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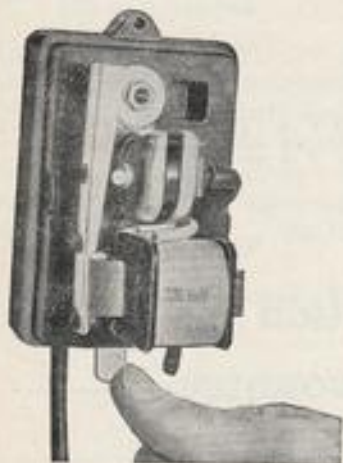
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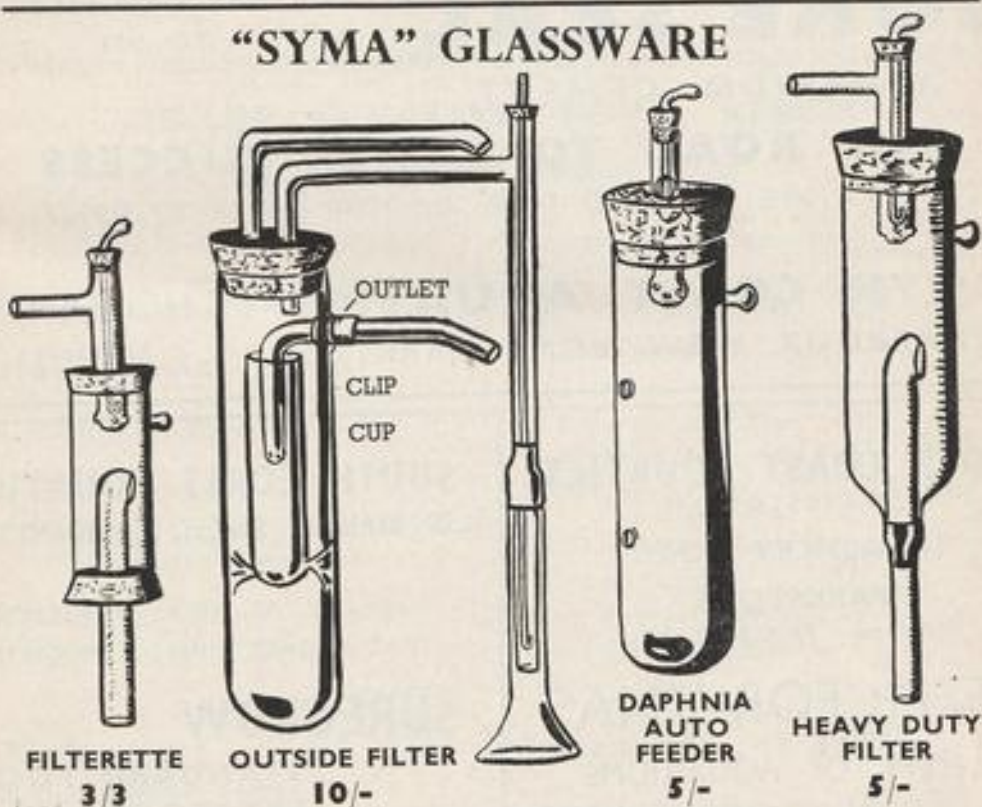
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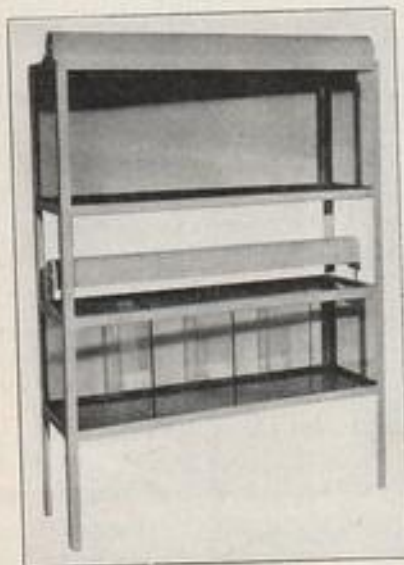
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The camera has given "Miss Festival of Britain" a double as Judy Breen was photographed admiring one of the 125 aquaria that house Mr. G. Allan's fish collection in Cairo

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1951

Editorial

A HUNDRED years' progress in railway zoological learning is marked by a news story told last month. It is Francis Buckland, that intrepid naturalist and "father of British fisheries," who supplies the first paragraph for this history in his record of the nineteenth century railway official's attitude to travelling live creatures.

Buckland's monkey Jacko had poked his head out of a bag at the station. "Sir, that's a dog; you must pay for it accordingly" said the official, and despite all demonstrations of Jacko's simian qualities, three and sixpence for the "dog" had to be paid. Then, Buckland goes on: "Thinking to carry the joke further, I took out from my pocket a live tortoise I happened to have with me, and showing it, said, 'What must I pay for this, as you charge for all animals?' The employee adjusted his specs, withdrew from the desk to consult with his superior; then returning, gave the verdict with a grave but determined manner, 'No charge for them, sir; them be insects!'"

Present-day railway classification of animate travellers appears to be more embracing, if it may be judged from the newspaper accounts which appeared last month. These concerned our friend Mr. Charles Schiller, who was questioned at Paddington about a can of neon tetras he was carrying. "Livestock?" asked the official. It could not be denied. "Excess baggage fare" had not been paid, so the can was weighed and the cash exacted.

Aquarists have apparently been fare-dodging for years as we have journeyed with our concealed jars of guppies, our matchboxes of white worms, our damp packets of *Tubifex* (or be them insects still?) Livestock? Most certainly!—our dictionary defines the term as "animals kept or dealt in for use or profit." As we pass through ticket-barriers in future we shall never feel secure, expecting to be pierced by the inspector's eagle eye and incriminated by an "Anything to declare?"

But perhaps we have a come-back. When our suburban train's tightly-packed compartments next disgorge us stiff and crumpled at our destination, may we not ask irefully: "Passenger rates for that?" What are we anyway—men or sardines?

Barb and Tooth-carp Egg-layers

by MARGERY G. ELWIN

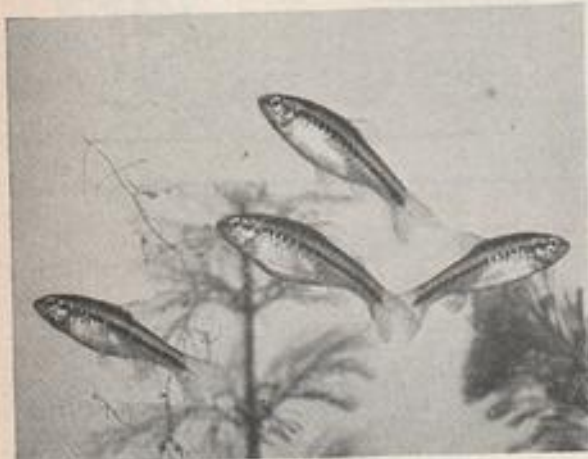


Photo: L. C. Mandeville

A ready breeder in a small aquarium—*Barbus titteya*

IN the first article in this series I discussed general principles which applied to the breeding of all tropical species. I now propose to go into the special requirements of the different groups in more detail.

Since most aquarists start by keeping one of the commoner livebearer species, such as the guppy or the swordtail, it would seem logical to discuss this group first, but I am not going to do so for the following reasons. Anyone who can keep tropicals at all can breed livebearers—of a sort. All that is necessary is to have a male and a female—sexing is simple—and to prevent cannibalism by feeding the adults adequately and providing plenty of cover for the young. In fact you cannot stop them breeding, although in a community aquarium where there are a lot of big fish you will probably not rear many of the young for, not only are these liable to be eaten, but they will also probably not obtain an adequate share of the food.

The real problem with livebearers is to produce "improved" strains by selecting for colour and form and this is a complicated matter which I propose to deal with later in a special article on colour inheritance, line-breeding, etc. So for the present I will leave the livebearers and discuss the breeding of some characteristic egg-layers.

Types of Egg-layers

For our purpose the egg-layers may be divided into three main classes:—(1) those which scatter adhesive eggs, (2) those which drop non-adhesive eggs, and (3) those which have much more highly developed breeding habits, usually involving parental care of the young fish. I propose to describe in some detail the breeding of characteristic fish from each group.

Barbus titteya is a good example of a fish which scatters adhesive eggs. I have chosen this example because (1) it is a very beautiful little fish and is gentle and quite suitable for the community aquarium provided this is well planted, (2) it will breed readily in a small aquarium and (3) it is available in this country.

Barbus titteya is only 1½ ins. when fully grown. At all times of pleasing coloration, when ready to spawn the male is

beautiful in the extreme. By comparison the female is dull and this and her deeper body make it easy to distinguish the sexes. You should select for your breeding pair a nice round, full-bodied female and a vigorous, colourful male.

A ten to twelve gallon aquarium is ideal for breeding the fish. It is possible to spawn them in a smaller aquarium but in that case the babies will soon have to be moved; they will become stunted. The tank should be well planted, the plants being arranged in dense thickets, and should stand in a sunny position. The best spawning temperature is 77°-82° F. but previously the fish should have been kept at a lower temperature, for it seems that it always the stimulation of bright light and rising temperature which "sets them off." It is for this reason that they commonly spawn in the early morning.

Typical Barb Spawning

The male first arouses the female by displaying before her in full coloration with his fins stretched till it seems they must split. He will nip her and flick her with his tail, but will not harm her unless she remains unresponsive, in which case his gentle nips may change to fin-tearing bites. However, she is a mature fish in good condition she will not succumb to his advances. He will then start driving a pushing her among the plants and, as they hover side by side, quivering and vibrating, one or two eggs will be expelled and fertilised. This process will be continued, with intervals, for two or three hours.

It is important that the fish should have been well fed before spawning or they may use these intervals to eat any eggs they can find. This regrettable tendency may also be checked by the presence of a few live *Daphnia*; but it is undesirable to put in many as you will probably want to get the newly hatched fish *Infusoria*, and *Infusoria* will not survive long where *Daphnia* are present. Directly spawning is complete the fish should be removed.

The eggs hatch in about a day and a half. For another 24 hours the fry will be seen hanging among the plants after that they begin to swim freely and are then usually found near the bottom. They should, if possible, be fed at first on *Infusoria*, but they will very soon take flour-dried food and they grow rapidly.

The mode of spawning described here is characteristic of all the barbs and most of the characins, and aquarists recognise it as being very similar to that of the goldfish. The smaller barbs are generally easy to breed, but characins, with a few exceptions, are extremely difficult.

Egg-laying Tooth-carps

We now come to another group of fishes which, although they spawn in much the same manner as the barbs, are definitely more difficult to breed successfully owing to the fact that their eggs take much longer to hatch and during their long incubation period they are likely to come to the surface. I am referring to the "egg-laying tooth-carps," i.e., *Panchax* species and their relatives *Pseudoliparis*, *Ritulus*, etc.

I have, personally, always been very fond of this group of fishes but they are not generally so popular, largely owing to the fact that they are essentially carnivorous. I pinch most of them will take dried food, but they still

really be given fleshy foods such as earthworm, whole or chopped, white worms, *Daphnia*, etc. Moreover, if kept in a community aquarium with very small fishes some of the latter may disappear! But they are not really bad characters. Most of them are quite peaceful and rather shy, and provided their companions are too large to swallow they will not interfere with them in any way. On the contrary, many of the species are not really suitable for the community aquarium because they are too retiring and cannot hold their own. But most of them are very beautiful and to my mind are well worth an aquarium to themselves anyway.

Pachypanchax playfairii

Before the war there were many species available but most of these have now disappeared. Of those which are available *Rivulus cylindraceus* is quite a pleasing little fish, easy to breed and definitely harmless, in fact rather too retiring. Another very attractive species is *Pachypanchax playfairii*, which will serve here as a typical example of the group.

Pachypanchax playfairii is about 3½ ins. in length when fully grown. The sexes are easy to distinguish even when small. The female is quite dull in colour and she has a conspicuous dark spot at the base of the dorsal fin. The male, on the other hand, is brilliantly coloured, the ground colour ranging from golden-yellow to bright green. Along the sides are rows of bright red spots.

Innes gives this fish a bad character, but I have found them very gentle. My three adult pairs are all living with half-grown livebearers and have never given any trouble. Innes also states that they eat their eggs as they lay them, but again this is not my experience. It is probably a question of feeding. Mine are fed exclusively on live food, mainly on earthworm. If the worms are small I give them to the fish whole, if they are too large I chop them. I vary this diet with any other live food which happens to be available. Personally I think it is as unreasonable to expect this type of fish to live on dried food as it would be to feed a cat on cabbage, and if it is not provided with the kind of food that is natural for it one can hardly blame the fish for trying to get it for itself! Most people can get occasional supplies of earthworms and these can be kept for quite a while in a little box or jar with some dead leaves or a little damp earth.

To return to breeding. This species, like most of its relations, will spawn in quite a small aquarium. Mine have



One species of the egg-laying tooth-carps, *Pachypanchax playfairii* (female above, male below)

bred in a five gallon aquarium and the last spawning gave me over 90 fish. The tank should be well planted, and it is particularly important to have floating plants or fine leaved plants which lie along the surface, as these fish seem to prefer to spawn near the top of the water. It is also absolutely essential that the aquarium should be quite free from snails and flat worms, as otherwise during the long incubation period, which is from twelve to fourteen days, many of the eggs will be eaten. My pair, which produced 90 babies, had spawned previously in a similar tank which I had not cleared and, owing to the depredations of snails and flat worms, from that spawning I raised only nine fish.

The best plan when attempting to breed such fish is to use quite a small aquarium but to set it up specially for the spawning, cleaning it right out, boiling the sand and thoroughly washing all the plants. A little salt in the water will make the flatworms curl up and fall off. These flatworms, which are so common in our tropical aquariums, especially those which have been set up for a long while and contain a lot of mulm, are generally speaking harmless, though when present in large numbers they are rather unsightly. Their egg-eating propensities only become a serious menace when we are dealing with eggs with an exceptionally long incubation period. The name of the particular flatworm we must beware of is *Planaria gonocephala*, and it is interesting to note that it is only found in our native waters in the south of England, where it has only appeared of recent years. It is interesting to speculate whether it has been introduced there by tropical aquarists.

Rearing the Fry

The best spawning temperature for *Pachypanchax playfairii* is about 80° F. Behaviour is in many ways similar to that described for *Barbus titteya*. Spawning continues for some hours, after which the fish should be removed. By the way, be sure that the aquarium containing these fish has a well-fitting cover glass, for this fish, like most of its relatives, is a great jumper.

In due course, if you have been successful with the spawning, the fry will appear and then hide themselves among the surface plants. They are fairly small at first, but compared with most fish fry they seem very long and thin. As they have relatively large mouths they can take very small *Daphnia* and *Cyclops* almost from the first, but it is a good idea to give them *Infusoria* for a few days if it is available. Failing this they can be started off with the yolk of a hard-boiled egg strained through fine muslin. This is a very valuable fry food in an emergency but must always be used with great caution as any excess will very quickly go bad and seriously foul the water.

The babies grow very quickly and are easy to raise provided they are given plenty of food. In less than two months they should be an inch long, coloured and sexable fish.

The *Fundulopanchax* fishes have an even longer incubation period, two months or more, and are very difficult to breed. The adults also are not easy to keep, and I have not seen them lately in this country.

AGED TROUT DIES

IF ever a fish deserved a full-fledged obituary it is a 28 years old mackinaw trout who passed to her reward recently at the Mt. Shasta, California, fish hatchery. The once-prolific matriarch was the last of California's hatchery-bred mackinaws. Although none of her possible family of 33,750 children were with her at the end, the hatchery crew was in attendance, clocking off the fish statistics "Old Granny's" 28 productive years had upset. She lived four times as long as the average wild mackinaw (*Aquarium Journal*, September).

Aspirator-Type Air Pumps

by D. PYE

THIS type of air pump, which works on the same principle as a laboratory aspirator, is very handy for use with a small number of tanks, or as an auxiliary pump in a larger fish-house. It costs only a few shillings, is easily constructed, reliable, may be regulated to give any required flow of air, and is, of course, silent in operation.

The pump consists of two vessels—an upper reservoir of water and a lower one containing air—connected by a piece of rubber tubing. The water is allowed to flow into the bottom vessel, driving out air which may be led off to diffusers or airlifts. As the volume of air supplied at one operation depends on the size of the vessels, they should be as large as can be conveniently handled. I have found that five-gallon disinfectant cans, obtained from a local hospital, are most convenient.

Making the "Pump"

These are large enough to work for a reasonable length of time, yet are not too heavy to lift when full of water. Other advantages are that they are tall and have a square base—thus taking up less space than other types, they have handles which greatly assist lifting, and are quite resistant to rust, especially if painted on the outside. Such tins have an inset telescopic tap at the bottom, but this does not leak if tightly closed, and the working of the pump is not impaired.

Also required are four taps, two for air and two for water. Very convenient for the former are the little brass drain-cocks obtainable at a garage. These may be very finely adjusted to regulate the air supply, and are just the right diameter to take the rubber tubing used by aquarists. They may also be used for the water taps, but if a large flow of air is required (as for more than one diffuser) it is better to use ordinary gas-taps and join them by red rubber gas tubing.

A hole should be cut in the top of each can, of suitable dimensions to take one of the small taps, and this may be soldered in place. Care must be taken to prevent solder running down and blocking the bottom of the tap, and to ensure that the joint is airtight, or leakage will occur. Next a hole is drilled in one side, near the base of the cans (as near as possible or some water will remain in the bottom) and the gas taps fitted. It may be found necessary to fit the taps on a short length of brass tubing, which is itself soldered into the hole. This extension permits easier turning of the tap.

Testing and Operation

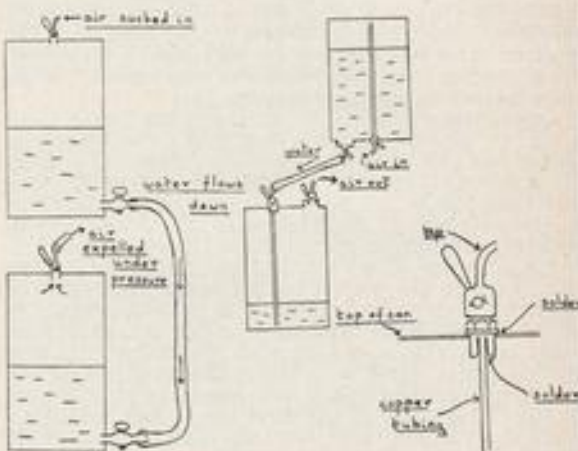
The construction is now complete and the pump is ready for testing and operation. One of the tins should be filled with water, and the caps of both firmly screwed down. The large taps are joined and the full tin raised above the other. I placed my can on the same bench as the tanks, about 3 ft. 6 ins. from the floor, and the other stood directly below it. Both air-taps should be opened and the lower one connected to the diffusers. On allowing some water to flow for a few seconds, sufficient pressure will be obtained to drive air into the tanks. The apparatus may then be regulated to work steadily, the flow of water being kept just sufficient to provide the air required.

The pump can also be controlled by adjusting the air

supply tap, but this does not produce an even pressure. Once the water taps are set to provide a certain flow, they need not be readjusted, unless other diffusers are added. When the upper can is empty and air has ceased to flow, the air-pipe should be disconnected and the positions of the tin reversed. Your energy expended in lifting the full tank is that which is slowly used in pumping the air!

Detecting Leaks

Any leaks in the apparatus soon become obvious and should be attended to, although, if the tins are treated with reasonable care, leaks can only be due to faulty soldering round the taps. Leaks round the air-taps may be detected by pouring a little water on to each can when it is under pressure, i.e., when working as the lower vessel.



Where large cans are available they can be used as shown in the left-hand figure. For smaller cans the centre figure shows how they may be used and the way the taps are fitted is shown on the right.

An arrangement such as that described will work on a diffuser for a whole day if turned right down, or a large number of a shorter time, depending on the flow required. Airlifts for filters, etc., may also be worked by a pump of this kind although they take rather a larger amount of air.

With smaller tins a slightly different system has been tried, with success. All taps were of the small type, on being fixed in the screw-on cap and the other being fixed in the top of the can. The latter tap had a piece of thin copper tubing, soldered into its base, which reached nearly to the bottom of the can; in operation the full upper can was inverted. The tins used were two gallon "anti-freeze" containers.

This pump was not as effective as the other owing to its smaller volume, and the tap set in the inverted cap was designed to leave the least possible amount of water behind. Owing to the more restricted water flow it was not found possible to work more than one or two diffusers or of airlift at a time, and the apparatus needed attending to more frequently. This design also necessitates re-making the connections each time the tins are reversed.

Anvers in Wonderland

by A. FRASER-BRUNNER

IT will not be necessary for me to remind you that Anvers is the French name for Antwerp, the centre of aquarium-keeping in Belgium. When, at the beginning of September, I received an invitation from that city to attend the opening of their "Wonderland" Exhibition as representative of this journal, I was not sure what to expect, but felt certain that attendance would be well worth while because nine leading Belgian aquarium societies were involved in its presentation.

As it turned out, nothing I could have presaged would have been anywhere near the actuality, for this was a show outside our ordinary experience. It was held in the *Feestzaal*, or Festival Hall, in one of the main streets of the city, to which I made my way immediately upon arrival.

To my astonishment the place was shut, and in darkness; the time was 6 p.m., and the opening was timed for 8 p.m. Now at any British aquarium exhibition there is always feverish activity and indescribable chaos two hours before the opening, and so, rather puzzled, I made my way back to the hotel. There I found Mr. A. J. Paus, the general secretary of the Exhibition, awaiting my arrival. He was the most unperturbed secretary I ever met. He waited me gently to a restaurant, where we found other officials and aquarists, and we sat talking and eating as though exhibitions were but a remote dream. It was Mme. Brans who first mentioned the show. "I hope you will like it," she said. "We think it looks beautiful."

Eight p.m. arrived, but no one hurried, and they assured me that all would go to plan. So we made our way at last to the *Feestzaal* and found it open, with a uniformed official



Photo: The Aquarist
The main hall of the Wonderland Exhibition, looking towards the entrance

inspecting the invitation cards. My bodyguard marched me along a red carpet to a salon, where the Burgomaster, his deputy, and members of the City Council, welcomed me with generous warmth, while in return I conveyed the greetings of British aquarists to those of Belgium. So we passed into the main hall, where a waiting throng heard and applauded a brief opening ceremony, and at last I was able to take a view of the Exhibition.

Breath-taking Lay-out

Wonderland! It was indeed. The first general impression was breath-taking. The extensive floor of the hall was laid out as a garden, its beds blazing with massed blossoms; its central feature was a large sculpture by M. Florian de Kuyper, of a man defending himself against crocodiles, while at one end was a large pond in which flamingoes waded among the water-lilies and fountains. On the laws at either side were tethered a variety of tame birds of prey, used locally for hawking.

Round the sides of the hall a false wall, handsomely designed with supporting pillars surmounted with natural-history motifs, had been erected, into which were built 60 aquarium tanks of various sizes. At intervals this wall formed niches, in which were placed a number of cages showing various kinds of birds. At one end was a broad double staircase leading to a balcony, upon which was an extensive display of insects and displays by the local microscopic and philatelic societies—the latter, of course, confined to stamps having natural history designs. At the other end of the hall, forming a background to the flamingo pond, was an exotic-looking panorama representing a Congo jungle, devised with living plants but populated mostly with stuffed animals (a living African grey parrot providing a somewhat disconcerting exception). This combination of real plants and mounted animals is remarkably effective, and was used again in an annexe, where a heath scene formed the background for a display of the wild life of Belgium; it was in this hall that a number of living reptiles and batrachia were shown.

From these broad outlines it will be seen that this differed from the kind of show to which we are accustomed in Britain. It was not in any way competitive. All the



The author's drawings of some Congo fishes seen at the Antwerp Exhibition. Top, *Barilius christyi*; left centre, *Phenocogrammus interruptus*; right centre, *Petersius coudalis*; bottom, *Synodontis angelicus*



Photo
The Aquarist
Massed blossoms surrounded the central large sculpture in the main hall

stock had been lent by societies for the occasion, with the object of providing an exhibition for the public. The result was more decorative and of more concentrated interest to non-aquarists than the rows of small unfurnished tanks which form such a large part of many of our shows.

I have one serious criticism to make, however. Although this was so pre-eminently a show for the general public, very little information was provided for them; most of the exhibits were merely numbered, and although a very attractively printed catalogue was on sale for only two francs it contained beside each number only the name of the exhibitor and that of the exhibit (usually the scientific name) which would convey nothing to people not already familiar with the subject.

Aquarium Stocks

Naturally, my main attention was given to the aquaria. As I have said, there were 60 of these, some of them quite large, and the first thing that struck me was the remarkable quality of the plants with which they were furnished. Every tank was thickly planted with large, rich green, clean specimens of all the familiar species of plants; never have I seen so many plants of such high quality in one place. At first I thought perhaps this marked a difference between British stock and Continental stock, but when later a contingent of Dutch aquarists arrived, and in their turn burst into expressions of amazement and admiration for these plants, I realised that in fact we were seeing the difference between Antwerp and the rest.

All tanks were beautifully arranged, and I understand that the man chiefly responsible for this was Mr. Beckers, a pleasant young man with whom I had a chat. He is particularly skilful in his use of rockwork, choosing unusual types like dolomitic conglomerate and placing them in such a way as to do an important job without being conspicuous; nowhere did I find the country churchyard effect so common in Britain.

Home-bred Shoals

Most of the varieties of fish commonly seen in this country were shown in these tanks, generally in shoals; practically all of them, I was told, had been bred by the people who exhibited them. So far as egg-layers were concerned, the average was well above that in our country, though in many cases the best did not reach that of the best that we can show. The livebearers were of poor quality;

one tank contained some red platys of very good colour and real, deep, chunky shape, though small in size, but there were no good swordtails, mollies or guppies.

Belgian Congo Fishes

As might be expected, the exhibits included a number of fishes from the Belgian Congo, some of which we know already—*Nannothrips trilineatus*, the inverted catfish, and so on—but some of which are new to us. Many of these were shown by my friend M. Dubois, an enthusiastic naturalist who has visited the Congo for the express purpose of bringing back new plants and fishes. I was particularly impressed with the beauties of *Phenacogrammus interruptus*, a characin with a lovely shining blue back, below which is a broad golden band along the side, the rest of the fish being olive green, except for the enamel-white edge to the caudal fin, the middle rays of which are elongated and marked with black. A shoal of these, each about three inches long, made a beautiful display, and among them swam some specimens of *Petersius caudalis*, which at first glance is somewhat similar, being black on the back, silvery on the sides, with a black bar at the shoulder and a dusky line along the side; a band through the middle of the caudal fin, and the tips of its lobes, are lemon yellow, and the middle band has a heavy black mark in its centre. The high dorsal fin and the front edges of the pelvic fins are enamel-white.

Another beautiful sight was presented by a shoal of *Barilius christyi*; these are rather elongate cyprinid fishes, somewhat trout-like in general appearance and movement; the back is olive, the lower sides silvery, but along the middle of the side is a band of rich golden, overlaid with a number of striking vertical indigo bars; there is a large horizontal black blotch at base of caudal fin; on the snout, just above the mouth, there is a large patch of pinkish-gold which gleams like a lamp.

Ctenopoma Species

In another tank I was intrigued to see three different species of *Ctenopoma* living together. These are members of the climbing perch family, having labyrinth organs for breathing atmospheric air. One of these, *C. kingsleyi*, is already known to us here, but the other two, *C. acutirostris* and *C. fasciolatus* have not yet reached us. These have been bred by M. Dubois for the first time in Europe.

The Congo is rich in attractive species which may be expected to find their way into aquaria before long, and even while I was there a new one arrived. This was a species of *Synodontis*, related to the inverted catfish (*S. nigricentris*) but swimming the right way up, and very attractively marked—quite the prettiest catfish we have seen, rivalling even the *Corydoras* species. It is dark, with a number of rather large, pearly-white spots and bars spaced fairly evenly on the body; its name is *Synodontis angelicus*.

Good Attendance

There was only one marine aquarium, showing a number of fishes from Madeira, no doubt obtained through the medium of our own Zoological Society. Although having the advantage of the City's resources behind it, no one could doubt that this exhibition embodied the loving care and enthusiastic voluntary effort which characterises our own shows, and it was pleasing therefore to see that it met with the response from the public which was the only reward its organisers asked. It was open for eight days, yet by the second day all the catalogues had been sold, and on that day over 5,000 people attended.

The City of Antwerp is to be congratulated on an exhibition which was well worth a long journey to visit, and I hope that, if the event is repeated next year, more of my countrymen will be there.

AQUARIST AT HOME:

Mr. H. Roper

Interviewed and Photographed

by JAS. STOTT

IT was a glorious day when I visited that lovely old city of Norwich to meet Mr. Williamson, who is the secretary of the Norfolk and Norwich Aquarists' Club. There was a pleasant holiday atmosphere on the river, particularly in the region of Thorpe where many Broadland visitors had moored their craft whilst they did a little sight-seeing around the historic city. Possessing a large share of that local sense of dry humour, a characteristic of the Norfolk people, Mr. Williamson makes good company. I found it difficult to tell which was the more enthusiastic about the hobby of fish-keeping, Mr. Williamson or his wife, because Mrs. Williamson is certainly extremely interested. Both were desirous that I should look in on Mr. Roper of Marl Pit Lane, Norwich, so we made the journey across the city to take this ardent aquarist by surprise, but nevertheless to be welcomed in the grand old Norfolk manner.

Mr. Roper is an aquarist who has many years of fish-keeping experience, plus the information handed on to him by his father, who was a life-long aquarist. He is the proud possessor of the very first issue of *The Aquarist*. Both coldwater and tropical fishes are kept by Mr. Roper in an establishment which arouses immediate interest. His fish house is a good size, containing 20 tanks ranging from five up to 40 gallons capacity. These are illuminated by natural light from top windows situated in the roof of the fish house and heated by immersion heaters. It was noticed that the larger size of tanks predominated. Mention of this quickly brought the remark from Mr. Roper that plenty of swimming space was one of the essentials for really successful fish-keeping.

His advice to beginners is to start with the largest tank they can afford and accommodate. In this respect Mr. Roper goes so far as to include in his fish house quite a useful sized pool and this is used as a developing ground for youngsters and, of course, a means of holding pond stock in winter if necessary. The size of this inside pond is 12 feet long by three feet wide by 18 inches deep. In the tropical section were angels, mollies, moon platys, platy *varianus*, black and golden wagtails, dwarf gouramies, fighters and swordtails. The most outstanding feature about the fishes was size; so many of the adults were fine, big specimen fishes.

Angel fish Breeding

A considerable amount of angel breeding is done in this fish house and the following methods are adopted with success. Several adults are run together in a large tank and pairs are obtained by natural selection. When this occurs a suitable pair is selected and placed into a breeding tank, unplanted, permitting plenty of surface area with five gallons of water at a depth of 10 inches. A large Amazon sword plant leaf is weighted at the base and placed into this tank in readiness for receiving the spawn. Conditioning of fish is maintained on earthworm and other live foods with the water temperature at 80° F. After the spawning, which is invariably on the leaf, this is removed to another

tank for the hatching and rearing. Aeration is supplied over the leaf during the intermediate stages until hatching occurs and the fry become free swimming.

For several years Mr. Roper has been busy breeding hardy strains of certain species of tropicals and, in this respect, he appears to have made progress. Outside, along the front of his fish house, are several asbestos cisterns (20 gallons capacity) in which were to be seen a considerable number of moon platys and yellow wagtails darting among the plants in tip-top condition. A cover glass was placed over each cistern, which would help to concentrate the heat of the sun, otherwise no heating was used except during the night when a small paraffin "brooder lamp," is placed under each cistern.

Although there are three burners in each lamp only one is used, which provides sufficient heat. The fishes are, of course, run in these during the better part of the year and taken inside during the winter months. Further to one side were some larger asbestos cisterns holding 100 gallons which were heated by electrical immersion heaters. These contained some lovely black mollies of good size and condition. Out in front of the fish house the garden is given over to a series of rock pools and an attractive semi-formal pond. Water is circulated through rock pools and



Mr. Roper's fish house is seen in the background to this picture of his rock garden and pond

pond by means of an electric pump. The rock garden setting is quite attractive and well planted with irises, marsh marigold, mimulus, primulas and the like with various species of rushes along the pond edging.

Shubunkins are the favourite coldwater fishes with Mr. Roper and he favours the Bristol type. Several of these could be seen in the larger pond. It was whilst looking in one of the smaller rock pools on higher ground in the rock garden that I got my big surprise. After looking into this pool several times I still had to ask to be sure, but I was right; black mollies swimming about obviously quite happy and content. Here I was told were the latest results of Mr. Roper's experiments in breeding hardiness into his tropicals. The particular pool was not heated artificially, the water was just the normal, natural temperature. Of course, I immediately remembered that Norfolk, during the summer, can pull some quite high temperatures, but still I was extremely interested. Mr. Roper informed me that the temperature in this pool during a week varied from 55° F. to 75° F. The forty or more mollies were half grown when placed into the pool and, although growth was slow, it had been steadily maintained and the fish, so far, had remained active and healthy. I propose to keep in touch with Mr. Roper to learn how these mollies fared through the summer.

Where Formality Finds its Place



Photo: H. & V. Joel
A London area garden pond picture taken in spring: tulips adorn the surrounding formal beds

I HAVE no use for the man who insists on enforcing his wishes with regard to a garden upon another. I quite understand that landscape architects are needed because there are those who have no knowledge of gardening whatsoever and are quite content therefore, to hand the planning of their gardens on to another. At the end of it all, however, it is never really their garden. Give me the man who, though he may not be a great expert, does read all he can and then plans out his own garden to suit his own needs and his own likes and dislikes.

There is nothing wrong in a formal pool, despite what some of the pundits say. It doesn't matter whether it is round or square or rectangular, as long as it fits into the picture and the surrounds are treated in a formal manner. Many a pool has formed a special little garden of its own; it may be suitably placed at the bottom of the lawn or quite close to the house, and when this happens, it is a very nice idea to go on with the formality and to choose the beds that surround the pool for bulbs in the spring with the right type of carpeting plants.

Bulbs look grand when planted in square beds on a terrace garden with the crazy or squared paving paths in between and the pool in the middle. When the bulbs are over these beds can always be used for Petunias or Geraniums, for the dwarf type of Dahlias or even for Zinnias with, say, the little French marigolds as a carpet below them. However, we are not discussing the summer beds; we are thinking of what may be done for the spring. The bulbs will be planted in lines running parallel with the edges of the beds, or when the beds are circular, what is called diagonal planting is carried out, and the simplest way of explaining this type of planting is that it looks rather like the wedges that are seen when an orange is cut through transversely.

Don't, whatever you do, try to carry out a complicated system of planting. If the beds are small, stick to one colour per bed and get it absolutely ablaze. If you are a beginner and try and produce a Union Jack with tulips, you are sure to find that some of the rows are not straight and the whole flag looks a bit "wobbly." Be very careful when you do plant because the bulbs are going to come up and show everybody whether your lines have really been straight or not, so let the right angles be right angles, and don't, as they say in the Army, "just chance your arm."

by W. E. SHEWELL-COOPER

If you are going to use carpeting plants, as they are called, put these in first and then you can be sure to plant the bulbs exactly in between them. If the beds are near the house then use the scented bulbs and the fragrance will be wafted in through the windows and will please you very much. Hyacinths are particularly useful in this connection as are the Chionodoxas and certain Narcissus. Plant bulbs of every type the same depth. Make a blunt-ended dibber from an old spade handle if you like and mark it carefully with a red hot poker so that you always push the dibber down to the same depth. Because of its blunt end, the bulb when put in position will sit firmly on the bottom of the hole and will not hang three-quarters of the way down with an air pocket below as invariably happens when you use a pointed dibber.

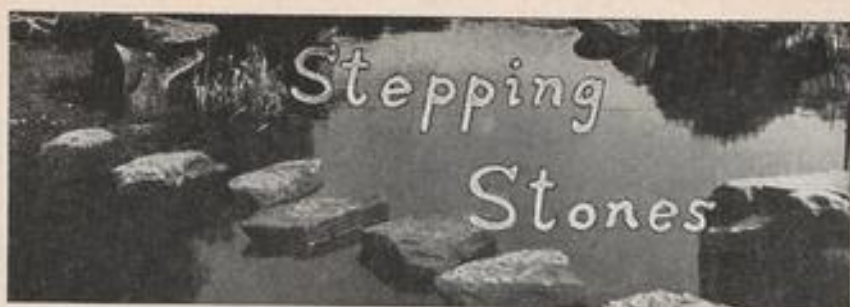
Bedding Schemes

When planning out the bedding schemes see that the size and the height of the plants correspond with the size of the beds. If you are lucky enough to have a very large garden then you may want the plants to be quite tall. Though the beds are to be only three or four feet square, it is inadvisable to have the bulk of the plants no taller than, say, eight or nine inches. Sometimes people ask me what bedding schemes I have found particularly successful, and if I should be in the mind of any reader, I would make the following suggestions, with the proviso that it is always possible to plan better ones with thought and experience.

If you like Irises, like the blue Emperor, then the V. Palmer's White makes a very good carpet below. If, on the other hand, you prefer a yellow Iris try as carpet plants St. Brigid anemones. The Daffodil Marian Crisp looks beautiful when carpeted with the Aubretia Dr. Muir while the pheasant's eye Narcissus goes well with a mass bed of Polyanthas. If it is Hyacinths, then try the John Boss with the winter flowering Pansies Ice King below, or if you prefer a blue, buy King of the Blues; carpet these with the double white Arabis.

Now we come to schemes that can be carried out with Tulips. If you want a very bright mixture, try the sea tulip Farncombe Sanders with the white tulip Zwanenb and having planted these alternately, carpet the whole with Cambridge blue Forget-me-nots. The royal blue Forget-me-nots on the other hand look very well indeed with Inglescombe Yellow Tulips flowering above them. The a bronzy purple tulip Louis XIV which I grew once carpeted with the wallflowers Fire King and the whole scheme was magnificent.

These schemes are just suggestions. There is no need to buy the largest and most expensive bulbs. Generally speaking, the smaller sizes make quite a brave show. For the crocuses three inches apart and two inches deep, tulips five inches apart and four inches deep, the hyacinths six inches apart and five inches deep and the narcissus daffodils eight inches apart and about the same depth. The Irises can be planted about three inches deep and six to eight inches apart depending on how brave a show you wish to make.



A page for
the beginner
contributed
by

J. P. VOLRATH

OF the many families of tropical fish that are well known to the old hand at fish-keeping, the Poeciliid or livebearer family is the best for the newcomer to the hobby. There are several reasons for this. The young are born alive and are a fair size at birth, so it is possible, though not altogether desirable, to bring them up entirely on prepared foods. Certainly it is not necessary to go to the trouble of preparing Infusoria cultures. Secondly, the fishes are easy to breed. Breeding fish is the essence of fish-keeping; it is the ambition of all of us to breed every species of fish we keep. Here then, is a family of fishes which the tyro can breed with little difficulty. Lastly, all the livebearers are easily sexed. The anal fin, which is on the underside of the fish just anterior to the tail, is modified in the male to form the gonopodium. As a rule, the female is larger and duller than the male. It is much better to be able to buy one or two pairs of fish than a few individuals.

Breeding Livebearers

Breeding the Poeciliids, we have said, is easy. One has only to provide a pair with suitable accommodation and food to get some youngsters. Rearing them all to maturity is another matter. The majority of livebearers are exceedingly fond of their children for small snacks. So, to raise all your baby fish, two aquaria are necessary. A divided aquarium is almost as good. A jar or basin floating in the tank is sometimes recommended, but it is very unsightly and is apt to become overcrowded. As soon as they are born, the young fish should be taken from their parents and reared separately. On no account net them. An old, bent spoon is quite useful for picking them up. If you can get a clear, plastic ladle and bend its neck by putting it into hot water, so much the better.

The baby fish can be fed on any fine food. When you're deciding what sized food to feed a fish, ignore its body size and look at its mouth. Give it food that it can consume easily. *Vermox* rubbed through a fine coffee strainer is very good; *Daphnia* which will pass through the same strainer are useful. Livebearers are not, as a whole, fussy what they eat, but don't be tempted by this to give them a monotonous diet of one brand of food. Here is a short list of a few foods that I have found useful: *Bemax*, ground oatmeal (in small quantities), finely chopped raw or cooked fish, beef, horse-flesh, chicken and liver and, of course, all the common livefoods.

Common Livebearers

Now a few words about the species that are more frequently kept. First and foremost is the guppy. He is a lively little fellow about an inch long and his wife is considerably bigger. We talked about guppies in the July issue, and detailed information on this species can be found in *The Aquarist* booklet *The Guppy*.

The platy is almost, if not quite, as popular as the guppy. There are many colour varieties to choose from: red and yellow wagtails with black fins and snout, and red and yellow bodies respectively; red, gold, speckled and blue platys are

also on the market. May I put forward a plea that you buy platys of only one colour variety from one or more sources and so don't produce any of the "mongrels" which are unfortunately so common to-day?

Swordtails are also available in many varieties. There are reds, greens, albinos, red-eyed reds and wagtails (similar to wagtail platys) to mention a few. The lower rays of the male's tail are elongated to form the sword. This isn't present in the young but grows to its full length as the fish reaches maturity.

The mollies are active, but peaceful members of a community aquarium. Perma-black mollies are very popular; the sailfin mollies deserve to be more widely kept. The dorsal fin of the male is enormous and very lovely when it is erect.

Last on our list of well-known livebearers is the mosquito fish. Like the sailfin mollies, it is worth more attention than it receives at present. Its coloration is not bright, but is attractive. It is less prone to eat its young than the other species we have mentioned.

Newcomers to aquarium-keeping are reminded that "The Aquarist" booklet series includes "Aquarium Technique for the Beginner"—an invaluable introduction to aquarium apparatus and methods. "The Guppy" and "Livebearers" are booklets in the same series and contain information not available elsewhere. Copies will be sent by post on application to "The Aquarist," 1/8 each.



"Yes, we started off with guppies . . ."

November, 1951

Functions of Amphibian Skin

by DR. E. ELKAN

THE more unfamiliar a subject, the more interesting is it likely to be. My particular pet, the South African claw-footed toad (*Xenopus laevis* D.), though it is kept in an aquarium like a fish, is still unfamiliar to most aquarists. I have only heard of a few cases where my attempts to popularise it have been successful and in those cases the owners of these new pets have certainly derived as much interest and as much amusement from them as if they had bought the strangest and most expensive new coral fish.

To the aquarist *Xenopus* is so suitable because it is an aquatic animal, and although it is not a fish but an amphibian, it lives like a fish in the rivers and swamps of the Cape peninsula. Unfortunately, living in the same environment, it eats fish too, and if you put a toad—unless it be a very young one—into a community tank, you can soon give up counting your fish. Your fish, if they could be asked their opinion of these toads, would unquestionably denounce them as alien pests and intruders; creatures that have four legs and breathe air should, they would say, live on land and eat slugs. Little would they suspect how many points in the biology of *Xenopus* indicate the past where they and the fishes had a not too distant common ancestor.

When, in those days, amphibia began to go their own way, a few of the new families, having just become quadrupeds and lung breathers, gave up. They did not go on land, they remained aquatic, and in their quality of primitive batrachians, became interesting specimen to evolutionists. Very few animals are to be found along this branch of the genetic tree; most of them never even reach the zoo, although a pipa toad can occasionally be seen there. We should be grateful therefore that the Cape Province has turned out an inexhaustible reservoir of specimens from one branch of this rare group.

The average member of a "brains trust," when asked to enumerate the main organs of an animal, would certainly include the brain, the lungs and the liver, but would he remember the skin? I doubt it. And yet, the skin is an



Fig. 2. This view from above of the posterior end of *Xenopus* body shows the "lateral line patches" in the skin



Fig. 1. Young *Xenopus* toad suffering from hydrops—accumulation of fluid in lymph spaces between skin and body. Cause of the disease is unknown and toads do not recover

organ as important, as irreplaceable and as highly specialised as the others. For the toad as much as for us, the skin is the frontier bordering on the big hostile world. The messages the skin can receive, decipher and sort out in "beneficial," "hostile" or "irrelevant"—the greater of safety. In warm-blooded animals the skin, as a natural garment, can become of the greatest importance in temperature regulation. Fish and toads follow the temperature of the water they live in; their skin has other important tasks to fulfil. The water world is a murderous environment. Everybody eats everybody else—if he can. Whoever wants to live there must make himself as invisible as he can. Aquarists know very well to what length fish go in attempt at concealment. In fact, if we were taken to the natural habitats of most of our brightly coloured pets, we should most probably, fail to see them. We should certainly fail to discover a *Xenopus* toad at the bottom of a pond and wonder if there are many storks alive that have ever caught one.



Fig. 3. Microscope picture of a thin vertical section through *Xenopus* skin, showing, from top to bottom, epidermis with tactile spine, corium spongiosum with mucous glands, corium compactum (consisting of collagen fibres) and the lining of lymphatic space. The crescentic spaces between epidermis and corium spongiosum have arisen during shrinkage of the tissue

But, living in a South African lake, we must not only keep others from eating us; we must feed ourselves, we must come to the surface to look for insects, we must come up to breathe, for we have no "Schnorkel" to help us and, before venturing forth from the safe mud at the bottom, we must know if there are large fish or crocodiles in the vicinity. We could, in fact, do with a radar system because our eyes are not of much use in the water. They look upwards only—towards the sky and the insects—and in any case, the water is probably muddy. What should we do without our skin, amazingly adapted to answer all these requirements? Yes, even if we were caught, all might not be lost yet. Our toad skin can, in a fraction of a minute, make us so slippery, that no hand can hold us, and as for eating us—our inside may taste alright to anyone liking toads for dinner, but our skin is riddled with little sacs full of a distasteful and poisonous substance. We can feel pretty safe within this armour of poison.

A whole text-book could be written on the importance of the skin of an aquatic animal. *Xenopus*, though surrounded by water all its life, never drinks as far as we know. It gets little fluid with its food, yet produces urine containing mineral salts in a concentration higher than that of the water in which it lives. This excretion must be maintained to eliminate, at the same time, metabolic products no longer of any use to the body. But if water and salt are continually excreted and the toad never drinks, where does the supply come from? It enters through the skin. In addition to its many other tasks the skin is a most perfect chemical filter and regulator, letting in water and salts just in the quantities needed and even letting them out again if conditions should change. Our knowledge of the osmotic regulation of fish and amphibia is still very incomplete, and much experimental work remains to be done in this field.

Even this impressive list of the accomplishments of the amphibian skin would be incomplete if we did not include the ability of colour adaptation. Only few of the terrestrial batrachians have retained or developed the ability to adapt their colour to their moods or to their environment; *Xenopus* has retained a good width of adaptability and the aquarist can easily devise experiments to show how the toad can vary from a deep warm brown-black through all kinds of black-brown mottling to a brown-yellow, and even to grey when it feels very cold, miserable and dying. All these problems are solved by the skin. Could there be a more important organ? And should we not like to know how it is all done? In spite of the labours of generations of biologists, we know as yet very little about the secrets of the toad's skin. A large unharvested field remains for future generations.

If you have ever tried to skin a toad or a frog you will have found that, compared with the skinning of mammals, the task is a very easy one, because for the most part, the skin is not adherent to the body at all. Between the skin and the body there is a space, usually empty but for a little lymphatic fluid, and the skin is only held in place by fibrous septa which carry the nerves and blood vessels to the skin and which divide the lymphatic space surrounding the toad into a number of watertight compartments. How watertight these compartments are can best be shown when something goes wrong with the regulation and the animal suffers from an accumulation of fluid in the subcutaneous space (Fig. 1). In such animals we can, without the use even of a magnifier, study the arrangement of the septa and the lymphatic spaces. It is clear that the toad's skin has an outer and an inner surface. Both have interesting features.

The colour of a normal healthy *Xenopus* toad is that of a brown-black mottled pattern on the back, but white to yellow on the ventral side. Distributed on the head, the back and the abdomen (not on the arms and legs) we see short white lines arranged in rows, and if we compare



Fig. 4. Microscope picture of vertical section through *Xenopus* skin showing two full and one empty granular glands

several toads we shall find these white lines always arranged in exactly the same way. Now the coloration of all skin is due to the presence or absence of star-shaped cells (chromatophores) filled with fine granules of coloured pigment. If the cells flatten themselves out, so as to cover as much surface as possible, the animal becomes coloured. If the cells contract, the colour fades. Looking at the white lines on the back of *Xenopus* through a magnifier, we observe that the chromatophores do not invade this territory. I counted the number of these patches in one toad and found there were 264 of them. The figure is of a certain interest, as we shall see.

A look at the underside of the skin provides us with a most attractive picture of the distribution of the skin blood vessels. Since all these little arteries and veins are equally pigmented, their course can easily be followed and the density of this capillary network alone must be taken as an indication of the importance of skin chemistry to the toad. Further than this the naked eye examination cannot take us. From now onwards we need a microscope and—for some features—a good one.

A look at Figures 3 and 4 shows us the main structures making up the toad's skin. Starting from the surface we first find a very fine horny layer covering the epidermis. This is a dense, cellular structure of flat cells, covering the rest of the skin about 10 cells deep. It is loosely attached to the next layer, the dermis or corium which, in itself, consists of two very different layers. The outer one (corium spongiosum) can hardly be called a layer, since it



Fig. 5. Tactile papilla and spine seen in vertical section of *Xenopus* skin magnified $\times 250$



Fig. 6. A vertical section made along a lateral line patch in *Xenopus* skin, exhibiting a row of five sensory buds ($\times 120$)

consists entirely of skin glands held in place by a loose network of connective tissue fibres. The glands are of two kinds. One, visible in Fig. 3, produces a thin, mucous fluid as soon as the toad is alarmed by an enemy. This makes it so slippery that it is quite impossible to hold in the hand and, by the way, has helped to provide the second part of the scientific name: *laevis*—smooth. The other type of gland (Fig. 4) appears as a large, irregularly shaped sac, full of a finely crystallised secretion. This has been examined by Professor Gunn in Cape Town who found that small doses of it are quite sufficient to poison small mammals.

The third layer, the corium compactum, is purely protective and consists of a dense, thick screen of fibrous tissue (Fig. 3). The fourth layer carries the blood-vessels and nerves and connects the skin to the fibrous septa mentioned before. All these structures can easily be distinguished at low magnification in sections through any part of the toad's skin.

But there remain two other structures, both of great interest and both of utmost importance for keeping the toads informed on changes in the neighbourhood. Firstly the tactile papillae (Figs. 3 and 5). These are the organs through which the toad feels touch and, perhaps, water pressure. At the site of such an organ, the epidermis forms a short compact "spine" which protrudes a little over the surface of the skin. At the bottom the spine is met by a process (papilla) from the corium, which carries very fine nerve endings. These finish between some large nuclei just under the end of the spine and the whole arrangement brings to mind the arrangement in the modern crystal pickups where the movement of the gramophone needle induces small changes in electrical potential in a crystal. Something similar probably happens here but we are still far from understanding how and to what extent nature has anticipated our discovery of the piezo-electric effect.

And finally the most intriguing feature of the toad's skin: the sensory buds. Aquarists probably know that all fish have a lateral line which starts behind the gills and ends midway between the fins of the tail. Also, that this lateral line is of the greatest importance to the fish because along this line lie the organs which enable it to feel and react to the movements of the surrounding water. *Xenopus*, being as aquatic as any fish, has retained these organs from piscine past, but its lateral line has become split up into the short white patches already mentioned, each of which carries 5-12 of these sensory buds (Fig. 2). We understand why these patches could not extend to the arms and legs of the toad. Fish have no arms and legs and there are no sensory buds on their fins. The finding, staining and photographing of these lateral-line-buds needs much patience but with luck a row of them can appear in the field as in Fig. 6 or, at higher magnification, in Fig. 7.

We can then see that these buds are entirely products of the outer skin-layer, the epidermis, whose cells are, in these

places, modified to form little cups with a slight central depression. The cups are filled with slender sensory cells each of which ends in a hair so fine that even a moderately good microscope fails to reveal its presence. Nerve endings can be found (with great difficulty) among the base of the sensory cells. Any stimulus touching the hairs of these cells, any slight movement of the water, any vibration set up by a potential enemy is, through this most sensitive apparatus, perceived by the toad, long before it can see what is coming. And its reaction, as soon as the intensity of the stimulus is suspiciously strong, is always the same: down into the homely, protecting mud, down until all tactile papillae signal: "equal contact with mud all around," down until the lateral organs cease to report any water movement, down until the whole complicated radar equipment is at rest again, down until the danger has passed. No U-boat can execute this manoeuvre as quickly as our humble toads and whether our radar and hydrophones are more efficient than theirs must remain doubtful.

Acknowledgement: The sections from which the photographs Figs. 5-7 were taken, have been prepared by R. W. Murray, M.A., of the Oxford Institute of Zoology.



Fig. 7. Vertical section through an epidermal sensory bud to show sensory cells and "hairs" ($\times 600$)

READERS' QUERIES ON COLDWATER FISHKEEPING

Feeding Pond Fish in Winter

I have an outdoor pond about eight feet by six in which I have a dozen goldfish and shubunkins. When should I stop feeding them for the winter?

It is difficult to lay down a hard and fast time for this, as so much will depend on the temperature of the water. As the water gets colder so the fish eat less. Between 60° and 70° F. most kinds of cultivated fishes will eat to the maximum, but as the temperature of the water decreases so will appetites lessen. Many will eat at 50° F. but as the water temperature drops towards 40° F. you will find that the fish ignore food and almost go into a state of hibernation. Near the actual freezing point it is useless trying to get the fish to feed at all; any food placed in the pond will only pollute it. The larger the pond the safer it is to risk adding food and vice versa. Remember that small ponds soon lose heat, and so the small pond will be the first one from which to withhold food as winter approaches. Once winter really arrives it is a debatable point as to the advantage or otherwise of feeding at all. Fishes should have been well fed on a varied diet well up to the actual frosts. After that some people advise that the fishes should not receive any food at all.

In this country the winters rarely start in cold and

answered by **A. BOARDER**

continue very cold without a break. Generally several warmish spells are experienced at intervals, and it is at these times that it may be advisable to feed foods such as earthworms. I do not advise feeding with any starchy foods during the winter; if the weather is fairly mild at any time you can tempt the fishes with a piece of worm, but do not add any more unless the fishes show some interest. Any uneaten food will cause trouble and turn the water sour, so remove any uneaten food as soon as possible. I have found from my own experience that if fishes get some food during the warm spells they appear to go through the winter in better condition. If water temperatures keep relatively high the more are the fishes inclined to move about and then they may require extra nourishment. There is another point which helps to decide how much food may be required: that is the number of fishes in the pond. With many fishes then naturally greater amounts of food are necessary. In a fair-sized pond with very few fishes feeding may be quite unnecessary, as there is always something in the natural food line for the browsing fishes.

Should I do anything to my water-lilies in the winter?

It is well to remove as many as possible of the decaying leaves. These will only tend to pollute the water; the old flowers and stems should also be pulled out. Any other water plants can have the same treatment. Make sure that the level of the water in the pond does not drop much below its normal height, for the crowns of lilies should not be so exposed as to receive frost on them.

Many queries from readers of "The Aquarist" are answered by post each month, all aspects of fishkeeping 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 sometimes see small patches of oil on the top of my pond. Is this a natural formation?

This may be a natural happening caused by something decaying in the pond; dead leaves may cause it and also uneaten food. It may also have been caused by some external means such as oil dropped from a plane. If the oil persists I should be inclined to search for a cause in the pond. I have known a dead frog in the pond produce the same results.

I have made a new pond in the garden. Should I try and plant it straight away?

There is no need to plant the pond until the spring. Any plant placed in the water so late in the year as this will not grow and may well die altogether. On the other hand, if you have any kind of water plant growing in a pot from another pond, it is possible to re-plant such a plant without waiting, always supposing that the water in the pond is fairly pure. A freshly filled concrete pond is not the place for any plant, and the water should have been left for some time so that it can mature. On the whole I consider that it is best to leave the pond filled with water and nothing else, during the winter.

At most bird shows there is a class for selling. Do you not think that it would be a good idea if the same was introduced at fish shows?

I have seen one or two instances of this practice at a show now and again and think it an excellent idea. As a rule, if a well established breeder has fish to spare he can usually dispose of them without much trouble. If, on the other hand, fish for sale were put in competition against others it would help the prospective buyer to assess their value far more easily. It would obviously be of little use showing poor quality fishes in such a class and I am afraid that few breeders would have fish of sufficient high standard to spare. Few beginners realise what a small percentage of show specimens the breeder of fancy goldfish is able to produce. Even these percentages vary with seasons, as the same parents are not always capable of giving the required high standard on all occasions. The very good fishes are the very ones which he needs to help build up his strain and he is not likely to part with these special ones. So few buyers will realise that as long as the fish are of good stock it does not matter so much if they are not perfect, as they are quite capable of producing fry as good or even better than the parents.

I have been asked £1 for a year old veiltail goldfish. Do you think this too dear?

If the fish were of good quality it is cheap, but without examining the fish I am not in a position to give an opinion. A very good veiltail is worth much more than a pound, for you must realise that such fishes are few and far between. The very scarcity regulates the price; if there were hundreds of good fishes about they would become cheap overnight. I tried to keep down the price of young fantails a few years ago, but discovered that a man who was buying hundreds from me at a cheap rate was taking them round the corner and getting half as much again for them from a dealer. This is the sort of thing that tends to keep prices up, for the breeder of the fishes asks himself why someone

who has done nothing should make a profit on his skill and patience taken in producing the strain. In one hatching from the same parents it is possible to breed fry worth from a few pence to a pound or more, with variations in price according to quality. Please do not go to a successful breeder and expect to take the pick of his youngsters and to get them for a mere song; after all, he has got to live.

I, too, have seen some queer decisions given by judges at some of the shows I have visited lately. Do not all judges work to the same standards?

Don't let us start a witch hunt after the poor judges. They have enough to put up with already, and I am going to take this opportunity of publicising one serious wrong. Perhaps you are not aware of the fact that the judge gets 15s. for his task. He may have to travel to Southampton, Nottingham or Manchester, and it is often impossible for him to do the trip and judge in one day. Sometimes judging may keep him the best part of two days away from home, and I do not think that many will agree that 15s. is a small fortune for such a number of hours, apart from the specialist nature of the job. I know some clubs who do not limit their payments to this sum, which is the Federation rate, but insist on giving their judges more. More power to their elbows! Most of the judges are doing their best, under difficult conditions, to give a fair judgement. On the subject of judges' decisions, certain standards are provided by the Federation but these still leave a considerable amount of latitude. Judges are often expected to judge mixed fishes in a class, and it is always tricky to try to assess the relative value of comets, orandas, lionheads, moors and fantails all in the one class. One judge may be a breeder of veiltails and give the best prize to one of this breed, whereas another may favour a fantail.

Until we can have classes for each kind of fancy goldfish then I am afraid that it will be impossible to give a true valuation of each type. I know already that many show secretaries will say that if they made enough classes for all the types then they would not be filled. This may be true but it would be better for the judge and exhibitor if there were only one fish in a class which could be awarded points according to its worth. Do you think for one moment that an exhibitor of an oranda which is beaten in the class by a comet can gain any information from this as to the value of his own fish? I certainly do not. On the other hand if exhibitors thought that classes would be provided for all types of fishes, and that the classes would not be merged, they would show more specimens. Many breeders look through a show schedule and if they see that their shubunkins for example have to compete with other types, they will not enter them.

I have a tank with a good number of this year's goldfish fry which do not appear to have grown much for some time and yet they look in good health. Can you give a reason for this?

It is possible that your trouble is that there are too many fish in the tank. If this is the case then they will not grow. Once the fry are over a month old they will each require about 24 square inches of water surface. If the fry have adequate room then lack of suitable food may have caused the stunted growth. Many breeders do not realise that fry can eat a fair amount of food each hour throughout the day; the practice of giving one fairly large feed once a day is a very bad one. A little food at a time is enough and this should be all eaten in about five minutes. Another similar feed can then be given each hour. If the total amount of food which the fishes can eat during such a day's feeding by this method were given at one time most of the food would be uneaten for a considerable time and may become sour. Once this has happened the fish will leave it alone, and then water purity suffers.

I wonder if your trouble is that your tank is too clear? The beautiful crystal clear tank such as a show specimen is not the best one for the growth of fry. Crystal clear water will contain hardly anything of food value for young fishes, whereas the tank with hardly any water plants therein and which has become a good green colour will contain much valuable food. Try next season to test this by a little experiment. Place an equal number of fry in two tanks: have one well planted and very clear, and the other without plants and filled with water which has been exposed to the sun and air until it is well charged with algae so that it is almost opaque. You will find that the fry in the green water tank will thrive much better than those in the clear tank.

Can I keep garden worms throughout the winter?

You have a better chance of keeping worms alive during the winter than during warm weather. Worms should be kept in a box in a dark, cool and damp place. I have found that they live very well in dead leaves without any earth. Once a month clear out the receptacle and place the worms in fresh dead leaves. With such treatment it is possible to keep the worms for a long time.

I have a number of spider-like creatures skiddin about on the top of my pond; will they harm the fish?

These are pond-skaters and I have never found them eating fry. They mostly eat flies which drop on the surface of the water and I have never known the skaters pierce the surface skin of the water. A very strange thing is that fish do not seem to make any attempt to eat them.



Photo:

A five feet aquarium containing 38 mixed fancy goldfishes displayed by Mr. R. H. I. Read at "This Wimbledon" Exhibition in September (see page 173)

Angel Fish Breeding in New Zealand

by E. C. TAYLOR

(Editor, *The Dominion Aquarist and Pondkeeper*)

MY breeding stock of angel fishes consists of three mature fish in an eight-gallon aquarium. In this small container, which I know is a departure from good practice, the fish—one male and two females, have spawned five times in the past three months. At spawning time the odd fish out is discretely poked into a corner by the two who are so intent on their all important task.

My method of hatching may also be unorthodox. When the eggs are lined up on a leaf of *Sagittaria gigantea* this is snipped off and allowed to float to the top. I allow the parents to fan the eggs for about four hours before removing the leaf to a twelve-gallon aquarium. This nursery tank is scrubbed out before the attachment of thermostat and heater and is filled with tap water from the house supply—no plants, no sand, just clear water at 80° F.

Water and Aeration

In the tank I set a clear glass basin on top of a flower pot to raise it near the surface water. The egg-laden leaves, weighted with small lead clips to keep them submerged, are then put into this basin containing tap water at the same temperature as the water in which they were laid. The pH of the water is never tested, for there is little point in making it more acid or alkaline when it seems so conducive to natural spawning and rearing. Actually our city supply (artesian) is slightly alkaline, with practically no variation.

During the hatching period gentle aeration is employed constantly and when the youngsters are free-swimming they are fed with micro worm and/or newly-hatched brine shrimp (*Artemia*). I have had equally pleasing hatching results (my best rearing has been 152), with and without the use of methylene blue in the water. Again, there is little point indulging in chemical additions when in practice they can safely be dispensed with.

From the foregoing it will be obvious that I am no disciple of "old" or "cured" water. There is plenty of evidence that raw tap water is a very marked stimulant in inducing *scalare* spawning. With reasonable spacing I believe I can control this event at will by removing one-third of the water from the bottom with a siphon and replacing with fresh water at the same temperature.

Feeding for Breeding

Readers may be interested to know how three angels thrive and spawn so well in such a ridiculously small aquarium. In it, their home since they were the size of drawing pins, they have never been allowed more than about three *Sagittaria* plants, which are removed and replaced with smaller ones as they grow to the top. Thus the fish are ever on view and have no privacy; they are friendly, and the only time they "stampede" is when I put my hand into the aquarium to remove, root and all, the fast-growing plants.

Having read this brief account of a New Zealander's technique of raising angels the critical or discerning fancier would be quite justified in feeling that the picture is not quite complete. He may probably concede the fresh water as being in accord with good practice but he may still



Photo:

W. S. Pitt

Male angel fish guarding eggs deposited on a bamboo cane placed in the aquarium to receive them

wonder about a vital phase—on what food are the parents conditioned? Here is a difficulty for many, not so fortunately placed as myself in having a number of ponds.

At no stage in their lives have these three aristocrats ever had to suffer any kind of food other than *Daphnia* and white worms alternately (twice a day), with an odd supper of water boatmen (our New Zealand species, *Anisops wakefieldii*) and an occasional breakfast of damselfly larvae when I have the time and inclination to collect it. Never have they been on the oft-proclaimed "hunger strike" but I do think this would happen if they saw a cloud of cereal food descending on them from above.

Cannibalistic Angels

The discerning fancier may also wonder why such a compatible threesome does not raise its young—a much simpler matter for the aquarist. Well, I gave them the opportunity not once but twice, and on each occasion they rebuked my good intention by "scoffing" the lot after 48 hours. Why they should do this I do not know, unless it is an instinctive anticipation of claustrophobia; for what well-brought-up self-respecting fish would want to have a hundred or so youngsters in such a small flat?

And a final question—how do I sex my angels? Here's another secret—I don't, because I don't know how. I leave sexing to the fishes!

Post-Mortem Examination of Fishes:

W. Harold Cotton, F.Z.S., 39, Brook Lane,
King's Heath, Birmingham, 14.

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

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



BOOK R E V I E W

British Reptiles and Amphibia

The British Amphibians and Reptiles, by Malcolm Smith. The New Naturalist Library, No. 20. 318 pp., 16 colour plates, 16 black and white photographs, 88 line drawings. Collins, 14, St. James's Place, London, S.W.1. 21s. net.

HERPETOLOGISTS have been eagerly awaiting the publication of the latest volume in the New Naturalist series, knowing what they can expect from Dr. Malcolm Smith. This has come fully up to their expectations, although unfortunately the printers have erred in the colour reproduction of one or two of the plates. This is particularly noticeable in plate 6, where the natterjack toad is shown as a bright green creature.

The book starts with an account of the history of observations upon the various species in this country, deals with their geographical distribution, and then takes each species in turn, a general account of the order concerned being given at the beginning of each chapter. The parasites of reptiles and amphibia are also described in a separate chapter, and the book concludes with a most interesting account of unsolved problems. These include the movements of species in the wild, hibernation and rates of growth—investigation of these points being bound up with the further problem of identifying individuals when they may be met under wild conditions, possibly after an interval of months or years. Other points concern the power of learning and colour vision.

Apart from personal observations by the author, those

interested will find a wealth of facts collected from a variety of sources, the papers used being given in an extensive bibliography. The fields covered include the distribution of species, past and present, courtship and breeding, ecdysis and hatching, differentiation between the tadpole and adult stages, feeding habits and such subjects as neoteny, which is illustrated by a pair of beautiful colour photographs of a neotenic smooth newt. For each species there is included a map showing the distribution in the British Isles, and a diagram of its year-cycle.

Everybody with an interest in British reptiles and amphibia should be in possession of this valuable and readable book, in which the author has combined field observations with the results of his study of subjects both in captivity and in museum jars.

J. F. D. Frazer

Aquarium Pets

Tropical Fishes as Pets, by Christopher W. Coates. 226 pp., 57 black-and-white photographs. Jonathan Cape, Bedford Square, London, W.C.1. 12/6 net.

THE author of this book is curator of tropical fishes at the New York Aquarium. He has had, in addition, considerable experience in presenting aquarium information in written form, for since 1931 he has conducted a weekly column on tropical fish in the *New York Sun* and *World-Telegraph*. *Tropical Fishes as Pets* was first published in 1934, and the present edition is an unrevised reprint issued this year. It is necessary to state, however, to avoid confusion, that a revised edition of the same book with colour plates, has recently been issued by its New York publisher at a much higher price.

For the information it contains, and for the author's very readable style, the book can be recommended to the amateur fish-keeper. It has chapters on setting up the aquarium, aquarium chemistry, fish diseases and diets, and chapters devoted to description of form and habits of the commonly-kept groups of tropical fish, with details of aquarium breeding. The photographs have unfortunately suffered in reproduction, the printing blocks appearing to be badly worn.

MARINE AQUARIA

Crawfish at the Zoo Aquarium

PROBABLY the finest display of rock lobsters, or crawfish (*Palinurus vulgaris*) ever staged in London can now be seen in a big tank on the London Zoo Aquarium's southern wall. The crawfish (*Langouste* to the French epicure, and *Aragosta* to the Italian) is our largest native crustacean, spanning quite two feet from head to tail, with magnificently sculptured gold and chestnut armour. Together with *Alpheus*, the "pistol prawn," it is one of our only two sound producing crustacea. By rubbing the leathery joints of its huge antennae against its central beak, it makes a loud grunting sound, very eerie when heard "coming up" in a pot, through several fathoms of water. Very large pots are needed to accommodate its immense "horns."

It is a near relation of the strange flat lobsters (from Madeira—very rare in England) often shown in the aquarium, and like them has a larval form quite unlike that of the true lobster. Only of recent years have these been properly understood. To fishermen they are still known as "glass



crabs," and early naturalists regarded them as a distinct order of crustacea, giving them the generic name of *Phyllosoma*. The true home of the *Langouste* is the Mediterranean where it is taken in very large pots, so lightly built that they would hardly survive a single tide in Channel water. *Palinurus* is only a summer visitor inshore, retiring to great depths with the approach of cold weather.

L. R. Brightwell

OUR READERS

Write—

Readers are invited to express their views and opinions on subjects of interest to aquarists. A selection from queries received will also be answered here. The Editor reserves the right to shorten letters when considered necessary and is not responsible for the opinions expressed by correspondents.



International Federation

THERE are now large bodies of aquarists organised upon a national level in several countries, and it appears to me that the time has come for serious consideration to be given to the possibility of bringing these organisations together. The idea of an international Federation is not a new one, but so far it has remained only an idea, and my purpose now is to urge that it should be made a fact, by the formation of an International Committee composed of representatives from those countries which have sufficiently advanced organisations.

The establishment of such a committee would benefit not only the countries concerned, but would speed the development of others. The ultimate goal would be the formation of a World Union of Aquarists, to be built round the mere nucleus which we can expect to form at the present stage.

I therefore wish to propose that you consult your organisation with a view to sending at least one delegate to an initial meeting, at which a Provisional International Committee would be formed. The task of this committee would be to find the best ways to develop a scheme such as that enclosed herewith, in order to make possible a larger and more permanent International Union. An easily accessible centre must be chosen for the meeting, and Paris or Brussels would seem to be most suitable.

This proposal is not made without knowledge of the problems involved, or of the difficulties that might arise, nor without careful consideration of the world situation. Indeed, I have already taken the precaution of discussing the matter with leading aquarists in Holland, Belgium, Germany, America, India and elsewhere, as well as in my own land, and in each case the idea has met with enthusiastic approval.

A. FRASER-BRUNNER,
Richmond, Surrey.

Enclosed with this letter, which we understand has been circularised to all leading aquarium journals and aquarists' organisations at home and overseas, were papers giving more detailed proposals for the development of a world union of aquarists, and it is hoped to give further publicity to these in a future issue of "The Aquarist."

Simple Pond

I ENCLOSE a photograph of a small tub which I have installed in the garden at very little cost, which may be of interest to readers of *The Aquarist*.

It is a galvanised zinc bath—largest size available—painted with three coats of black bituminous paint, which is

used for painting water cisterns. It is not quite flush with the soil; this is to prevent the rain washing in soil from the surround, which would make the water look muddy whenever it rained. A small rock wall is built round one side, with soil from the excavation piled behind it. Rock plants, forget-me-nots and montbretia complete the picture.

The iris—collected from a stream—is planted in a flower pot, the pot being camouflaged by a thick growth of Canadian water weed, obtained from the same stream as the iris. The stock is four two-inch goldfish, which have successfully weathered the last two Scottish winters. (Weathering this year's summer could also be a claim to fame!)



The tub was obtained from the hardware department of a large store, at half the normal price, because the rim on which it sits was damaged. This does not affect its ability to hold water. Apparently with large consignments of zinc baths the bottom one in the stack sometimes has its "sitting" rim damaged, making it useless for keeping an even keel on the floor. If you are lucky enough to obtain one of these, you can have a miniature pond, including the price of the paint, for 25/-.

SIMPSON BUGLASS,
Glasgow, S.A.

Prolific Daphnia

RECENTLY, before going away for two weeks holiday, I bought a shillingworth of *Daphnia* to leave some food for the fish while I was away. After putting the *Daphnia* in the aquarium I saw that there were two left in the jar. I took them into the garden and put them into an old bath together with some water weed. On returning from my holiday I was amazed to find the bath swarming with the water fleas. I have been feeding my fish on them ever since. And they all descended from two!

A. K. WAKEMAN,
Coulston, Surrey.

White Spot Treatment

THANK you for including in your August issue a paragraph entitled "Quinine Treatment for White Spot Disease." Due to my inexperience, I had put infected barbs into my community tank and lost a number of fishes before I realised the cause. I tried potassium permanganate, which kept the infection down, but failed to cure it, but after trying the quinine treatment for a week I can guarantee your claim for one hundred per cent. success.

R. J. CAYLESS,
Greenford, Middlesex.

Painless for Whom?

IT troubled me greatly to read in your September issue Mr. D. W. Waters's suggested method of killing fish by electrocution—not from any humane point of view, for it could be the most humane way—but because in such a cryptically short letter a means of sudden death is suggested to all and sundry. Sudden death not only for the fish but for the unwary aquarist as well. No warning is given that the "jar" must be either glass or earthenware, and be without metal in its make-up. No warning is given that if the cable to the electrode was wetted the insulation would be useless.

No warning is given about tampering with electricity with wet hands—an aquarist's hands are so often wet. It is a sign of the times that we use electricity in so many ways in the home, and the aquarium for that matter, that we become contemptuous of its dangers when used carelessly. No! I would suggest that readers think twice about using this method of painless death—and then don't.

J. D. MENZIES,
Carlisle.

Criticism of Traders

MAY I reply to the somewhat hasty letter of Mr. E. Bold (*The Aquarist*, September)? He would seem to suggest that because sample cultures of Grindal worms which have been supplied may not contain very large numbers of worms, the transaction is in the nature of a swindle.

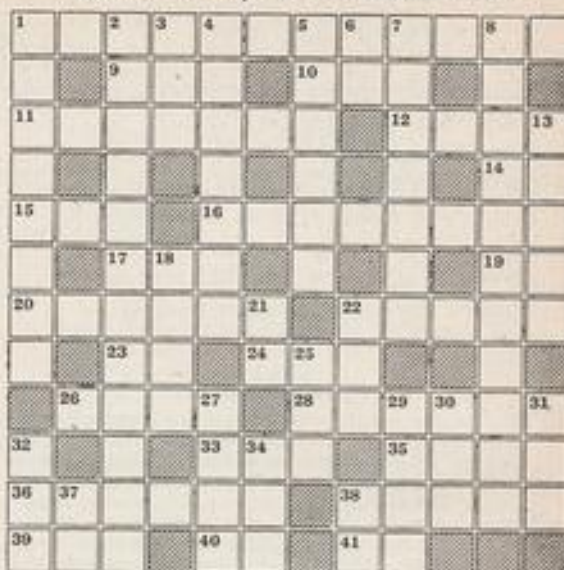
The worms in these cultures are not, of course, intended for feeding direct to fishes but to form the breeding stock for larger cultures which will ultimately be used for that purpose. Many people who have taken the necessary care to grow the worms are more than satisfied with the result.

I have recently been engaged in preparing pure strains from these worms and to do this it is necessary to start with a single specimen in carefully sterilised medium. I have started a number of such pure cultures, each from a single worm, and in every case the culture has succeeded and given rise to a thriving colony in the course of a few weeks.

A. E. FALKUS, B.Sc. (Eng.),
Romford, Essex.

The AQUARIST Crossword

Compiled by J. LAUGHLAND



CLUES ACROSS

- 1 Aquatic Coleoptera (6, 6)
- 9 She's from the rabid acara (3)
- 10 First on the agenda (3)
- 11 Servant (anagram) (7)
- 12 This head is a fancy goldfish (4)
- 14 Thus a half sole (2)
- 15 A taste of liquid (3)
- 16 —And the unpleasant effect of many such (8)
- 17 She discards the M.M. and is no longer madam (3)
- 19 Steamship or screw steamer (1, 1)
- 20 Incoil (6)
- 22 A test for condition (5)
- 23 Sappers from orfe (2)
- 24 Less and more than none (3)
- 26 Frog genus (4)
- 28 Old *Elodea* (6)
- 33 Clump or patch, if of blanket-weed no welcome on it (3)
- 35 Free from danger (4)
- 36 Black beauty, perhaps (6)
- 38 Fish with a heavenly body, perhaps (5)
- 39 Nose (3)
- 40 The opposite of drinking like a fish (1, 1)
- 41 Bovine animal (2)

CLUES DOWN

- 1 Aquatic Coleoptera (8)
- 2 Producing young alive (12)
- 3 Not quite ideal fish (3)
- 4 Sea unicorn (7)
- 5 Sometimes temporary tanks, (too small to keep bass in) (6)
- 6 For example (1, 1)
- 7 Burbot or blenny (3-4)
- 8 Unlimited warfare for aquatic plant (11)
- 13 Broken snore (5)
- 18 Remove (4)
- 21 Look from loach (2)
- 22 River sedge (3)
- 25 Catch with a net, of course (3)
- 27 Leave out of the Haplomi tribe of fishes (4)
- 29 Pike genus (4)
- 30 This animal's horn is common term for *Plasmodium* (3)
- 31 Aged (3)
- 32 Devil fish fry? (3)
- 34 See 31 (3)
- 37 Alternative of orfe (2)
- 38 —And colonel of comets (1, 1)

PICK YOUR ANSWER

(1 mark each. No cheating, if you please)

1. *Hyphessobrycon innos* (the neon tetra) was named by: (a) Ellis. (b) Fraser-Brunner. (c) Hubbs. (d) Myers.
2. The first photograph of a living fish was taken in (a) 1854. (b) 1864 (c) 1874. (d) 1884.
3. The scientific name of the Texas mud baby is: (a) *Gambusia aquatica*. (b) *Echinodorus radicans*. (c) *Heteranchoera australis*. (d) *Najas flexilis*.
4. *Barbus canisingsi* is native to: (a) Borneo. (b) Ceylon. (c) Singapore. (d) Sumatra.
5. Which one of these famous naturalists died by drowning? (a) Agassiz. (b) Artedi. (c) Cuvier. (d) Linné.
6. The labyrinth organ of the Anabantid Fishes develops when the fish is about: (a) two to four weeks old. (b) four to six weeks old. (c) six to eight weeks old. (d) eight to 10 weeks old.

G. P. H.

(Solutions on page 174)

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 preceeding 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.

South London Display

A DISPLAY of tropical fishes and goldfish varieties was staged by members of the **South London Aquarists** at the end of September as part of the Borough of Wimbledon's "This Wimbledon" Exhibition. Highlight of the show was a special display of fancy goldfishes arranged by the society's secretary, Mr. R. H. I. Read. His aquarium (pictured on page 168) was five feet long by 18 ins. wide and 18 ins. high, and it contained 38 picked fancy goldfishes of all ages—shubunkins, scaleless veiltails, black moors and scaled fantails, forming a most unusual and attractive picture. Over 400 plants were set in the tank, which was illuminated by a five feet fluorescent tube overhead—this "cool" light obviating over-heating of the aquarium water. As the display took all day on the Sunday before the Wednesday opening to erect, the three days waiting period gained enabled all the tanks to be shown with beautifully clear water. A coldwater aquarium staged by Mr. Pinhorn contained a team of well-grown and exceptionally deeply-coloured scaled fantails, and in the tropical tanks neon tetras, glowlights, rasboras and ticto and cherry barb were of high standard. The whole display reflected the highest credit on members of the South London Aquarists who had worked hard to place the delights of aquarium-keeping before the eyes of the people of Wimbledon.

Breeders' Exhibition

NOTEWORTHY event in the **East London Aquarists' and Pondkeepers' Association's** programme last month was an exhibition of member-breeders' fishes. Judges were set a hard task with the 85 entries, for fishes were assessed on individual merit and not by classes. Of the F.B.A.S. standard groups, mollies, platys, danios and barbs obtained the greatest number of high placings. Mr. A. E. Collyer's tiger barbs obtained for him the Breeding Achievement Cup for the most outstanding effort (bred 18th May). White cloud minnows (Mr. P. S. Campkin, bred 6th March), were judged best egg-layers and double sword guppies of Mr. E. A. Davey were best livebearers. All fishes shown were of high quality and made a display of which the Association was justly proud. Show organiser was Mr. B. Howe.



Display of aquaria staged by the South London Aquarists at Wimbledon in September



ANNUAL general meeting of the **Swansea and District Aquarists' Society** was held last month. The chairman, Mr. P. Bassett Jones, in his report, expressed satisfaction with the membership approaching 60, and with the enthusiasm shown by members. During the year a fully furnished aquarium was presented to the Children's Ward of the Swansea Hospital (photograph of the presentation above) and similar presentations are planned for other hospitals. A visit to Bristol Zoo Aquarium was made by members on 14th October, and a full programme has been arranged for the coming year.

Secretary Changes

CHANGES of secretaries and addresses have been reported from the following societies: **High Wycombe and District Aquarist Club** (Mr. R. G. Gray, Elmsmore, Totteridge Hill, High Wycombe, Bucks); **Lotus Aquatic Society** (Mr. G. R. Pearce, 3, Tabor Grove, Wimbledon, S.W.19); **Oldham and District Aquarist Society** (Mr. G. Dyson, 131, Bolton Street, Oldham); **Paisley Aquarist Society** (Mr. W. Blair, 3, United Place, Paisley); **Plymouth and District Aquarists' and Pondkeepers' Society** (Mr. M. Kitt, 48, Dale Gardens, Mutley, Plymouth); **Rugby and District Aquarists' Society** (Mr. J. W. Gillings, 26, Lawford Lane, Bilton, Rugby); **Swansea and District Aquarists' Society** (Mr. W. Hal Jones, Plas y coed, 36, Hazel Road, Swansea); **Taunton and District Aquarists' Society** (Mr. G. R. Ridge, 25, Greenway Crescent, Taunton Somerset).

New Societies

Brixton Aquarist Society

Secretary: F. J. H. Seymour, 14, Beauchamp Road, Clapham Junction, London, S.W.11.

Meetings: Every Friday, 7.30 p.m., at Brixton Men's Institute, Effra Parade, London, S.W.2.

Chingford and District Amateur Aquarist Society

Secretary: D. T. Kemp, 2, Rolls Park Avenue, Chingford, E.A. (Phone: LAR 5173).

Preston Aquarists' Circle

Secretary: Mrs. D. Crawford, Eastwood, Garrison Road, Fulwood, Preston.

Slough and District Aquarist Society

Secretary: F. J. Harries, B.Sc., 120, Mercian Way, Cippenham, Slough, Bucks.

Meetings: First Monday and third Friday each month, 7.45 p.m., at the Nag's Head, Crown Corner, Slough.

Wombwell and District Aquarist Society

Secretary: D. Walton, 70, Main Street, Wombwell, Yorkshire.



Mr. S. Harker judging entries in the coldwater section of the competitive show held between Welling & D. A. & P. Club and Amersham Grove A. Club

AT the inaugural meeting of the Directorate of Colonial Surveys Aquarist Society in September, Mr. J. B. Catford, Directorate of Colonial Surveys, Kingston Road, Tolworth, Surrey, was elected secretary. Meetings are to be held on the first and third Tuesdays of each month.

LAST month saw the formation of an Aquarists' Section to the Hawker Athletic and Social Club. Secretary is Mr. H. K. Lambert, 82, Knollmead, Tolworth, Surbiton, and the meeting place is the Hawker Sports Pavilion, Richmond Road, Kingston-on-Thames, Surrey.

CLASSES in aquarium-keeping are held every Thursday evening, 7.30 p.m. at Tower Bridge, Bermondsey Evening Institute, Fair Street, London, S.E.1. The instructor is Mr. B. Stacey, who cordially welcomes beginners and aquarists to attend.

Aquarist's Calendar

1st-3rd November: Bristol Aquarists' Society annual show at Y. M. C. A. Hall, Trenchard Street, Bristol.
 5th-7th November: Middlesbrough Aquarist Society display of tropical aquaria in the Middlesbrough and District Chrysanthemum Show at Middlesbrough Town Hall.
 8th-10th November: Scottish Aquarium Society 17th annual show at Kelvin Hall, Glasgow. Full details from secretary, Strachan Kerr, Esq., 42, Aytoun Road, Glasgow, S.1.
 24th November: New Cross and District Aquarist Society display at St. George's Hall, Brockley Cross (No. 35 tram from New Cross). Doors open 2 p.m.
 6th-8th December: National Exhibition of Cage Birds, incorporating Water Life Display of aquaria, fishes, reptiles and amphibians, at National Hall, Olympia, London, W.14.



Shown above is the three feet tropical aquarium stocked with 65 fishes presented by the Harley and D. A. & P. S. to the Redhill County Hospital. The society's chairman, Mr. A. F. Gray, is making the formal presentation to the matron, Miss Nicholls

Mr. W. Hipperson, winner of the open furnished aquarium class at the Nelson & D. A. Annual Show is seen below with his entry. A presentation of fishes was made to the local hospital at the show



PHOTOGRAPH of the Bournemouth Aquarists' Club's first open show and exhibition is shown above. 108 furnished aquaria and the same number of competitive tanks were staged, showing tropical, coldwater and marine exhibits, the latter two classes being supplied by locally-caught specimens. An aquarium was presented to a local hospital, following the show.

Crossword Solution

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

PICK YOUR ANSWER (Solution)

1 (d). 2 (a). 3 (b). 4 (b). 5 (b). 6 (a).
 6 marks—Super!; 5 marks—Excellent; 4 marks—Very good; 3 marks—Good; 2 marks—Fair; 1 mark—Poor; 0 marks—Dud!

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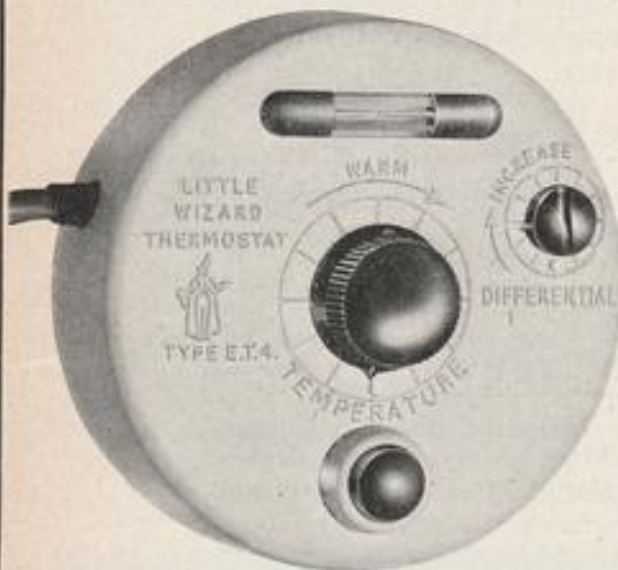
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