

I felt that the fish were a bit small to breed with, but I was assured that one was more likely to succeed with young, small fish rather than large, old specimens. Having now bred them in fairly large numbers I fully agree. I am pretty certain that in many cases failure to breed these fish is due to attempting to breed with fish past their prime. I attribute my early failure to that reason. From the single pair that I was given I have now bred many lyretails. As I am writing this three pairs of the fifth generation are spawning in their little tanks in a thin layer of peat.

Last year a total of approximately 600 lyretails was produced from my fish house. How hardy and willing they are to spawn was demonstrated to me and my friends at the last British Aquarists' Festival. I took three dozen pairs of these fish for a dealer at the show. He transferred them to a newly set-up tank, and within a few minutes these fish were pairing up and spawning in the gravel at the show. I find that they are happiest and breed well at 72°-75° F. They are distinctly unhappy at 80° F. They will stand amazing drops of temperature as long as such drops are not too sudden.

Just as with angels, once more we see that experience does not bear out what has been said about the water conditions required by these fish. They have been kept and bred very successfully in all sorts of water conditions.

In next month's issue the author will give his results of experiments in breeding glowlight tetras and neon fish.

Photo: H. & V. Joel

A small circular pond at the edge of the lawn in one corner of this north London garden provides a focus of interest in view of the French windows of the house. The formal outline of the pond is offset to some extent by the irregularities of the rockery and flower bed to each side of it. A stone seat set in a sheltering recess of the rockery offers a pondside observation point

What to do about Algae

by AQUARIUS

IT is correct to state that algae in one form or another gives more headaches to aquarists than anything else. There are several kinds of algae, some green, some brown, some red and others blue-green. Some are so minute that they are composed of a single cell whilst others form huge masses of slender strands. Certain of the sea-water types may reach over a hundred yards in length. One tiny alga, *Pleurococcus*, can be found out of water, growing on shady sides of trees or on damp walls. All the algae appear to contain the green pigment chlorophyll, although in certain kinds this is hidden by other colour pigments which give them the appearance of red, brown or blue-green. Here, the types which are found in fresh waters will be dealt with mainly as they are the ones more likely to be encountered by the average aquarist.

Green algae are the most common and will form in quantities where there is sufficient light. These algae will not thrive in the dark, and so the amount of light reaching either a tank or pond will determine the amount of them to be found there. When conditions suit the free-floating green alga the water becomes so thickly charged with it that the whole of the water turns green. A small amount does little harm and, as a matter of fact, it is an oxygenator and is eaten by fry of certain fishes. *Daphnia*, or water fleas, also eat some of it, but if it gets too strong a hold in a tank it can turn foul for no apparent reason and become poisonous to fishes. Once a good healthy growing mass of other water plants is established in a tank much of the green algae can be choked out but it is usually in the early stages, after a pond has been made or a tank set up, that the trouble occurs.

It is of little use changing the water, as once fresh water is introduced the algae will quickly spread again. It can be cleared by dosing the water with copper sulphate, two to four parts to a million parts of water. Some water-plant growers use 23 grains of copper sulphate to a 1,000 gallons pond. The crystals are placed in a muslin bag and this is drawn through the water. Copper in any form should not be used when fishes are present as minute quantities can kill them; even a fifth part to a million of water will kill certain species. The addition of potassium permanganate to a pond soon after it has been first filled will assist in keeping the water free from green algae. A teaspoonful of a saturated solution added to each gallon of water should suffice. Another method to control the algae is to introduce some floating aquatics, such as the forms of duckweed (*Lemna*). These plants cover the surface of the water and prevent a great deal of the light from penetrating it. Once the water has cleared, much of the floating aquatics can be cleared off the surface of a pond by raking or hosing.

In an indoor tank the green alga is usually thickest when the tank stands in a window where it gets a good deal of strong light. Such cases can be improved by shading the glass at the window side and at the ends by painting or pasting on dark paper. Only the front need be kept clear. Shading may be removed from one end for the winter so that the other plants in the tank get enough light.

The blue-green algae, a group known as Cyanophyceae or Myxophyceae is one of the lowest forms of algae and is closely allied to bacteria. Other colour pigments are often present which change the main colour to brown, violet or yellow at times. These algae appear to thrive in foul conditions, and if too much uneaten dried food remains at the bottom of a tank the blue-green algae can soon get established. The growth can often be siphoned off from the base of the tank, and when this has been done some fresh well-washed sharp sand can be poured over the base. This freshens up the tank and improves the look as well as discouraging the formation of fresh algae.

There are also red algae, known as Rhodophyceae, which inhabit sea water, and a freshwater type called *Bactrachosperum*. This kind can be found in tanks and often takes on a brown colour and can form a mass on stones, snail shells or plants.

Other forms of algae grow in strands or masses, when they are called filamentous algae, flannel weed or blanket weed. *Oscillatoria* grows as a bluey-green slime on stones and on the bottoms of ponds and canals. During hot weather portions of this growth detach themselves, and owing to their being charged with gases rise to the surface of the water in lumps. The type which may cause most trouble in the pond is blanket weed or *Vaucheria*. This forms in long strands and can grow to such an extent on plants that they are completely covered and eventually choked. This weed will also become attached to the sides of a concrete pond so firmly that it is almost impossible to pull it off. This indicates that the plant is fond of lime or it would not get so attached to the concrete.

It is no easy task to clear a pond of blanket weed but if patience is used and a regular attention is given, there is no reason why most of it should not be cleared. Remember that if a pond has a good growth of oxygenating and surface-leafing water plants there is less chance of the blanket weed getting a hold, and if one pulls out as much as possible of the weed by rake or by hand then in time the water plants in the pond will gain the ascendancy and the strength of the blanket weed will lessen. If a green stick is broken and then twisted into a mass of the weed it can be pulled out quite easily. In tanks it can be gradually pulled out by hand. As some strands are drawn out so they pull up more and if a continual steady pull is kept up much of the blanket weed will be removed. This weed will often grow upon oxygenating plants and become tightly attached to them. Where this happens so that the blanket weed cannot be removed the plants can be thrown away and fresh ones put into the tank.

It appears that most algae will thrive in a pond or tank to which fertilisers have been added, perhaps for the water lilies or other flowering plants. The floating green algae can often be cleared from a pond by placing water fleas in, but this does not always work, as if the algae are too dense the water fleas appear to die. Some aquarists feed their fry on green water, but great care must be taken in this as, although sometimes this is successful, at times the water becomes too thick with algae and the fishes are in trouble. There seem to be peculiar conditions which suit certain forms of algae; for instance, in a row of out-door tanks it has been noticed that whereas some remain quite clear others will become so densely infested with green algae that it is impossible to see an inch down into the water. In such a tank fishes are not happy and will die in warm weather. Such a tank can suddenly become clear when conditions in the water become too foul even for the algae.

Certain aquarists have their own methods for clearing their tanks of algae; one plan to rid tanks of blue-green algae is to use methylene blue, three drops of a 5 per cent. solution to a gallon of water. Once the algae dies the tank should be emptied, cleaned out and set-up again. Many well-established tanks have a small amount of filamentous algae growing on the rocks, but this is not enough to cause trouble and in fact can do a good job. Much of the free-floating matter in the water appears to be drawn to such algae, and when the weekly servicing is being done the

(*Continued overpage*)

In the Water Garden in MAY

by ASTILBES

OXYGENATING plants in the garden pond are almost a necessity, especially where it is hoped that the fishes will breed. The underwater plants make a good anchorage for the eggs and give a certain amount of protection to the fry. The action of the plants in giving off oxygen to the water is also beneficial for the fishes, although perhaps not quite so important as in an aquarium. In the open air, where winds can ruffle the surface of the pond some exchange of gases is always taking place. Although the provision of extra oxygen is very good, the underwater plants are also very useful for using up much of the waste matter such as fish droppings in the pond.

For ornamental effects they are not as a rule as effective as those plants which have many of their leaves at or above the surface of the water. There are one or two oxygenating plants, however, which can be very attractive for the garden pond. One of the best is water crowfoot (*Ranunculus aquatilis*), which has very fine leaves under water and forms dark-green shiny leaves on the surface. In addition this plant produces many pure white flowers which can make a grand mass in the early spring.

Limit the Number of Types

There are many oxygenating plants which can be grown, but there is little need to introduce several different kinds in a fairly small pond. As most of them will rarely be seen there does not seem much object in planting as many differing species as can be obtained. The average pond could be run quite successfully on one type alone, as it will be found that often a very strong-growing plant will only choke out the more tender ones.

For the average pond the plant which usually thrives better than anything else is *Lagarosiphon major*, which used to be known as *Elodea crispa*. This plant is a favourite with aquarium keepers and is said not to be hardy. However, at least in the southern parts of England it grows very well, and although it certainly dies down somewhat in the winter it soon grows afresh in the spring. The plant makes brittle shoots, some few feet long, which are closely clothed with back-curling leaves, which form such a dense mass on the stem that it is almost hidden. Even a small piece of this plant thrown into the pond will send down roots at least two feet to reach the mulm at the bottom.

Another fine plant for underwater work is *Egeria densa* (formerly known as *Elodea densa*). This plant also sends out long shoots rather densely covered with longish leaves, but these are less brittle and do not curl back as much as the previously described plant.

Hornwort (*Ceratophyllum demersum*) is an excellent plant for a breeding pond as the close, fine leaves are ideal for receiving the eggs of such spawners as the goldfish. This plant is another one which dies back a great deal before the winter. As the end of the year approaches the plant shrinks and the ends die away so that only the top of each shoot, which resembles a small horn, is left. These rather hard shoots remain at the bottom of the pond all the winter and do not start to grow until the water warms up in the spring. Where conditions suit it the plant will then grow very well and form large masses with many branched stems.

Inclined to spread

Water crowfoot has already been mentioned, and its surface leaves and flowers are so pretty that it is worth its place in a medium-sized pond. Where it is introduced into a natural pond it can spread to such an extent that the whole surface of the water would be covered within the space of three years. Another plant noted for getting out of hand is *Elodea canadensis*, a very good oxygenator. The long shoots are thickly clothed with rather small dark-green leaves, and it is a plant on which fishes can spawn. Unless this plant is watched and pruned well occasionally it can choke up the water to such an extent that fishes have difficulty in finding swimming space.

There are many other species of oxygenating plants but some are not strong growers and serve no useful purpose in the pond. If any of the three *Elodea* types are used it will be found that they do their job quite well, and there is then no need to try to fill the pond with a number of more tender plants. The three plants recommended are: *Lagarosiphon major*, *Egeria densa* and *Elodea canadensis*.

Planting such plants in the garden pond can provide a problem, and many people have great difficulty in getting their plants established. The usual way to plant is by getting shoots of the plant and fixing strips of lead around the stem and dropping them into the pond. For all beginners my advice is on no account try to plant with the aid of lead strips. Unless you are expert at the job all you will do will be to cut through the very tender and brittle stems and after a short time the plants will be found floating at the surface of the water. To be able to bend lead over a tender stem to such an extent that it will hold it firm is almost impossible for the average beginner. By far the best way is to make sure that your plants are properly rooted before they are introduced into the pond. Most of the plants are obtained as rootless shoots, and these should be placed in 2 lb. jam jars with an inch or so of soil at the bottom and filled with water. If placed in a fairly sunny position the cuttings will develop roots and become firmly rooted in the base soil. They can then be carefully removed and planted in the pond. Small pans, either earthenware or plastic, can be used in which to plant these oxygenators, and these can be gently lowered into the water.

Where such planting is done it is always a good plan to cover the top of the pan with stones so that the soil is not washed or pushed out by the fishes. The best time to plant such specimens in the pond is when they are making rampant growth, that is in May, June and July. If there is a quantity of soil or mulm at the bottom of the pond, the water plants can be planted directly into this. The best way is to lay the cutting on the bottom and place a stone or flat rock on the end of the shoot. See that sufficient of the stem is covered to keep it anchored safely and it will soon make roots and grow on well. If shoots are just pushed into the soil they often rot and usually do best when just laid on the mulm and anchored there.

Remember that the appearance of your pond is not altered a great deal by the underwater plants; this is left to the water lilies and other flowering plants growing above the surface.

What to do about Algae

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siphon tube can be waved through the algae and most of the detritus can be removed. Another point which is often lost sight of is that all the goldfish types will eat a certain amount of algae, especially the soft types. This will not happen if the fish are being continually fed, but if they are left unfed whilst their owners go on holiday for a fortnight most of the soft algae will have been eaten by the fish and the water will be clearer than ever before. At the same time it is a fact that any tank in which over-feeding with dried foods has been carried out will be almost sure to have too flourishing a growth of algae.

Good clean conditions with healthy, growing water plants will tend to keep the pond or tank free from any kind of algae.

AQUARIST'S Notebook——

by

RAYMOND YATES

I OFTEN wonder how many aquarium enthusiasts were born under the sign of the zodiac known as Pisces, the fishes. With a birthday in mid-March I am certainly one of them, and I was reminded of this recently when my birthday brought home to me the fact that I had been fishkeeping for 40 years. Looking back is really enjoyable and makes one wonder how the hobby was ever possible without the hundred-and-one gadgets which are available to-day, not to mention the huge library on the hobby accessible to the present-day hobbyist. In those days one had to have tanks more or less made to order and gadgets (apart from some weird efforts at ornamental rockwork made of clay) just didn't exist, nor was it possible to obtain graded gravel. All too often river sand, builder's sand or silver sand had to suffice, regardless whether it was suitable or not. Of course, in those days children made their own pleasures, unlike to-day, and were often quite well up in natural history, partly because they were often in closer touch with the countryside and through the educating effects of numerous cigarette-card sets.

My first aquaria were all large electrical battery jars of various sizes, mostly quite large. These suffered from the glass being rather rough, and hard to see through clearly, and the difficulty of cleaning. Invariably they were taken down and cleaned out thoroughly and, as might be expected, sooner or later they slipped an inch or so and cracked. I can't remember how many came and went this way, but accidents never dimmed the enthusiasm. The contents were usually locally caught carp, pond plants of one sort or another and the occasional goldfish. Disease was unknown, and it seems that the less we knew about the hobby the better we succeeded. Be that as it may, the day came when I wanted something more imposing than belljars, storage tanks and goldfish bowls, however large.

Some time previously I had won a twelve-guinea bicycle in a competition in a boy's magazine. I decided to sell the bicycle and put the proceeds to buying something more ambitious in the aquarium line. Sure enough, we found advertised in a paper a second-hand privately made tank which sounded like an aquarist's dream. It certainly was, and once it was seen I never rested until it was safely installed at my home. This aquarium was quite large, with a huge slate bed into which was fitted an outlet pipe and a fountain. The whole stood on four stout wooden legs, with magnificent paintings of snails thereon, standing roughly four feet or more from the floor. This indoor aquarium was crystal clear and contained silver sand and willow moss, which showed off the colours of the fishes wonderfully. The fishes were three 4-in. black and red goldfish, four 4-in. golden orfe, two 6-in. rudd and three 4-in. perch. In those days this was a set-up and no mistake, and it was a local wonder. Also, it was easy to maintain (with running water laid on to the fountain); live food was no difficulty. I wish I had the same youthful energy now I had then!

As time went on this tank was put outside on specially built brick supporting-stands, and even in winter it was never emptied. How it survived the cold winters of those years I cannot imagine, but it did. Sometimes the ice inside the tank was 2½ in. thick from the surface and the sides, but the fishes never worried nor did the glass crack. It must have been fool's luck. However, luck always turns at last, and I was no exception. One morning one of the large sides was badly cracked, and my parents took the opportunity to suggest it was impossible to repair, etc., etc., and, in the end, I gave it away to an older boy who was mad on fishing. I never saw it again.

Garden ponds followed, of various sorts, but they were very makeshift affairs until at last we produced a really big (for us) effort. This looked ideal, being in the shape of a rectangle with a semi-circular bay at one side, the other side being banked with high rockwork, complete with cypress trees. Large as this was it was only 9 in. deep. However, the water was always clear and the plants (willow moss again) looked delightful in the full sunlight which fell upon it. Fishes took a very dim view of this pond, although they survived quite long periods, probably because I used carp, rudd, goldfish and orfe. Cats caused trouble, but not overmuch, and once again the frost was kind. However, Jack Frost at last hardened his heart and my pond was ruined. In some ways I wasn't sorry, because I had become rather tired of the grind of sweeping the surface every day with a newspaper to remove soot, the bane of near-town life. I always remember, when this pond was first built I could hardly wait to set it up, and after a week introduced six minnows. They swam happily away but next morning I found them all bloated and dead on the surface, and a horrid purple colour. A month later another six minnows were tried out and this time all was well.

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Coldwater fishes were always a great favourite with me and we kept at one time or another almost every possible variety. The worst jobs of all are when one has to nurse large orfe or fancy goldfish through very high-temperature periods in mid-summer. In those days no aeration was available and they found their hospital ward in our bath. All survived, but the owner was hard put to it to follow their example. At this time I was able to obtain really fine rudd in perfect condition for a few coppers and these, with orfe, were my favourites. Later I saw my first bitterling and was much smitten. Of course, a day came at last when I had 21 different varieties of coldwater fishes on display at a college, as well as tropicals, but there were many years of trial and error before that happy state was reached.

Tropicals came later. The difficulty about the early days of tropicals was the expense. Coldwater-aquarium keeping was almost a no-expense hobby, but tropicals were a different matter. Not everybody had electricity, and many beginners used gas heating under a copper strip. How far away this seems now! Then the method of heating the water by an ordinary electric lamp or lamps built into the base appeared. All tropical tanks in those days were tiny affairs, and their occupants very diminutive also. Also they were rare fishes—to us. Breeding was almost unknown, and there were very few of the species of fishes which hobbyists can buy almost anywhere to-day. The first of all of the tropicals was the paradise fish, now rarely seen; those specimens which are available are often poorly coloured through inbreeding.

The guppy had its day, and probably introduced more fanciers to the tropical hobby than any other. Some cichlids made a very early appearance. Most fishes when first offered were sky-high in price compared with to-day's low rates, even the tiger barb being in this class. Well over 50 tropical plants are now available, but this is the result of the huge success of the hobby since the war; it wasn't always this way. Way back there was no wide assortment

of dried or live food commercially available, nor chemical cures, but the fishes certainly prospered. In fact, the great fear of those days was chilling, but most losses were due to boiling. I doubt if things have altered so much in this direction !

Does enthusiasm for the hobby wane after so many years ? Generally, no; once bitten you never get the fever out of your blood, and many of those who took up the hobby, later to drop out, did so because they were only interested in financial gain or never were of the really keen variety. On the other hand one becomes so experienced that one no longer wants to be bothered with large numbers of tanks, or even fishes. You are satisfied with just a few specimens which need not be "show" specimens but very ordinary representatives. You no longer try to do the impossible and disaster or disease never really worries you. You dispose of what can't be saved and instead of bothering about the losses of the present enjoy the past and look forward to future successes.

* * *

Mr. Brian Cheshire, of the Belle Vue aquarium at Manchester, was telling me recently of his bad luck with the piranha which he purchased from the South Bank Aquarium at its closure. This particular fish cost £10, and appeared to be in fine fettle. He provided it with a 36 in. tank to itself and for a fortnight it made short work of frogs or young rudd which were offered as food. Worms and raw meat were looked upon with obvious disfavour, although the Belle Vue piranha appreciates this diet. However, by the third week it began to sulk and refused all food, no matter how tempting, and a month to the day of purchase it died. Now, in pickle, it looks quite a formidable fish, but why it died remains a mystery. This is not the first piranha to last out exactly a month and a suggestion was put forward that Manchester water is unsuitable. This is usually about 3 to 4 degrees of German hardness and pH 7. The difficulty with fishes like the piranha is that when in difficulty there is just nobody to ask for advice, and very little in the literature of the hobby. I mentioned recently the way these fish fail to stand up to handling in their own native waters. Have any readers any suggestions ?

Talking of Belle Vue reminds me that the local club celebrates its "coming of age" this year. The famous electric eel at the aquarium died at the end of 1956, after a period of wasting away and complete lack of interest in food. After over six years in the aquarium if measured about 5 ft. 8 in. and regularly ate about 30 rudd a week. Towards the end it was eating only a single rudd and seemed to waste away in the manner only too well known with more diminutive tropicals. The butterfly fish have also died off at last, one specimen only being left. These fish are surface eaters, and when the end is near they seem to keep to the middle depths, a sure sign that their day is over. An amusing spectacle is provided by the giant gourami, which is really enormous. Old as it is it never seems to have realised that people snapping fingers at it through the glass really are out of reach, and it will follow up and down the glass without ever becoming weary; perhaps it feels it is a game which relieves the monotony. Who can tell ? This fish eats large quantities of lettuce.

I made enquiries about the eye trouble with angels in the large tank of pompadour fish. I wondered if the pompadours were to blame, because these fish do attack the eyes of other fishes (usually other pompadours). However, they are not to blame. The trouble seems to be of long standing in this particular tank, and seems to affect all angels put in it sooner or later. There is no doubt that damaged or diseased angels are an eyesore (no pun intended) and no advertisement to the hobby. Surely they are better destroyed. I was in a dealer's shop some time ago and he had half a dozen very large angels all frightfully knocked about and misshaped. I cannot imagine anyone buying such stock.

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From time to time I have made adverse comments about the tight-fisted type of dealer who will sell anything to anyone who is fool enough to buy. Fortunately most of these gentry have left the business, but it is still advisable to buy with a certain amount of care. We all know the story about the dealer who gives all purchases a free dose of white spot, and this is founded on fact because many imported fishes do contract this trouble. One well-known dealer goes to the opposite extreme and guarantees to replace free of charge any fishes purchased, within a week, if they die as a result of disease. This is quite unique and I know of no other firm which goes to these lengths. The dealer is McLynn's Aquarium of Ewhurst, Surrey, well known to clubs who go by coach on Sunday, so much so that it is usually booked up on Sundays from early March until late November.

Mr. D. McInerny, one of the proprietors, explained to me how it was possible to give such a guarantee, and readers will find some food for thought in this attitude to business. The firm contend that quality is the first consideration, and set themselves out to sell only first-class fishes in perfect health and condition. The majority are raised on the premises and are generally known to be free from trouble, but imported fishes are not only quarantined but not sold until they have been built up into good shape with rounded "tummies" and are perky, with well-erected fins. Any which fail to reach this standard are not sold, so runts and fishes with deformed fins or spines are killed as being unsuitable for sale or breeding. No fish would be sent out with obvious disease but some troubles cannot be seen, and it is for this reason that the week's guarantee is given. This has been offered for the last 10 years, during which time many thousands of fishes have been sent out, and not more than 120 instances of replacements have occurred. All that is asked is that the dealer or hobbyist is honest and returns the corpse of each dead fish for examination.

This assists by proving the fish has died, that it is one sent out and that its death is not due to a thermostat sticking. Fishes killed by heat or suffocation through overcrowding almost always die gasping, with wide-open mouths. Another feature is the fact that no substitutes are sent out if the fishes ordered are not available. The price list states the species, popular name, size in inches of specimens available, whether young, half grown or adult, and the price. Free notification is given by letter or telegram and the fishes are sent out in double polythene bags containing sufficient water and blown up with oxygen. The bags are contained in insulated cartons which have to be returned. One cannot compare the small dealer with a large firm like McLynn's, and it would not be fair to do so. The fact remains that all too few dealers replace losses and it is encouraging to mention one who does.

* * *

Spatterdocks are hardy enough if they are left alone but often suffer, if moved, by losing their leaves, which slowly decay. Some time ago I had some fine plants but made the mistake of putting some sea salt and Epsom salt in their tank. The quantity used was negligible as far as the fishes were concerned, but the effect on the spatterdock was shattering. Within hours they had turned black and every leaf turned to pulp, decomposing rapidly (and dangerously for the tank) in the way many coldwater plants do when exposed to tropical conditions. However, the large crowns were unaffected and fresh leaves have thrown up, so all will be well. A plant with leaves like these is very much at the mercy of any chemical introduced, and proper care taken will repay the owner.

Giants and Runts in Typical Broods of *Betta splendens*

by P. SCHOLES, B.A.

IT is a common observation among aquarists that on rearing a brood of fishes there are some few in that brood which grow with a speed out of all proportion to that of their fellows. Conversely some few fish never seem to make any headway at all. The mass of fish are of an intermediate size between these two extremes. Why is it that such a disparity of size exists between individual fish of the same brood spawned at the same time as their sibs and of the same parents?

It can be argued that the genetical differences within individual fish are sufficient to account for the size hierarchies which occur. Different efficiency of food utilisation could account for such differences. However, having reared Siamese fighters for eight generations with brother-and-sister mating and found the same disparity in individual sizes in the eighth generation as in the first, I do not think this can be so important. Also, aquarium stocks of blue fighters, which are the fish I have studied in this respect, breed pure for colour, and the broods obtained by mating blue male and blue female and in successive breedings mating brother and sister give remarkably uniform fish, except for this one character—size. Altogether each fish is as like to the others as peas in a pod, but the size varies enormously. At the age of 28 days one fish may be 24 millimetres (mm.) in length whilst its smallest sib may be but 6 mm.

The reason for the size difference lies not in the nature of the fish but in the nurture. The amount of food eaten determines the eventual size of the fish, other things such as the size of the tank in which the brood is reared, etc., being equal.

Suppose we take a concrete example. From a brood of fighting fish that have just become free swimming, let us take 60 fish and place them in a 24 in. tank half-filled with old matured water, and let us look after and feed them well. A rich growth of Infusoria is produced, and in due course the fish go on to micro worm, *Artemia* nauplii, *Daphnia* and white worm. At the end of 28 days let us measure these fish. The result is shown as a table.

Length (mm.)	No. of fish	
6	1	Runts
7	5	
8	1	
9	2	
10	4	
11	4	
12	3	Averages
13	4	
14	3	
15	4	
16	1	
17	3	
18	5	
19	1	
20	2	Giants
21	–	
22	1	
23	1	
24	1	
	46	(Total)

Size distribution of brood of 60 Siamese fighter fry after 28 days. Mortality has been 24 per cent.

Five fish are above 20 mm. in length; these are the giants. The main body of fish, though here again the individual variation is great, lies between 12 and 18 mm. and the runts are those below 10 mm. This is a typical size distribution obtained from a spawning. Now suppose that instead of placing these fish all together in an aquarium we take 10 fry and place them separately in 4 lb. jars in 24 in. tanks at the same temperature, and let us feed them at a known rate. After the Infusoria stage the prey organisms can be counted more easily, so when the fry are eating micro worms 10 of them are taken from the brood. They are apparently all of a similar size and are fed on identical amounts of food.

At the end of a month they have the following sizes: 17, 16, 15, 16, 16, 17, 17, 15, 16 and 17 mm. The difference is here but 2 mm. between the largest and smallest fish, and could be accounted for by slight initial differences since the fry at first cannot be accurately measured to within a millimetre and must be estimated by eye. However, no significant differences such as are always found when the fish are reared together can be seen. It seems then that the important factor which produces the extreme range in size is in some undefined way the action of each fish on its neighbours and *vice versa*.

From close observation of the fish brood when fed on, say, micro worm, there seems to be no direct driving away, intimidation or interference in the smaller fish's feeding actions by the larger fish. Each fish seems to feed independently of its neighbour and seems to be in no way restricted in capturing and eating its prey. This being so it is hard to understand how one fish eats far more and hence grows faster than its neighbours on either side. Nothing seems to be preventing them from eating as much as they want and there seems to be ample food available.

But let us examine more closely this food capture or foraging ability of an individual fish. It can be shown that the "grazing ability," as measured by the time taken to capture and eat, say, 10 prey organisms out of a total of 27 at a concentration of one per litre, is dependent on the length of the fish. This relationship is such that at the earlier stages of growth, from 6 to 10 mm., an extremely small increase in size results in a relatively large increase in grazing power.

Let us return to the problem of the 60 fish in the 24 in. aquarium. Some are more forward in development than others. Since the spawning of 200 eggs may take six hours or more the first-spawned eggs begin their development six hours before the last-spawned. They are six hours ahead all this period. The yolk sac is absorbed and they begin feeding six hours before the last ones. In this six hour lead they decimate the Infusoria prey population and grow slightly. The mass of the fish, immediately the yolk sac is absorbed and they begin feeding, is placed at a double disadvantage. In the first place most of the prey has been eaten and is sparse, and also the first-hatched fry are larger and have a greatly enhanced foraging ability, so that of the prey that is left they can capture and eat more than their less-fortunate brethren.

The first-hatched group are destined to become the giants,

since the more they eat the larger they grow and the easier it becomes for them to eat more. The effect is culmulative. The last-hatched fish feel the competition most keenly and some which can obtain very little food are starved to death. Of the 60 fish we started with, after 28 days 46 remain.

After the first few days the first-hatched and larger fish, subsequently referred to as group *A* fish, go on to a diet of micro worms. The mass of smaller fish are still feeding on Infusoria, and now when their larger sibs go on to micro worms the majority find the competition for infusorian food less severe. They grow faster and soon themselves come to eat micro worms; the competition becomes more severe since they are once again competing with their more efficient, group *A* brethren.

The last-hatched fish are in a poor way. They have to feed first on very depleted food supplies and this in turn ensures that they continue to be small in size. All the while competition for them is severe and food scarce. Initially, when feeding on Infusoria, some of these fish may be starved to death. The survivors in this group constitute the runts in the brood.

The enhanced grazing power of the larger fish is a fact and can be demonstrated, but how initially an advantage in size is gained is not known. The theory given here, coupled with the proved relationship between size and grazing power, would account for the size hierarchy that is typical of all rearings.

How can the practical breeder get over this effect and produce the maximum number of larger quick-grown fish from each brood? Since the phenomenon of disparity in size is due to intraspecific competition, ideally each fish should be isolated and grown on its own. This is ordinarily not practicable, however, and what can usually be done is to cull the fish and place all those of a similar size in large aquaria and feed them heavily. Usually, with plenty of space and frequent sorting this results in a uniform rearing of quick-grown large fish.

To conclude, it is reasonable to suppose from the above account that if excess of food of all descriptions (Infusoria, *Artemia*, micro worms, etc.) is present at all times, then in theory there should be no discrepancies in size in the resultant rearing. In the early stages, which are crucial for setting the size pattern, this high level of feeding is not physically possible under the usual static conditions. Suppose 60 fish are reared in a 24 in. conventional type tank half full of water; the amount of infusorians necessary to feed all these abundantly is exhorbitant. Such a culture, owing to rapid depletion of available oxygen and production of waste products, etc., would be lethal to the fish. From the first there must be some lack of food for some of the brood.

It is only necessary for this lack to be reflected in the speedier growth rate of some fish and conditions are set up such that the observed size discrepancies are bound to occur. Although ample micro worm, *Artemia* nauplii, etc., is now provided, the initial size differences laid down when feeding on Infusoria will become greater, and the typical size hierarchy will be produced in which one fish may be five times the length of its smallest sib and many times the weight.

TROPICAL FISHKEEPERS' REFRESHER COURSE: *by Pisces*

Barbus ticto

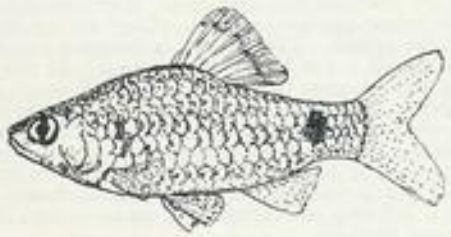
ORDER:—Ostariophysi, from Greek *ostarion*—a little bone, and *physa*—a bladder.

FAMILY:—Cyprinidae, from Greek *kyprinos*—a kind of carp.

SPECIES:—*Barbus ticto*, from Latin *barbus*—bearded, and *ticto*—a native name.

ALTHOUGH not the showiest of barbs, this fish has many staunch admirers, and has found a home at one time or another in almost all community tanks. Innes gives its length as 3½ in., but I have never yet seen one which approaches such a size. In shape and in general appearance it resembles the rosy barb, particularly when young, but as it grows it remains an all-over glistening silver, taking on no other hue anywhere upon the body.

The fins are very transparent, and apart from a very reddish fringe to the outer margin of the male dorsal, almost without colour. The specific name *Barbus* seems inappropriate inasmuch as the fish is without barbels.



Male Barbus ticto

Temperature tolerance is good, and if you are one of those aquarists who sometimes forgets to "turn on the heat" your *ticto* are unlikely to suffer, provided that the forgetfulness does not last for several days during a really bitter spell.

Sexing is easy because of the difference in colour of the dorsal fins of males and females, and because when the female fills with roe she is noticeably rounder and heavier in the body than the male.

Spawning usually takes place within a temperature range of from 70 to 80° F. Either sex may take the initiative, nudging and prodding the other until the love play develops into a chase in and out among thickets of plants, with batches of adhesive eggs being dropped by the female and fertilised by the male. The eggs adhere to whatever they contact—glass, plants, snail shells, rocks, stones or sand. The parents are avid egg-eaters unless gorged with live food before spawning begins, so that if it is desired to rear them in any quantity, batches of egg-laden plants should be removed from the spawning tank as the drive proceeds, being replaced with fresh batches of weighted plants.

If spawning catches you unprepared, portions of "blanket weed" can be used as a spawning medium, or clumps of grass or bunches of raffia.

Those aquarists interested in experimentation might well try spawning these fish by artificial means. Catch the female, hold her in shallow water (the same temperature as that of the spawning tank) and stroke her gently just above and forward of the vent. This should release a number of eggs into the water. Then catch the male and stroke him similarly so that milt is released into the water which

(*Please turn to page* 36)

Pronunciation of Fish Names

by "Secsip"

THE mispronunciation of a word may not be, indeed is not, a sin comparable to worshipping a graven image or coveting your neighbour's wife; yet it is a sin, if only because it offends against the ear. The English language is the heritage of every one of us, and it is neither pedantry nor affectation if we deplore its debasement and uphold its music.

It is, however, by no means easy to draw a dividing line between correct and incorrect pronunciation. To say that the educated pronounce their words correctly and the uneducated do not, is not only unhelpful in itself, but altogether too much of a reminder of that snobbish catch-phrase that all men are equal but some are more equal than others.

Yet there is much truth in it, if we divide words into two classes; the everyday words that all of us know and use, and the rare words that few of us know and still fewer use. There is, in fact, a lesson to be learnt from this; for we cannot overlook the fact that, so far as everyday words are concerned, it is right and proper that we should accept the popular pronunciation of the plain man. It is no virtue, deserving of praise, to insist on speaking of an ex-tra-or-din-ary experience, when most of us are content with ex-tror-din-ary. On the contrary, it merits censure because the speaker is attempting to establish his culture at the cost of his hearer's patience. On the other hand, the plain man must grant the scholar his right to speak of having received a com-min-atory letter, and no one should raise a supercilious eyebrow if the plain man himself, when called upon to use the word, prefers to help himself out with com-min-a-tory.

Withal a limitation must be imposed. The acceptance of the popular pronunciation of everyday words must not be allowed to sanction the mutilation of them. It is no great sin to persist with the popular zeb-ra (instead of the correct zee-bra) because the sin is only the minor one of wrong accentation. It is altogether another matter to persist with air-ee-ation (instead of the correct air-ation) because the mispronunciation mutilates the word and makes utter nonsense of it.

It is perhaps only natural that most aquarists should mispronounce the scientific names of fishes and plants. Apart from the fact that to-day most of us, like Shakespeare, have small Latin and less Greek, we are aided and abetted by aquarium literature, which fosters the view that as we cannot be certain how the ancient Greeks and Romans pronounced their words, the simplest way out is to pronounce the scientific names as though they were English words.

It is deplorable. True, we cannot be certain how the ancients pronounced their words, but we can make a very good guess. It was more phonetic. Modern Greek, and to a lesser degree modern Italian, are not very helpful, and must not be taken as a guide. The modern Greek pronounces the B like a V, the D like the TH in *father*, and the diphthong EU either as EF or EV, IF or IV, the precise pronunciation depending on whether the E is short or long and which letter follows the diphthong. It would, I think, create a great deal of surprise if the aquarist spoke of thefterothon for *Deuterodon* and vrachygovius for *Brachygobius*.

The successful pronunciation of a scientific name, therefore, is not so much a matter of imitating the intonations of southern Europe, and rupturing the mouth in the attempt, but rather in avoiding the Anglicising of a name that is fundamentally foreign, and making a polite acknowledgment in some part of the name to its Greek or Latin origin.

In attempting to pronounce a foreign word, most English people go wrong because they place the accent on the wrong syllable and fail to give the vowels their full values. The general rule in pronouncing all scientific names is to enunciate every syllable, place the accent on the penultimate one, and give full value to the final vowels as well as to the middle ones. It should not be difficult, because we have before us examples such as I-*re*-ne (peace), Zo-*e* (life), Sel-*e*-ne (moon) and Chlo-*e* (young green grass), all of which are Greek words used as proper names in England. Invariably they are pronounced in the Greek way.

If we apply this rule to the scientific names of fishes and plants there should be no difficulty in determining the correct pronunciation, and no excuse for mispronouncing anna-*kar*-iss (*Anacharis*) as *anack*-ar-iss, krypto-ko-*ry*-nee (*Cryptocoryne*) as krypto-ko-*ryne*, ckry-o-*pee*-ops (*Chriopeops*) as ckry-*o*-peeps, and mimma-go-nee-*a*-tees (*Mimagoniates*) as mimma-*go*-nee-ates.

The enunciation of the individual letters introduces a number of traps for the unwary. It would be impractical, and perhaps confusing, to suggest a pronunciation for every letter in the Greek and Latin alphabets. More can be done by drawing attention to the correct enunciation of those letters that give most trouble to the English tongue.

In Greek there is no C, only a K, and the Latin C is always enunciated hard as in *cat*. The temptation, therefore, is always to enunciate the C hard. English usage, however, sanctions the C being sounded soft when it comes before E, I and Y. It follows, therefore, that it is more correct to speak of sick-la-so-ma (*Cichlasoma*) rather than kick-la-so-ma, and sy-no-lee-bee-ass (*Cynolebias*) rather than ky-no-lee-bee-ass.

The compound CH, however, is always sounded hard, as in *loch*, and the popular pronunciation of characin as char-a-sin, *Chela* as chee-la and *Charax* as char-ax, should be corrected to kara-sin, kee-la, and kar-ax.

The G in Greek and Latin is always sounded hard as in *get*, but, as with the letter C, English usage sanctions it being sounded soft before E, I and Y.

Of the remaining consonants, the S presents the greatest difficulty. It should be sounded sharp, and in particular never hung on to when it occurs as a final. *Aequidens* and *splendens*, for example, should be pronounced eye-quee-dense and splen-dense.

Most aquarists know that the diphthong AE is pronounced as in *aisle*, but they go astray with the diphthong AU. It should not be pronounced like the English word *or* but like the vowel sound in *cow*. The names *australe* and *auratus*, for example, should be pronounced ow-strar-lay and ow-rar-tus, rather than or-strar-lay and or-rar-tus.

In Greek OE is not a true diphthong and both letters should be sounded. Correctly, therefore, *Poecilia* should be pronounced po-ee-sil-ee-ar. As, however, the OE is a transliteration of the Greek diphthong OI, an alternative pronunciation is poy-sil-ee-ar. The pronunciation pee-sil-ee-ar, which is very frequently heard, is quite wrong.

The enunciation of the vowels introduces almost insuperable difficulties for the aquarist, because a vowel may be either long or short, and correctness comes only from a knowledge of Greek and Latin quantities. A further difficulty lies in the fact that the aquarist is unlikely to know the original Greek word, and, in consequence, whether the epsilon (short E) or eta (long E), the omikron (short O) or omega (long O), is used in the original.

The best that can be done, therefore, is to make a general statement that, though it will not be right every time, will at least be right most of the time.

As an initial the A should be sounded short as in *fat*, as a final long as in *father*, and as a medial short, except when

the syllable is accented, when it should be sounded long. The I should be sounded either short as in pin or long as in machine. It should never be sounded like the English I. Despite what we are told in aquarium literature, such names as *innesi*, *brederi* and *arnoldi* should be pronounced innes-ee, breder-ee and arnold-ee, and never innes-eye, breder-eye and arnold-eye. The U is sounded either short as in wood or long as in mood. The difference is not so pronounced that the quantity matters in an occasional scientific name. The English U sound, however, is better avoided. A name such as *punctatus* is better pronounced poonk-tar-tus than punk-tar-tus; a name such as *pulcher* is better pronounced pool-ker than pul-ker, which wrongly places the accent on the first syllable.

One further problem in the pronunciation of the scientific names calls for comment. In Greek there are no silent letters and in names such as *Pterophyllum* and *Pseudocorynopoma* the P should be sounded. As the English tongue finds it hard to enunciate two consecutive consonants, ter-ro-phy-lum and seu-doh-ko-ry-no-po-ma are the regular pronunciations. It is, perhaps, an unimportant point, but the more correct pronunciations are p-ter-ro-phy-lum and p-seu-doh-ko-ry-no-po-ma.

On the whole, none of this is difficult, and, with a little practice, it soon becomes second nature to pronounce the scientific names correctly rather than incorrectly. But it does call for a little effort at the start. The effort is worth while, if only because there is no good reason for doing a thing badly when it is just as easy to do it well. Sam Weller's advice to his son, "vether it is vorth vile going through so much to learn so little is a matter o' taste," may still hold good of marriage, but not, I suggest, of correct pronunciation.

Barbus ticto

(*continued from page* 34)

contains the eggs. How many will be fertile? How many infertile?

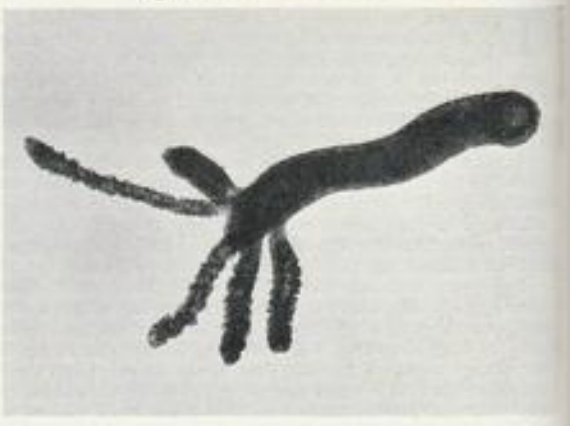
In a separate container catch the male and release milt *before* the eggs from the female. Compare results as the eggs which have been fertilised develop. Which container shows the greatest proportion of fertility? It has always been assumed that the male releases milt only when the female gives him eggs to fertilise, but it could well be the other way round.

The eggs should hatch in about 2 days from fertilisation. The tiny fry are like splinters of glass, and hang for most of the time just where or quite near where they burst from the shells. Absorption of the egg sac occupies them for another 48 hours or so, after which the swim bladder is inflated and the fry are able to balance themselves at any desired depth in the water. Feeding on small Infusoria and free-floating microscopic algae now begins. With barbs a proportion of vegetable food is a necessity to ensure healthy and balanced development, and should always be included.

Live foods are preferable to dry at any time, so meat can be provided by helpings of brine shrimp, micro worms, *Cyclops* nauplii, small *Daphnia* and the like. Growth with these foods is rapid, and unless the fry are grossly overcrowded one is soon delighting in the appearance of a small shoal of healthy fry growing daily more like their parents.

B. ticto are not scary fish, and hold themselves well when exhibited. From the visitors' point of view, however, they compare less favourably with some of their more showy relatives.

Hydra Catches a



A lazy animal, that moves with difficulty and only when it feels there must be a better fishing ground somewhere else, Hydra spends most of the time hanging in the water, waiting. It waits for small creatures such as Daphnia, the water flea, which, although much more highly organised than Hydra, forms its food

HYDRA is a little animal that lives in ponds and lakes, attached to some water plant. That its body is at times long and at times drawn up short impressed Anthony van Leeuwenhoek, who was the first to observe the creature through the microscope. Despite its remarkable ability to contract and expand, it is a simple animal as far as structure goes, consisting of not much more than a hollow tube, which is closed at one end and open at the other. The open end is the mouth and anus at the same time; whatever cannot be digested goes out the same way it went in. Around the mouth several tentacles are arranged, formidable weapons, which serve to catch minute creatures that may happen to touch them.

Hydra has no eyes, nothing that could be called a developed brain, though it has nerve cells, sensitive to outside influences. These nerve cells govern its activities.

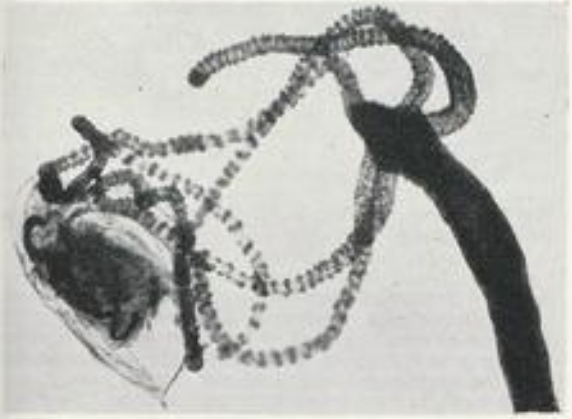
Daphnia, the water flea, has well-developed internal organs such as a heart, a brain and a digestive tract into which food enters at one end, and residues leave from the other. It also has a "compound eye" with about 20 lenses, and two strong antennae help it to swim about in the water in a jerky movement

Water Flea

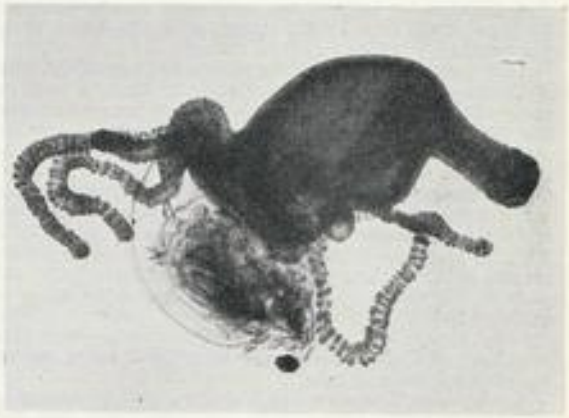
Photographed under the microscope

by ERIC V. GRAVE

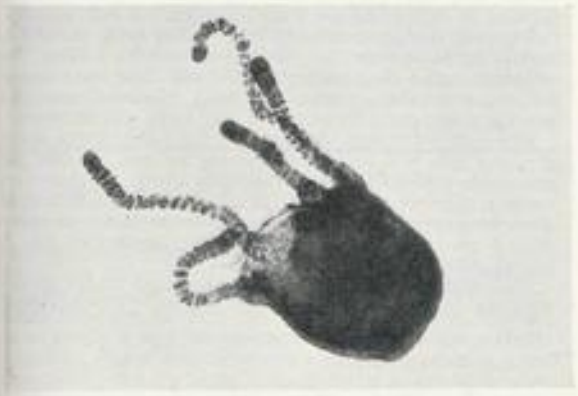
A primitive animal that is scarcely more than a hollow tube captures an animal with a brain



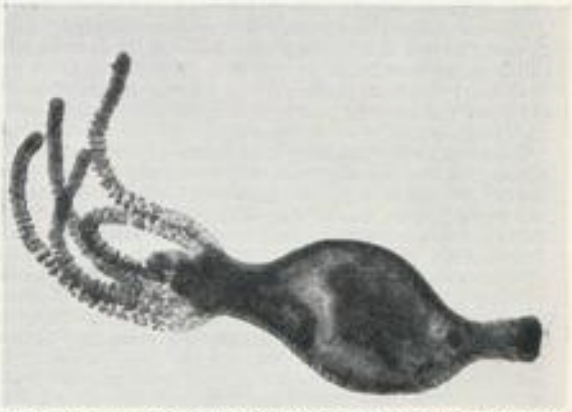
A water flea touches one of Hydra's tentacles and its fate is sealed. A paralysing poison released from structures on the tentacles render it helpless



The single entry into the tubular body of the Hydra is opening around the paralysed water flea. Hydra is capable of ingesting small fish fry in the same way



Now the water flea is nearly all devoured. The body and tentacles of Hydra are capable of extension and contraction, as can be judged from their varying sizes in the photographs



Within the distended body of the Hydra can be seen the swallowed Daphnia through the transparent body wall. The round, black eye of the flea is visible to the right, towards the base of the Hydra

Imported Eggs

A RECENT Board of Trade announcement concerning goods to be added to the list of those for which no individual licence is required for import, included live fish eggs from any country as one of the items.

Long-distance Salmon

A SALMON "tagged" after being stripped of eggs and before its release at Loch na Croic, Ross-shire, has been recaptured nearly a year later in Eqaluq Fjord, Greenland. The distance between these two places is about 1,730 miles and is the greatest distance recorded in studies of migration in salmon.

Karachi Aquarium

KARACHI Municipal Corporation has made plans, which have recently been approved by the Chief Commissioner of Karachi, for a large National Aquarium to be built at Clifton. This will be the first public collection of aquaria of this kind in Pakistan, and it is planned to display local and foreign sea- and fresh-water fishes. Construction is expected to begin very soon.

Cacti in the Fish House

In the paragraph under this heading in last month's issue the John Innes potting compost recommended for use in repotting adult cacti is no. 2, not no. 8 as printed.

Microscopy for the Aquarist—30 *by* C. E. C. COLE

LAST month we discussed thickness of slides and a method to be adopted, if the slide was too thin, to build it up so that the condenser could accurately focus an image of the light source upon the object being examined.

This month we deal with the other extremity of the slide thickness—the cover slip. For reasons which I hope to make obvious as we proceed it is of great importance that the cover slip, or more accurately the distance above the object to the upper surface of the cover glass, should be correct for the objective we are using.

First let me say that neither the thickness of the slide nor that of the cover slip is of great importance when we are using *low-power* objectives, say, from 4 in. to $\frac{1}{2}$ in. This is because these objectives utilise comparatively narrow cones of light and consequently there is little displacement of the light rays in their journey from mirror to object glass.

It is quite a different story, however, when we reach medium and high-power lenses, with short, wide-angled, broad-based cones of light.

Bearing in mind what we have already learned concerning light rays and their behaviour, and also about the numerical aperture of objectives, let us now examine the diagrams appearing on this page. These are exaggerated for emphasis, and represent a single dry objective, e.g. a $\frac{1}{6}$ in. (4 mm.). The light source is accurately focused upon the object and remains unchanged in each diagram.

In computing the objective the manufacturers have assumed that it will be used on a 160 mm. body tube with slides having cover slips of 0.17 mm. (17/2,500 in.).

If due regard has been paid to correct illumination the objective will give its best performance only if used under such conditions.

This ideal state of affairs is indicated in diagram *A*. In diagram *B* the objective remains accurately focused upon the object, and so does the condenser. Apparently nothing has been altered except the slide, which has a different thickness of cover slip, thicker than the first one.

The effect of the new cover slip upon the way the cone of light enters the lens is obvious. The cone is no longer using the full aperture of the lens, but is confined to the central portion. It is upon the rays of light entering the marginal zone of the object glass that the resolution of finer details is dependent. Consequently these are lost in the image of the object. Moreover, if light *does* enter through the marginal area it does so at a different angle and comes to a focus in a different spot, fogging the image. In bad cases the whole may be obscured with a milky haze.

Magnified views of teeth of the dragonfly (Aeschna) nymph (left; $\frac{2}{3}$in. objective, × 8), and of the larva of Chaoborus (right; $\frac{1}{4}$in. objective, × 8)

What can be done under such circumstances?

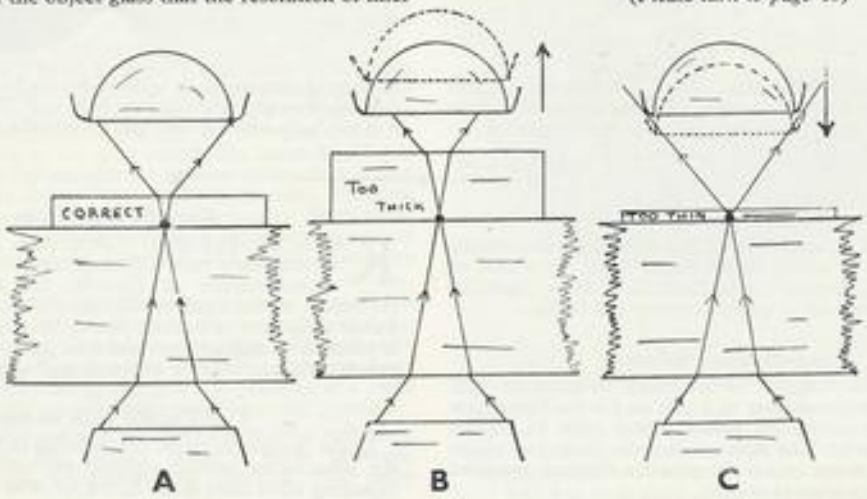
To restore the original conditions in which the cone is correctly utilising the whole of the lens aperture, we must *raise* the objective to the position of the dotted line. "But if we do that," I can hear you object, "we defocus the object, and what purpose can that serve!" It can be refocused by shortening the body tube.

The average modern body tube is 140 mm. in length, and is increased by use of the draw tube. With the objective under discussion the tube will have been drawn out about 20 mm. and so, if necessary, can be shortened a matter of 20 mm.

For each 1/100 mm. of excessive thickness of the cover slip, the tube will require shortening 10 mm., so that the maximum permissible extra thickness which we can overcome in this way is 0.02 mm., or 1/1,250 in. Some makers allow even greater latitude, and as, when slides are purchased, no cover-slip thickness is ever discussed, this is just as well.

Now look at diagram *C*. This represents what happens when an unusually thin cover-slip is used. The emergent

(*Please turn to page* 40)



Fancy Goldfish Breeding—4

by A. BOARDER

4. Care of the Fry

ONCE the fry have hatched there will be plenty for the aquarist to do, as fairly constant attention is necessary. Especially is this true in the early days, to ensure that many fry will be reared. As is generally known, the fry do not move about when they are first hatched. They anchor themselves on the sides of the hatching tank or on the water plants. They may remain so for about two days before they start to swim freely.

If the tank is disturbed they will swim around like little dark splinters, coming to rest again after a short time. It is not advisable to disturb the fry at this stage as they are gradually gaining strength and feeding from the yolk sac with which they were hatched. If the water takes on a bad smell it is imperative that most of it should be changed as soon as possible. This must be done carefully so that as little disturbance as possible is caused. See that the fresh water is of the same temperature as that in the tank.

The causes of foul water are varied but one of them is the fact that a large number of eggs may have been infertile. These would soon go bad and pollute the water. Also some of the water-plant leaves may have died and helped to turn the water foul. During hatching time some Infusoria should have been cultivated and this should form the first feed.

When to start Feeding

The fry will soon tell you when they need feeding. It is when they are free swimming, and this time depends on the temperature of the water. If kept at about 70° F., it is probable that the fry will be swimming within 48 hours; at a lower temperature they will take longer. When they can be seen on the move some Infusoria must be given. The fry can feed almost all day long and so the necessity of plenty of available food at all times becomes apparent.

Some of the water can be removed from the tank and some Infusoria-charged water gently poured in, or a drip system can be arranged. First of all it is most important to make sure that there are Infusoria actually in the fluid which is being put into the fry tank. Just because the water smells it does not mean that Infusoria are present. I consider that a microscope or a strong magnifying glass is essential, and if a small drop of water is put on a slide the presence of any living creatures will soon become apparent. A powerful microscope is not necessary for this purpose, as even a 24-fold magnification will clearly show if there is enough food present. If a drip feed is arranged so that the Infusoria water can drip into the fry tank, make sure that the hole does not get blocked up and restrict the flow.

The fry can be seen to take the food if watched for a while. They will be seen to make a sudden dart at something too small for you to see, and if they are continually on the move around the tank, making these sudden darts, all will be well. The water temperature can be kept up to about 70° F., as this is quite a good warmth to allow. Remember all through your rearing times that the colder the water the less active will the fry become; the less active they are the less food will they require and the longer will it take them to digest it. Also the colder the water the slower will their rate of growth be.

Foods after Infusoria

The next problem is when to start giving some different foods. A lot will depend on the rate of growth of the fry, but if all is going well they should be getting too large to feed exclusively on Infusoria by the time they are seven days old. The next feed can be either micro worms or brine shrimps. It is certain that if sufficient live foods can be given the fry will thrive much better than if all dried foods are given. These foods can last until the fry are a fortnight old, when they should be able to take the smallest *Daphnia*. Also at this time they can take mashed earthworm or white worms. This must always be given through a fine sieve or net to make sure that too much skin is not included in the meal.

During the first fortnight the water must be watched with care to see that it is always pure. The addition of Infusoria water can easily upset the balance, and some changes may be necessary. If the fish were bred in individual tanks there may be no need to remove the fry from the hatching tank, but if the system of removing the eggs on weed from a pond for hatching was adopted, then it is important to make sure that the following is carried out. Once the fry in the hatching tank are free swimming they must be removed to a fresh tank as soon as possible. This is because the water plants from the pond may contain many pests which can kill the fry. One of the worst of these pests is *Hydra*. These can be present on the water plants and when they contract themselves they can be almost invisible to the casual observer. They can, however, kill and devour many of the fry and I have known whole tanks cleared in a week or two. It is only when the fry are very small that they are likely to be eaten by *Hydra*, but even once they have grown a little they are still not safe. There may be other pests present in the water introduced with the plants. One of the worst for killing fry is the water louse (*Asellus*), which can feed at night and clear a tank of fry in a short space of time. Such pests as the larvae of water beetles and dragon flies can also be introduced into the tank with plants from the pond, and once feeding with *Daphnia* takes place other pests such as water boatmen can be a danger.

I find that the safest plan with fry when hatched from pond plants is to remove most of them from the hatching tank as soon as the majority are free swimming. This is usually three to five days after hatching. A fresh tank is prepared, well sterilised to ensure that there can be nothing alive left therein. The water is taken from the tap (no copper pipes please), and allowed to mature for a few hours. This allows any chlorine present to pass out from solution. Then it must be tested for temperature; see that it is about the same as the fry tank.

Now use a small milk saucepan or similar object and carefully lower it under a bunch of fry. Raise gently and slowly so that the fry gradually swim to the bottom of the pan and are not washed out of the saucepan when it is lifted from the tank. If a white pan has been used it is possible to see any pests which may be present, so that they can be killed. Most of the water can be run off carefully and then the fry are allowed to swim out into the new tank. There is no need to have any plants in the new tank for some time. When any are introduced you must

make sure that they have been thoroughly cleaned so that no pests are among them.

Artificial Aeration

The question of artificial aeration must now be considered. For general work I do not recommend an aerator, as I contend that unless a tank is overcrowded an aerator is not essential. However, an aerator can be of great value for keeping the water well aerated when eggs are hatching, and once the fry hatch it can be very useful to keep small particles of dried foods on the move to encourage the fry to feed. The aerator should never be allowed to send out too strong a stream of bubbles once the fry have hatched, as this can be very disturbing and sweep the fry about, taking all their strength to move around.

The question of overcrowding must also be considered before very long. When tiny the fry do not seem to mind at all if they are rather crowded, but once they grow large enough to appear as real fish, say after a fortnight, they must have more room as otherwise their rate of growth will be restricted. To raise 1,000 fry to an inch in length you will require 84 standard (24 in. by 12 in. by 15 in.) tanks.

I consider that the first fortnight is when the fry most need constant watching, as if anything goes wrong then, the fry can disappear in a few days, and they are very difficult to cure should any troubles occur. These possible troubles will be dealt with in the next article but meanwhile a few points of interest concerning rearing with dried foods may be of use.

In the first place I must make it clear that I prefer to rear on all live foods if possible, at any rate up to the time when the fry are a fortnight old. Before this time if anything is allowed to pollute the water the fry can be in trouble very quickly, and as they are so small the chances of cures are very remote. I have always found that the feeding with some kinds of dried foods allows the water to become too foul for the fry, and then they develop a kind of fungus. This can usually be seen at the gills and on their tails. It may appear as tiny blobs of white fluff and if not treated can soon cause the death of the fish. A little salt added to the water seems quickly to clear up the trouble; use about a heaped teaspoonful to four or five gallons. As a matter of fact I find that a slightly brackish water suits the fry better than a clear water, especially when dried foods are being used. There is a danger though that after a time the water starts to smell, when of course it must be changed.

Dried Foods for Fry

Now we can consider the kinds of dried foods we can use. The dried-egg powder is a very fine form of food and one which the fry will take at four or five days of age. However, if too much is given it can soon pollute the water and encourage the fungus trouble described. It is better to use it by placing a little in a small tube of water and shaking it up well, and then gently pouring the suspension into the fry tank a very little at a time. One thing about feeding with this food is that it can be easily seen in the bellies of the fry as soon as it is taken. I do not like to give too much of this food at a time as the fry can get too bloated and then lose their balance.

Other forms of dried foods are finely ground Bemax, dried shrimp and the siftings of packet tropical fish foods. I have sifted some of the latter through a silk stocking and found that two-thirds of it will go through. This can be used for the fry, but again make sure that only a very little is given at a time. How often? Well, the fry can take a little food almost all day long, and so very small feeds at frequent intervals are to be recommended, as often as once an hour if possible, so that a large amount of food is never present at one time, which might pollute the water if uneaten.

The value of mashed earthworms or white worms must not be overlooked. Small earthworms should be used and the worm shredder on the market is a very useful accessory for the aquarist. Not only will it mash up live foods but it can be used for getting dried liver, meats and Bemax to a fine powder ready for feeding to very small fry. I have had successful rearings with fine dried liver, but when trying to use fresh liver I have always found that the water becomes polluted too quickly. From now on see that the fry have plenty of space, well-oxygenated water and plenty of the right-sized foods at all times, and with the necessary warmth they will soon grow.

Microscopy for the Aquarist

(*continued from page* 38)

cone of light spreads sooner than the other two we have illustrated so by the time it reaches the objective its outside rays miss the lens altogether and are lost. We are unable to utilise the full cone of light. A narrower cone, for which the objective is not computed, introduces aberration and the object is no longer clearly imaged.

The remedy in such a case as this is to *lengthen* the draw tube. Lengthening will slightly magnify the image, and in order to focus this the objective must be *lowered*, until eventually it is again making full use of the illuminating cone.

Throughout this article I have consistently used the expression "cover-slip thickness." To this thickness must be added that of the mountant, unless this is so small as to be negligible and the object is stuck to the cover-slip itself.

There is more to this subject, but it must be deferred until next month.

For those of you who are using cavity slips and drops of water for examination, I recommend covering the cavity with a cover slip. The majority of objectives are computed to include the thickness of a cover slip and can hardly give of their best unless used with one. Ask for slips 0.17 or 0.18 mm.

Phantom larvae

Yesterday I purchased a small quantity of *Daphnia* from my local tropical-fish dealer. When examining the contents of the jar upon my return home I discovered that besides *Daphnia* and a few *Cyclops* there were a number of other creatures. These were about half-an-inch long and almost transparent, so that their internal workings could be seen quite clearly. They appear to be free swimming and propel themselves along by doubling up sideways and then jerking out straight. Can you tell me what they are, something about them, what they eat, and whether it is safe to feed them to the fishes?

The creatures you have found among your *Daphnia* are specimens of "glass" or "phantom" larvae. They are

larval stages of a fly (*Chaoborus*) which lays its eggs in *Daphnia* ponds. When the eggs hatch, the larvae feed upon the water fleas, catching them by means of the beak-like apparatus in front of their heads. A drawing of this, and of the comb-like "fin" at the rear extremity, was recently published in the series "Microscopy for the Aquarist" (*The Aquarist*, February, 1956). They are excellent live food for feeding to fishes, which appear to relish them. As far as I am aware they confine their attentions to *Daphnia* and present no sort of a menace to fishes or fish fry.

Further Observations on Habits of Frogs

by LAURENCE E. PERKINS

(Illustrations by the author)

I WAS particularly interested in Mr. Wynford G. Whittaker's article on the common frog in the February issue of *The Aquarist*, because his personal observations were the first which I have read which so exactly confirm my own findings, while confounding the textbooks. Our native frog, it appears, has been much overlooked, and a lot that is written about it is either false or too sketchy, omitting many of the interesting features of its mode of existence.

Observation on the part of enthusiastic amateurs will often reveal much more that is of interest about wild creatures than is purveyed by the specialists, probably because the amateur is interested in all aspects which are apparent to him and because he will be more likely to carry out his observations in the field or under normal conditions rather than in the laboratory and within a narrower scope.

I stocked a small pond (the label is a misnomer since it was an old-fashioned copper of some ten gallons capacity) with tadpoles, and those which reached maturity left for pastures new just as soon as they were sufficiently developed to do so. With but a singular exception they were never seen again. Later in the same year I introduced five adult frogs, which settled in nicely and left the water by day only n order to bask upon the rockwork around the sides. At night, however, they could be found scattered around the garden among the plants.

I frequently amused myself (and, doubtless, the frogs!) by catching worms with a pair of pliers in torchlight and dropping them in front of these terrestrially inclined strays from the pond. On such occasions the selected frog would, if the torch beam were directed upon the writhing worm, seize it and thrust it down its gullet with both forelegs in much the same manner as does a clawed toad but with less

A meal of garden worm by torchlight at night is always appreciated

The "pond" in which the frogs live. Originally an old kitchen copper, it is buried in the ground and is surrounded with rocks and ferns. Solomon's seal, creeping jenny, ice plants, house leeks and irises

finnicky attention to particles of soil adhering to the worm. This performance has never ceased to delight me, mainly because it usually terminates with much rolling of the eyes and a frog-sized burp!

Wanderlust

On mornings after these nocturnal perambulations I always found the frogs back in the pond, although heavy rain would result in a longer absence sometimes extending until the next rainfall. Since my house is one of only a few in a small block bounded by roads, I was easily able to locate the site of any other ponds in the immediate vicinity and found that there was one only and that two gardens from my own. I became friendly with the owner and learned from him that he had never seen any frogs in his very small pond until quite recently, when some had appeared, remained for some days and then disappeared. He willingly agreed to my request for their return should they appear again in his pond.

I then closed as many gaps in my ancient garden fence as I could find and followed this up by introducing eight edible frogs to the pond, to see how they would co-exist with the native specimens. From my observations in Holland and Germany I had always found that these two species kept themselves very much to themselves, two ponds side by side often containing each, exclusively, of the two kinds. I therefore expected one or other of my two tribes to vacate the small quantity of water which I was forcing them to occupy, but was greatly surprised at the way in which the newcomers settled down to live amicably with the residents. True that on hot days they each fore-gathered on opposite sides of the pond's small perimeter, but there was no apparent antagonism between them. The edible frogs are, of course, far more timid than our native specimens and whenever I entered the garden they would dive into the water as one, but the common frogs would remain and permit me to approach to within inches of them.

The summer wore on and when the rain was heavy all

Winged ants during the mating season provide nourishment and sport for the frogs

the frogs would leave the water and would frequently be absent until the next shower. My neighbour sometimes brought them back but remarked one day that he found great difficulty in catching some of them. He had discovered one of the great differences between *Rana temporaria* and *R. esculenta*! I made no attempt to find and block up the holes in the fence through which they were able to escape, for as time passed I realised that the absenteeism was only temporary and that my charges usually returned eventually, although I was not able to discover what it was about my ten gallons copper which was preferable to the larger pond offering roomier quarters in my neighbour's garden.

Ant Harvest

Then came the mating of the ants. It was a good year for winged ants—if one happened to be a frog, that is. Both species left the pond and came out into the centre of the lawn—a rare occurrence indeed, so far as the edibles were concerned. They leaped and hopped all over the lawn in their endeavours to catch these winged tit-bits, and during these extremely funny displays of gymnastics I noticed another great difference between the two species. The edible frog's agility was more marked than that of the common frog and his leaps were more prodigious. Further, the edible frogs were far more accurate, and rarely failed to secure their prey.

It occurred to me that the common frogs, left to themselves, would probably have lurked in positions of vantage and relied upon catching those ants which came within tongue-range, and that it was the example of the edible frogs which had induced them to attempt jumping for their food. The sex life of the ants was all too short, and a couple of days saw the end of the frogs' rich harvest, but it had given me an idea. I made a crude rod and line from a cane and some cotton, tying a piece of haddock on the end of the cotton for bait. I pushed the rod out of a window overlooking the pond and gently bobbed the haddock up and down above the frogs.

The edible species were the first to respond, as I had expected. When basking on land they exhibit particular intelligence in so positioning themselves that they command, between them, a view of the entire surroundings, so that from whatever quarter danger may threaten, one of them at least will see its approach and dive for the water, his comrades following within a split second. When my piece of haddock bobbed above their differently disposed persons, those facing the wrong way for an attack altered their positions in rapid but jerky movements until all of them were directly in line with the bait.

I lessened the extent of the bobbings and three of the frogs sprang and collided in mid-air, but one had taken the bait and held on just as though he were hooked as I slowly drew the line in. Only when my hand was within a foot of him did he let go, drop to the ground, and spring into the water into which his companions had already disappeared. The common frogs were still sitting on the pondside, and although they responded to the bait in the same fashion, their jumps lacked the zest and the skill of the edible frogs. I was not able to experiment fully with the common frogs because the edibles made an almost immediate reappearance at the water surface and slowly crawled out and on to the bank in a most sinister way jumping for the bait just as soon as it came within their range.

After this I often placed a piece of not-too-fresh fish upon the pond side and derived much amusement from the frenzied competition among the edible frogs when bluebottles, attracted by the strong odour of fish, appeared and began to settle near the twofold bait. The common frogs did their best but they hadn't a look-in, which may explain, in part, the reason for the separation of the two species under entirely natural conditions. (Another more important reason, of course, is connected with the theory that edible frogs will take common frog tadpoles underwater.)

Underwater Croaking

Mr. Whittaker's remark concerning the underwater croaking of frogs is, again, the first written account which accords with my own experiences. I have heard and witnessed this occurrence several times during the mating season and should have thought it worthy of mention, since a vocal noise produced under water which fails to result in the emission of air in the form of bubbles is interesting enough in itself.

There is no doubt that the common frog is likely to be found in natural ponds all the year round, and I would have no hesitation in labelling this creature as primarily aquatic, it taking to the land merely when seeking food and straying any distance from water only when heavy rain makes the going easier and results in certain types of food, i.e. slugs and worms, becoming more plentiful. That they hibernate throughout the winter is not so definite as the text-books would have us believe, for if a winter be a mild one my frogs continue to forage and appear among the garden foliage from autumn to spring with no hibernation period at all.

If it comes to the choice between the text-book and the findings of an amateur observer, give me the amateur every time, for he recounts what he sees and does not reiterate what has been said before without bothering to check what is fact and what is mere assumption.

An edible frog basking beside the small pond in the author's garden

OUR EXPERTS' ANSWERS TO TROPICAL AQUARIUM QUERIES

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.

Please can you tell me the life span of the zebra fish?

The zebra fish (*Brachydanio rerio*) is not a long-lived fish. In ideal surroundings, say, a large aquarium well planted and not stocked with other fishes of a bullying nature, the zebra fish may live for about three years, but generally speaking, it starts to go into a decline after it passes the second year of its life. Plenty of live food and a temperature of between 70° and 75° F. will help to prolong life in these fish. But too high a temperature, and a diet of dried food only, will shorten its life considerably.

Photo: Laurence E. Perkins

A lively group of zebra fish, a species guaranteed to promote activity in a community aquarium

During the last few months, several of the fishes in our community tank have grown very fat, and then died. The latest casualty was a gourami. This fish became puffed out as though filled with air, and the scales stood out on the sides. We should appreciate your comments.

The symptoms you described in your letter indicate a dropsical condition. Several species of fishes are likely to contract dropsy as they near the end of their lives; and some fishes contract the disease when they are quite young. Labyrinth fishes seem particularly prone to dropsy. Medicinal treatment is not always successful, though a cure is sometimes effected by a bath in quinine. A fish in an advanced stage of dropsy is best put out of its misery.

What, if any, function is performed by the ventral fins in a fighting fish? I ask this question because I have a female fighting fish born without ventral fins, and I am wondering whether it would be kinder to destroy her rather than let her suffer through her deformity.

All the fins of a fish have a part to play in maintaining balance, braking, ascending and descending in the water and locomotion, though some fins play a more important part than others, and, indeed, in some species, seem quite superfluous. A fish which loses a fin or fins, or is born without its full number of fins, does not appear to suffer in any way, though naturally it may not be able to swim so quickly as its better-equipped companions. The ventral or pelvic fins in a fighting fish are not of great importance to it in a functional capacity. They help in maintaining balance, and in ascending and descending in the water. But it would be unkind to kill the fish because she lacks these fins. We advise you not to worry about her.

I am a beginner in tropical fish-keeping and would very much like to keep angel fish. I have been told that angel fish are rather temperamental, and really flourish best when they are kept in a tank by themselves. Is this true?

Angel fish are temperamental or moody, and little things like tapping on the glass front of the aquarium, the introduction of a new fish or fishes into their aquarium, or even the rearrangement of their aquarium, may send them off their food and lead to their moping in the plant life for days on end. Although angel fish add great charm to the community tank, they always appear to settle down better when they are placed in a tank by themselves. The most suitable tank for angel fish is one on the deep side, say, 15 in. deep and well planted with *Vallisneria* or tall-growing *Sagittaria* plants. Acid water suits angel fish best, and they do not like too bright a light. A temperature ranging between 72° and 78° F. is ideal. Plenty of meaty food or live food should be given to them in preference to dried food.

Please will you tell me the best food to feed to my white-cloud-mountain minnows? I am a newcomer to the tropical fish-keeping hobby.

White-cloud-mountain minnows are not at all difficult to feed provided that the food offered is on the small side. They will thrive on a mixed diet of fine-grained dried food, micro worms, tiny white worms, finely minced earthworms or *Tubifex*, and crumbled scrambled egg. They love water fleas (*Daphnia*), but cannot manage to eat large ones, which they maim and then leave them to die on the bottom.

I recently bought some young *Scatophagus argus*. Is it possible to breed these lovely fish in the ordinary home aquarium?

We have not heard of "scats" being bred in the aquarium. In fact, very little is known about the life histories of the Scatophagidae.

I have noticed that after I give my fishes a good feed of *Tubifex* they stay quiet on the bottom or hide away in the plant life. Why do they act in this way?

Fishes often eat at one time more than is good for them and so get indigestion as a reward for their greed. It is not a wise plan to offer too much live food at a time. A little and often is the better plan.

I have a fighting fish which has developed what looks like a bubble on its eye. Is it possible to burst this "bubble" without endangering the life of the fish?

It is possible to perform such a surgical operation on a fish without endangering its life. Obtain a fine, sharp-pointed needle, and, after placing the fish on its side on a soft cloth dampened with tepid water, prick the bubble, and immediately swab with a weak solution of iodine and water or salt and water before returning the fish to the aquarium.

Please will you give me some information on the spawning habits of *Corydoras* catfish?

Corydoras catfish prefer alkaline water having a temperature of about 70° F. They do not breed so readily in a

high temperature. The water should be shallow, say, about five to eight inches deep, and the bottom should be covered with fine sand, preferably covered with a layer of rich brown sediment. Some pieces of rock, or clumps of wide-leaved plants, should be provided for the fish to hide behind and use as spawning grounds. The female usually places her eggs on the leaves of plants, on a cleaned surface of rockwork, or sometimes on the glass side of the aquarium. When the baby catfish hatch out, they hide away in the sediment and feed on the tiny organisms they find living there. Additional food may be provided in the form of mashed white worms, micro worms and pea-flour.

Can you tell me why fish suddenly waste away? I have restocked my community tank several times with new fishes, but after a time some of them always dwindle away and die while the others prosper.

There are a number of reasons why a fish will waste away while its companions purchased at the same time remain in the pink of condition. Some species, though they are recommended for the community tank, are best kept by themselves for the simple reason that they are easily driven away from food by other, more boisterous fishes, or may, in fact, need special food. Some of the sucker catfishes, for instance, require plenty of algae in their diet, and if they do not get this they will soon grow very thin and die. Then again, some fishes have a short life span, and go into a decline very quickly. Furthermore, there are fishes which need a special environment if they are to flourish in the aquarium, such as scats, which like saline water, and black-banded sunfish, which like very acid water and a plentiful supply of live food at all times.

How much salt is needed to give a fish a salt bath?

Some species can stand a greater degree of salinity than others, but generally speaking, a level teaspoonful of common household salt or evaporated sea salt to every gallon of water is about right for most species except catfish, which dislike salt intensely, and should not be given saline baths.

I have been keeping fishes for about three months, but have yet to learn a lot about them. I am worried at the moment because I have noticed long worm-like tubes hanging down from the vents of some of my guppies. I hope this is not a sign of disease.

What you have noticed is probably the excreta of the fish hanging from the vent. Normally, a fish's excreta is expelled right away, but sometimes the food eaten or given may give rise to constipation and this in turn results in the excreta not being expelled as quickly as it should be. A fish suffering from constipation should be given a more laxative diet such as water fleas, minced earthworms and, for those species which nibble at green food, some cooked, mashed spinach, finely cut lettuce or soft mossy algae.

I have just emptied a tank recently infested with white-spot disease. Please tell me how to disinfest it and render it safe for use in the immediate future?

Sprinkle plenty of salt on a damp cloth and rub it all over the glass and along the inside frame of the empty aquarium. Another method is to splash a strong solution of Dettol and water over the inside of the aquarium, leave for a short while, then wash well with fresh water before setting the tank up afresh.

I have heard a lot about "conditioning foods." Will you please tell me what is meant by "conditioning foods," and are they easy to procure?

"Conditioning foods" are those items in a fish's diet which bring it into perfect condition for show or breeding. In other words, the foods which stimulate the reproductive organs, and enhance the colours of the fish. The best conditioning foods are earthworms, chopped fine for small fishes, water fleas, mosquito larvae and washed liver reduced to a fine pulp.

FRIENDS & FOES No. 56 Water Beetles *(continued)*

COLEOPTERA

FAMILY: Dytiscidae

NOT all members of the Dytiscidae are as large as *Dytiscus marginalis*. The majority are considerably smaller. Even *Acilius*, the next largest species, is only half the size. There are two species commonly found in ponds throughout the country. One of them has furrowed elytra. They are strong swimmers and divers, but more interesting to me are the strange-looking larvae. These have a very small head, with a long, rapidly widening first thoracic segment, which looks for all the world like a long, fat neck.

They normally swim very gracefully and smoothly in the pond, but if a shadow falls over them, they wriggle with lightning speed to the bottom of the pond, in exactly the same way as do gnat larvae. If the catching net is not under them before they see you or your shadow, they will escape capture every time.

It is fascinating to watch their movements through the sides of a glass container. When trapping prey they swim down as though intending to pass it, and then suddenly there is a jerk upwards of the long segment and the head, and the victim is caught. They seldom if ever miss, and wreak havoc if accidentally introduced into a jar of live food. They will be eaten by fishes (not all species) if squashed and dropped into the aquarium.

Fully grown larvae are well over an inch in length.

Left, larva of the water beetle Acilius (natural size); right, view of upper surface of the adult Acilius (X 2)

The female beetles lay eggs throughout the spring and early summer months. In a pond frequented by the beetles it is possible to find larvae in all stages of growth. When collecting larvae, do not place several in the same jar. Battles royal will ensue, and the chances are that upon arrival home the majority will be dead, or at least severely injured.

C. E. C. Cole

COLDWATER FISH-KEEPING QUERIES answered by A. BOARDER

I have a tank 30 in. by 15 in. by 15 in. lighted by two 40 watt lamps for roughly nine hours a day. The sand at the bottom of the tank is covered by a blue-green film which I siphoned off, but it is beginning to grow again. What can I do to clear this?

The best way to treat the tank is to find out what is causing the trouble first. I suspect that you have been overfeeding the fish. If this happens they do not go over the bottom of the tank searching for food. It is a very good sign when goldfish work over the sand, looking for food, and suck up mouthfuls of it. In this way they keep the sand clean and prevent the film from forming. If they are fed too much some food gets left behind to cause pollution and the fact that the fish are being fed constantly means that they have no need to search for food. Stop feeding them for a fortnight and the tank should become clear of any base film again.

I wonder if you can help me out. Lately we have had some difficulty in finding something interesting to talk about at our aquarist society meetings. Can you make any suggestions?

A very good plan is to try to get all your members to say something. I know that there are always those with plenty to say, but not all they say is welcomed, but there are others who may be too shy to make a start. They are often the ones who can give some useful information to others. You can try this idea. Get some back numbers of *The Aquarist*, and read out some of the questions dealt with in them. Then invite any of the members to give an answer to the problem. This will surely start an argument, as I am sure plenty of readers may not agree with, for example, my findings. Also drop a line to the secretary of the Hendon Aquarists' Society. I know they are always only too glad to help anyone and they have an interesting meeting every week. I am too busy to get there often, but when I do I find a good meeting every time. You could also borrow from a library the book 1,001 *Questions Answered*, by Mellen and Lanier, and read from that. Another plan is to have one species of fish on show every meeting to give something to discuss. Points could be awarded for the fish considered best by the most members and a prize at the end of the year given.

One of my goldfish has a white patch on the side of the head. I do not think that it is normal colouring, and the fish does not appear ill. What is the cause of it?

If the patch is not raised there may be little wrong with it. I think that it is probable that it has had a touch of fungus or has had some kind of wound there. The new skin is forming and unless the patch gets larger or shows distinct swelling I am sure that it will soon recover. When a fish has any kind of damage in the colder part of the year it takes a long time for it to heal.

I am a new reader of *The Aquarist* and shall be obliged if you can tell me if there have been any articles on veiltails and orandas lately?

There have been several references to these fish and they will also be dealt with in the current series "Breeding Fancy Goldfish" in *The Aquarist*.

Please can you tell me how many fishes varying from ¼ to 2½ in. it is advisable to keep in a tank 24 in. by 12 in. by 12 in. without having to use an aerator for long periods?

You can have up to 12 inches of fish for your tank without having to use an aerator, as long as the tank is fairly well planted and serviced once a week. I have two tanks beside me as I write which have been running for over 10 years, and have never had an aerator in and the fishes are quite healthy. Slightly less fish will mean that they have more room to grow than if they were crowded, and they always look better and the tank looks more natural that way.

I am thinking of setting up a small coldwater tank in my bedroom. Would the carbon dioxide given off by the plants at night be harmful to persons sleeping in the room?

Do not worry over this as the small amount of gas given off would not be likely to harm anyone. Over 50 years ago I kept fishes in my bedroom and I am still going strong! It may have been that in my case there may have been too much competition from the other inhabitants, such as newts, snakes, silkworms, canaries, caterpillars, etc., but I am sure that you need not worry at all, and good luck to you with your venture.

I have a large goldfish which has developed a number of dark streaks on the pectoral fins, which appear to have become clogged. Also the fish has a patch around the mouth. I have treated it with salt and I have put some of an advertised fluid into the tank where the other fish are. Is there any more I can do?

You should not have put the fluid you mentioned into the tank with the other fish. This is only used as a bath for fish for a limited period. Left in a community tank it can be harmful. The fish appears to have been suffering from a form of fungus and the salt treatment should effect a cure. Never try to cure any sick fish in a community tank; always segregate it for the necessary treatment.

I have recently glazed a coldwater tank and after filling it and putting in the gravel and rocks I find that it has a slight leak. Must I empty it or is there anything else I can do to stop it? I allowed three days to elapse before filling the tank.

I have not used the compound which you used but it is usual to fill a tank as soon as it has been glazed so that the weight of water can exert a good pressure to house the glass well. Very often a tank will have a small leak when first filled but it often seals itself up. If it does not, then you had better empty the tank and force in some more compost where the leak occurs. It is not often that an effective repair can be done from the outside, although a strip of one of the new sealers might be tried.

I have been a keen reader of *The Aquarist* for a number of years and I cannot remember seeing any account of *Vallisneria* flowering in a tank. My plants have produced some white flowers. Do they flower every year?

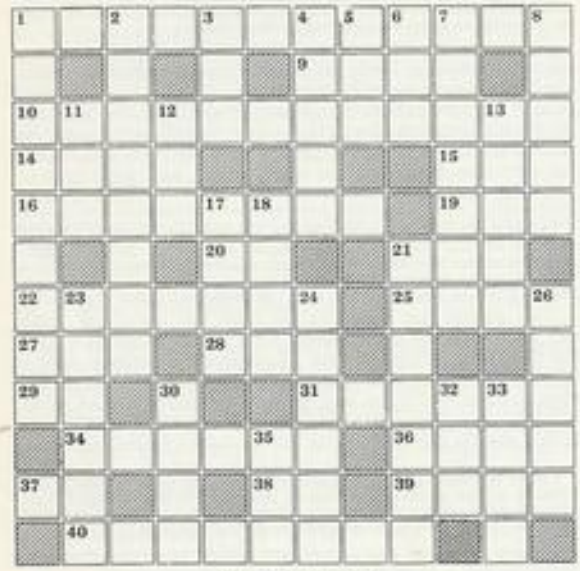
It is not unusual for *Vallisneria* to flower and they can do so every year. My own plants rarely fail to flower each year.

Can you help me to make my aquarium look more attractive? I have several plants and one large piece of Mendip rock.

I expect that you have had the large piece of rock almost dead-centre of the tank, and in such a position I can well imagine how dull the tank looks. I have seen many like it. You should break up the rock into four or five pieces. Now place some sand or compost in the bottom of the tank so that it is 3 in. deep at the back but no higher than the front frame in the front of the tank. Now arrange the rocks so that a fairly large piece is near one end and rather towards the back, but not right at the back. Next arrange the other pieces in descending order of size next to the first piece so that you form a natural "outcrop" of rock. A few small pieces can be placed near the other rocks to give the appearance of having broken away. Now arrange the water plants so that the taller-growing kinds are at the back, and see that the back corners of the tank are hidden. Keep the front of the tank clear, but you can have one or two plants at each end of the tank. Do not place quick-growing plants in front of the rocks or these will soon be hidden and then may just as well have been left out. If you have plants with different coloured leaves see that they are arranged to give the best effect. You will find that the tank will look better if you have small clumps of water plants rather than single stems of plants stuck in at regular intervals.

The AQUARIST Crossword

Compiled by J. LAUGHLAND



CLUES ACROSS

1 Siam last, Anna, for aquarium plant (6.6)
9 This lane has a turning, hence dash (4)
10 Bream (7.5)
14 To wind in rings as a snake does (4)
15 Little Leonard leaves *Colisa lalia* (3)
16 *Asellus*, cousin of the wood-louse (8)
19 Expression of disgust, now outmoded (3)
20 Initials of Stevenson, writer (1.1)
21 Asians leave ASCIDIANS for Castilian (Short Ox. Dic. Castile, Spain) hero (3)
22 Wheel animalcule, minute aquatic creature (7)
25 The fin of 7 Down (4)
27 Orfe, a golden fish (3)
28 West-country river (3)
29 Thus (2)
31 Waterlogged condition, a disease frequently affecting fishes (6)
34 Joined (6)
36 Tiny item in a way (4)
37 Surely you are entitled to this, sir (2)
38 The French for this (2)
39 Bring forth young (4)
40 Aquarium plant as in vial (8)

CLUES DOWN

1 Aquatic plant as in a char (9)
2 Water by ditching, etc. (8)
3 If want to keep this, say nothing (3)
4 A bird does this; so, in a way do anabantids and sticklebacks (5)
5 White-linen vestment covers half an albino (3)
6 Bituminous substance, poison to fishes (3)
7 In a flan (anagram) (4.3)
8 Piece of piscine armour plate (5)
11 Often the hoot of a boor (3)
12 The lot (3)
13 Ida and Ma in the vale (5)
17 Ide, a golden fish (4)
18 Genus of furze, gorse and whin (4)
21 A bomb in the accountant for a lovely aquarium plant (7)
23 Smells (6)
24 Incarnadine (6)
26 Producer of eggs (5)
30 Breathing apparatus of a fish (4)
32 This dish may be chiefly of pike (3)
33 Fish, spangled banner, or gazer, perhaps (4)
35 He is of the elite (3)

PICK YOUR ANSWER

1. 'How index-learning turns no student pale,
   'Yet holds the . . . . of science by the tail.'
   The missing word in the quotations is: (*a*) carp; (*b*) eel; (*c*) perch; (*d*) sprat.
2. The Weberian ossicles were first described in: (*a*) 1780; (*b*) 1800; (*c*) 1820; (*d*) 1840.
3. The mother-of-pearl fish is the popular name of: (*a*) *Aphanius dispar*; (*b*) *Cynolebias bellottii*; (*c*) *Nothobranchius taeniopygus*; (*d*) *Oryzias latipes*.
4. *Ambassis* species are included in the family: (*a*) Apogonidae; (*b*) Centropomidae; (*c*) Glaucosomidae; (*d*) Pseudochromidae.

G.F.H.

(Solutions on page 48)

Our Readers Write

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

Improvised Breeding Trap

I RECENTLY had need to move into a new tank some three gravid livebearers, and not having a breeding trap I decided to improvise one.

My wife had just purchased a plastic colander (price 3s. 3d.) at the local multiple stores and I found that the overlapped rim caused it to float. The three fish were quite happy and delivered their broods with no fuss. I thought that readers may find some interest in this.

ALLEN TOZER, West Hartlepool, Co. Durham.

Strange Antipathy

MR. Raymond Yates, writing in "Aquarist's Notebook" for March, refers to Siamese fighters picking fights with other species in community tanks and coming off worst. On the second day that I introduced a male fighter into my community tank he took a dislike to a male red-eyed red swordtail and removed a large portion of its caudal fin. Despite treatment with mercurochrome the wound developed fungus, the "sword" fell off and the fish had to be destroyed. I returned the fighter to the shop where I had purchased it, and the proprietor tells me that it is now living a *blameless* life in somebody's community tank!

M. W. SHEAD Folkestone, Kent.

Fair Dealing Wanted !

MAY I register a protest about the disgraceful attitude of the aquatic trader to the public? When a fish dies within a week of its arrival you are calmly informed that (in the words of one dealer) they must assume something is wrong with your handling. Another shop refuses to reply to any letter whatsoever. Another kept me waiting four months for a jar of fish food and then sent the wrong one. Yet another sends more mud than *Tubifex* in his weekly parcels—these are just a few examples, there are plenty more.

May I suggest a "star scheme," as have others before me. It would help to remove those in the trade who discourage beginners and infuriate the more experienced. Something must be done about this apathetic attitude, which must be partly responsible for the slight decline in the number of aquarists.

In closing I must mention the extreme politeness of the dealers to whom I have written in the U.S.A.—we should follow their example.

A. G. LYMAN-DIXON, New Forest, Hants.

Fair Dealing Obtained!

I AM finding it very difficult, living in such a remote part, to get supplies not only of fishes but even ordinary equipment. Many of the leading firms I have approached take little interest in mail orders. There are long delays before they reply, they pack badly so that the article is broken, send wrong articles and generally behave as if they would rather not be bothered with small orders.

I would, however, like to say that Singleton Bros. of Penzance (the Es-Es manufacturers) are the most efficient firm I have ever dealt with. Their parcels are beautifully packed and sent by return of post. Their letters are courteous and queries are answered in a friendly and interested manner. I have had several letters from them including wiring diagrams and other helpful suggestions. The difference in service from other firms I have dealt with is astounding.

EDNA M. KNOWLES, B.Sc.,
Betws-y-Coed, Carnarvonshire

Marine Aquaria

I CAN heartily endorse every word in Mr. P. Scholes' excellent article on the difficulties of marine aquaria. At the same time I think it lamentable that coastal clubs do not make more of their opportunities. The Brighton and Hove Aquarists' Society, for example, has just disbanded—unable to take any interest in the sea only 50 yards away, and content to say the same things the year round about "show points." Its epitaph should be "This club died of shore apathy and inertia."

In two- to six-gallon tanks I can keep blennies (4 years), sea urchins and prawns (2½ years) and hermit crabs (4 years). I admit that my modest success entails twice-weekly changes of sea water, shade from too strong sunlight and avoidance of overcrowding. I have given up sand or grit floors—deadly bacteria nurseries.

L. R. BRIGHTWELL,
Peacehaven, Sussex.

Marine Aquaria

MR. H. J. Vosper's letter (*The Aquarist*, February) on temperature and tropical marines prompts me to contribute the following. I think his statement that death occurs at 90°F. should be reconsidered.

There is much to be said about ocean temperature. Extremes may be put about 24° and 85°F. more or less. The open ocean varies perhaps less than that part of it which is above the continental shelf. Water off the coast of Maine, U.S.A., at about the level of Boston has a summer-to-winter range of 27°F. (62° to 35°) at the surface. Sixty-five feet down the range is about 18°F. (55° to 37°). At 330 feet there is no range, 39°F. being the temperature. Monterey Bay, California, U.S.A., has little more than 7°F. seasonal change (53° to 60°).

On the Pacific coast of Central America the sea is always warm (about 84°F.). Large rock pools containing two or three tons of water and cut off from the sea at low tide reach 91.5°F. and are crowded with algae, fishes, anemones, urchins, sea cucumbers, etc. Small pools containing about five gallons reach 98.5°F. and harbour large snails, crabs and anemones with an odd goby or two. Tiny pools of about six ounces of water reach 100°F. and are often carpeted with anemones. In one such pool I took a reading of 102°F. This pool contained algae, small barnacles and minute snails. Sometimes, when the water of their pool evaporates, these snails are left high and dry to roast on the burning rock at well over 140°F. These temperatures were all taken at 11.30 a.m. Of course, they should never be duplicated in a tank. Nature is quite another matter. When the first wave of the rising tide foams over these pools the temperature falls 15° to 20° in a matter of one or two seconds; something also to be avoided in the tank.

But these temperatures need not worry the aquarist. Living in a tropical country I have no heaters, and my marine tanks fluctuate every 24 hours. At 9 a.m. they may be 72°F. and at 3 p.m. 78°F. In warm weather the morning reading is perhaps 78°F. with an afternoon reading of 82°, 84° or 85°. Caribbean fishes such as the blue and gold fairy basslet, French angels, queen angels, neon gobies and orange demoiselles do well at 75-80°F. In another tank golden coral fish (clown fish) and black-and-white coral fish do well at 75°F. but show a marked preference for 82° or 83°F. Once, to cure an outbreak of white spot, I raised the temperature to 90°F. for a week. They were cured (with the additional use of chemicals), and did not seem to mind it in the least. A similar temperature, in a tank at least, will kill French, black and queen angels.

I do not agree with Mr. Vosper's statement that tropical marines live in a range of 59° to 68°. This would be much too low. It is true there are fishes living within this range, and in far colder, even icy, water on the ocean floor two or three miles down. But such fishes are only tropical because their particular part of the ocean happens to lie within the tropics. The intense black of French and black angels is ruined by spreading grey patches when the temperature is too low. I have seen crowds of blue tang, ocean tang, pomacentrids, sea horses, etc., swimming for most of the day within a yard or two of the surface in the West Indies, where the temperature is about 85°F. Memories of gorgeous "marines" habitually living under similar conditions on the coasts of Ceyon and East Africa are a joy to me yet. I think Mr. Vosper would be more successful if he kept his tropical marine tanks at the usual temperature for tropical fresh-water tanks.

JOHN BOURSOT,
El Salvador, C.A.

News from AQUARISTS' SOCIETIES

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

A VARIED programme has been arranged by the **Independent Aquarists' Society** for the coming year to cover all aspects of the hobby. Officers elected at the annual meeting were: Chairman, Mr. F. C. Tomkins; show secretary, Mr. T. Pizzala; treasurer, Mrs. D. I. P. Dare; secretary, Mr. L. W. Dare.

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AN open show is being held at Temple Colston School, Bristol on Saturday, the 22nd June by the **Bristol and Bath Section** of the F.G.B.S. The show secretary is Mr. John Wheeler, 53, Cameley Green, Twerton, Bath, from whom schedules may be obtained. Entries are restricted to members of the F.G.B.S.

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MEMBERS of the **Ringwood Aquarists' Club** spent a pleasant April meeting with a 20 questions session and a table show which was won by Mrs. M. Seabright.

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NEW members are invited by **Middleton and District Aquarists' Society.** The meetings are held at the Railway Hotel (opposite Middleton station) Oldham Road on the second and fourth Mondays of each month. The secretary is Mr. F. Partington, 446, Oldham Road, Middleton, nr. Manchester.

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IN their twenty-sixth year as an independent Society, **Croydon Aquarists' Society** report an excellent attendance at all meetings although these have been increased to two instead of one each month. On the 16th May the lecture will be by Captain Betts on Coldwater Fishkeeping.

A FILM show was held by the **Coventry Pool and Aquarium Society** at the last meeting. There was a good attendance with visitors from Banbury, Nuneaton and Leamington societies. A coach trip to the Wild Fowl Trust has been booked for this month. The annual show will be held during the third week of September, and the above mentioned societies will be competing.

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A BLACK shark owned by Mr. A. W. Amps took the best fish in the show award at the members' show staged by the **Cambridge and District Aquarists' Society** in April. An interesting talk was given by Mr. P. O. Johnson, the subject being Electric Fish and Electric Fishing. The speaker dealt in considerable detail with the varieties of fish which have, within their bodies, an organ capable of emitting electric impulses. Mr. Johnson illustrated with the aid of slides microphonographs, sections and projections, showing how each tiny cell was connected in series to many similar cells. The fish illustrated included the electric catfish, the torpedo ray and the electric eel.

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OFFICERS elected at the **Folkestone Aquarist Society** were: President, Major G. stG. Stedall; chairman, Mr. B. Pilcher; secretary, 16, Windmill Street, Hythe, Kent; treasurer, Mrs. M. Bukin. The meetings are held on the second Thursday of each month at 62, Tontine Street, Folkestone at 7.45 p.m., and aquarists on holiday in the locality are most welcome.

AT a recent meeting of the **Northampton and District Aquarist Society,** Mr. W. H. Snedker spoke on the history and breeding of the gourami and danio. At a table show for barbs, danios and minnows the prizewinners were: 1, Mr. L. W. Roy; 2, Mr. W. H. Snedker; 3, Mr. J. Stead.

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THE programme at the last meeting of **Colwyn Bay and District Aquarist Society** included a quiz which proved highly popular with the members. The hon. secretary is Mr. H. Warsop, 8, Abergele Road, Colwyn Bay.

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"THE Chemistry of the Aquarium" was the title of a talk given by Mr. J. Copson to the **Sunderland and District Aquarists' Club** and proved most interesting. The table show of barbs was won by Mr. B. Hodgson first and second, Mr. Collett being third.

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THE **Macclesfield Aquarium Society** have booked the Brocklehurst Memorial Hall, Queen Victoria Street for a two day exhibition on the 12th and 13th July in association with the National Cactus and Succulent Society. This is the sixth annual event and will include fishes of very good quality and varieties. Mr. H. F. Cox, 24, Brynton Road, Macclesfield who is the hon. show secretary will welcome any enquiries.

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THE **Eastern Counties Section** of the Federation of Guppy Breeders' Societies will be holding their 1957 open Guppy Show at Altmore Avenue School, East Ham, London, E.6 on Saturday the 29th June. Show schedules can be obtained from E. G. Wignall, 481, Roman Road, London, E.3.

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SWORDTAILS and platys were the fish displayed at the **Poole Aquarist Association** table show recently. The meeting was well attended and the result of the competition was as follows: Swordtails—1, Mr. N. Walker; 2, Mr. J. Shaw; 3, Mr. H. Pearson. Platys—1, Mr. J. Stickland; 2, H. Walker; 3, H. Pearson.

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THE annual open show of **Romford Aquarists' Society** will be held at the Wykeham Hall, Market Place, Romford, Essex on the 31st August. Schedules and entry forms can be obtained from Mr. C. E. Berkley, hon. show secretary, 37, Bridport Avenue, London Road, Romford, Essex.

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RECENT events of the **Leeds and District Aquarists' Society** included a lecture on judging by Mr. E. Chapman of Sheffield, the well known F.N.A.S. judge. Mr. Bates of Newcastle was the lecturer at the last meeting.

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AMONG the new officers elected at the annual general meeting of the **Lowestoft Aquarist Society** were: President, Mr. B. F. Thompson; chairman, Mr. A. Chapman; vice-chairman, Mr. T. Drew; hon. secretary and treasurer, Mr. M. Rackham, 16, Clifton Road, Lowestoft. New members would be welcomed.

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A SUCCESSFUL year and a balance in hand are reported from the **Derwent Aquarist Club,** Derby. In the election of officers Mr. K. Allen was re-elected to the chair and the treasurer, Mr. T. R. Swinburn, also remains in office. There is a change in secretary, Mr. J. Cook, 36, Buller Street, Derby filling the vacancy.

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AT the last monthly meeting of **Grimsby and Cleethorpes A.S.** the lecturer was Mr. F. C. Katritzky. Members were highly appreciative of the talk which was illustrated, the subject being plant life.

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INTER-CLUB table show competitions are thoroughly appreciated by the **Thurrock Aquarist Club** and **Thameside Aquarists.** On this occasion Thurrock were beaten in the first leg by a very good showing of fish, but Mr. Horsey secured the honour of best fish for Thurrock.

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INVERNESS **and District Aquarists' Society** held its annual general meeting recently and the following officials were returned to office: President, Mr. R. Curtis; treasurer, Mr. J. Clark; secretary, Mr. J. Bain, 52, Dunain Road, Inverness. New members will be cordially welcomed and are invited to contact the secretary.

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FOURTEEN clubs took part in an open table show held by **Burnley Aquarists' Society** and there was a record entry of 326 fish. The result of the show was a win for Burnley, Accrington being second, three other clubs tieing for third place. The best fish in the show was an Exodon paradoxus entered by Mr. J. Hodgetts, Burnley A.S.

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RECENT talks to members of the **Bristol Tropical Fish Club** have included one on breeding and rearing of Tiger Barbs, Beacons and White Cloud Mountain Minnows by Mr. R. Cockram and another lecture was delivered by Mr. V. Jones who dealt with the best methods to be used in the setting up of tropical aquariums.

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THE annual show of the **Dunstable and District Aquarists' Society** will be held on Saturday the 29th June at Grove House Gardens. The April lecturer was Mr. H. Russell Holland.

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MR. R. V. COOMBS, a former secretary and president of the society and a member of the coldwater judges panel, has been made a life member in appreciation of his work for **Bristol Aquarists' Society.**

Mr. Coombs has been transferred from the Bristol office of his firm to Liverpool and will be moving shortly.

The speaker at the April meeting of the society was Mr. L. G. Emery, vice-president of Bath A.S., who spoke on coldwater fish breeding.

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MEMBERS of the G.S.G.B. saw their new super, slide projector in action for the first time recently and heard three lectures packed with information new to members.

The President showed coloured slides of Japanese fish and discussed metallic, nacreous, matt and net-like transparent fish in Japan and Britain.

Mr. E. Telfer described experiments with feeding young fish and showed slides of two batches of fish—one used as a control and the other fed on the special food.

Miss D. Morris exhibited two new variations (mock metallics and pseudomatts) which have arisen in her strain of Singletails and gave details of crosses extending over many years.

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AN interested audience of the **Hounslow and District Aquarist Society** heard a talk by Mrs. W. M. Meadows, the well-known judge and speaker, on the breeding of egg-laying fishes.

Willow tree root could be prepared, she said, for adjusting water for breeding fish that need slightly acid conditions, and the ordinary jenny creeper grown in gardens could also be used in aquariums for breeding.

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Middlesbrough and District Aquarist Society held a table show at the Black Lion Hotel, North Ormesby, which attracted a good entry of labyrinth type fish. Results were: 1, Mr. J. Bower; 2, Mr. W. Cowlam; 3, Mr. F. Tuffnell. Special, Mr. J. Soulsby. Highly commended, Mrs. K. Whittam.

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AMONG the forthcoming events during May in the **Mansfield and District Aquarists' Society** programme is a visit to the Trent Freshwater Fish Hatcheries at Calverton and a discussion on Aquarium Plants by Mr. R. Howorth. The secretary is Mr. A. Atkins, 53, Newton Street, Mansfield.

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AT the fortnightly meeting of **Kirkcaldy and District Aquarist Society** the guest speaker for the evening was Mr. Kerr, treasurer of **Edinburgh Aquarist Club,** and he gave a most interesting talk on various aspects of fish keeping and breeding.

CARDIFF Castle Management Committee recently turned down the suggestion by the **Welsh National Aquarists' Society** of setting up an aquarium in the Castle.

But the committee have not dismissed the matter altogether, and it was referred to the next parks committee meeting.

Mr. W. Nelmes, director of Cardiff Parks, suggested that Roath Park would be the ideal spot for an aquarium and that, in fact, it had an aquarium for many years—but it was taken away during World War II.

Mr. W. Kear, chairman of the **Welsh National Aquarists' Society,** told the meeting that the society were prepared to loan tanks and give instructions on how the fish were to be kept.

Secretary Changes

CHANGES of secretaries and addresses have been reported from the following societies: **Derwent Aquarist Club** (Mr. J. Cook, 36, Buller Street, Derby). **Tyneside Aquatic and Biological Society** (Mr. R. Brown, 11, Talbot Green, Denton Square, Newcastle-on-Tyne, 5.)

Aquarist's Calendar

23rd-25th May: **Hendon and District Aquarist Society** eighth annual open show at the Brotherhood Hall, Edgware Road, West Hendon. Entry forms are available from Mr. A. Baldock, 239, Squires Lane, London, N.12.

22nd June: **Bristol and Bath Section of the F.G.B.S.** open show at Temple Colston 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 Altmore 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 Brocklehurst Memorial Hall, Queen Victoria Street, Macclesfield.

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

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.

Crossword Solution

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PICK YOUR ANSWER (Solution)

1 (*b*). 2 (*c*). 3 (*a*). 4 (*b*).