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AND PONDKEEPER

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Editorial

CHANGES in body chemistry enabling a fish to prepare itself for seasonal temperature changes and to become more resistant to extremes of heat or cold in natural waters are known to occur during the year. These extremes form a range of 37°-95° F., and whereas a fish adjusted for one end of this range at one season would quickly die if removed to water at the temperature of the other end of the range, at another season it will be found to have reversed its powers of resistance. The adjustment takes place slowly, of course, and it might be thought that slowly rising water temperatures in spring or slowly falling temperatures in autumn provided the signals for the body changes to occur. That these are not the only signals, however, has recently been demonstrated by Dr. W. S. Hoar, of the University of British Columbia in Canada.

Dr. Hoar, who has reported his results to *Nature* (18th August, 1956), has found that changes in the total number of hours of light received by a goldfish each day can also set off the mechanisms in preparation for changes of temperature. He showed this by keeping two groups of goldfish of similar size in aquaria maintained at about 65° F.; one group was exposed to artificial light for eight hours daily and the other group received the same intensity of light for 16 hours daily. The groups were thus getting light in amounts corresponding to that occurring naturally in winter and summer. After 40 days of keeping the fish in this way, and feeding them all on the same diet, Dr. Hoar tested the ability of each fish in each group to withstand extremes of temperature. Those in the group that had received eight hours of light daily were found to be most resistant to cold but less resistant to heat, and the fish in the other group showed most resistance to heat and poor resistance to cold.

For the aquarist this means that if he is keeping fish under conditions that will expose them to seasonal temperature fluctuations, for example in an out-door unheated fish house, then if they receive the same amount of artificial light throughout the year the fish may be failing to get an important signal for their adjustment to temperature change.

Starting a Tropical Aquarium—9

by AQUARIUS

ONCE the tank is running well and all seems in good order the aquarist will wish to try his hand at breeding some of his fishes. Do not be in a hurry to start this, as it is essential that keeping the fishes in excellent condition is mastered first. Fishes cannot be expected to breed unless they are in the pink of condition. Feeding is also most important, as although fishes require a certain amount of food to keep them healthy they need extra to form eggs and milt if they are to produce young.

The two main divisions or types of fishes are the egg-layers and the live-bearers. As their name implies, the former lay eggs which are fertilised by the male as they are laid. The live-bearers produce their young alive, and so the embryos have to be formed when still in the female. The live-bearers, which are usually bred from in tanks, are: guppies, mollies, platys, swordtails and mosquito fish. There are a few other live-bearers but the above list will do for a beginning. Generally speaking it is far easier to get the live-bearers to breed than the egg-layers, and many youngsters are born in a community tank when the aquarist has done nothing to encourage the fish to breed, and in fact sometimes some youngsters suddenly appear with little warning for the novice.

The live-bearers can all be sexed quite easily, as when the males are developed the anal fin is so shaped as to become an intromittent organ for fertilising the female. Also, the males are generally smaller than the females. Sexing the egg-layers is not at all easy with some of the species. The main point to remember is that when the female is in good condition and near to laying, the belly will be distended with eggs, making her fatter than the male.

Although it is possible to breed a few live-bearers in the community tank it is not a good plan to do so and it is not fair to the youngsters. Many parent fishes will eat their own young under certain conditions, and other fishes in the tank will be forever chasing the fry; if they are not actually eaten their lives must be made a constant misery by the constant worrying from the older fishes. Therefore it is essential that if one expects to breed a few fishes under decent conditions a separate tank or two should be procured where the babies can be born and have a fair chance of survival. For every youngster bred in a community tank and which reaches maturity there, it is probable that dozens are killed or eaten.

When a live-bearing female is heavy with young she will show a distended belly and a blackish patch over and behind the vent. When a fish is noticed in such a condition it should be caught carefully and placed in the spare tank so that the young may be born in peace. Even then it is possible sometimes that the mother fish eats some of the young, but if care is taken to see that there is plenty of live food for her and that there is plenty of cover in the form of fine-leaved water plants, many of the fry will live on and stand a very good chance of making adult fishes.

Some of the types of live-bearers have been so altered from their natural size, colour and shape that there are now many different varieties. This is specially true of the guppy and platy. It can be realised quite simply that all the varieties of the two-mentioned fishes can inter-breed with fish of their own species, and so it is important that if the breeding of either of these types is considered, only one variety should be kept in a community tank. Female guppies can be fertilised when they are quite young, well before they are full grown, and this is almost sure to happen when you have a mixed collection of males and females in one tank. This is a bad method of breeding but I am sure that many beginners wish only to breed a few fishes regardless whether they will be of any use after.

If you have some good fishes among the live-bearers it is better to keep the females separate from the males until an actual pairing is required. It can be taken as a sure thing that if show fishes are required it is of little use allowing the young parent fishes to grow up with the sexes mixed. The only hope of obtaining really good youngsters is to ensure that only one variety of guppy or platy is kept in the same tank. It is then fairly safe to assume that any fry born are likely to be true bred and not the result of a promiscuous cross. The latter will be useless for breeding purposes and will only eat good food which should have been for a decent fish. Among the platys are many varieties, and if more than one distinct variety is kept in the same tank it is almost certain that the young ones will be of little value.

Many beginners think that they have only to set up a tank with a number of various species of live-bearers and before long they will be producing hundreds of little ones with which it is possible to make a fortune. This may be a happy dream but it is not likely to work. If you wish to produce a number of good-class fish then it is absolutely essential to have many tanks and to keep the varieties segregated from other kinds.

Most of the live-bearers will breed well in a temperature of from 75° to 80° F. It is not essential that the temperature of the water should remain constant at any one figure as many fishes are more healthy when there is a variation of a few degrees from day to night, about seven degrees variation is quite safe. The tank where the fry are expected to be born should be well planted and shallower water than usual should be given. Some aquarists use breeding traps in which they place the gravid female. When the young are born they are able to pass through the fine bars and so escape the attentions of the parent fish. No fish should be placed in such a trap unless it is certain that it can obtain sufficient food whilst there.

Some of the floating water plants such as *Salvinia* are very useful for creating a fairly dense cover to the top of the water, and the small fry can get plenty of shelter there. Also in such plants there is often a quantity of small life which forms a part of their food. Make sure that the female fish gets plenty of food, especially live food, when she is nearing the time for the fry to be born. If the young can be removed from the parent soon after they are born it is a very good plan. The parent fish usually plays no further part in the upbringing of her young and so there need be no fear that the young will perish when taken from the mother.

Live-bearers are able to feed themselves almost as soon as they are born, and do not have to absorb yolk sac like the egg-laying types before they are able to swim about and feed on their own. Some of the egg-layers are guarded and cared for by their parents, but this is not the case with the live-bearers.

Remember that most of the live-bearers can produce young in about three months from being born if they have been well fed. Many are only a few weeks old when they may be fertilised by a male and so the necessity of separating the sexes as soon as possible is apparent. As most of the live-born youngsters can eat fair-sized foods so soon in life there is no need to provide such tiny foods as Infusoria. Youngsters can eat very fine fish foods as their first food but most will benefit from a varied diet which includes some live foods such as micro worm, brine shrimps and tiny *Daphnia*.

The breeding of some of the egg-layers will be dealt with in the next article.

An Experience with the Pompadour

by DR. ERICH MEDER
(*Germany*)

FOR a long time the pompadour fish (*Symphysodon discus*) has been a dream for many aquarists, and if signs do not deceive, this fish has a future like that of the angel fish. At the present, the position is one where the fish is being imported from the wild, in ever-increasing numbers each year, and it needs very different treatment from that given to the long-domesticated angel fish.

Last year I was able to obtain seven specimens, and amongst them I hoped there would be a true pair. The fish, each nearly two inches long, were in good condition apparently, but I soon noticed that they had become infested with white-spot disease. This is always a serious threat to newly imported fish, which may never have been in contact with the parasite during their wild life. Treatment with trypaflavin together with methylene blue, and frequent changes of water, abolished signs of the disease after ten days, and the only loss was a young fish which died in the first few days.

However, when skin and fins appear to be cured, the gill membrane commonly becomes infested again; so I was not surprised to see signs of infestation of this site eight days after treatment. The pots, rocks and rooted plants were removed from the 95 gallons aquarium, the bottom was siphoned clean and a good part of the water was renewed daily. At last everything was normal again and the fish were cured.

The tank was about four feet long and two feet wide and two feet deep. At the bottom and at the back glass had been replaced by concrete slabs. Indirect daylight was received by the aquarium for about three or four hours daily, and for the rest of the time it was lighted by two 40 watt tubular fluorescent lamps of the "warm-white" type.

Plants in the aquarium were *Ceratopteris* and *Hygrophila*, grown in a mixture of sand and loam in thin glass tanks; the soil was covered with basaltic gravel. The water was filtered through well-washed horticultural peat (about one gallon) and filtered water was returned to the tank in such a way that a strong surface current was created. The rest of the aquarium was stirred by the air current from an aerator. These procedures gave water which was perfectly clear, and made cleaning the aquarium an easy matter.

Water of hardness 7 degrees was used, and it was slightly acid (pH 6.5). Some sea water was added—about one pint for every ten gallons of water in the aquarium. Twice weekly the bottom gravel was siphoned out, washed and returned to the tank. The water lost by this procedure (nearly nine gallons at each cleaning) was replaced with fresh water to which sea water had been added in suitable quantity.

This procedure, although tedious, is almost indispensable for success with newly imported fish, for it gives water with a low bacteria content and prevents the accumulation of nitrogenous products, which occurs even with good filtration and aeration if the water is not changed. Bacteria and nitrogenous accumulation quickly bring about the deaths of newly imported fish.

In water that does not suit it the pompadour becomes shy and timid; it loses colour and stops eating, and its rate

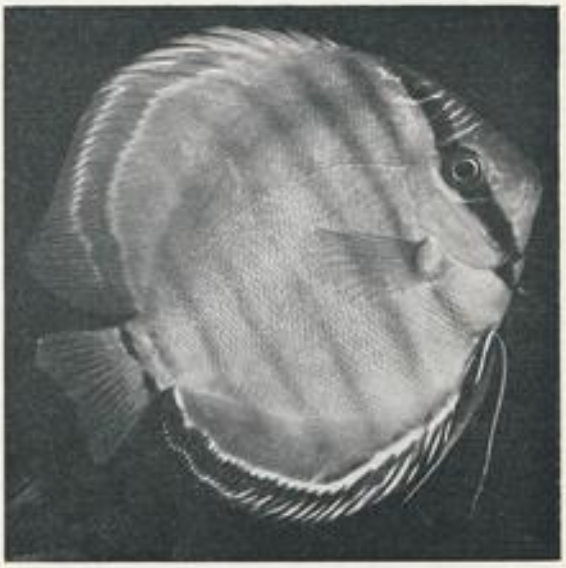


Photo : Laurence E. Perkins

Although still in the expensive class of tropicals the pompadour (depicted here and on our cover this month) is breeding in captivity and it is hoped that numbers of available specimens will increase

of gill movement is noticeably increased. It is necessary for the breeder constantly to watch the behaviour of imported fish, and particularly their respiration, just as a doctor takes the pulse of his patient.

My six fish, to which I was, of course, particularly attached, were fed on *Cyclops*, *Daphnia*, mosquito larvae, freshwater lice and the larvae of harmless aquatic insects. I gave them micro worms only occasionally and in small quantities. Even from the beginning, I aimed at all costs to avoid "fattening" the fish with unsuitable food, such as *Tubifex* or white worms. It is only by providing conditions and food similar to those of the natural environment that one can hope for success.

When the fish were frightened they put on a "dress of fright" (vertical bands). But this happened only rarely, and their normal colour was an even yellowish colour to a dark chestnut; this enables them, in spite of the blue lines and red tint on the fins and the iris, to conceal themselves almost completely in the middle of the plants.

One of my fish, however, was in the beginning behind the others, without showing signs of any definite illness. It was constantly on the search for food, but this food was always disgorged after having been swallowed, chiefly because the fish was chased by its bigger companions, who then greedily took up the released food.

The constant search for food by the pompadour fish is exciting to watch. It scatters all that is in its way (sand, mud, weeds, etc.) by blowing it until it is able to seize for itself the coveted prey. This behaviour leads one to suppose that in nature the fish are constantly browsing on the very rich fauna living amongst water plants; if plants growing in running water are examined, one cannot help but be astonished at the richness of the animal life (crusta-

ceans principally) which prospers there. Here is a valuable indication of a source of food for the aquarium.

Among the five biggest pompadours, two that appeared to move wonderfully well and who became much bigger than the others, could soon be picked out. As they were almost constantly together, it could be thought that they were acting as a true pair. And yet their behaviour lacked the harmony which can be observed in many cichlids. The secondary sexual characters equally gave cause for doubt; if the bigger of the two were the male, it lacked the winding blue lines in the dorsal and anal regions given as a male characteristic in all the American photographs.

This blue pattern is a good sign of sex difference; on the female only the front third of the lower edge of the reddish-brown anal fin shows the spots or blue lines, whereas in the male these lines spread all over the anal fin, and some spots may even occur on the caudal fin. The lateral stripes are another characteristic: they spread over the male horizontally from the head to the middle of the back. These markings are developed very early and allow the determination of the sexes to be done very quickly.

I watched the behaviour of those two fish with much curiosity. One day the smaller of the two appropriated the whole front right-hand corner of the tank, cleaned the putty and started to lay.

False Alarm

The attitude of the bigger fish, which I thought to be the male, was even more surprising: attracted by the smaller one when she was laying, he went nearer to the eggs and started to swim from top to bottom as if he was preparing to fertilise them. But instead of this he swallowed them one after the other and then turned away from the laying site. Once the "male" was away in a corner of the aquarium, the little female returned and started to deposit one or two rows of eggs, and the game with the bigger fish began again. Once again he was driven to the laying site, once again he swam from top to bottom, to finish by eating all the eggs and to go away again. This behaviour was repeated many times, until the female stopped laying.

For a time I had hoped that the bigger fish was a poor-coloured male, and I was therefore very surprised three days later to see my "male" start laying on a large leaf of *Cryptocoryne ciliata*. It was the smaller female who was then waiting in a corner of the aquarium; she also was driven to the laying site and behaved exactly as her partner had three days before.

It was necessary to face the truth that my "pair" was composed of two females. Such "false pairs," which one encounters always among females, are very frequently seen in captivity, principally among the cichlids. Innes has already noted that most of the imported *Symphysodon discus* are females.

As my four other fish were also females, I entrusted two of them, which were ready to lay, to Dr. E. Schmidt, of Frankfurt, who possessed a definite male. In spite of the journey—in a plastic bag, thus avoiding the least injury—the fish started to lay within six days. And then that which one had hoped for but did not dare believe would happen took place: after several tries and at the time of a further laying, the male placed with the bigger of the two females fertilised the eggs and kept watch over them afterwards, without eating them as he had done formerly.

The embryos left their covering after about three days, just as the literature had informed us, and were guarded by their parents exactly as angel fish do. Towards the sixth day, as with many of the cichlids, the young swim freely, but constantly come to attach themselves to the sides of their parents, principally to the female. This behaviour—during the first ten days—has often been observed, the young seeming to "pick" at their parents' sides.

There are several possible explanations. Personally, I would like to believe that there were microscopic creatures (Infusoria) on the skin of the adults, which proliferate there. But it is necessary to consider also other observations which have been made on several cichlids by other people. In some, particularly *Etroplus maculatus*, the young come to the surface of the mother's skin under the pectoral fins to take from it very tiny particles which are invisible to the human eye. One can see that the adult fish seems to ruminate, and fine particles of the chewed food are driven backwards along the body by movements of the gills. Why should the pompadour fish be different?

The fact is that the young pompadours during the first ten days, and this has often been described in literature, cling constantly to their parents' bodies (principally to the body of their mother). It is only after this period that they go away from their parents to seize some small living prey (nauplia of *Artemia* were given primarily).

These statements permit one to foresee the necessity for a microscopic food such as *Paramoecium* in abundance, if the young pompadours are to be separated from their parents, as is the practice with the angel fish. I cannot affirm that such attempts have been crowned with success up to the present. Anyhow, if one can leave the fry with the parents, the results of breeding must be better.

This story of pompadour breeding confirms that the acclimatisation of newly imported fish represents the greatest difficulty. That goes for all fish which have not been domesticated. Mostly, the pompadours either die or become too fat and sterile. The secret for the first reproduction of new specimens lies in the manner of bringing them to maturity.

(Article translated from L'Aquarium et les Poissons)

J. W. Lester

IT is with great regret that we record the death last month of Mr. John Withers Lester, curator of reptiles at the London Zoo, at the early age of 47. Although his main interest was in amphibians, he could truly be described as an all-round naturalist, and in latter years he led a number of successful expeditions to Africa to collect specimens of all kinds of animals and birds for the London Zoological Society. In 1954 and again in 1955 he made expeditions abroad in conjunction with the B.B.C. television service, and as a result of this many more people became aware of his warm, friendly and unassuming personality from the appearances that Mr. Lester made on television. He was unfortunately taken ill in British Guiana last year, and it was that illness which has led to his untimely death. Mr. Lester was always willing to interest others in his own subject; for many years he was an advisory editor of *The Aquarist*, and he was a founder member of the British Herpetological Society. He leaves a widow and four daughters, to whom we offer our deepest sympathy in their loss.

Aquarium Cinematography Technique

by MASON SMITH

ASSUMING that the reader has now assembled tank, plants and background and has decided upon the type of fish he is proposing to film, the next step will be to work out a rough filming programme. I say rough, because that is all that one can do in filming an unpredictable animal like a fish.

The script I wrote for my film "The Fighting Fish of Siam" ran in its basic form something like this.

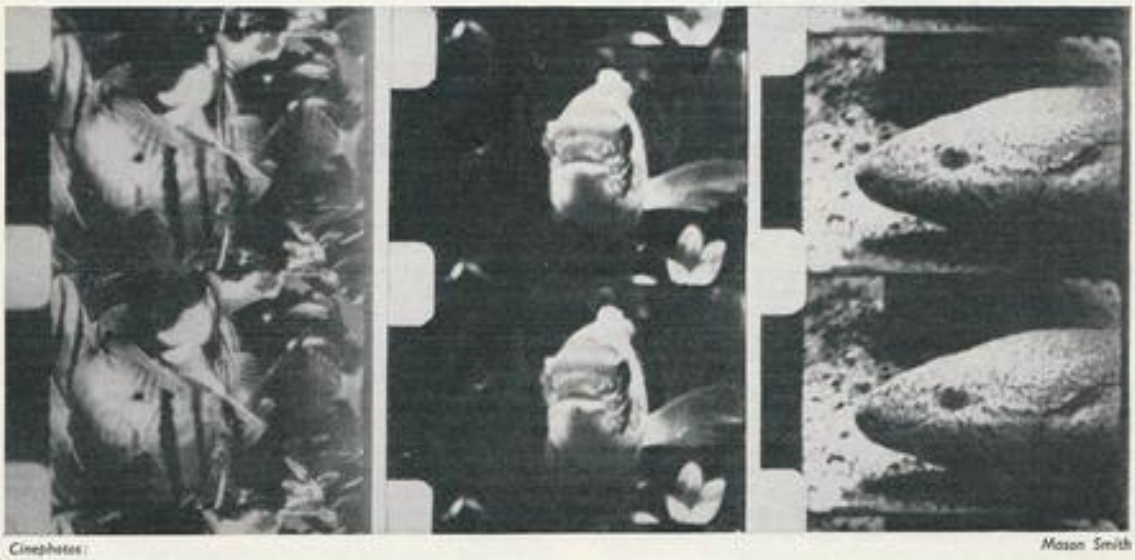
1. Credit titles and main title with location map of Siam. (If the reader likes he can have his titles drawn and filmed at a cost of about 3s. for eight words by firms who advertise in appropriate magazines).
2. Travelling down a stream in Siam with shots of crocodiles, cranes, etc., camera eventually focussing on a frog swimming along the surface. (This scene was faked in the Cambridge University Botanical Gardens).
3. Camera leaves frog and goes below the surface, coming to rest on a red male fighter who is joined by a blue male fighter. (This was the start of the filming in a tank).
4. A fight starts while a female fighter looks on. The red fish is the loser.
5. Blue male courts female and starts building a bubble nest.
6. Blue male drives female under nest and starts nuptial embrace.
7. Shots of eggs being discharged and male putting them in the nest.
8. Shots of young fry at various stages of development, i.e., 24 hours, one week, etc.
9. Male fish hunting for food, finds and catches small fish.
10. Camera leaves scene and travels to surface and once again we are travelling along a tropical stream.
11. End title.

Running time of film: 14 minutes. Kodachrome colour, 8 mm. gauge, with sub-titles, and incidental music on records synchronised to film.

The above film took six 50 ft. reels of film to make, out of which about two-thirds was used. This is about the usual wastage when making films.

Whatever the species of fish being filmed it is most essential that there should be some story to connect up the different sequences. Otherwise the film will become just a series of unconnected snapshots. A book on film editing and making will prove most useful at this stage. The film, when it comes back from the developing, is cut and joined together by an instrument called a splicer. This enables underexposed or lengths of film which are unwanted to be cut out and the remainder welded together again by the splicer and film cement. Splicers cost about £2. This process is called editing.

For the actual filming my set-up is as follows: a 24 in. by 12 in. by 12 in. aquarium is stood on the end of a table which has previously been spread with a sheet of white paper. From the tank centre to a point three feet in front of the tank the white paper is marked with black lines at every six inches. Written beside each line is the appropriate measurement. Therefore the first line in front of the tank will be marked 1 ft., the tank front being the 6 in. mark and tank centre zero; as the camera is moved backwards and forwards in front of the tank it is now possible to set the



Cinephotos: *Mason Smith*

Enlargements from 8mm. films made by the author. Left to right:
1. Angel fish (from the monochrome film "Blue Gouramies from Sumatra.") *2. Blue acara (from the colour film "Tropical Aquarium Fishes."* *3. African lung fish (from the colour film "Tropical Aquarium Fishes.")*

focussing on the lens without having to measure from tank to camera each time.

Of course, if the fishes being filmed are at the back of the tank or right near the front glass an adjustment of six inches will have to be made either way on the measurements read off the table. When filming at such close distances, it is absolutely essential that focussing should be as accurate as possible. The depth of focus at distances of one or two feet is very small indeed.

The camera itself is mounted by its tripod bush on to a large block of wood fitted with four wheels. This enables it to stand by itself and yet allows it to be mobile. The lighting switch should be mounted on the table in a position where it can be easily switched. The above set-up I have found more mobile than if a tripod with pan and tilt head is used. Time taken setting up a tripod has in the past made me lose quite a few unique shots.

The next problem to tackle is the one of reflection in the front glass of the aquarium. The glass, when the tank is lit, picks up and reflects the images of the camera and cameraman. The fish also get very worried to see somebody peering into their tank at close quarters.

Both of these problems are overcome by the simple expedient of filming in a dark room. The light "spill" from the tank is sufficient for working with. Polarising filters can be used to cut down reflections on tanks, particularly those set up outside in the sun, but these require an exposure increase of one stop. This rules out their practical value for artificial-light filming.

It will be found that it takes quite a bit of patience to get the fish used to the tank and lights, also the close proximity of the camera frightens them at first. But eventually they will ignore them.

A useful exposure reading can be taken by pointing a photo electric exposure meter to the tank background. Readings should also be taken with the meter pointing to the surface of the water and to the tank bottom and adjustments made accordingly.

Perhaps after reading these three articles in which I have given a rough outline of my technique for photographing aquarium fishes, those readers who do not possess the necessary equipment will despair of ever being able to find the necessary cash for it. Yet, after all, the whole equipment can be bought for the price of a television set!

When the apparatus is not being used for the filming of fishes, films on the family and other subjects can be made. Anyhow, I hope that in the future we shall be seeing some unique films on the various breeding habits of fishes.

A film production unit would give societies an extra activity and would perhaps bring in a few more members. The necessary cash could be found by hiring the films to other societies.

Water Hyacinth

(Eichhornia crassipes)

by JAS. STOTT

THIS attractive and unusual floating plant derives its popular name from the supposed similarity of the pale-mauve flowers to those of the bulbous hyacinth. It is a true floating aquatic and although not accepted as a hardy subject it will often do quite well in this country floating on the surface of the garden pond during the summer months, especially if the weather is really warm, but, of course, will not winter in such a position.

The ideal place for this subject is in the large tropical tank situated in a fish house or greenhouse where there is a tendency for the air to be warm and humid. In such conditions the plant will thrive and propagate itself well, which it does by means of runners. Young plants should not be separated from the parent plant until at least two leaves have formed and a good root system is produced.

The plant develops a dense and long root growth, violet in colour, finely cut and feathery, thus providing excellent anchorage for the spawn of those fishes which produce adhesive eggs. Goldfish will readily spawn on the roots of the water hyacinth. It possesses thick, fleshy foliage, light green in colour, and the plant is easily recognised by the enlarged bladder-like appearance of the leaf stems, which gives the plant its remarkable buoyancy.

When flowers are produced they are certainly attractive, and like the bulbous hyacinth a number of flowers are borne on a single stem. Each flower is pale mauve with a light yellow marking edged with dark blue shading on the petals, but, unfortunately, these flowers do not last for more than a day at the most.

In its native habitat, which is South America and in parts of Africa, it is so prolific in growth that it is responsible for choking the rivers to such an extent as to interfere with river traffic.

During the short days of mid-winter in this country it may be found necessary to supplement the natural light by means of artificial lighting to keep the plant healthy, and the ordinary incandescent electric bulb appears to be the best light source for this purpose.

The Scientific Approach to Fish-keeping

by Dr. F. N. GHADIALLY

IN a recent issue of *The Aquarist* (May, 1956), I criticised some experiments carried out by another aquarist. Briefly I there pointed out that the approach was faulty and the results worthless. This in a sense was negative or destructive criticism. It is only of limited value to say this is wrong, that is imperfect, you must not do this or that, if such remarks are not followed up with suggestions as to the right course to follow.

In the course of a brief letter this was not possible, but as this is an important subject I feel it would be worthwhile to examine the problem in greater detail. I would like to lay before you some of the ways in which experiments can be planned and executed so as to yield results that would be of value to the hobby.

Strange as it may appear, this will involve us in discussion of logical principles, philosophy and horse sense rather than factual science. For research is truly a philosophical activity. A research scientist is not just a person who knows a lot of physics, chemistry or biology but one who thinks scientifically. This is indeed a way of thought, a way of life, and bears little direct relationship to the amassing of a pile of factual knowledge as indulged in by the average science graduate. To draw a simple analogy, we all have a basic knowledge of language and grammar and can read and write, but that does not in itself mean that we can create immortal prose or verse.

Amateur Investigators

Needless to say, the creative mind is not the monopoly of the trained scientist, it can be found in many other walks of life. Hence those who feel that they too can make original contributions to knowledge, should not hesitate to try. Let us not pretend that this is easy or that everybody can do it. But past history shows that it has been done and that it can be done by the right person irrespective of whether he has degrees in science or not.

Examples of valuable work done by amateurs and hobbyists in various fields of scientific endeavour are well known; to name but a few—the first-class pioneering work done by radio enthusiasts on the use of short waves for communication, the work done by numerous amateur astronomers in gathering data on meteorites, the patient, painstaking observations of biological phenomena collected by enthusiastic naturalists, and in our own hobby the grand work that has been done in developing scores of strains of beautiful fishes and recording for the first time the feeding, breeding and other habits of hundreds of varieties of fishes. This is truly a record to be proud of; you too can join in the fun and contribute your share. Your reward will be the satisfaction of having done a worthwhile piece of work and perhaps the recognition of this by fellow aquarists.

As aquarists, we are mainly interested in the biological sciences (e.g., botany, zoology, microbiology, biochemistry, biophysics, medicine, etc.), so let us consider how knowledge is built up in this field. There are two main, fairly distinct ways, and although there is some overlap of the two groups, for descriptive purposes it is best to treat them separately. (*a*) By observation of naturally occurring phenomena. (*b*) By performing experiments.

Both of these are no more than methods for collecting factual data. Later they must be interpreted, and where possible, tentative deductions and working hypotheses drawn from them. More about that later, but first let us examine these two groups in more detail.

Observation of Natural Phenomena

Making observations is the way in which the amateur can play an important part. Here, as a matter of fact, he has numerous advantages over his professional colleague. For one thing he is likely to have more time, enthusiasm and energy available to devote to such observations than his colleague weighed down with elaborate experiments, abstract hypotheses and statistical calculations. No special apparatus is needed; a pair of eyes and an inquiring, inquisitive mind are the main requirements.

For example, as aquarists we can note the feeding and breeding habits of fishes and other forms of life in our aquaria. We can study their external features, such as shape, size and coloration. We may observe the growth and propagation of plants. You may say that all that has been done before. Yes, but there is still a lot awaiting to be done. New species appear quite frequently on the market and there is a lot to be learnt even about fishes that have been known to us for years.

For instance, until quite recently we did not know how a male guppy actually fertilised a female guppy. Much discussion raged over whether actual contact between male and female occurred or whether the sperms were shot out of the male into the female from a distance. That actual contact is made could have been observed by an intelligent, patient aquarist, and if he had happened to be a photographer too he could have recorded this and given the world final proof that actual contact does occur. However, unfortunately this was not to be, and it was left for the scientist to determine that contact does occur and that sperms are transferred into the female only during such contacts and never from a distance.

The study of size, shape, colour and other external features has received much attention and has resulted, on the one hand in the development of beautiful strains of fishes, and on the other hand in our controversial show standards. Here there is work to be done too, for not all the variations that can occur have been by any means observed, far less fixed. With this in view every spawning should be carefully examined for any interesting mutations (sports). Two notable recent achievements by amateurs in this direction have been the production of black angels and black fighters. The scope is indeed infinite; only the dull in mind would imagine that everything has been done before and there is nothing new to do.

We need not rest content with observing the external features of a fish only. By simple dissection and observation much may be learned about the state of the internal organs. For this purpose one should learn to recognise firstly the normal appearance of organs. Past articles in this and other aquatic journals and text-books on zoology should be consulted by those who want to learn to recognise the various internal organs. After having gained a sound knowledge of the normal, one can proceed to observe the effects of diseases on these organs. This again is a vast field, to which one could devote a lifetime of study.

To elucidate the problems in the field of breeding both observation and experiments are required. The challenge offered by difficult or "impossible-to-breed" fishes such as

neons, pompadour, scats and scores of others, has yet to be met. What has been said about fishes applies also to plants. Observation of rates of growth, method of reproduction, etc., can be made the subject of much thought and study.

Before we leave this section a few remarks about observation and how to observe must be made. It is strange how we can look but not really see what is going on right under our noses. By observation one does not mean sitting in front of a tank for hours aimlessly watching the fishes swim past while listening to the radio with one ear and thinking about neither. This is, of course, a very pleasant and relaxing way of spending a few idle moments, but serious watching is different. One must concentrate on what is going on in the tank. In short, watch not only with the eye but also with the fully conscious mind. It is a great help to know what we are looking for.

"Looking" and "Observing"

Let us take a simple example: suppose we want to observe how *Vallisneria spiralis* var. *torta* propagates itself. What we would do would be to observe the plants in our tank regularly, say once every day. All being well we would see a runner or a number of runners issuing from the crown of the plant. Note their size, shape, number, directions, etc.; how long they grow before they reproduce another plant; what a runner does when it meets with an obstacle; what happens when it overhangs an edge; and so on. This is a simple though by no means a very original observation, but it is by hundreds of exercises such as these that one can develop one's powers of observation.

There is a fundamental difference between a trained observer and a lay observer. The former, because of his training (and quite often considerable talents in that direction), can take in far more in far less time on looking at an object or a phenomenon than can the untrained observer. What is more he is almost invariably more accurate. He looks with a plan, with a system, which by long practice has become second nature to him. You cannot expect to develop this power overnight nor can it be easily taught in an article by someone else. Work along the lines indicated and try and develop your powers of observation; nobody else can do it for you.

This will be of use to you not only in your hobby but in everyday life, for you will literally and figuratively begin to see things differently from the way you did before. In a similar way, also try to develop visual memory, so that not only do you observe things but remember with confidence what you have observed. (The importance of recording observations will be dealt with later on.) To recapitulate briefly, we have seen that much information of scientific value can be collected merely by observing natural phenomena as and when they occur.

This sort of naked-eye examination of a specimen or a phenomenon is often spoken of as macroscopic examination or inspection. We can, however, carry our observations further by the use of a microscope; this is spoken of as microscopic examination. The cost of a good microscope can deter people who would like to go in for this type of study. However, much can be done with quite a cheap secondhand instrument. It is indeed a sobering thought when one realises that most of the great discoveries in this field were made not with elaborate instruments giving great magnification but with magnifications as low as 50-100 times.

Microscopy is a vast field in itself and we cannot deal with it here. The reader is referred to the excellent series of articles that is now appearing in *The Aquarist* and to numerous popular books on the subject available from public libraries.

Next month the author will describe in this series of articles how aquarium experiments should be planned and performed.

FRIENDS & FOES No. 49

Black-flies

SIMULIDAE

Pupa of the blackfly Simulium

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

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

THE Simulidae are flies not exceeding one-quarter of an inch in size, which have aquatic larval and pupal stages. The female imagines of some species cause considerable irritation to man and beast by piercing the skin of exposed parts to draw blood. In some foreign areas the flies are so numerous that man and his domestic animals cannot live there for months at a time. Fortunately this state of affairs is unknown in the British Isles. Nor is the aquarist likely to encounter them by his garden pool, for egglaying is confined to river and moving waters.

The various methods of egglaying are interesting. Some species enter the water to deposit their eggs. Others keep clear of the water, but lay such a weight of eggs upon a leaf or leaves that the egg mass is forced below the surface of the water. Still others seem able to sense a rise in the depth of water, and place their eggs so that the increase in volume submerges them. Some females choose sites where no other of the same species will lay, yet with others a large number of females share the same site.

In America the files are "popularly" known as "buffalo gnats," probably because of the humped-back appearance which gives them a faint resemblance to the bison—or possibly because they are particularly worrying to these cattle.

The larvae, of which more next month, are appreciated as fish food. The flies themselves, if newly swatted, are also taken. As it is usually a case of "swat or be bitten" when the flies are encountered why not use the victims as titbits for your pets?

C. E. C. Cole

AQUARIST'S Notebook——

by

RAYMOND YATES

AN interesting new service has been started by the Canadian Aquaria Society which could well be copied by clubs over here. Owing to the difficulties of getting good lecturers they have now had some 19 different lectures reproduced, and copies can be obtained by any interested club so that some experienced member can read out the lecture. The advantage of this method is that other additional copies are available for any or all of the members of the club. The charge for this service is 10 cents per copy, subject to 15 copies of any one lecture being ordered. This works out at about 6d. a copy (or a little more) but this is cheap considered against lecturers' fees and expenses. All the lectures so far have been written by Mr. W. L. Whitern. They include: Building a Fish Room, Water Chemistry, Fish Enemies, Fish Anatomy, Building an Under-sand Filter and an Auxiliary Outside Aquarium, and some breeding talks on *Corydoras*, fighters, mollies, leeri gouramis, white clouds, zebras, anabantids, lyretails, glass fish and tiger barbs.

This club has also published its own handbooks, namely, Setting Up and Aquarium Plants and their Purpose; Aquarium Enemies, Diseases, Diagnosis and Treatments; Breeding Angels; Foods and Feeding (live, dry, cultured, collected and Infusoria). These are sold at 35 cents each (about 3s. 6d.), or about 1s. 5d. each for 10 or more. This is a really go-ahead club.

The secretary of the Society is Mr. R. Taylor of 131, Woburn Avenue, Toronto 12, Canada. He would be very pleased to receive copies of any club magazines issued in England in return for the monthly magazine issued by his own club. He already gets one from the Guppy Breeders Society and I have sent him recent issues of the magazines issued by Portsmouth, Nottingham and Kettering. Perhaps any interested clubs will contact Mr. Taylor.

Aquarists in this country often grumble if they have to travel just a few miles to a show but Mr. Taylor does it in a big way. On a recent week-end he left Toronto at 10 p.m. on the Friday night for Chicago—500 miles away. He arrived there at 9 a.m., Saturday morning, and immediately checked in at his hotel, after which he went straight to the John G. Shedd Aquarium. This aquarium was started in 1923, finished in 1929 and cost the equivalent of one million pounds. After this he attended the T.I.F.A.S convention of international aquarium societies and finally left for home at 8.10 p.m. on Sunday night. He arrived in Toronto on Monday morning at 9 a.m., just one hour late for work!

* * *

It is not often nowadays that one gets the chance to visit a well-kept public aquarium free of charge, and it is for this reason that the authorities in Bolton are to be congratulated. The aquarium is situated in the town-hall extension below the Art Gallery and Library, and there is no admission charge. The majority of the tanks contain coldwater fishes of large size, including eel, pike, carp, gudgeon, perch, bitterling, sunfish, orfe, chub, goldfish, bream, dace and roach. Silver sand is used to good effect with fluorescent lighting, no plants being used in the tanks. Features are the complete lack of algae on the rock sides of the tanks and the intense clarity of the water. The fishes are shown with thought; for example, one tank contains golden tench and golden rudd, another golden and silver orfe. One tank contained large gudgeon with one-inch sunfish and six-inch terrapins. These latter did not worry the fishes. One tank is cleverly given two facing-glass fronts to the viewers, these forming an angle of roughly 110 degrees. The result is odd, because a fish swimming in full view across one front seems to disappear in full view.

The tropical tanks are very large, and have mixed collections which get on well together purely because they have so much living room. Some very large black sharks from eight to 12 inches in length caught my eye. These did not bother the other fishes but each seemed to have a hiding place in the rockery which it looked upon as its own. I observed a tendency to swim about upside down in these water caves, as if the rock surfaces were being cleaned. Other fine fishes were flying foxes, *Botia*, large *Corydoras julii*, and a snakeskin gourami 10 inches long. A full-grown (eight inch) specimen of *Mystus vittatus* was on view, a fish not often seen. They remind me in some ways of young whiting but, unlike the latter, cannot stand salt. This particular fish did not seem to be a potential danger to the many small fishes sharing its tank, which also included two really large *Cichlasoma severum*. The fluorescent lighting was unsatisfactory with the tropicals, those most brilliantly coloured losing their pleasing tints. The only plants used are *Cryptocoryne*, which are planted at varied heights in the tanks; this gives a fine effect. This aquarium is visited by many children, who are quite fascinated. Is it too much to hope that other authorities in time will follow the lead of Bolton?

* * *

Very few experienced aquarists show much enthusiasm for snails in their tanks. Snails and fish breeding just do not go together, and most hobbyists at some time like to try their hand at breeding the egglayers. The other main objection to snails is the damage they can cause to plant life, aquarium plants being often in short supply and too expensive to be allowed to suffer the depredations of hungry snails. One must be fair, however, and say at once that the red ramshorn and the Malayan (trumpet) snails are not plant eaters but general scavengers who are particularly partial to soft algae.

Unfortunately, the most commonly kept snail is *Physa*, which is both attractive and active, and one which multiplies rapidly. This snail is the one so often brought home after a visit to a dealer or a friend's fish house and it can, and will, ruin many plants by making small holes in the leaves. Of course, not all plants are attacked; *Vallisneria* and *Sagittaria* are practically immune, fine-leaved plants like *Cabomba*, *Ambulia* and *Myriophyllum* are untouched, but *Cryptocoryne* sometimes suffer and *Hygrophila* and *Aponogeton* are ruined.

Not all the holes which appear in the leaves of water plants are due to snails; in particular the surface leaves of frog bit and water lettuce are frequently riddled by internal blights about which one can do nothing. Spatterdocks have light and tender leaves but rarely suffer attack from snails.

This plant is most attractive at all sizes and seems to keep quite free from blue-green algae when other plants are covered. It grows quite well in electric light but is slow to start if planted out as a young seedling. Spatterdocks require more than just ordinary gravel and if put in this will mark time until sufficient detritus has gathered round their roots for good growth. Once real growth starts it is quick

and it is not long before one of the leaves reaches the surface. The root formation is a rhizome (as in the terrestrial iris) and new plants can be obtained by cutting the rhizome into pieces and replanting.

The huge snail *Ampullaria* is now well known to most fish-keepers and is an avid plant eater. It has many names, such as apple snail, mystery snail and Infusoria snail, and it is mainly kept for producing Infusoria, being fed in a separate container on lettuce. This snail can, and will, climb out of its tank, so a cover should be provided.

* * *

Two excellent fishes for your tank are *Otocinclus affinis* and *Plecostomus plecostomus*. Both are keen algae eaters and it is true to say that *Otocinclus* eats nothing else. However, a single specimen will do very well in an ordinary furnished tank and will not be bothered by any of the other inmates. These fish spend all their time hanging on to a leaf or the glass sides and are very quaint, even more so than *Corydoras*. If another fish with warlike intentions should approach, *Otocinclus* knows in good time and merely flits away to another leaf. They are hardy (provided that algae is always available) and resistant to disease. *Plecostomus* is a much larger fellow but one about two or three inches is excellent for a community tank. These also live on the glass sides of the tank and on leaves, removing algae, but they will also take bottom foods, including chopped worms. Really night feeders, they will become quite tame but are not always easy to catch. If underfed they will disturb the bottom. Both fishes are quite harmless to other inmates. The flesh of a dead *Plecostomus* seems to be tasty, and nothing is left but the head portion by the other fishes if one should die off in the tank. *Otocinclus* can sometimes attach themselves to other fishes but no harm is done.

* * *

The Singapore Society show catalogue for 1955 made fascinating reading. It ran to 30 pages, was well printed on excellent paper in both English and Chinese, with numerous illustrations and a coloured front. The 51 classes were detailed in the two languages together with some very interesting notes on the hobby, club history and F.B.A.S. standards. I must admit that the Chinese characters add a great air of mystery and charm, in particular to the many advertisements. Quite a breath of fresh air after the average club catalogue of recent years.

* * *

A feature of the famous Tower building at Blackpool are the many zoological blue-green tiles which depict various types of fishes and other animals. The real fishes in the Aquarium are well worth seeing, whether tropical, cold-water or marine. I was much taken with some swallow-tailed casternets (*Chromis chromis*) and some red cardinals (*Apogon imberbis*) from Madeira. A large tank contained about 60 Jack Dempseys, and this cichlid is rare in so far as no squabbling takes place—so very different from other varieties of this family. Very large *Metynnis* have a wonderfully clean look, but they will nibble plants, although I observed that large clumps of Indian fern were not touched. *Hygrophila* grows well in this public aquarium and often in tanks which are not well lighted. This point is of interest, as *Hygrophila* has usually been considered a "plenty-of-sunshine" plant. Some large *Barbus filamentosa* caught my eye. Frankly, I think that the females prove the most colourful in maturity as they retain the red lobes of the tail. The male dorsal filaments are only attractive when held erect; with age these trail in a tired manner and are not so beautiful. An innovation was a tank half filled with masses of floating fern, submerged logs and large cichlids. Don't fail to look in when you are next Blackpool way.

* * *

I have previously mentioned the use of coco-nut fibre as a spawning medium and am reminded of this by Mr. N. Walker of 24, Denmark Road, Poole, Dorset, who is now marketing this on a small scale for the benefit of aquarists. Coco-nut fibre is fairly fine, lasts indefinitely, is free from smell and is clean to handle. It should be boiled for about five minutes, by which time the water will be peaty-brown in colour, then rinsed well under the cold-water tap, after which it is ready for use. The tangled mass can then be spread out as desired and it is usually necessary to weigh it down with rockwork or lead. It provides an excellent and cheap substitute for fine-leaved plants, is less messy than willow-root and provides ideal protection for young fish from the unwelcome attentions of their elders. Mr. Walker markets this in polythene packages roughly 5 in. by 4 in. by 1½ in., a quantity which is quite sufficient for the average breeder.

* * *

What a lot of odds and ends there are in fish houses and fish rooms which the owner will probably never use again! Most hobbyists in the course of time amass a large quantity of used equipment, much of which lies unused and unwanted, month in, month out. Many of these items would gladden the heart of some newcomer to the hobby—look through your stock and see if you are hoarding things you'll never want again. You will be surprised at what you find. These can then be passed on to struggling beginners or to a club for auctioning for funds or for use as raffle prizes. Some time ago I took along 17 "gifts" of this nature to a club for raffle purposes, and members were more than delighted. If things can be passed on to youngsters so much the better; junior aquarists have so much enthusiasm and so very little money. Knocking around as I do I notice that juvenile sections of clubs are not so numerous, which is rather a pity. Whenever I buy raffle tickets at a club I always make these out for "The youngest member of the club." Recently, at a midland club, my number came up at last and an enthusiastic junior received a furnished tank, complete with fishes. Frankly, I am not at all sure who got the greatest kick out of this, the lucky junior or yours truly. Have a clear-out and make some other hobbyist happy.

* * *

Many fishkeepers think that a fish has only to be damaged, even slightly, for fungus to show itself. This is just not true, although, of course, it can happen and is, perhaps, more likely in coldwater tanks than tropical. Nature seems to be very quick at covering up scars, and readers will have observed the rapidity with which torn fins heal. If a tank has had a heavy growth of fungus in it the possibilities of attack are really enormous, but this does not mean that any fish, slightly injured, that is introduced will show fungus. On the face of it they should but in fact many don't. On the other hand, put in a dead insect and the fungus appears almost immediately. Some time ago I had a swordtail and a platy which had been savaged by a large cichlid, and I feared the worst. Nothing of the sort, all scars and scales healed and they carried on none the worse.

* * *

It is commonly thought by many in the hobby that if fishes are crowded together when young they will become runted and never grow. This is only half true—it all depends on the fish. Young cichlids can be crowded and kept for months at an inch in length, but give them better conditions and they will, in time, become normal. Fighting fish also will remain small and the fins will not grow, but give ample space and food and big finnage appears. By and large livebearers seem to be the most liable to runt, but large fishes (like the larger tropical barbs) assert themselves once the chance offers.

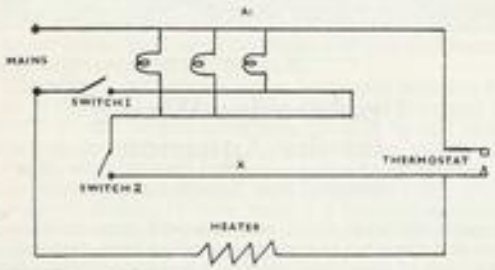
Unobtrusive Wiring for the Aquarium

by LAURENCE SANDFIELD

THE problem of connecting the domestic tank to the electric mains without exposing an unsightly mass of wire to the observer's gaze often exercises one's ingenuity. It is particularly important where the aquarium is to be a dominant—if only by its size—feature of the decor.

Having freshly decorated a room in primrose and cream I found myself faced with this problem, and succeeded, I think, in solving it. The lady of the house is satisfied, and who are more important than the ladies, bless their nylons! The first step was to work out, with the help of an electrician colleague, the circuit shown herewith. It can be seen that there are two independent circuits which can, at the turn of a switch, be made into one.

When switch 1 is closed the three bulbs are connected straight through, and provided that switch 2 is open, the loop marked X has no current running through it. Reverse the order of the switches—open 1, close 2, and the thermostat will control the lamps for you. If you have the type of lamp holder with its own switch as an integral part, then this integral switch must be "on" when you are using circuit loop X.



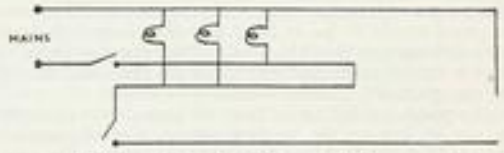
This kind of thing can be very useful in the long cold days ahead of us. Those of you who are due to visit Aunt Maggie during the festive season, or at Whitsun or Easter, will find it very convenient to give your plants a certain amount of light, while not exposing your fish to the rigours of a week or so's continual wakefulness. Again, those households in which the two partners are at work all day will be able to see that their plants have more light than can be given during the few hours of relaxation in the evening.

The next step was to put some oil on my wheelbrace and drill four 7/32 in. holes at the top of the legs at one end of the angle-iron stand. Four chromium-plated 3/16 in. Whitworth screws went through here, heads facing inwards. These secured to the stand a sheet of plywood four inches wide. A three-pin socket was attached here with 2BA countersunk screws. A piece of twin flex ran from the socket to a two-pin female socket left temporarily hanging free. Two wires were attached to the earth pin and also left free.

Attention was next turned to the tank. This was placed upon a table and an external thermostat attached to the rear panel with Bostik, which was supplied by the manufacturers.

The circuit shown was set up on the vertical back of the lighting hood, without, for the moment, the heater or thermostat being attached. To achieve this the lamp holders were inserted with short wires already attached, and three-way terminal blocks secured to the hood with 6BA screws and nuts. These were steel, brass being avoided in all positions where it was remotely possible for condensation to reach. The switches were placed at one end and the terminal blocks beside each light. A two-way terminal block was placed at the extreme end near the switches. This was the mains input.

A two-pin female socket was fixed at the opposite end. Wire X was attached. Wire A was run from the mains-input terminal block through the top terminals of the



three-way blocks, one wire from each lamp socket also going with it. At this stage attention was turned again to the tank. The heater—the type one can bury—was placed inside, the wires bent closely to the top frame and a male two-pin was attached to them. Having wired the hood as shown, with the second and third places on the terminal blocks bridged to ensure continuity through X, the hood was laid on the top frame. It was at this juncture that the top frame was fitted with rubber tube in the usual manner. Then the leads from the thermostat were attached, the first pair to the two-pin female socket (one wire of this pair forms the connection of wire A with the same terminal of the socket as wire X, so that a partial circuit as shown in the figure above was obtained). The second pair of wires from the thermostat (mains connections) were connected one to the terminal block beside the third lamp and the other to the mains-input terminal block. A piece of twin cable was fixed to this block. While doing this operation, it was made sure that all the wires were hidden by the tank frame. By plugging the mail two-pin from the heater into the female socket loop X was completed.

With the tank upon the stand a two-pin male was attached to the cable or flex leading to the mains-input block. This was plugged into the female already attached to the three-pin input socket. The two wires attached to

(*Continued at foot of next page*)

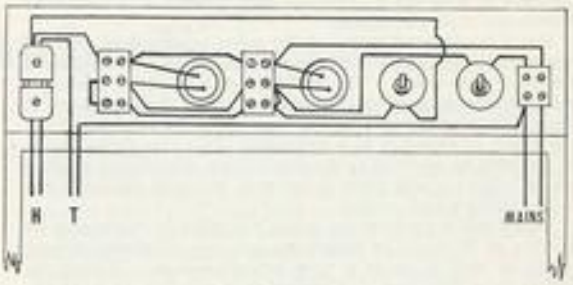


Diagram showing wiring lay-out at the back of the aquarium hood. Only two of the lamps are shown. The mains-input block is at the extreme right. The two-pin female socket at the left (uppermost) is secured to the hood but the male plugged into it is free. T, Thermostat; H, Heater.

In the Water Garden in September *by* ASTILBES

NOW is a good time to look back over the year to examine the success or otherwise of your pond. If there have been failures with some of the plants it is possible to pin-point some of the faults, so that these may be rectified before another year. The water lilies are still the best flowering subjects for the pond as they can be had in so many colours and types which can be planted in varying depths of water. Where some may not have done well it may be that they have the incorrect depth of water above the crowns. Some of the pygmy types need only a few inches of water above the crown whereas others need two feet or more.

Most of the best water lilies will succeed in about eighteen inches of water, that is, above the root stock. Therefore your pond needs to be at least two feet deep. It is not always necessary to have the whole of the pond so deep, as a part of it can be made fairly deep for the lilies and then the sides can gradually shallow to almost no depth.

If the pond has not more than 60 square feet of surface area, say 10 feet by six, or thereabouts, a good plan is to make a hole about 2½-3 feet deep near the centre; the rest of the pond need be no more than a foot and a half, shallowing away at the sides. A strong-growing lily can then be planted in a suitable pot in the deep part. Once any cleaning of the pond is necessary the pot can be drawn out of the hole and when the pond is emptied it will be found that most of the black mulm and mud will have collected in the deep hole. This can then be removed by bucket and the pond swilled round with the hose. Again all the waste matter will be washed into the hole, when it can be easily emptied again. The deep hole also means that there will be a fairly safe place for the fishes during a severe freeze-up.

The genus *Acorus* provides a few rush-like plants for very shallow water or the pond side. A well-known kind is *Acorus calamus* var. *variegatus*. The foliage is very attractive with green and cream markings. *A. gramineus* is a smaller-growing type for a smaller pond. Such plants do well in the type of pond which has a shallow surround, where it is possible to have a depth of loam into which the plants can be planted directly, so dispensing with the need for pots.

If you have a fairly large pond and need a handsome rush for the edge you can hardly do better than to use one of our finest English native rushes. This is *Butomus umbellatus*, a strong-growing rush which has a large umbel of flowers, pinkish-red in colour almost like a large onion flower in shape. Where this plant has a good depth of soil it will soon thrive and flower. However, if it is left in a poor position it will fail to produce any flowers and give only numerous rush-like leaves.

For a small pond some of the more ornamental types of water plants generally used for aquaria can be well employed for decorative work. The well-known tank plant, *Ludwigia mulertii* can be used in a small pond at the shallow end. It should be planted in a pot so that it can be removed from the pond in October to a protected place free from frosts. It can also be planted at the pond edge, actually in shallow water, where it will grow quite well, but it is doubtful if it will survive a bad winter.

Many water gardens are made beautiful in the spring by groups of *Myosotis* or forget-me-not, which always appear to do so well when in a very moist position. Where the plants have flowered and seeded it is possible to store the old stems, and then in the spring, if the bag in which they have been kept is shaken over a prepared site it is probable that many seedlings will appear. Whether this is worth doing these days is rather questionable, as good fresh seed is available fairly cheaply. If one allows these plants to seed naturally it is probable that they will throw back each year, and whereas they produced fine, large and well-coloured flowers in their first year from new seed, the flowers may become much smaller and paler if they are allowed to set seed in your garden. The professional grower takes great pains when growing plants for seed to ensure that only the best types are kept for seed and that as far as possible they are kept true to strain.

During this month the fishes must not be forgotten. If the pond is not too well stocked with water plants and their attendant pests which form food for the fishes, it may be necessary to step up artificial feeding to make sure that they receive as much nourishment as possible to enable them to go through the winter in good health. If the autumn feeding of the fish is neglected it is probable that in the event of a bad winter they will not have the strength to survive, and even if they do they may be very prone to attacks of fungus in the spring.

It is strange how many pondkeepers complain in April that some of their fishes are being attacked by fungus when this may have been avoided by the simple process of feeding them in the late autumn. The earthworm is always a good food with which to tempt the fishes in a pond, and if one or two are offered each day they will be able to build up a store of strength to last them through the winter. Do not overfeed with dried foods now, as if too much uneaten food remains in the pond it can have dire consequences later on in the winter. Try to keep the pond water as pure as possible at this time of the year, as a pond which has sweet healthy water now is more likely to go through the winter in a good condition than one which already has tainted water.

Unobtrusive Wiring for the Aquarium

(*continued from preceding page*)

the earth pin were fixed, one to a lead wire fixed to the frame and the other to a screw projecting from the hood.

A length of three-core cable with a three-pin plug at each end was run between the three-pin wall socket and the three-pin socket on the tank. For the three-pin socket on the tank stand, an ordinary wall socket was used. It functions in this position as an input rather than output, which is its usual function.

Wiring was now complete and was tested by pouring enough water into the aquarium to cover the heater and switching on. Having seen that the lights worked and felt that the heater was warm, switch 1 was switched off, switch 2 turned on; the thermostat manual control was moved and the lights were seen to turn on and off. Next the tank was set up.

To ensure that no condensation reached the hood I had two pieces of picture glass cut to lie over the top. They measure 11½ in. by 11½ in. and are tubed around the edges. In addition I painted the inside of the hood and the screw heads thickly with white cellulose, which is a better reflector than bare aluminium.

The plywood sheet, painted either cream or the colour of the stand, presents a neat appearance. This is enhanced if the plug and socket are painted to match. In my case they are cream. With all the wiring concealed by the hood and the mains lead largely hidden by the stand leg, one is spared the untidy appearance that can be caused by careless wiring.

The Lyretail

(Aphyosemion australe)

Male lyretail

ORDER:—Cyprinodontes—from Greek *kyprinos*—a kind of carp, and *odontos*—tooth.
FAMILY:—Cyprinodontidae.
SPECIES:—*Aphyosemion australe*, from Greek *phyo*—to grow, Greek *semeion*—a mark, and Latin *australis*—southern.

SEVERAL years ago, this little fish—a native of Africa—was re-introduced to enthusiastic aquarists in this country, and was eagerly purchased by all who had the opportunity. Now it seems largely to have disappeared again, although still appearing on the stock list of some of the larger dealers in tropical fishes.

Maybe this is because it is not the easiest of fishes to breed—in spite of claims to the contrary—and unless in conditions which suit it, tends to fade out most of its beautiful coloration.

Soft, acid water, to which has been added a little sea salt, is ideal. Acidification of ordinary water can be achieved by placing a layer of boiled peat on the bottom of the tank. If fresh, unboiled peat is used, the water will turn the colour of tea and not clear itself for weeks. Water from a mains water softener can be used, or in the absence of this rain water or a mixture of rain water and distilled.

Under such circumstances, fed frequently with live foods (any of the usual will do) and in a temperature range from 70°-78° F., the poorest specimens will pick up and in a few days look new fishes. The males will swim swiftly about the tank, with frequent long pauses, during which time they will pose, all fins spread, and glowing with colour—sufficiently striking to draw unstinted admiration from any who see them thus for the first time—so different from the thin, wan, specimens in many aquaria.

The female of the species is not anything like so colourful, and fails to show any trace of the "lyretail." This makes separation of the sexes possible at an early age—a decided advantage if indiscriminate breeding is not desired.

A plentiful supply of floating plants—*Riccia*, *Lemna*, or uprooted *Cabomba*, *Ambulia* and Indian fern is desirable, because the majority of eggs are laid among these plants. It is on record however, that eggs which fall to the bottom can hatch normally. The eggs are easily seen, are fairly hard, and semi-adhesive.

The male is an ardent suitor, displaying his finery before the female, and pushing her into the clumps of plants. Courtship is a very protracted affair. The first eggs laid by the female may well be hatched out (and they take up to 11 days to do so) before she is spent.

Reliable Parents

Normally the parent fish if well fed do not bother the eggs or fry—this is to be expected where overall spawnings are small, or where the process of egglaying takes so long. The young fish, of course, vary considerably in size. This is one case where culling on size is useless—the smallest fish are not necessarily undernourished or weak—they may be just younger. Of course, they may not, a chance that has to be taken.

The addition of small amounts of powdered dried food a day or two before the first eggs are expected to burst will ensure a supply of Infusoria to feed the fry. By the time the last eggs have hatched the largest fry will be ready to take sifted *Daphnia*, brine shrimp, *Cyclops*, etc. A little sorting out is justified to avoid the possible destruction of Infusoria by these foods and the resultant starvation of the smallest fry.

With ample food, growth is rapid, and the young fish will be half the size of their parents in a couple of months.

Remembering what has been said above, I would recommend any aquarist who intends exhibiting these fish to take sufficient water from the home aquarium to fill the show tank. Only by so doing can he or she be sure that at least the water will favour the fish looking their best. If three sides of the tank can be shaded it will also help.

Breeding the Silver Hatchet Fish *(Gasteropelecus laevis)*

by

ANTHONY E. STANLEY

ON finding in September, 1955, that the two specimens of this lovely fish which I had the luck to possess seemed to be male and female, I cherished no fond hopes of breeding with them. However, by October, they had begun to jump about together violently, and the female seemed full of spawn. When I emptied the community tank in which they lived, I left the two hatchet fish in, to avoid damaging their fins by netting—not for breeding purposes.

So they promptly spawned, violently jumping out of the 3½ in. of water left in this 24 in. by 12 in. by 12 in. tank, from which all plants and rocks had been removed. Most of the eggs floated, only a few sank. After six hours I removed the parents, and put out the 60 watt lamp. The parents were killed soon after by a thermostat failure.

Only the eggs which sank seemed to have hatched, and the others, covered by fungus, were removed. The 15 fry which hatched, all died within three months. I believe this was due to the foods given (Infusoria, then dried egg, mayfly larvae, etc.) and think that some special food is needed at one stage, as all the fry died when about the size of a silver threepenny piece. I hope to obtain another pair, and perhaps next time, if they will only spawn in the summer, I shall be luckier.

Photo: Laurence E. Perkins

Congo Tetra

(Phenacogrammus interruptus)

by

RODNEY YORKE

THE Congo tetra (*Phenacogrammus interruptus*) is quite a recent arrival on the fishkeeping scene but one which has made friends wherever it has appeared. It is quite a big fish for a tetra, at three inches, and needs a roomy tank if it is to be seen to advantage and to have freedom of movement. These fish are always ready for food and will accept almost anything at any level, but they watch the surface and are lightning quick when anything falls on to it. This means that they prefer insect food, a fact they will be pleased to demonstrate for you or your guests if given the chance.

Soft water, low pH (6.6 to 6.8) and a temperature of about 77° F. suits them best, although three degrees either way will not inconvenience them unduly. They enjoy a tank with sunlight or a bright top light streaming in through the surface, and a small shoal of them gives the best effect. Although they can be kept as a community fish they look better on their own, and may not be safe with much smaller fish. As Raymond Yates has so aptly remarked, they resemble in some ways the rather smaller Buenos Aires tetra, which is no angel and can, and does, use its efficient teeth if not well fed. However, even if a fish should lose half of its tail in this way there is no cause for concern, for this grows again in next to no time. This regeneration is accomplished without any obvious scar, a quality not present where fighting fish are concerned. Salt addition has been recommended for keeping this fish, one teaspoonful to two gallons of water, or a little less.

Spawning is possible if the fish are provided with what they need, namely, a sizeable tank, really soft water (low pH, filtered peaty water), spawning root clumps to which to attach the eggs and a temperature of 77° F. Sunshine (or artificial light) is needed for stimulation. Eggs, which are yellowish in colour, tend to expand, as with the common perch, the headstander and *Mogurnda mogurnda*. They hatch in under a week and the following day brine shrimps will be needed. Hard water or high pH tends to encourage fungus on the eggs

For breeding, Dr. Ladiges suggests the addition of 0.1 g. of tannic acid to about 2½ gallons of tank water, the breeders not being put into the tank until two to three days after the inclusion of the acid; this is to prevent suffocation by gill interaction. The acid produces a bacteria-free spawning tank temporarily.

The Congo tetras have unusually shaped tails in the males, and iridescent lights and sheens which are hard to describe as they change with each movement of the fish. The scales are large and the fins bluish. The whole fish has a bluish overcast and lateral lines of this colour intermingled with others. There are several other African tetras somewhat similar but with less colour.

A Rare Barb

(Barbus callensis)

BARBUS CALLENSIS is native to Algeria and Morocco, and perhaps southern Spain. It is seldom seen in dealers' tanks, though it has been known to keen tropical fish fanciers in this country for about 18 years.

It is a long—up to eight inches—slim, rather mournful-looking fish, coloured olive on the back, buff on the side, and silvery-cream to white on the underparts. The male has an irregular dark band or stripe extending between the gill-opening and the caudal peduncle. Above and below this stripe are a few shadowy markings. The species has four noticeable barbels, and swims close to the floor of its tank, where it sifts the sand and noses the plant debris in search of food.

As an aquarium fish, there is nothing very thrilling about its appearance or habits to impress the average aquarist; but as an object of scientific interest it leaves quite a lot of species out in the cold. How true this statement is may be appreciated when it is known that the hot springs which feed some of its native pools often send the temperature up to 180° F. The fish also frequents the springs themselves. According to observers of this fish in its natural surroundings, the great heat does not seem to trouble the fish in the slightest degree.

But whether the barb could survive excessive heat in the restricted space of the ordinary home aquarium is a point which has not been investigated. It is a well-known fact, however, that the fish in captivity does need a temperature of at least 80° F. if it is to remain active and well.

Jack Hems

COLDWATER FISH-KEEPING QUERIES answered by A. BOARDER

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.

I have read that one body inch of fish is calculated to consume the oxygen absorbed by one square foot of water. What size tank would you advise me to get to accommodate at least two shubunkins, allowing for them to reach full size?

I do not know where you read the above but it is not correct. A square foot of surface area, i.e., 144 square inches, is sufficient for six fishes. The usual method is to allow 24 square inches of surface to each inch of coldwater fish. The out-of-date method is to allow an inch of fish to each gallon of water, but unless this is taken in conjunction with the shape of the tank it can be very misleading. For instance, a tank of one cubic foot would hold six inches of fish if the surface were 12 in. by 12 in. If the top of the tank were 12 in. by 3 in. and it was 48 ins. deep it would only hold an inch and a half of fish, although it still contained six gallons of water. On the other hand, a tank 48 in. by 12 in. by 3 in. deep, still holding only six gallons of water, would now hold 24 inches of fish. Allowing for your two shubunkins to grow to six inches in length, you will need a tank at least 24 in. by 12 in. by 12 in. for them.

I have a pond which holds about 300 gallons of water and contains some fairly large goldfish. A short time ago I lost one with the following complaint: a kind of green fungus formed along its back and some patches of black appeared among the red colouring of the fish. Fin-rot set in later and I had to destroy the fish. I am afraid that some more of the fish are similarly affected and wonder if this is a new disease, as I can find nothing like it described in the books.

The fish was suffering from fungus. The green colouring to it often occurs in a pond and it is caused by the presence of myriads of tiny water plants, in other words, algae, the plant which causes the water in a pond to turn green. The black colouring is often an aftermath to a fungus attack. The skin is damaged and when reforming it may come black at first. Ordinary goldfish turn black just before they change to red, and the process is being repeated with the formation of fresh skin. As a change from the salt treatment you can try using Liquitox, advertised in *The Aquarist*; if you carefully follow the instructions you will effect a cure.

I recently bought a small coldwater catfish and would be pleased if you can tell me how to feed it, what temperature to give it and if it can live with goldfish.

The coldwater catfish will take the same meaty and live foods as given to goldfish. It also will be quite happy in water at the same temperatures as goldfish. It can live peaceably with goldfish as long as the catfish is not a good deal larger. European catfish can grow to a large size but are not likely to do so in a small tank.

My one ambition is to breed the common goldfish; so far I have not succeeded. I have a breeding tank 24 in. by 12 in. by 12 in. and would like to know what other equipment is needed.

The only other equipment absolutely necessary is another tank or bowl in which to hatch and rear the fry. A pair of goldfish would give you all the eggs you would need, so do not overstock the tank. Plenty of growing water plants should be in the tank, and if you lower the water to about two-thirds full of water it will suit the fish better. Once they spawn you must either remove the parent fish to another tank or else take some of the eggs which adhere to the water weeds and place them in a spare container for hatching. There is much more to breeding goldfish than this, and I think it would be a good idea for you to get my book *Coldwater Fishkeeping* (obtainable through *The Aquarist*), as this will give you much more information.

I am constructing a pond and find that the cost of material for shuttering is prohibitive. Can you tell me if I can use a piece of hardboard and then move it along to the next piece, and, if so, how can I get over the possibility of leaks later on at these joints?

There is no need to use any shuttering at all. As long as the sides of your pond are not vertical or nearly so, you will find that you can float the concrete on quite easily. A pond with vertical sides is always more trouble to build than one with a natural slope say, of about or just under 45 degrees. The vertical-sided pond is also more likely to crack badly when frozen over than one which has sloping sides. In any case I do not think that you would be very successful at making a pond with separate small pieces of shuttering, as you suggest; the places where you stopped and restarted would be almost sure to leak.

I understand that fishes must have some live food every day. I can get *Tubifex* only twice a week and cannot keep them for long. What else can I use? Would it be all right to feed with chocolate-covered Bemax?

Although it is advisable to feed with some form of live foods as often as possible, it is not absolutely essential. I have kept many fishes healthy for long periods with no live foods. Twice a week with the *Tubifex* will be quite all right, but you will not be able to keep these worms alive for long unless they are under running water. Do not feed with the chocolate-covered Bemax. Ordinary Bemax is a grand food, together with other kinds, but the chocolate would soon discolour the water and I doubt if your fishes have sweet tooths.

I wish to start keeping veiltails and would like to know the answers to the following queries. Do they have to be kept at a steady temperature; is a tank 36 in. by 15 in. by 12 in. large enough to keep them in; do they require special foods and are they liable to any special disease such as swim-bladder troubles?

Your tank is a good one in which to keep veiltails, it will hold about 18 inches of fish, but do not overstock in the first instance as the fish must have room in which to develop. They require no special food, simply the ordinary goldfish foods with some live food when possible. If they are developed fish their feeding will not affect their shape much, but if they are only small fish you may find that a diet with plenty of starchy foods will be beneficial in assisting the formation of a chunky body. A diet which contains Bemax, oatmeal and dried shrimp is quite a sound base, and the addition of garden worms now and then will ensure that the fish keep in good health. As for temperatures, they will do all right at the usual coldwater tank temperatures but in the winter I advise that their water should never be allowed to drop below 50° F. If veiltails have to withstand cold water often they develop blood streaks in their fins, and are liable to get fin-rot or fungus, especially at the ends of the fins. Some strains of veiltails are certainly liable to contract swim-bladder troubles, and it is often those which are very pale in colour. Water in the region of from 60° to 70° F. suits them best. If young are reared in warm water it assists the rapid development of the flowing tail, but too much warmth must not be given as it can encourage less-deep bodies.

I have a coldwater tank in a room and it contains shubunkins, goldfish, an orfe and a bitterling. It is well planted and up to recently has been quite clear. Now the water has become cloudy. I have emptied and refilled but after a time it has clouded over again. I shall be grateful if you can tell me why this has happened.

During the warmer months of the year some tanks do

Photo: William J. Howes

Clear and sparkling water in the coldwater aquarium is obtained only by careful use of dried food and regular removal of excess sediment

cloud up a little. This may be only a temporary phase and the water may clear itself before long. Tanks can cloud up for more than one reason; if green there is probably too much light, if milky and smelly the water has become foul through decaying uneaten food. If slightly milky with little smell it might be through the presence of thousands of Infusoria. Again the cloudiness may be caused by mud or mulm being stirred up from the bottom of the tank. If you take a little of the water and place it under a microscope or strong magnifying glass you will be able to see what is causing the clouding. If something can be seen moving in the water, Infusoria is the cause. This is usually encouraged by uneaten foods in the water. If tiny green spheres are seen then algae appears to be the culprit and light to the tank should be lessened. If just a large amount of dust-like matter is seen this may be mud and silt stirred up by the fish. If the latter, introduce one-half inch layer of washed sharp river grit to the tank, just covering all the base. This should improve matters. If the trouble is Infusoria empty most of the water out, refill and refrain from feeding with any dried foods for at least a week.

On my return from abroad I found my outdoor pond infested with leeches, and a number of fishes had succumbed. I have removed the remainder of the fishes and would like to know how to clear the pond of the leeches.

As you have been able to remove your fishes from the pond the task of clearing the leeches will be less difficult. Whatever disinfectant you could use strong enough to kill the leeches would in all probability kill the fishes. Once the fishes and as many water plants as possible have been removed you can put into the pond some household ammonia or Dettol. Leave for a day or two, then empty the pond, wash it out and refill. Whilst so doing kill all the leeches you see. When you have all apparently clean you can return the plants and fishes. Examine the plants well as some of the leeches are capable of laying eggs on the water plants. If you were unable to empty the pond completely a method you could try would be to lower a piece of raw meat into the pond on a piece of string. This would have to be protected from the fishes by some netting; remove the meat each morning and kill any leeches that are clinging to it.

Last year I bred just over a hundred goldfish in my pond. I removed them before the winter and kept them indoors. Some are 2 to 2½ inches long but none has started to change colour. I have been told that goldfish bred in this country never get the golden colour of imported fish. Is this correct?

No, it is incorrect! It is quite possible to breed goldfish in this country and have them change colour in from three to 12 months. Some strains do not colour up as quickly as others. A lot also depends on the rate of growth, feeding and the temperature of the water. The warmer the water and the more sunshine available the sooner will the fish change colour, but added to this must be the rate of growth; the slow-growing ones are usually, but not always, the last to change colour.

In some books I read that when setting up a tank the compost for the bottom should be coarse sand; others say shale and some recommend some loam. Which is correct?

This is a subject wherein many aquarists agree to differ; that is, some use one thing and some another, although all may be successful. It is a matter of opinion. My own opinion, which I make no claim to be perfect, is that when setting up a tank for the first time it is advisable to place a little loam at the back of the tank. This enables the water plants to get some nourishment and to establish themselves with healthy roots in a fairly short time. On the other hand if too much loam is used, or if it is of the wrong composition, it can cause trouble in the tank later on. The loam used should be a top spit from an old undisturbed meadow which has been allowed to stand to rot down a little. For the 24 in. by 12 in. by 12 in. tank about two double-handfuls is sufficient. This should be covered with about two inches of sand at the back and enough sand in the front to come up to the top of the bottom frame. If no loam is used it is a good plan to set your plant cuttings in small pots or jars of loam. These are placed in water until fresh growth is made, when the whole root system can be buried in the coarse sand near the back of the tank. There is no doubt that the provision of some loam enables the plants to become established more quickly and grow better. Too much nourishing soil should not, however, be added as then the plants' roots will not need to search for food in the tank and so will do less to help clear up the waste matter from the fishes.

I am anticipating setting up a furnished tank and have been told by a dealer that he never uses plants in a tank as he considers that they are quite unnecessary. What is your opinion?

I have seen and judged hundreds of tanks but have yet to see an attractive one set up with no plants at all. Apart from their decorative value plants can do considerable good in helping to keep the water clear and pure. They give off oxygen under good light and use up much decaying matter in the tank. Plants can be dispensed with in some fry tanks but if I were setting up a tank for decorative purposes I would always use some water plants.

Cacti in the Fish House

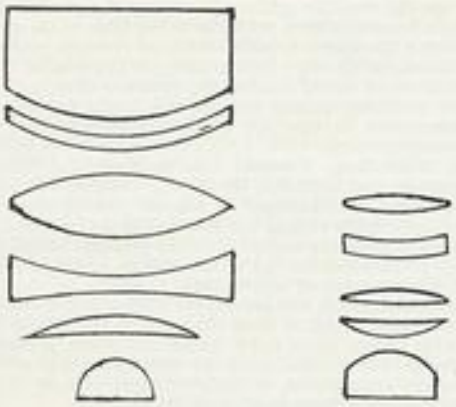
ONCE fresh growth is seen in a cactus the plant must be watered as often as it dries out. Knowing when water should be given or not is most important, as no success is likely if this point is not understood. Obviously no plants can grow without some water but over-watering will do more damage than anything else. The amount of water needed will vary according to the plant; a young growing one will need more than an older plant. Also the position of the plant will make a great deal of difference. Plants in a fish house will get a certain amount of moisture from the air, whereas plants on a tropical tank in a living room are likely to dry out more quickly. The weather also has a great deal to do with the frequency of watering; in a hot summer, small pots can dry out in a matter of hours and even once a day is not enough watering to keep the plant healthy.

Microscopy for the Aquarist—22 *by* C. E. C. COLE

THE table which accompanied my article last month tells quite a story about object glasses. One thing that must have been immediately plain to you all is the indisputable fact that good moderate- and high-power objectives are quite expensive. I sometimes hear it said that they should be considerably cheaper—that the whole business is a racket, etc.

At one time, years ago, I was inclined to agree—but now I have a different opinion. A word or two on what is involved before the finished product is saleable will help you, too, to change your mind.

To begin with, all medium- and high-power object glasses are compound lenses—not single pieces of glass. In fact, they may comprise as many as six separate elements, and at least two different kinds of glass. A glance at the accompanying diagram will make it clear that the lenses are not even similar in shape, necessitating extremely careful preparation and mounting. The slightest inaccuracy in any of the elements will ruin the performance of the whole objective.

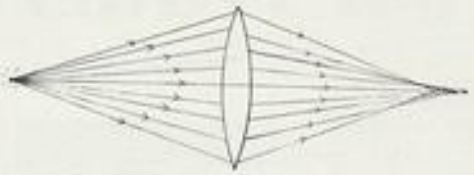


Sectional views of the arrangements of lenses found in an oil-immersion objective ($\frac{1}{12}$ in., left) and in a high-power dry objective ($\frac{1}{6}$ in., right)

Is such a complicated lens necessary? Well, let's see what would happen if only a single lens was used. It has already been stated in early articles of this series that light rays from any given point are bent out their original course upon encountering glass at any angle other than a right angle. The ray or rays striking it at exactly 90 degrees pass straight through without the slightest deviation, and are called "normal rays." This property of glass is made extensive use of in the construction of lenses.

A single lens, convex either side, will concentrate all the rays reaching one side of it from a given point into an imperfect image of that point at an equal distance the other side of the lens, at what is known as its principal focus. The imperfections in the image are caused through several different kinds of aberrations, all of which must be corrected before an almost perfect replica of the point is produced.

The principal aberrations are "spherical" and "chromatic." No matter how carefully ground or polished a simple double-convex lens may be, the rays passing through the outer edges will come to a focus at points slightly different from those rays passing through the middle.



Rays of light from an object (left) which pass through the edge of a lens focus closer to it than rays passing its more central parts. This causes "spherical aberration" of the image

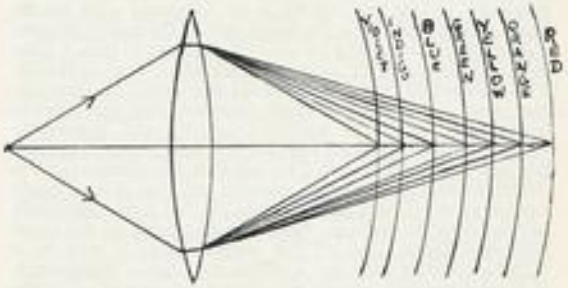
White light—daylight—is composed of a mixture of red, orange, yellow, green, blue, indigo, and violet light rays, all of which come to a separate focus. Violet is nearest the lens, red furthest away. Not only this, but different colours magnify to different extents. The computer of a quality high-power object glass incorporates different-shaped lenses, some of crown and some of flint glass, and succeeds in overcoming the aberrations to a remarkable degree.

As far as chromatic aberration is concerned, most object glasses are "corrected" for one colour. These are the achromatic lenses. Semi-apochromatic or fluorite lenses are corrected for two colours, and the finest of all lenses, the apochromats, are corrected for three. These last are extremely costly, and must be used with specially constructed "compensating" oculars or eyepieces. Having justified as far as possible the expense of the good achromatic objectives in my table, let us look at the other columns.

Column two is the English translation of column three. Column three is the so-called focal length of the objective. A more accurate and less misleading term would be "equivalent focus," for it is not the true focal length of the objective, but that of a simple lens with an equivalent power of magnification, and we have already shown that our object glasses are anything but simple lenses.

The next column is headed "N.A." Before embarking upon an amplification of this term, what can we discover from looking down the column? It is immediately apparent that among the various members of each individual group of a given power, the "N.A." differs only slightly, but between the groups it is considerable.

(*Please turn to page* 136)



Colour light rays are bent (refracted) to different degrees by a lens. This causes "chromatic aberration" of the image

our readers write

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

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

Sex Changes in Fishes

I SHOULD very much like to compliment Dr. Myron Gordon on the excellent evaluation of evidence regarding sex changes in the swordtail and other viviparae (*The Aquarist*, July). There appears to be a very widespread acceptance of extremely poor evidence in this connection, and the lucid manner in which Dr. Gordon explains the essential requirements for complete sex change should go far towards disposing of the misapprehensions which are so widely distributed amongst aquarists.

I hasten to say that in spite of long experience with livebearers, and with due acknowledgement of Dr. Gordon's infinitely superior qualification, I still maintain an open mind on this subject, and perhaps I may be allowed to draw attention to two points made in the article, which are apparently not quite in line with the general argument put forth. Firstly, it is stated that a" perfect gonopodium is essential for transfer of sperms from male to female" (caption to figure "The distal half of male swordtail's gonopodium").

This statement seems to me to suggest that the writer is accepting a negative quantity as positive evidence, or at least assuming what has not, so far, been proved, i.e. that an imperfect gonopodium *cannot* be used to fertilise a female. Would Dr. Myron Gordon be prepared to *prove* that no fertilisation has ever, or can ever occur without the presence of perfection in the secondary male appendages? I think the statement in question is a little too broad.

Secondly, the example of an apparently reversed fish depicted on page 66 is a remarkably poor one. Even macroscopically, the fish has only a superficial resemblance to a male, in that the anal fin is by no means even faintly like a gonopodium, and the lower rays of the caudal present a very poor picture of a sword. In contrast to this, I have in my aquarium at the moment a fish which is so obviously a male swordtail that nobody would ever dream of questioning its sex. I happen to know, however, that this fish has borne two broods of perfectly healthy and apparently normal young. I do not say that it is now a fully functioning and potent male, but I do say that the gonopodium is macroscopically identical to normal, and that it is as freely mobile as any I have seen. Also, the fish pays apparently normal court to females, including all phases of the usual courtship dance. All of this suggests that it may be a fully functioning male, but I still do not know. Body shape is now completely masculine, suggesting almost complete disappearance of the large amount of ovarian tissue, and in contradistinction to the fish pictured, which is still typically female in outline and still appears to have a large ovary.

Perhaps Dr. Gordon will agree that the development of a secondary sex-character such as sword, is more probably due (on the available evidence) rather to the positive action of male hormones from testicular tissue, than to the absence of female hormones brought about by removal or atrophy of the ovarian glands. In that case, the appearance of even a small sword would indicate the presence of at least some active testicular tissue, and as this could hardly occur spontaneously in late life, it must therefore have been present from birth.

In concluding, I would like to make the following suggestion, and hope that Dr. Myron Gordon will deem it worth some consideration. I suggest that all female fish which apparently change sex later in life are endowed from birth with testicular tissue. It is the presence of this tissue which predisposes the fish to sex change, and it is possible that the presence of active male hormone in the initial development stages will prevent the completion of degeneration in bone structure from the male to the female form. In other words, could not a female which was predestined to change, retain sufficient of the male anatomical structure to render regeneration of such structure at least feasible, when the testes "took over" from the ovary?

Perhaps someone will dissect a female showing the very first signs of changing, and determine whether the bone structure at the base of the anal fin shows any difference from the normal female anatomy.

L. WARBURTON, Romiley, Cheshire.

More Salt Wanted

MR. L. R. BRIGHTWELL is not alone in his surprise at the slow progress of marine aquaria in private homes. I, for one, am astonished and dismayed at the extraordinary want of literature on the subject in England.

In America the marine part of the hobby is 75 years ahead of England, and it is not uncommon to find articles on sea aquaria in American journals. The number of dealers selling tropical marine fishes on the east and west coasts of the U.S.A. puts England to shame. In Miami alone there are half a dozen or more dealers where one may buy the most gorgeous Caribbean fishes, at very moderate prices, as well as living marine invertebrates and plants along with dead coral, sea-fans, sponges and shells. Cleverly constructed aquaria with the glass sides projecting higher than the top rim of the stainless-steel frame are popular, as the arrangement prevents any stray drops of sea water from falling back into the tank. Some dealers import beautiful coral fishes from Hawaii and the western Pacific. Mr. Straughan of "Coral Reef Exhibits" has successfully bred the

neon goby seven times, and has made a colour film of the event.

The high price of bright coral fishes in England, and the relative drab colours of the native "marines" as compared with the showy freshwater tropicals may account for the lack of interest, but I very much fear the real root of the trouble lies in the too conservative character of the British people. They have slowly come to accept many things but anything new is usually frowned upon. The freshwater tank is part of English life but the marine tank (with real sea water, Great Scott!) is as yet considered too foreign; almost in bad taste.

And so it is that the British aquarists keep telling each other *ad nauseam* the already well-known methods of breeding this or that species, and lose many valuable years of their life in discussing and rediscussing the already endlessly discussed guppies, platys and goldfish. There is no excuse for it. Sea-salt mixtures are now on the market (at least in America) and are claimed by many to be better than real sea water. But if the marine branch were to develop in England, many dealers would carry a supply of natural sea water. Let's have "a little more salt in some writers' essays."

JOHN BOURSOT,
El Salvador, C.A.

Temperature and Tropicals

WHY a tropical fish transferred suddenly from warm to very cold water dies in a very brief period of time is a problem of considerable interest. Though we have only a rough idea about the actual processes involved, it can be shown quite easily that death is not due to anoxia (lack of oxygen) produced by cessation of gill action as suggested by Mr. Yates when he states "Tropicals die in colder water because they become so numb that paralysis sets in, their muscles no longer work and breathing stops. If a current of water could be passed over the gills it might be possible to save some such chilled fish which die merely because the breathing action stops . . . "—(*The Aquarist*, July, 1956).

The following are the reasons why such an explanation is unacceptable. A fish respires not only through its gills but also through its skin. Cessation of gill action for a few seconds or even minutes is not therefore likely to cause death. One of the best examples of cessation of gill action is seen in a fish when a food particle becomes impacted in its mouth or throat. In some cases, of course, the obstruction is partial, but in many others it is total and no gill movements can be seen. Under such circumstances no fresh water can flow over the gills. Yet the fish often remains alive for approximately 15 to 30 minutes, and if within that time the obstruction can be removed, it swims away none the worse for the experience. I have learnt from bitter experience that feeding young barbs on coarsely chopped maggots is an almost certain method of producing this sort of trouble.

Another instance illustrating that cessation of gill action is not necessarily followed by death within a few seconds is when a fish jumps out of water. The gills are then more or less useless and out of action, yet if the skin of the fish is kept damp it can often survive for more than an hour; on the other hand, if it is allowed to dry it will die shortly afterwards, as drying interferes with the gaseous exchange through the skin. Even a frog, with apparently well-developed lungs, cannot survive very long if its skin is allowed to dry out, for it also relies heavily on oxygen obtained through the skin.

One interesting point that one may note here is that, as one would expect, a fish whose gills are rendered functionless (i.e., by choking on a large food particle) will last longer in air than in water, for air is richer in oxygen. Thus we see that cessation of gill action cannot, and does not, cause death in a matter of seconds; it may do so after many minutes or hours. As a general rule it would be safe to say that anoxic deaths are long drawn-out affairs. For instance, it takes quite some time for a man to drown to death or to be smothered to death. For most tissues can survive partial anoxia for a considerable length of time.

Tropical aquaria are the hobby of Mr. D. W. Richards, who is a restaurateur, so he has combined business and pleasure by installing tanks in the Bodega Restaurant in Manchester. "The Aquarist" appears to be on the menu!

When death occurs in a matter of seconds as it often does in chilled fishes (90 seconds is the time quoted by Mr. Yates), it is safe to seek the explanation in the nervous rather than the respiratory system. Indeed, the most likely explanation of why a tropical fish dies when suddenly immersed in cold water is primary nervous shock. By this we mean that harmful stimulii reaching the nervous system and brain causes reflex inhibition of the cardiac (heart) action. Any painful stimulus (sometimes quite trivial), not necessarily extreme cold, can do this, and the effect is also seen in many other animals and man.

The most interesting example in this connection is the almost parallel one of people who have committed suicide by jumping into icy waters. It is found that in such cases death sometimes occurs in a few seconds due to shock, as explained above, for on post-mortem examination we find that the numerous classical signs of asphyxial death and drowning (water in the lungs) are absent.

DR. F. N. GHADIALLY,
Sheffield, 10.

Oldest Society

I HAVE only recently taken over secretaryship of the Scottish Aquarium Society, whose headquarters are in Glasgow, and its membership is drawn from a wide circle throughout the country. The society was formed in 1927 and I have in my possession the attractive programme which marked our Silver Jubilee in 1952.

This makes us considerably older than the Croydon A.S., and though, strictly speaking, we may not be in the English-speaking world as most of our members are Scots, I think we can fairly claim not only to challenge the Croydon statement but surpass it in no small measure.

At the moment we are going forward vigorously with a very full programme of lectures, talks and exhibitions and I am bending my personal energies to expand public interest still further in the society and also in the pastime as a whole. I would thank you to draw the attention of the Croydon A.S. and to your readers generally the facts as I have given you.

R. B. DICKSON,
Glasgow, C.1.

Loss of Cryptocoryne Plants

ABOUT three years ago I placed two or three roots of *Cryptocoryne cordata* in a 24 in. by 12 in. by 12 in. tank. In time they became firmly established and developed into very nice plants with large, finely coloured leaves. A few weeks ago all the large leaves suddenly decayed, and I was left with some very much dwarfed plants. I cleared away all the decayed matter and waited, hoping that the plants may have passed through some kind of seasonal change. The small shoots grew to an inch or so in length, became mushy, and died away. The plants did not seem to be dead, however, as new shoots continued to appear rapidly, these also rotting when quite small.

I decided that it was time to strip the tank and I found that the *Cryptocoryne* had developed a tangled mass of very long roots. Jumping to the conclusion that this was the cause of the trouble, I re-set the tank with fresh sand, and replaced the plants after thinning out the roots. In the meantime, a friend asked me to look after his aquarium, pending a removal, and this was transferred to my home. His collection included several pieces of *cordata* and I placed one of these in my own tank. Within a few days, all the large leaves had died but new shoots continued to appear. The remainder of his plants in another tank continued to flourish.

In view of all this, I am wondering whether *Cryptocoryne* may be subject to some kind of communicable disease which, however, does not affect other species of plant. The *Hygrophila* and Amazon chain sword plant, which I also have in the tank, are doing well, as are the fishes.

If any of your readers have had any experience of this kind of occurrence I shall be very glad to hear about it.

P. J. THOMPSON,
London, W.14.

Loch Ness Monster

WITH reference to an interesting article on the Loch Ness monster may I quote Sir Arthur Keith, who said, when a certain "Daily" first launched the monster many years ago: "People talk of *the* Loch Ness monster, but if there is one at all it must have a mother, a father and possibly aunts, uncles, etc.—if not brothers and sisters—for it may be an only child, but there *must* be relatives of some sort.

"In conclusion I suggest the Loch Ness monster is less a case for the scientist—or biologist than the psychologist." The last paragraph is significant.

L. R. BRIGHTWELL,
Peacehaven, Sussex.

Microscopy for the Aquarist

(*continued from page* 133)

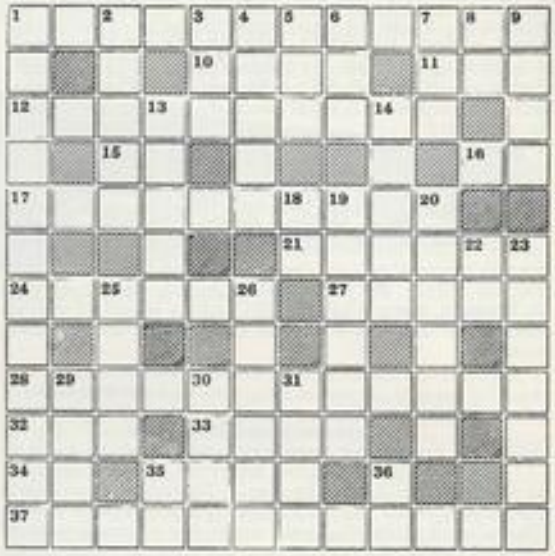
The smaller the power of the objective the smaller the N.A. Column five again shows that difference in magnification among the objectives of equivalent power is only small, but marked between the separate groups of objectives. It would seem from this that there is some connection between N.A. and magnification.

Column six contains just a few indications of working distance to be expected when the objectives are in use. They are only a rough guide, for working distance (the distance from the object slide, when the object is in focus, to the lens) varies according to tube length, oculars in use, and quality of eyesight of operative.

Nevertheless they do indicate that the higher the value of the objective the nearer it has to be to the object in order to focus it.

The AQUARIST Crossword

Compiled by J. LAUGHLAND



CLUES ACROSS

1 *Kryptopterus bicirrhis* (5, 7)
10 Imago loses a thousand. Ah! —the pity of it (4)
11 Female fallow deer (3)
12 One of the best pond grasses for aeration (10)
15 Christian era (1, 1)
16 Denoting presence, nearness, or relationship (2)
17 Hair grass (10)
21 Angler afloat, perhaps; or straw hat (6)
24 Cavity which immediately contains the ovum (6)
27 *Aequidens*, a cichlid (5)
28 Tire most chat (anagram) (12)
32 Mainly organ of balance in fishes (3)
33 She shows the flag by the pool (4)
34 City of the Chaldees (2)
35 Fin seen in canal (4)
37 Common tiddlers or Jack Sharps (12)

CLUES DOWN

1 Species of nest-building fishes (British) (12)
2 Microscopic floating plant life (5)
3 Rest on haunches (3)
4 Anglers' haul (5)
5 Turkish chief officer (3)
6 Rocky height (3)
7 The girl for aid when confused (3)
8 Thus you see half a sole (2)
9 Condition-controlled thermostat (4)
13 Gods, or a variety of goldfish (5)
14 Pertaining to lower intestines (5)
18 Qualified seaman (1, 1)
19 Cooks in oven or before fire (6)
20 Begins (6)
22 Royal cypher (1, 1)
23 Her cans (anagram) (7)
25 Rise in a way from Linden's river (4)
26 Lo! char confused promise harmony (6)
29 Stag of six years or over (4)
30 Fur is chiefly writing fluid (4)
31 Strain (4)
35 Current of 27 Across (1, 1)
36 Car from 27 across for motoring body (1, 1)

PICK YOUR ANSWER

1. George Boulenger, the famous ichthyologist, died in: (a) 1907. (b) 1917; (c) 1927; (d) 1937.
2. *Mugurnda mugurnda* is referred to the family: (a) Achiridae; (b) Eleotridae; (c) Gobiidae; (d) Pomacentridae.
3. The generic name of the four-spined stickleback is: (a) *Apeltes*; (b) *Eucalia*; (c) *Gasterosteus*; (d) *Pungitius*.
4. *Limia vittata* is native to: (a) Cuba; (b) Dominica; (c) Jamaica; (d) Trinidad.
5. In Japan the moor goldfish is known as : (a) demekin; (b) maruko; (c) ranchu; (d) shukin.
6. The popular name of *Potamogeton densus* is: (a) duck's meat; (b) frogbit; (c) frog's lettuce; (d) swanweed.

G. F. H.

(Solutions on page 138)

News from AQUARISTS' SOCIETIES

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

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

ONE or two societies in the **Association of South London Aquarist Societies** have successfully arranged lectures on the subject of the hobby for societies, youth clubs and other bodies who normally have no connection with fishkeeping. In order to further spread the interest of the hobby the Association is offering to supply speakers and even film shows to any group in the South London area. **Forest Hill and District A.S.** has been doing this for two years or so, and has found youth clubs most receptive to the idea.

* * *

AT a meeting of the **Belle Vue (Manchester) Aquarium Society** held on 2nd August the twentieth anniversary of the society's foundation was celebrated. An "animal, vegetable or mineral" quiz was held during the evening.

* * *

BASINGSTOKE **Aquarist Society** obtained 10 awards at the recent Portsmouth show. These included 1st and 4th in livebearers breeders' class—Mr. W. H. Lock-Bowers (black mollies) and Mr. D. L. Edmonds (guppies) respectively; 2nd in egglayers breeders' class—Mr. B. Keeping (rainbow cichlids).

* * *

NEXT month (2nd October) **Blackburn and District Aquarists' Society** are to hold a film show, at People's College, Whalley Range, and members of all nearby societies are invited to attend. Also planned for October is an outing to Blackpool for members.

* * *

A GROUP of established aquarists of the Borough of Lewisham have formed the **Brockley Breeders Circle**. Membership is by invitation and there is no competition to be offered towards the societies already existing in the area. The aims of the group are twofold: 1, to encourage the examination of all aspects of fish-keeping; 2, to encourage the growth of organised fish-keeping. These aims are followed in the programme, which is also twofold: "internal"—discussion groups in which all participate; "external"—to increase the strength of local societies by organising exhibits, giving talks, film shows, etc. Prospective new aquarists to be directed towards their nearest society. At a recent meeting of the Circle, a 50-frame filmstrip entitled "Fish out of Water," was shown by a member, and a short commentary given.

The strip was in colour and shows clearly the unique breeding procedure of the "grunnion"—a marine fish found off the coast of South California, U.S.A. During the highest early summer tides these fish come up in the breakers to deposit their eggs at high-water mark; the fry become free-swimming when the waters reach them again some 14 days later. Eggs have on occasions been dug up from a depth of 18 in. and several hundred feet from normal water level. It is understood that local people make up "grunnion fishing parties" and go picnicing on the beach at the appropriate times. Fish may be had easily as they launch themselves through the surf.

* * *

CUP winners at the recent members' show of the **Cambridge and District Fishkeepers' Club,** held at their clubroom in the New Spring, Chesterton Road, were Mr. R. Thurston, Sadler Cup and Lambert Shield; Mr. B. Mynott, Fuller Shield; Mr. M. Diver, Reserve Cup and Yallop Shield; Mr. D. Savidge, Pairs Cup; Mrs. E. Condor, Livebearer Cup. Class winners were:

A. V. Coldwater Fish—1 and 3: goldfish, Mr. B. Mynott; 2: shubunkin, Mr. M. Diver.

A. V. Livebearer—1: Red swordtail, Mrs. E. Condor; 2: d. s. guppy, Mr. D. Savidge; 3: wagtail platy, Mr. R. Thurston.

Anabantids—1: Siamese fighter, Mr. Diver; 2: leeri gourami, Mr. A. Wilson; 3: Siamese fighter, Mr. D. Savidge.

Cichlids—1: zebra cichlids, Mr. D. Savidge; 2: Jack Dempsey, 3: Jack Dempsey, Mr. B. Mynott.

A. O. V. Egglayer—1: silver tetra, Mr. R. Thurston; 2: blind cave fish, Mr. R. Thurston; 3: red-line *Rasbora*, Mrs. B. White.

Pairs—1: blind cave fish, Mr. D. Savidge; 2: nigger barbs, Mr. J. Hesson; 3: three-spot gourami, Mr. D. Savidge.

* * *

AT the recent Lambeth open show **Chelsea Aquarium Society** collected one silver cup, four gold medals, four award cards for seconds and three cards for third positions. The club furnished tank was placed third. This was Chelsea's most successful show so far. In August, Chelsea held their second annual show and exhibition in conjunction with the local cage-bird society. The theme of the show this year was "Aquarium in the Home and Garden."

* * *

WITH 275 entries at this year's annual show of the **Corby and District Aquarists' Society** the display was much larger than last year. Federation judge, Mr. B. Meadows, commented on the high quality of the exhibits, and 11 gold stars (for 90 points or over) were awarded. Results were:

Individual furnished tropical aquaria—1, Mr. A. Baldock (Hendon); 2, Mrs. R. Skipper (Hendon); 3, Mr. S. D. Simons (Kettering); 4, Mr. N. E. Lyon (Northampton). Coldwater aquaria—1, Mr. W. Snedker (Northamp-

British Aquarists' Festival Next Month

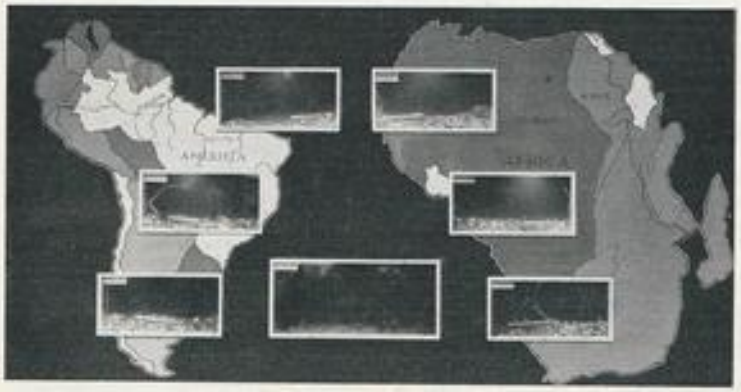


Exhibit staged at last year's B.A.F. by Ashton-under-Lyne and District Aquarium Society

ON 6th-7th October, the B.A.F. is being held at Belle Vue Gardens, Manchester. Visitors are promised a good show, for this is the aquarists' exhibition with an entirely original method of presentation.

LIST OF AWARDS

Best fish of the Show (awarded to the owner). "Daily Dispatch" Challenge Trophy and "The Aquarist and Pondkeeper" prize card.

Classes 1A-1B and 14. Best furnished aquarium: The Cussons Silver Challenge Trophy and "The Aquarist and Pondkeeper" prize card.

Class 1. Six pairs of fish: The St. Martin's Aquaria Trophy and "Aquarist" prize cards.
" 3. 1st £25, 2nd £15, 3rd £10. The Hammond Trophy and "Aquarist" prize cards.
" 4. Federation of Northern Aquarium Societies Trophy and "Aquarist" prize cards.
" 5. Livebearers: The Fraser-Brunner Silver Challenge Cup and prize cards.
" 6. Coldwater fish: The Belle Vue Trophy and prize cards.
" 7. Cichlids: The National Aquarists' Society Trophy and prize cards.
" 8. Labyrinths: The F.N.A.S. Trophy and prize cards.
" 9. Fighters: The Bland Trophy and prize cards.
" 10. Barbs: "The Aquarist and Pondkeepers" Trophy and prize cards.
" 11. Characins: The East Lancs. Trophy and prize cards.
" 12. A.O.V. Tropical Fish: F.N.A.S. Trophy and prize cards.
" 14. Individual furnished aquaria: Prize as in Classes 1A and 1B.
" 15. F.N.A.S. Trophy and prize card.
" 16. F.N.A.S. Trophy and prize card.
" 17. F.N.A.S. Trophy and prize card.

Subject to entries and the Judges' decisions, trophies are available for the best common goldfish, shubunkin, guppy, angel fish and plants.

The trophies and prizes in Classes 1A, 1B, 2, 3 and 4 are awarded to societies only; the awards in the other classes will be made to the owner of the fish or plants, who must be a member of the society staging the exhibits.

Fully detailed schedules are available now from show secretary: Mr. G. W. Cooke, Spring Grove, Fieldhill, Batley, Yorks.

ton); 2, Mr. W. Hailstone (Corby); 3, Mr. J. Harris (Kettering); 4, Mr. S. D. Simons.

Tropical egg-layer brood—1, Mrs. B. Robertshaw (Hendon); 2, Mr. and Mrs. Turtle (Bedford); 3, Mrs. B. Robertshaw; 4, Mr. D. Wright. *Tropical* live-bearer brood—1, Mr. J. Krzenek (Corby); 2, Mr. H. Thompson (Corby); 3, Mr. B. A. Abraham (Bedford); 4, Mr. J. Krzenek.

Coldwater brood—1, Mr. W. Hailstone; 2, Mr. D. J. Atkins (Corby); 3, Mr. S. D. Simons; 4, Mr. Page (Bedford). *Guppy*—1, Mr. D. Brett (Corby); 2, Mr. P. Edwards (Hendon); 3, Mr. B. A. Abraham; 4, Mr. P. Edwards (Hendon).

Swordtail—1, Mr. D. Coulter (Corby); 2, Mr. G. H. L. Booth (Bedford); 3, Mr. and Mrs. Turtle; 4, Mr. D. Worlding (Peterboro'). *Platy*—1, Mrs. R. Robertshaw; 2, Mrs. G. Richardson (Hendon); 3, Mr. S. A. Bean (Peterborough).

A. O. V. tropical live-bearer—1 and 2, Mr. E. Love (Bedford); 3, Mr. J. Krzenek; 4, Mr. P. L. Craddock (Kettering). *Characin*—1, Mr. L. Bell (Hendon); 2, Mr. R. Oliver (Hendon); 3, Mr. D. R. Hunt (Bedford); 4, Mr. H. Thompson and Mr. R. Sutherland (Corby.)

A. V. barb—1, Mr. R. Taylor (Hendon); 2, Mr. G. H. L. Booth; 3, Mr. J. Krzenek; 4, Mrs. D. Nixon (Corby). *Catfish*—1, Mr. A. J. Wainwright (Hendon); 2, Mr. H. Thompson; 3 Mr. S. D. Simons; 4, Mr. G. Richardson (Hendon).

Labyrinth—1, Mr. D. Coulter; 2, Mr. H. Thompson; 3, Mr. G. Richardson; 4, Mr. H. Thompson and Mr. D. Coulter. *Cichlid*—1, Mrs. M. Dicks (Corby); 2, Mr. G. Richardson; 3, Mr. A. Baldock (Hendon); 4, Mr. D. Coulter and Mr. R. Whitehead (Peterborough).

A. O. V. tropical egg-layer—1, Mr. D. E. Jones (Corby); 2, Mr. R. Fisher (Hendon); 3, Mr. C. P. Hanchard (Bedford); 4, Mrs. R. Robertshaw. *Common goldfish*—1, Mr. T. Atkinson (Hendon); 2, Mr. Meads (Bedford); 3, Mr. R. R. Pope (Bedford); 4, Mr. W. Watson (Corby).

Fantails, veiltails, moors—1, Mr. H. H. Ede (Nottingham); 2, Mr. W. Hailstone (Corby); 3, Mr. S. D. Simons; 4, Mr. W. Hailstone. *Shubunkins*—1, Mr. R. R. Pope; 2, Mr. W. Watson; 3, Mr. E. T. Davison (Hendon); 4, Mr. W. Hailstone. *A. O. V. coldwater fish*—1, Mr. W. Hailstone; 2, Mr. R. Skipper; 3, Mr. F. Oliver (Hendon); 4, Mr. W. Hailstone.

The C.A.D.A.S. perpetual challenge trophy (club championship) went to the Corby society, who beat Hendon by nine points.

Noble trophy, for the member gaining the highest points total, Mr. W. Hailstone.

* * *

THE aquarist section of the Dagenham Town Show was extremely well supported this year by members of the **Thameside, Romford** and **Thurrock Aquatic Societies.** This year was the first time Thurrock A.S. had joined the two local clubs in putting on this annual display and celebrated the occasion by winning the cup for the inter-club furnished aquaria competition. The number of entries for the 21 competitive classes was above the normal, and Mr. Mealand and Mr. Creed (F.B.A.S. judges) were impressed by the overall quality. The diploma for "Best Fish in Show" was won by Mr. W. Gawler of Thameside A.S., and best individual furnished aquaria by Mr. F. Ahrens of Romford A.S. Plans are already being laid for big improvements and novelties for the 1957 D.T.S.

* * *

"SETTING up a Tropical Aquarium" was the title of a lecture and demonstration given to **Derwent Aquarist Club** members at a recent meeting. Mr. Frank Holloway, who gave the lecture, also won plaques in a table show for any variety fish with a thick-lip gourami and a *Pelmatochromis kribensis*. Show judges were Mr. T. A. Mear and Mr. D. W. G. Fretwell, chairman and secretary respectively of the Burton-on-Trent and District Aquarists' Society

* * *

MR. R. O. B. List, secretary of the F.B.A.S., reports that he has been advised from the Persian Gulf that an experiment with the use of tape recordings has been successfully concluded.

These tapes were made with lecture material and were sent out to the Bahrain Island Aquarists Club, at the request of their (then) secretary, Mrs. V. Fenwick.

With the assistance of Mr. J. P. Mitchell (F.B.A.S. council member), who had most of the necessary equipment, the tape recordings were made and the necessary data collected so as to avoid obliteration of the tapes, as they were being sent by airmail and the magnetic fields in aeroplanes tend to obliterate the recordings, unless precautions are taken such as foiling before packaging.

This was done and as well as lecture material, it was possible to record some of London's noises—trains, etc., for those out there who know London. The tapes arrived safely and provided a great treat for the Britishers on Bahrain Island. This will now provide a source of further lectures for that society, and, as well, enable the F.B.A.S. to send lectures by this method to other overseas affiliated societies.

* * *

AN open show held by **Romford Aquarists Society** on 11th August attracted 1,500 visitors. Entries totalled nearly 200, the best-supported class being that for barbs. The furnished aquaria classes were poorly supported compared with previous shows but the general standard was good. An outstanding *Badis badis*—a real "jewel"—took "Best fish in show" for Mr. Brightman of Mitcham. He also scored a clear-cut victory in the breeders' egglayers class in which he took all three awards; his neeri gouramies were particularly good. Results were:

Inter-club Furnished Tropical Aquaria—1, Romford A.S.; 2, Forest Gate A.S.

Individual Furnished Tropical Aquaria—1, Mr. A. J. Wilson; 2, Mr. A. J. Wilson; 3, Miss P. Berkley.

Male guppies—1, Mr. R. Alley; 2, Mr. F. Ahrens; 3, Mr. R. Hammond.

Female guppies—1, Mr. R. Alley; 2, Mr. A. J. Wilson; 3, Mr. R. Alley.

Mollies—1, Mr. V. Owen; 2, Mr. F. Ahrens; 3, Mr. R. S. Barnes.

Platys—1, Mr. A. L. Stebbing; 2, Mr. P. Tidmas; 3, Mr. R. Alley.

Swordtails—1, Mr. C. E. Berkley; 2, Mr. A. L. Stebbing; 3, Mr. L. F. Clemens.

Barbs—1, Mr. R. Adamson; 2, Mr. R. Adamson; 3, Mr. C. E. Berkley.

Danios, rasboras and minnows—1, Mr. J. Wilson; 2, Mr. C. E. Berkley; 3, Mr. J. O'Farrell.

Characins—1, Mr. C. H. Brightman; 2, Mr. J. Wilson; 3, Mr. F. Ahrens.

Siamese fighters—1, 2 and 3, Mr. F. Ahrens.

A. O. V. labyrinths—1, Mr. L. F. Clemens; 2, Mr. F. Ahrens; 3, Mr. A. J. Wilson.

Dwarf cichlids—1, Mr. F. Ahrens; 2, Mr. J. O'Farrell; 3, Mr. F. Ahrens.

A. O. V. cichlids—1, Mr. C. H. Brightman; 2, Mr. F. Ahrens; 3, Mr. L. F. Clements.

Catfish—1, Mr. R. Morgans; 2, Mr. F. Ahrens; 3, Mr. R. Morgans.

Egg-laying tooth carps—1, Mr. C. E. Berkley; 2, Mr. A. J. Wilson; 3, Mr. L. F. Clements.

A. O. V. tropical fish—1, Mr. C. H. Brightman; 2, Mr. F. Ahrens; 3, Mr. C. H. Brightman.

Breeders (egglayers)—1, 2 and 3, Mr. C. H. Brightman.

Breeders (livebearers)—1, Mr. R. Alley; 2, Mr. E. D. Thompson; 3, Mr. A. J. Wilson.

A. V. Tropical Aquarium plant—1, Mr. F. Ahrens; 2, Mr. A. J. Wilson; 3, Mr. C. E. Berkley.

Pilditch cup for best fish entered by member of Romford A.S., was won outright (third successive win) by a black shark (Mr. F. Ahrens). Salmon cup for best furnished aquaria by member of Romford A.S. (Mr. A. J. Wilson). Salmon junior cup for best furnished aquaria entered by member of Romford A.S. under 16 years (Miss P. Berkley). Smith cup for best entry by junior member of Romford A.S. (Miss P. Berkley). Judge, Mr. C. W. Creed (F.B.A.S.).

Aquarists' Calendar

12th-15th September: **Coventry Pool and Aquarium Society** annual show at St. Margaret's Institute, Ball Hill, Coventry. Opening times, first day 7 p.m.-9 p.m., all other days 10 a.m.-9 p.m.

19th-22nd September: **Peterborough and District Aquarists' Society** fourth annual open show at St. Paul's Church Hall, Lincoln Road, Peterborough. Schedules and entry forms from show manager Mrs. S. Bean, 195, Eastern Avenue, Peterborough.

20th-22nd September: **Three Counties Aquaria Show** at the Oakley Memorial Hall, High Wycombe. Schedules available from show secretary Mr. K. H. Palmer, 3, Dedmere Rise, Marlow, Bucks. Closing date for entries, 31st August.

21st-22nd September: **Stoke Newington and District Aquaria Society** open show. Schedules and details available from show secretary Mr. W. H. Snaith, 116, Lordship Road, London, N.16.

22nd-23rd September: **Federation of Guppy Breeders' Societies** annual show at the Zoological Gardens, Regent's Park, London N.W.

6th-7th October: **British Aquarists' Festival** at Belle Vue Zoological Gardens, Manchester 12.

26th-28th October: **Blackpool and Fylde Aquatic Society** annual open show in conjunction with the Chrysanthemum show at the Olympia Winter Gardens, Blackpool.

Secretary Changes

CHANGES of secretaries and addresses have been reported from the following societies: **Chelsea Aquarium Society** (Mr. P. How, 24, Luna St., Chelsea, S.W.10); **Gloucester and Cheltenham Aquarist Society** (Mr. J. H. R. Rendell, 41, Oldbury Road, Hesterway, Cheltenham, Gloucester); **Ilford and District Aquarists' and Pondkeepers' Society** (Mr. A. L. Stelling, 30, Fields Park Crescent, Chadwell Heath, Essex); **Llantwit Major Aquarist Society** (Mr. R. S. Wigg, 17, Ham Lane South, Llantwit Major, Glam.); **Oldham and District Aquarist Society** (Mr. F. Greasley, 346, Featherstall Road, N. Oldham); **Smethwick and District Aquarist Society** (Mrs. J. Selvey, 53, Sydney Road, Warley, Smethwick, Staffs.); **York and District Aquarist Society** (Mr. F. L. Crowther, Wheatcroft, 181, Water Lane, Clifton, York.).

Crossword Solution

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

PICK YOUR ANSWER (Solution)

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