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Photo:

Laurence E. Perkins

"You never will see eye-to-eye with me, will you? This pair of celestial goldfish was pictured at the London Aquarium, and other rare varieties recently arrived are shown on page 235

Editorial

ONCE upon a time it would have been possible for beliefs to be held, and not with unkind intent, that fairies existed at the bottom of a neighbour's garden. With the disappearance of the fascinating wee folk from the face of the earth it seems that more sinister suspicions about bottom-of-the-garden activities can be engendered in neighbours' minds. Take, for example, the Case of the Hendon Garden Shed. Most nights of the week it can be seen to be brightly illuminated, and it's no secret that its owner spends a lot of time in it. That's enough to start anyone with time to spare wondering about what goes on in the mysterious Shed, and if you add to the observations the fact that every night the clarity of local television screens was being spoilt—well! Could the Shed house a high-powered transmitter communicating with Russia, or with Outer Space, or hide an atomic pile in the making, or even a Death Ray machine? Only one thing to do—tell the G.P.O. And so, last month well-known Hendon Aquatic Society chairman Mr. Roy Skipper received an official visitor to his fish-house. It is not recorded exactly what the official had been led to expect to find there, but hazarding a guess, we would say that fishes were just as far from his mind as were fairies. A source of television interference? Well, hardly. It has been said, however, that some Hendon screens are now showing a suffused pink coloration. This may be only the reflection from red faces, and the fishes are certainly responsible for those.

A NORTHERN newspaper reported that a certain aquarists' society, finding itself in the position of having to raise some funds to avoid closing down, had appealed to the local education committee for a grant. This was done on the ground that the society helped schools with lectures, material and information. An alderman praised the society's evening activities: "It gets children into the Town Hall . . . children who would otherwise be running about the streets." Now a correspondent from the north tells us that a grant of ten guineas has been made. This is pleasing evidence of official recognition of the educational and social value of this hobby.

Cold Weather Transport of Tropical Fishes

by RAYMOND YATES

OUR climate being what it is most aquarists take the precaution of carrying their fish around in one form of insulated jar or another. Undoubtedly, the best are those made by the Thermos Company of London who have been making vacuum insulated containers of this type for fifty years. Normally, they are used for the storage of liquid or solid hot or cold refreshments but apart from this, and the carriage of tropical fish, they have also been used by laboratories, universities, etc., for low temperature research work or for use as liquid air traps. Several were used by the Everest expedition for the collection of specimens and they have been put to similar scientific use in Greenland and with the South Georgia Survey. In the Atlantic "Queens" Thermos jugs provide iced water in the cabins for the convenience of passengers. Another use for jars has been in transporting vital vaccines and serums packed in ice and transported to patients by air, thousands of miles away.

Some facts about the construction of these "magic bottles" will be of interest. A vacuum flask or jar is really two glass bottles one inside the other, the necks of which are fused together. Silver is deposited on the outside of the inner vessel and on the inside of the outer vessel. The air is pumped out of the space between these two leaving a vacuum, or almost so because it is not possible to create a perfect vacuum and there is always a little air left behind. The vacuum is an excellent insulator of itself, but it is improved by the silvered surfaces, which reflect the inside infra-red and other heat rays inwards and the outside rays outwards. This is why the same flask will keep hot liquids hot and cold liquids cold. It cannot keep them hot or cold for ever, because some heat changes due to conduction occur at the neck of the vessel, even although glass is a poor conductor, and cork, good as it is as an insulator, cannot prevent temperature changes in time. The outer case is strong of necessity, and is fitted with a shock absorber at the base and a rubber collar which encircles the neck of the vessel.

Before use for tropicals the inside of the jar should be warmed up with water of similar temperature. Never pour boiling water into a cold Thermos vessel—it isn't needed and might damage the glass. Care should be taken to avoid scratching the interior, hence, do not put sand or grit inside. It is a mistake to only half-fill your Thermos jar, they should always be filled as near the top as possible to prevent heat loss. There are many different sizes in use (about 20 or so) but those mainly used by fishkeepers are the quart, half gallon and gallon sizes. How many fish can be carried in each is not a question which can reasonably be answered without knowing the size of the fish and the time they will be in the jar. It is never wise to attempt to carry too many fish in a small container. In a quart jar half a dozen fish the size of an adult *Pristella* can be carried for about two hours, and I have kept this number for three and a half hours on occasion, but it is taking a risk. A dozen small neons will survive three or four hours. A quart of water is not very much and the reader is advised to measure it out in a saucepan to give him a better idea of what he is expecting of his fish. Roughly speaking, a

quart covers the bottom of a white enamelled bucket to a depth of about one inch. If, therefore, more fish are to be carried or longer journeys undertaken, a larger container becomes a must.

The gallon size jar is excellent for this purpose because it enables the hobbyist to travel long distances by car or train without fear of loss of temperature or suffocation of the fish. Even in summer there are grave disadvantages in the use of large tins (uninsulated) for fish transport over long distances. There is always someone in the carriage who wants both windows or the corridor door open in the train and the temperature can drop alarmingly. Waiting for connections can be a worrying business, particularly in winter. The Thermos jar obviates all this. From time to time I like to dash down to London for the day (200 miles each way) and here the large size Thermos is most useful, as five or six hours in a jar on the return trip cannot harm the fish. In winter, if travelling at night, one can fill the jar with boiling water for the outward journey and shave on the train in comfort before arrival, where every moment of your daylight stay is already mapped out.

It is wiser to fill a Thermos jar with tank water from a rubber pipe or cup—never dip it in the aquarium for this purpose. If this is done some water will seep through the rubber neck and, in time, will rust the inside of the container bottom. This does not, of course, affect the use of the jar. Only the collapse of the glass vessel can affect the insulation, so a Thermos is either efficient or useless—it cannot deteriorate. When you look into your flask or jar you will notice two or three dark spots on the bottom or half way up the sides. These are not defects but asbestos supports placed between the walls to strengthen them. Spare parts can be obtained for almost all sections of these jars, including the glass bottles, which are known as "Refills." After use, wash out and leave the cork off. No fishy smell will then remain and there is no reason why your jar should not be used for home purposes. Ice will stay ice for many hours, butter can be kept solid in the hottest weather, ice cream in cartons or tubs is easily kept. Mrs. Aquarist will be interested to hear that heat-resisting glass is used for all the larger models. The small tea flasks can also be used for tropicals but they are limited by size, some holding less than half a pint.

Cacti in the Fish House

NOT all types of cacti are suitable for the fish-house but by visiting cacti exhibitions it will be possible to find out which kinds are likely to suit you best and names can be taken for future reference. As with other plants it will be found that cacti are given a generic name and a specific one. The former is always shown with a capital letter whilst the specific name is shown with an ordinary letter. There are over a hundred and twenty different genera of cacti alone and a few of these contain hundreds of species. There are also very many other succulents, most of which are found in Africa, but the treatment for these is often the same as for the proper cacti. A few kinds of the other succulents are not quite the same as cacti, where their growing periods are concerned. The *Lithops*, or stone mimics, need a rest from December to April, when they must have no water. The *Conophyton*, another mimicry type, rest from about April to July or August, and must receive no water during that period.

RECENT
IMPORTS:

Concerning Catfishes

by A. FRASER-BRUNNER

Illustrated by the Author

IN my reports upon the Wonderland exhibition in Antwerp I have referred to the catfish *Synodontis angelicus* which was brought from the Belgian Congo and exhibited there. These notes aroused a good deal of interest among those aquarists who keep an eye open for "something different," and it is perhaps not surprising therefore that some specimens of a black catfish with white spots that arrived in some recent importations to this country were promptly assumed to be the same species.

So far as I can ascertain, however, the three or four specimens of *Synodontis angelicus* which I saw at the first Antwerp show are the only ones so far brought to Europe, and these same fish, grown much larger, were exhibited again last year. They had not improved with age, having lost the bright pattern of pearly spots on a black background, and assumed a sombre blackish-brown colour all over. These fishes are, of course, related to the well-known inverted catfish, *Synodontis nigriventris* from the same region, but they do not swim upside-down. They belong to the African family Mochocidae.

The specimens recently imported to Britain admittedly have a certain resemblance to *S. angelicus*, but only in a sketchy way. They come from British Guiana, and belong to the American family Auchenipteridae. The name to be applied to them is *Centromochlus aulopygius* Kner.

The coloration is mainly black, and there may be white spots, but it is far more elongate than any *Synodontis*, and should not be confused with that group. The lower surface of the head, breast, pectoral and pelvic fins is gleaming white, very sharply contrasted with the black of the rest of the body. Some whitish oval spots are nearly always visible on the caudal fin, but their appearance on the body seems to be associated with the emotional state of the fish. Having now kept two of them for some time, I would say that the spots are a bad sign, displayed when the fish is alarmed or sick; contented healthy fishes show



Centromochlus aulopygius (from British Guiana)

an even, deep black. The white spots, when present, are smaller, more oval, and generally more regular than in *Synodontis angelicus*; as in that species, however, they seem to be more conspicuous in young examples.

It would be idle to pretend that this is a showy fish. To begin with, it is nocturnal, so that it will hide away during the day; but it has some rather quaint ways of doing this—for example, it will lie head upward in the shadow of the angle-bar of a corner of the tank, and if there is a heater or thermometer there it will get behind that; or it will assume odd attitudes among the plants, usually lying along a stem or large leaf, so that it is difficult to see.

During the evening, however, it begins to move about, resting from time to time in curious attitudes, in search of food, even though the tank is still illuminated. This is the best time to admire its glossy black sides and shining white shirt-front.

Bottom Feeders

My specimens have never been seen to eat dried food, for they do not take anything moving through the water, but pick up food from the bottom, or off the leaves of plants. In this way they take whiteworms, chopped earthworms or *Tubifex*, but it is possible that during the night they pick up scraps of food left by the other inmates of the tank (two species of *Crenopoma*, and a *Distichodus* which likes dried food).

This species takes the range of temperature allowed for the others (between 65° and 80° F.) and needs no special attention apart from the provision of a little food at night. Once it has settled down it leads a quiet, blameless life, more or less forgotten in its seclusion until it charms us by an unexpected appearance. This is not the first time it has been available in the aquarium; some odd ones were imported in 1936, and were recorded in Germany at the time. It has never been bred, and nothing is yet known about its breeding habits.

Six species of *Centromochlus* have been described from various places in South America, but this is the only one known to have the pale spots. There are six slender and rather short barbels. The small dorsal fin is surprisingly far forward, above the pectoral fins, and the adipose fin is above the anal. The dorsal and pectoral fins have the



(Above) *Entropiella debauwi* (from the Congo)
(Below) *Macrones tengara* (from India)

serrated spine usual among catfishes. The caudal fin is proportionately rather large.

Because of the sombre colours and quiet habits of so many catfishes, they have no great popularity, but there are nevertheless many aquarists who take a special interest in them, and for these I may mention a few other species that have put in an appearance recently.

Macrones tengara

Of these the most attractive is *Macrones tengara* from India, when young. Behind the head it has a large black spot surrounded by a gleaming pale golden ring, and a similar but smaller mark lies at the base of the caudal fin; above these, running the length of the body, are two pale lines, and two others lie below them, these lines tending to bend round the anterior spot. The effect is quite striking, and forms a very characteristic pattern, but it unfortunately becomes indistinct or quite disappears with age.

This species has been confused with its relative, *Macrones vittatus*, the young of which has a somewhat similar pattern, though the shoulder and tail spots are smaller and the underparts are paler. The easiest way to distinguish the two in the aquarium is to look at the adipose fin, which is easy to see. In *M. tengara* it is very long, occupying the greater part of the tail region—its base much longer than that of the dorsal fin—whereas in *M. vittatus* it is in every way smaller than the dorsal. These fishes belong to the

family Bagridae, and have eight barbels, two of which are very long and usually held stiffly forward. They hail from India. Intending purchasers of these fishes should be warned that they may grow to a foot in length.

It is worth mentioning again the pretty little *Entropiella debanisi* from the Congo, which is one of the best catfishes for the aquarium because it remains small, is very attractively marked with three black stripes along a translucent body, and is much more active than most catfishes, spending its time near the surface, swimming to and fro at a great pace. It takes dried food, whiteworms and *Daphnia*, always in mid-water, never picking up anything from the bottom—a very unusual thing for members of this group. It is seen at its best when several are kept together as a small shoal. This species belongs to the same family as the well-known glass catfish (*Kryptopterus bicirrhus*)—the Schilbeidae.

Other Species

Among others which have arrived in recent consignments have been various species of the American genera *Pimelodes* and *Pimelodella*, but these are difficult to name without a dead specimen in one hand and a text-book in the other, and they tend to grow too large for the aquarium.

Of the ever popular Armoured Catfishes, particularly *Corydoras*, new kinds continue to turn up, but these will have to await a subsequent article all to themselves.

Microscopy for the Aquarist—5 by C. E. C. COLE

LAST month I left you with a limited range of microscopes from which to make your final choice. So far we have eliminated "no-name," non-standard, binocular, and ten-inch body-tube models. Also, I advise you to ignore models without a means of inclining the body to any desired angle between vertical and horizontal. A fixed angle (usually vertical) model is uncomfortable to work with for long periods at a time, and in any case we shall want to examine many creatures with the microscope body inclined very much forward.

It matters little whether the models you have left possess tripod or horseshoe bases. Some microscopists complain that the tripod gets in the way of substage apparatus. This is a very minor difficulty which can be eliminated by reaching farther round with the hand when using condensers, filters, or manipulating the substage mirror for lighting. There is another danger, however, which should be guarded against, and that is discovered when one of the three feet of the tripod slips over the edge of the table upon which it is standing. This could be a major disaster, so if you procure a tripod model, watch carefully where you place the feet.

Tripod or horseshoe, the base should rest firmly and squarely upon any flat surface. Any trace of wobble or rocking, under such circumstances, indicates a twisted base—a very bad point.

Below the stage will be the mirror. This is usually upon a pillar, which should be rigid. The mirror is flat one side and concave the other. Both surfaces should be perfectly silvered, although, other things being satisfactory, there is no reason to abstain from purchasing a microscope with an imperfect mirror. Re-silvering is not a costly or lengthy job. The last mirror I had re-silvered cost me a shilling, and even at that price the dealer almost apologised for the expense! It is more important to see that the mirror is centrally situated, with its centre exactly below the centre of the hole in the stage.

Now move above the stage. The limb of the instrument should not be too loose—that is, loose enough to cause the

tube to fall gently to the horizontal when tilted forward. Tightening the hinge joint is the remedy here, but do not tighten so that brute force has to be used to move the body. It should never be necessary to use force upon a precision instrument. Place the body tube in the horizontal position and test the base for stability by pressing gently downward at the top of the tube. Release of the pressure should cause the tube to resume the horizontal. Look now at the stage—with the tube in the horizontal position the stage should be vertical.

Shift your attention to the body tube. There should be no play between the tube and the focussing ratchet. If there is, it indicates either wear of the ratchet or loose screws in this vicinity. The latter can be tightened easily enough, but a worn ratchet can cause endless exasperation, rendering correct focussing an impossibility. If equipped with a draw tube, pull this gently out of the body-tube. Movement should be easy but not loose. Under no circumstances should it slip, for slipping upsets focussing quite as much as a worn ratchet, although it is more easily adjusted.

Finally, we come to objectives and eyepieces. There is so much to be said about these, however, that I will devote my space next month entirely to them. After that, we can really get down to operating our purchase.

Aquarist's Wallpaper

In a recent edition of "Aquarist's Notebook" mention was made of the wallpaper "Ocean Playground" made by the Wall Paper Manufacturers, Ltd. (Crown Wallpapers) of Manchester. The number quoted for the design was incorrect; it is number 3161 and costs 20s. 6d. a roll approximately. The same design is also available on a white background (number R 14891) and on a green background (R 14892), and these retail at approximately 10s. 6d. a roll.

AQUARIST AT HOME:

Mr. H. Foden

(HUDDERSFIELD)

*Interviewed and photographed
by JAS. STOTT*

ONE Sunday morning, last year, I was out with fellow enthusiasts collecting willow root, which, as is now well known, when cleaned and boiled is excellent as an egg trap in the spawning tank for certain species. We were in the vicinity of Huddersfield, and one of my companions suddenly announced that he would take us to see a fish house which in his opinion was well worth a visit. He said it would probably be of interest to me. No doubt he had this particular feature article in his mind at the time. Knowing him to be a person who is an ardent enthusiast and not given to exaggeration I immediately became interested.

Three-quarters of an hour later I stepped through the doorway into the establishment of Mr. H. Foden, who lives in the Birkby district of Huddersfield, and interest turned to enthusiasm, for I could very quickly see that here was a fish house which not only contained several good ideas in



A five feet long display aquarium is seen behind Mr. and Mrs. H. Foden, seated in their fish house



Breeding tank section of Mr. Foden's fish house. The glass panes in the roof are situated immediately over the aquaria, and good overhead electric lighting is also provided

its design but one that was kept scrupulously clean and tidy. As far as appearance was concerned I instantly got the impression that a woman's hand was, to some measure, responsible, and later I found that this was correct, because Mrs. Foden shares her husband's interest in the hobby and cleaning the fish house is part of her share in running the establishment. During my conversation with Mr. Foden I got the impression that he greatly appreciated his wife's efforts in this direction for he is quite a busy man in his spare time. Apart from being an aquarist he is also an expert grower of chrysanthemums.

Neat Fish House

The fish house is a converted greenhouse 30 feet in length, consisting of two compartments; the first is eight feet wide and the second 12 feet in width. This second part is actually an extension to the original eight feet long greenhouse. The roof is ridged and is eight feet high in the centre and five feet six inches at the sides. From the ridge to approximately half way down on each side of the roof slope there is an inner lining of insulation board and then glass to the eaves, thus bringing the panes directly over the top of the tanks, which are arranged around the sides of the building. The roof is double glazed and the central covered area, Mr. Foden informed me, helps to prevent excessive light passing through the front of the tanks. Insulation board covers the sides and ends of the building.

Concrete is used for the floor, and this is covered with lino, over which is laid fibre matting. I was informed that this was not intended to be there merely as an item of comfort but to help to conserve the heat in the building. Although adding to the cost of converting the greenhouses to their present use, double glazing, fitting insulation board lining, and the lino and fibre matting have been well worth the money because of the considerable saving in fuel and electricity. Mr. Foden contends that the current consumption was reduced by a third after these improvements had been carried out.

Some 40 tanks were housed in the building at the time of my visit, ranging in sizes from 18 ins. by 12 ins. by

12 ins. up to 5 ft. by 15 ins. by 15 ins. These are placed on a strongly constructed staging made up of lengths of iron glazing bars mounted on brickwork supports. The fish house is heated by the usual greenhouse type hot water heating system, and the tanks are individually heated by immersion heaters thermostatically controlled in sections. Over all the stock tanks was fitted a system of shades containing incandescent bulbs for supplying artificial top lighting when required, but the breeding tanks were so placed as to receive the full natural top lighting which Mr. Foden favours for breeding tanks. He does, however, use a certain amount of artificial lighting over the rearing tanks.

The narrower part of the fish house is used as the breeding section, while the stock tanks are situated in the wider part. In this department, which was furnished with several comfortable chairs, an electric clock and a radio, was the large five feet display tank. This was attractively set up with both plants and fish in grand condition. It was, like all the other tanks, clean and well maintained. I was particularly impressed by some rosy barbs which I saw in this tank, for they were of good size and showing magnificent colour. Tank frames, top lighting shades, shelving, all the woodwork and side boarding were all beautifully painted

in a colour scheme of cream and very pale green. The chairs were upholstered to match, as did the curtains which divided the two compartments; in general the place was made comfortable for, no doubt, many hours are spent in the fish house by Mr. and Mrs. Foden.

Breeding Stock

A wide range of tropicals is kept in this establishment. Regular breeding is carried out with zebras, fighters, beacons, gouramies, several different species of barbs, danios and tetras. Mr. Foden has also bred *Panchax playfairi* and *Nannostomus anomalus* and, of course, most of the livebearers are kept and bred. Mr. Foden believes in feeding little and often. He also strongly favours the use of white worms; in fact it appears they form the main item of diet for his fish as far as live food is concerned. He told me that to feed the white worm cultures in his 20 large boxes it takes an average of three two pound loaves of bread per week. Milk is never used with the bread—it is always mashed with water. A member of the Huddersfield Aquarists' Society, Mr. Foden has been actively interested in the hobby for six years.

In the Water Garden in FEBRUARY by Astilbes

IT may seem a little unseasonable to talk about the water garden during this month, but there can be plenty to do however, if one has the future appearance of the pond in mind. Just because you have a good pond and it flourishes each year it is by no means certain that it may not be possible by some slight alteration or addition to increase the look of the pond or your own interest. If one is able to alter something now and again it gives added interest and breaks the monotony.

I wrote last month of the possibility of adding a small waterfall, and I consider that if something of this nature has been done it may be possible to continue the beautifying process by adding some suitable stones from the level of the falls to around at least one side of the pond. A glance at the accompanying photograph will show how the addition of rocks has increased the beauty of the pond. A lot will depend on the type of pond one has to deal with, as it would not do to carry out this idea with a formal pond in the centre of a lawn. If rocks are well placed they will blend with those used in the construction of the waterfall. The rear of the rocks can later on be planted with irises or primulas, as are shown in the illustration. It is surprising how soon a pond surround can look well established; when first completed it may look anything but attractive but once spring arrives and the waterside plants start to grow, the whole scene will change for the better.

Although it will be too early to sow any seeds at present, it will be helpful to look through the seed catalogues in search of suitable ones. These can be ordered in good time so that you are ready to start sowing in March, if in slight warmth, or in April in the open. Many of the attractive pond-side plants can be more easily raised from seed if one makes use of a small propagating frame. This can be little trouble and expense—even a wooden box with a sheet of glass over the top will give protection to seeds and seedlings and so enable one to sow about a month earlier. This can mean quite a lot later in the season, as seedlings set out in late May will be far more likely to make good specimens and flower than those plants raised from seed out of doors with no protection. Some aquarists with tropical tanks are able to germinate their



Photo:

Laurence E. Perkins

Rockwork placed around the pond side at this time of year can later have planted behind it irises and primulas as in this example

seeds on the top of a heated tank, but this method must be carried out with great care as once the seedlings are up, they are likely to become drawn and weakly if they are not soon gradually hardened off to lower temperatures.

Watch your pond during this month as at this time we are likely to experience very hard frosts. See that the ice is not allowed to remain too thick all over the surface of the pond, as bad cracks can develop where the stress of ice is too strong. Do not interfere with any plants in the pond yet, but if any transplanting has to be done later on, see that you have sufficient large special pots for planting purposes. If you have things ready it saves time when the actual conditions are right.

Behaviour Patterns in Fishes

by LESLIE REID

THE science of animal behaviour, or ethology as it is now called, has made notable strides in recent years, thanks largely to the work of two men: Lorenz of Austria (author of *King Solomon's Ring*), and Professor Tinbergen of Oxford. Intensive studies of many kinds of animals have been carried out; and in this work fishes, since they can be watched at close range in an aquarium, have played an important part. Among fishes none has been studied with quite the same painstaking thoroughness as the common three-spined stickleback and certain species of cichlid.

In the spring the whole way of living of a stickleback community changes completely. From being gregarious and tolerant they, that is to say the males, become solitary and aggressive. Each one develops a keen sense of property, looking upon a patch of shallow water as exclusively his own. At the same time he dons the well-known nuptial livery, electric blue back and sides, gleaming red underside. These colours become steadily more vivid, and at the same time belligerence increases. Both rival males and unassuming, silvery females are chased away with extraordinary ferocity, the former because no other male can be tolerated within his territory, the latter apparently from superabundance of fighting spirit. It has been proved conclusively by experiment that the landlord stickleback reacts, not to the general appearance of the trespasser, not to any detailed impression of stickleback-nature, but almost wholly to his red underside. Crude models, no more than vaguely fish-shaped, so long as they are painted red on the underside, will be fiercely attacked. Exact models, lacking any red coloration, call forth only a feeble response. It is a matter of signal and answer. But this is by no means his only activity.

In the intervals of fending off intruders he is feverishly active collecting wisps and streamers of water-weed which he builds into a small heap on the floor of the aquarium, gluing them together by means of a sticky secretion from his kidneys. To do this he creeps over the heap repeatedly with an odd, slow movement, his body quivering from nose to tail. A few days later a fresh stage is reached. Again there is a creeping movement, this time from one side of the heap through to the other. The result is a tunnel, a nest, ready for the laying of eggs. Meanwhile development towards breeding condition has been going on among the females. Their bellies are swollen with maturing eggs, and before long one of them, who up to now has been chased out of the territory, will begin to respond, not by flight, but by adopting a posture of submissiveness and invitation, head up, body curved in an arc, in such a way as to accentuate her swollen underside. Here is another signal, and it calls forth another response, a courting and not a fighting response. The male approaches her by a zig-zag course, first away from, then towards her, ending by placing himself beneath her and slightly to one side, jostling her, pressing upwards from below. Here once more response is made to one particular signal, the swollen belly arched upwards. The crudest model, so long as the

underside protrudes markedly, will evoke the zig-zag dance. A faithful model, lacking this necessary adjunct, will fail to do so.

At this stage it is vitally important for the male to indicate the nest to his mate and urge her to spawn within it. This he does by swimming towards it with flashing speed, hoping that she will follow. But an innate reluctance on her part has to be overcome, and there may be several unsuccessful attempts before the two of them are together at the nest. After he has pointed out the way by pushing his head in, she enters. The sight of the nest has acted as a releaser stimulus, as it is called, inducing her to enter, but now she needs another stimulus, further encouragement, before she can be persuaded to spawn. The male gives it by hovering above and behind her and prodding the base of her tail with his snout. Without this prodding no eggs will be laid. It can however be induced artificially by means of a glass rod. This strange ambivalence of attitude is caused by the fact that the female stickleback is actuated by two conflicting drives, the drive to escape from the clamorous insistence of the male, and the drive to fulfil her destiny as a mother.

As soon as the eggs have been laid, and the whole process repeated with perhaps two other females, the male enters and deposits his milt, stimulated to do so probably by some chemical emanation from the eggs. At this stage his responsibilities have no more than begun. First the eggs require careful and prolonged aerating, since the hatching process causes them to consume additional quantities of oxygen. To do this he fans them with his fins, a habit known also to many other egg-laying fishes. With his pectoral fins working in reverse, his tail-fins in advance, he remains motionless in one spot obliquely above the nest, in such a way that a current of water is passed over the eggs. The time given to fanning increases steadily throughout the week or so required for hatching. When the fry have emerged the zealous father guards them vigilantly from dangers caused by predators on the one hand, and by their own venturesomeness on the other. After a time they are left to their own devices.

Recognition Signals

This is the general pattern, the chain with its component links. In outline it does not vary, and it is important to the species that it should not, for the links are recognition signals, which means that they serve to bring together a male and a female of the same species. If one member of the pair should belong to another species, accustomed to another chain of behaviour, either the wrong answer will be given to a signal, or no answer at all. In that case the chain will be broken and mating will not take place. This does not mean that no variations in the pattern are to be observed. There may be many and notable variations, but they will be concerned with the intensity of actions and reactions, depending on the intensity either of the internal drive that causes them, or of the response that they call forth. Thus the zig-zag dance of the male may consist of wide sweeps hither and thither, or of an approach which is almost a straight run.

Another form of variation is more interesting and appears to be caused either by a conflict of drives in some instances and failure in receiving response to a signal in others. Thus two males confronting one another, a territory-owner and a trespasser, will display vigorously with raised spines and gaping mouths. But two opposing drives actuate them, a drive to attack and a drive to escape. The nervous

tension thus arising may be so severe in one of them that he upends himself and begins digging with his snout in the sand, which is an action preliminary to the building of a nest. An even more striking instance often occurs when a female fails to respond to the male's invitation to swim towards the nest. In that event he can be seen to swim there himself and set to work vigorously fanning, in spite of the fact that the eggs have yet to be laid. Such actions are given the name "displacement activities."

Various species of cichlid have been intensively studied also, with the result that both a general resemblance and notable contrasts between their breeding behaviour and that of sticklebacks have emerged. It has been clearly established, for instance, not only that the territory habit is very strongly developed, but that the adoption of breeding colours is closely linked with it. A male, removed from his territory, loses his brilliant colouring and regains it when replaced. At the same time competition for territories is so keen that the vacated territory will at once be taken over by a rival. Fights between males are frequent, beginning as displays with gill-covers raised and mouths gaping to show brightly coloured throats. *Cichlasoma meeki* and *Hemichromis bimaculatus* are adorned with conspicuous spots on the gill-covers which are made the most of during displays.

In actual fighting the rivals will butt and seize one another by the throat. Physical injury seldom results, and the fight comes to an end with one of the combatants signalling that he has had enough by drooping his fins and swimming away. When a male meets a female he goes into display but she makes no answering display, thus indicating that the time has come not for aggression but for courtship. His response is to place himself in front of her and thus invite her to follow. The two of them then make for a spot on the floor of the aquarium where they dig out a hollow. When it is ready he invites her by his movements to lay her eggs, and this she eventually does. The male and female of *Aequidens latifrons* take turns in fanning the eggs.

With many cichlids then the hollow in the sand takes the place of the stickleback's nest: with others it is the mother's mouth that becomes the nest. The female of the large

cichlid, *Tilapia natalensis*, takes the eggs into her mouth as soon as the male has fertilised them. There they hatch out, and there they remain at least in the earlier stage. Later the young ones emerge, but remain close to the mother, retreating into their strange refuge when danger threatens. With other species not only the unfertilised eggs are engulfed but the male's milt as well, so that fertilisation takes place in the mouth as well as hatching. In order that there shall be no danger of the mother making use of her young as food, she fasts during this stage of her life history. Lorenz has recorded, on the other hand, that at least one species of cichlid is capable of distinguishing between young and food, and acting accordingly. In this instance it was the male who, when carrying a young one in his mouth, was confronted with a tempting morsel. After some hesitation he spat out the young one, gulped up the morsel, and took the young one back into his mouth.

From all these, as well as other observations, there emerge certain fundamental principles applicable to the behaviour of fishes generally, and for that matter to many other animals as well. First there is the paramount importance of territory, which is more than a convenient *lebensraum* for purposes of breeding. There is reason for believing that attachment to a territory overrides attachment to a mate, that the territory amounts to a sort of extension of the creature's individuality. Linked with it, and emphasising its importance, is the fact that those still rather mysterious internal changes which bring the animal into breeding condition, often shown by the adoption of a nuptial livery, take place when the territory is first marked out, and are accentuated as it is defended. The matter of action and reaction, signal and counter-signal, is also of primary importance.

Each part of the behaviour-pattern is linked to the next and the signals are invariably few and simple—the red underside of the male stickleback, the swollen belly of the female. Yet another highly important point is that the urges prompting these creatures are two-fold and conflicting, the urge to come together for mating, and that other, more generalised, urge to keep at a distance. This leads to ambivalence and so to nervous tension which can be relieved by displacement activities.

FRIENDS & FOES No. 33

CHIRONOMUS

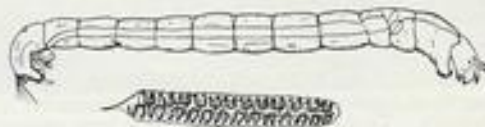
PHYLUM:—Arthropoda, from Greek *arthro* joint, and *podos*—foot.

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

BLOODWORMS are probably the best known of all the *Chironomus* midge larvae. They are useful as food for fishes and as scavengers in pool and pond. Their red coloration is derived from the presence of haemoglobin in their bodies, which enables them to live in very foul conditions.

The female lays large numbers of eggs in a "sausage" of gelatinous material, moored securely to submerged stems of aquatic plants, or to the sides of pond and pool. After emergence from the egg and the envelope, the tiny larvae wriggle to the bottom of the pond and build mud tubes in which to live. These are constructed quite quickly, and often as quickly deserted, for the larvae are quite active in their search for food, which consists for the most part of decaying vegetation. Whenever they leave their mud homes they construct a fresh one

Bloodworms



Bloodworm ($\times 4$) and egg "rope" below ($\times 2$)

wherever they happen to land after their outing. They are capable of moving quite vigorously through the water by violent contortions of the whole body. At the end of their abdomens are a number of fleshy protuberances—the gills. These are replaced in the pupa by bunches of white hair-like filaments.

Pupae look like small chillies capped by fungus. They may be found almost anywhere in water in which a number of leaves have fallen, during the whole of the summer months. Pupae are about half an inch long, and until ready for the imago to emerge, they lie on the bottom of shallow water, feebly moving to create a current of water over themselves.

C. E. C. Cole

Dwarf Gourami

(*Colisa lalia*)

ORDER:—Percomorphi, from Greek *perke*—a kind of perch, and Greek *morphe*—form or shape.

FAMILY:—Anabantoides—from Greek *anabaino*—to go up.

SPECIES:—*Colisa lalia*—from native names.

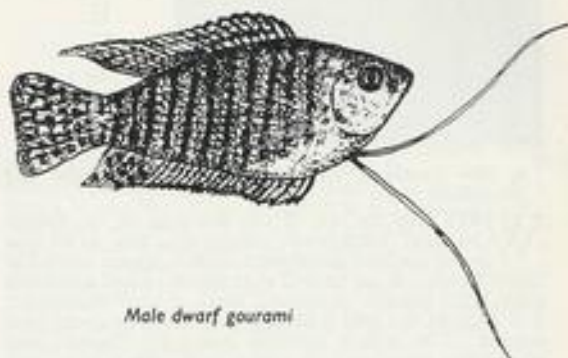
IT is many years now since the dwarf gourami was first introduced into this country, and it has remained a firm favourite ever since. During the war years it disappeared from our ken, but no sooner were hostilities finished than one way or another fresh specimens were obtained and bred. For this two-inch gem from Northern India has many endearing qualities. It is peaceful, of outstanding beauty, will live in somewhat cramped quarters, and has most interesting breeding habits, whilst feeding and sexing is simple in the extreme.

The male fish has a ground colour of pale blue, upon which is imposed a number of almost vertical stripes of red. Both blue and red is carried into the dorsal, caudal and anal fins. The pectoral fins are completely transparent, and the pelvics modified to form a pair of hair-like feelers as long or longer than the body of the fish. Both sexes use these fins to caress each other or make out the shape or substance of obstacles in their tank. Everything which is new to them is thoroughly inspected, the fins being passed over the surface until the fishes are satisfied or reassured.

By comparison with the male the female is very ordinary—almost drab. True, she has vertical bars, but they are a mere shadow, and her basic colour seems to be a pale brownish green. Her dorsal fin is rounded at the rear margin and not pointed like that of her husband. Even when ready to spawn, she is no beauty, but the courting raiment of the male is almost breath-taking. His face and chest become a brilliant, gleaming blue of an exquisite shade, and his whole body seems to glow in a manner that has to be seen to be believed.

Dwarfs like a high temperature—somewhere around 79° to 82° F. in which to breed, and should be given liberal supplies of live food to induce tip-top condition. Some breeders like to reduce the water depth to six or seven inches, but this is not essential. It may, however, relieve the anxiety of the male, for he spends quite a time scooping mouthfuls of sand and spitting them out where he intends to build his nest. Of course, the sand falls to the bottom of the aquarium, making a sizeable heap very often, which reduces the depth of water at that particular spot. I can think of no other possible explanation for this behaviour of the male—fishes are not stupid, and usually do things with a definite (instinctive) purpose.

A layer of floating plants is desirable in the breeding aquarium, for the male fish uses them to form a rough nest to help confine the eggs to a small area. Large quantities of bubbles are also used in these nests. When the nest is completed to the male's satisfaction he seeks out the female and parades himself before her, trying to convince her what a fine fellow he is. If she is really ripe, she falls for his performance and submits to his embrace beneath the nest. He wraps himself round her body and helps her to release a batch of eggs, which float upwards to the water surface. These are gathered in the mouth of the male and shot into the nest. Sometimes the female will help him, but often



Male dwarf gourami

she waits for him to finish and return to her.

The time comes when she is spent, and the male's attitude changes. From being a courteous, gentle lover he becomes an angry wife-beater. He is now afraid that the female will interfere with either eggs or nest, so drives her away and mounts guard beneath them. Constantly he repairs or adds to the bubbles and weeds which comprise the nest, and watches vigilantly for any sign of attack from outside sources. Enemies of the eggs are many—cyprids, planarians, snails, *Asellus*, all love to consume them. It pays the careful breeder to see that none of these otherwise interesting creatures are present in the breeding tank. It is possible, if the male fish is too worried and forced to work too hard to protect the nest and its contents, that he himself will become the destroyer—and who can blame him? For this reason, when I was breeding the creatures in quantity, I used to float the nest gently into a saucer, where it was completely safe from molestation. Even, as sometimes happened, when the nest partly broke up, development of the eggs proceeded normally, and hundreds of youngsters successfully hatched out.

Once in breeding condition, the female will be ready to spawn every seven to ten days, and the male is always ready—seven days a week. Should it be considered undesirable to spawn the fishes as often as they are ready, reduce the temperature of the water to the lower seventies. This slows down the rate of production of eggs in the female and cools the male's ardour. At 80° F. the eggs hatch in about 48 hours. The fry are practically helpless for a couple of days, and can remain in the saucer (if you have adopted this method) quite safely. As soon as they are able to move around more freely, however, give them as much space as possible, and start to feed water which is green with unicellular algae. Follow this with the smallest infusorians or the finest powdered fish food. Feed at frequent intervals, and provide gentle aeration to augment the amount of oxygen in the water and get rid of a large amount of decomposition gases.

When older, of course, the fry will be able to come to the surface and gulp in air, but the labyrinth organ in which they store this air is not present in the very young stages. It begins to develop when the fry are about three weeks old, and care should be taken at this time to protect them from draughts across the top of the water. Keep the cover glass firmly in position. It is best to have a tiny corner cut off one end and the hole covered by another small piece of glass which can be pushed to one side for feeding purposes and immediately replaced. Growth will

(Continued overpage)



BOOK

R E V I E W

The Blue Continent, by Folco Quilici. Weidenfeld and Nicholson. 21s.

WRITTEN by one of the members of the Italian National Underwater Expedition, this is far and away the best underwater book to appear since *The Silent World*. It can be read as an action-packed adventure story, but it contains in addition much of scientific interest. The aquarist will find it hard to put this book down once opened. The author explodes many pet theories and contributes numerous new angles to the study of aquatic life. He introduces us to a method of speaking underwater through a mouthpiece made of a waterproof membrane, and for the first time we meet the curare harpoon, although this deadly poison seems to have little effect on fish in the event.

Dangers from sharks and barracuda seem remote compared with the discomforts of the poisonous stings from fire coral, lion and scorpion fish and the lethal discharge from a certain conical shell. Clams, however large, are no worry in coastal waters, have no knowledge of their own power, and prove easy to pull up off the sea bed or to prise open. The author considers that sharks are very cowardly. He remarks that sharks have better eyesight than is generally believed, but that their sense of smell is not the reason for their quick appearance on the scene of trouble. Time after time he has proved that blood in the water from a dead fish, or throwing a dead fish into the water brings no sharks. A wounded fish brings them in a few moments. He considers that the answer is acoustics. Sharks must have some power our ears fail to register and the vibrations of a sick fish or even a frightened fish bring them in no time. When cornered, sting rays commit suicide by stinging themselves with their own tails, this being no accident but general.

The Expedition discovered that all fish, except coral fish, leave an area in which man is constantly diving in time—the word “spreads around.” There is a fine chapter on underwater photography with tables for exposures in natural light, flash and colour. Most photographs were taken at 1/50 of a second, but close-ups of sharks need

f/3.5 at 1/1000 of a second. The book runs to 170 pages with 26 really wonderful colour illustrations, and 35 other photographs, some of which are truly exceptional. A fine book for winter reading.

The Underwater Naturalist, by Pierre de Latil. Jarrolds (London) Ltd. 16s.

ALTHOUGH the author is an underwater hunter in the Costeau-Haas tradition this book is not exclusively devoted to hunting, although this aspect is considered. The area covered is the Mediterranean in the vicinity of Cannes and Nice, and the fish found there are considered in detail. These include blennies, gobies, wrasse, grey mullet, bass, scorpion fish, congers and morays, rock fish, red mullet, sand fish, skates, sting rays and groupers.

Issued in 1951 under the title *L'Homme Chez les Poissons*, it was translated into English in 1954 and in the main constitutes the life or case histories of the fish mentioned above. The author makes many points of interest to aquarists. For instance, he refers to mouthbreeders and explains at length that during the period of sexual activity the entrance to the alimentary canal swells up so that the fish simply cannot swallow. The parental care is considered to be nothing more than the feeding instinct (for a later date) and instances are given of the stickleback, whose genital organs swell up to a third of its total weight and all interest in feeding stops. Similar examples in the eel and salmon are mentioned. Blennies are fond of their own home and drive intruders away. In every case the owner of the territory wins any fight, no matter how great the difference in size. Of all the fish encountered the bass gets most marks, as this fish is at once prudent, proud, courageous, intelligent and cunning. It seems that bass learn very quickly from experience and, as fish go, have a very high I.Q. Moray eels never leave their holes even when attacked and their bite is not venomous, as often imagined. Their blood, however, is highly toxic. Out of water a moray can be extremely dangerous . . . the reverse of the medal.

This book is a mine of information on fish psychology and makes fascinating reading to the amateur underwater naturalist. There are 268 pages, 15 photographs and 24 line drawings together with an index, the latter a feature all too frequently omitted from books of this nature. In conclusion simple instructions are given for identifying sand or flat fish . . . viz.—a flounder has orange spots. If the nose is within the general round-oval shape it is a sole. If it swims on its right side with two eyes on left side it is a turbot, unless its head is not marked with scattered little blisters, when it is a brill.

Raymond Yates

Dwarf Gourami (Continued from preceding page)

be speeded if small live foods are fed from the time the fry are half an inch in length. Carefully inspect the live food before placing it in the tank to make sure that no predatory larvae are present with it. Many a promising batch of youngsters has been destroyed through neglect of this elementary precaution.

Growth will be slowed to an almost unbelievable extent if the fry are inadequately fed or overcrowded. Experiments can easily be devised to prove the correctness of this statement. One batch of youngsters can be selected, and divided into several different groups of even number. All one group can be placed in a small tank, and all another in a large tank. Both can be fed exactly alike, and growth rates compared. A third group can be placed in a small tank and fed double the quantity of live food, so that there

is always a little swimming around. Similarly, with a fourth group in a large tank. The results will probably surprise you.

Shyness of newly purchased pairs of dwarf gouramies can be overcome in a few days if they can be made to associate your appearance with that of food. This is usually very easy. If in a community tank, the presence of other fishes busily snapping up particles of food will usually be enough to lure the dwarfs from their hiding places, for starvation or “left-overs” is the alternative to claiming their rightful share.

Colisa lalia look well in exhibition tanks if they are prevented from hiding in the corners; put them in the tanks well before judging is due to start. The males have a tendency to fade out some of their brilliant coloration under the usual exhibition conditions. This sometimes leads to the remarks one hears to the effect that the onlooker has better fish himself in his own tank at home.

AQUARIST'S Notebook



by
RAYMOND YATES

THE United States can well be called "The land of surprises." It is true that the Americans are very fond of having all sorts of handy gadgets, and this is true of them also in the realm of the aquarium. Looking through the advertisement pages of this magazine the reader might be tempted to think that fishkeepers in Britain are able to obtain from dealers just about anything the wit of man can devise for the hobby. This is not quite true, however, as a glance at the American market will show.

In the feeding line the American fancier can buy a fish-feeder which automatically feeds non-toxic gelatine food capsules to the fish at intervals. In addition he can obtain frozen brine shrimp (7,000 to a cubic inch) and frozen *Daphnia* and many dried foods containing aureomycin. Plants are rather more expensive than on this side but there is one unusual item called "aqua seed." These seeds are planted just below the surface of the compost and soon rush-like plants appear. A new giant form of *Hygrophila* from Brazil is obtainable. For those interested in the use of chemicals there are hard-water testing kits, water softeners, algae killers and all you need for tail docking. Tanks can be obtained in numerous weird shapes unthought of here and covers also. One cover is made to resemble the lid of a treasure chest.

Aerators are often hidden by ceramic efforts disguised as volcanoes or sunken clipper ships and there is also an underwater windmill which turns. Yet another aerator produces a curtain of mist bubbles the whole length of the tank, to give the effect of a waterfall in reverse. There is also a filtration booster which runs a number of channels of air and water underneath the gravel. Most filters are outside-fitting and much larger than those usually seen in England. So, for that matter, are the prices, and it is safe to say that the hobby is more expensive for the ordinary man living in the States than it is for his counterpart in Britain. English-produced aquarium equipment sells in the States but usually not under its English name. Where the English name is used the fact that it is a British product is not unduly emphasised.

Three-dimensional pictures in wooden frames can be obtained of underwater scenes introducing angels, discus, fighters, mollies, swordtails and gouramis. These are hand-painted on several pieces of glass, one behind another. The effect is delightful but those which have been offered for sale here have been rather high priced. One which I saw (of angels) was marked at 15 guineas. Backgrounds for aquariums are common, an unusual one being an external fitting hand silk screened effort. British aquarist literature is available, but sells at a considerably higher price than in Britain. All things considered, the home aquarist here is probably better off in his pursuit of the hobby than his transatlantic cousin.

Whenever I meet a fellow aquarist casually in the street or in a bus or train, I always ask him if he is in a club and the answer is invariably in the negative. It is quite true that our clubs, great as has been the growth of the hobby in recent years, have only scratched the surface of the potential membership which is available to them. With no figures available it is hard to know the true position but it is estimated that for every aquarist who is a member of a club there are at least six, and perhaps as many as ten, who are not members of any society. Where do all these non-member aquarists live—in the wilds of Snowdonia, or the Lake District or Exmoor? Of course not. They live in your street and it is up to you to get in touch with them and take them along to your club.

Many people are very shy of going among strangers and if they are newcomers to the hobby they feel, perhaps not without reason, that they are very small fry to go and join a crowd of experts. What is wanted is the personal touch. Nowadays wherever you go you see tropical tanks in windows. Make it your job to get to know the owners of these tanks, call on them when you think they will be in, tell them you too are an enthusiast and admire their fish and set-up. If only every member of every club took one new prospective member along per year it would be of great service to the hobby in general and the clubs in particular. Encourage visitors, don't badger them to join: if your club is good and friendly they'll join; if your club is no good, that is your affair: they will see what it is and not turn up again. The main thing is to take them along personally or at least give them a personal invitation to look in. Press notices and advertisements are of little value in getting new members in any quantity.

Some time ago I was in the Peak District in a little village and there I admired a tiny tank of guppies in a window. The owner asked me inside and I discovered many large tanks set up with a wide variety of fish. He told me many other people in the village had tanks and he supplied them with plants and fish. So hunt up these non-members in your district and get them to come along. All societies need an influx of new blood to keep them lively and moving forward and to keep the "experts" on their toes.

One is sometimes asked to name the fish which has first place in your affections or even the most popular with you in each class, livebearers, anabantids, cichlids, etc. It is preferable to stall such questions because they can be used against you at some future date, and you may some time be judging at the questioner's club show! In any case it is almost impossible to say that one particular variety holds pride of place—most keen aquarists have half a dozen equal favourites. However it is good fun at a club "natter night" to issue everyone with pencil and paper and ask them to write down the numbers 1 to 10. They are then asked to write the name of their favourites against the numbers as follows: 1. Livebearer, 2. Characin, 3. Bubble nester, 4. Cichlid, 5. Panchax, etc., 6. Barb, 7. Coldwater fish, 8. Tropical plant, 9. Coldwater plant, 10. Best fish of all.

The results are surprising, as also is the spelling in some cases. Few lists agree, almost all are widely different and this enables the members to spend the rest of the evening debating the relative merits or demerits of the fish concerned. Other items include "Fish which are hardest to keep," "Easiest or hardest to breed" and so on. It is better to have two sections, one for advanced and one for novice members, as the beginners naturally have a much more restricted knowledge of the various varieties. Try it out—you will find the committee will be able to have a rest for once when the arguments start!

The vibratory or diaphragm pump is the type mainly used by aquarists for the simple reason that it is far cheaper than the larger piston type of pump. Although many thousands of various makes of these pumps are in use, most fishkeepers have only a hazy idea of their method of working and performance statistics. As a general rule alternating current is applied to a coil wound on an iron former which

alternately builds up and collapses a magnetic field. This in turn attracts and releases the armature, which is free to move up and down in the magnetic field. The armature drives the diaphragm and air is expelled due to the action of the inlet and outlet valves.

The consumption of the larger pumps (such as the well known "Procter") is about nine watts, and, contrary to what is generally believed, the consumption rises when the output is pinched off due to the armature being forced away from the coil field. The smaller type of diaphragm pump takes about five watts as against 25 to 30 watts for piston pumps. The speed of operation is also not generally realised by the aquarium owner. The larger vibratory pumps operate at 6,000 strokes per minute, which is something like 3,000 million strokes per year if used continuously! As a rule pumps of this type are tested to give full output at a depth of two feet of water, but most will operate quite satisfactorily at considerably greater depths.

In the main this type of aerator gives very good service, needs no oiling and rarely needs repair except for the replacement of worn rubber diaphragms, which the aquarist can do himself. The danger of siphoning back when the pump is disconnected from the mains supply is not generally understood, and makers are still getting a number of pumps returned by irate owners which have been ruined through the water siphoning back. Personally, I have found siphoning back is rare, and never happens if the pump serves more than one diffuser or if it also operates a filter. The safest way, of course, is to make it quite impossible for the pump to siphon back by merely keeping the pump above the water level.

Daphnia are gluttons for oxygen and are not easy to keep in quantity in relatively small receptacles over several days. This trouble can be overcome by using a two gallon bucket (white enamel preferably) to hold the water fleas and run into this an extra diffusing stone from your aerator. This way they will not die on you before you have had a chance to feed them to your fish.

Many aquarists find the water plant *Cabomba* difficult, but it is generally agreed that it needs soft water and good light if it is to flourish. Heat near the roots is fatal and mulm settlements on the leaves quickly stunt it. Although it is known that the plant can produce rather pretty white flowers, practically no mention is made of this in aquarium literature for the simple reason that few aquarists ever manage to grow the plant to this state of perfection. I think the reason is that *Cabomba* will only flower if the stems are allowed to grow to some considerable length; too many fishkeepers cut the plant back as soon as it reaches the surface, and replant, with the result that, in time, growth and size decline. If, however, the plant is allowed to continue it will lie just below the surface and circle the tank several times.

Recently, I have had a wonderful growth of flowering *Cabomba* in a small tank (30 inches) which was covered with a thick mat of duckweed and lit by two 40 watt lamps for about 15 hours a day, no daylight being available. The water was crystal clear (a feature of a good growth of *Cabomba*) and the stems were quite long. One was 30 inches long before it divided out into two stems each, another 15 inches in length. One of these was normal, the other had no submerged type leaves but bore instead an aerial leaf at two inch intervals, each of these on a stalk about two inches long. A second stem left the main stalk at these intervals, again two to three inches long bearing a single white flower. In all I had probably some two dozen flowers, these remaining in bloom about ten days. Some fell off, others broke off and floated to the surface and a few withered. Only a few of the flowers pushed up above

the surface; the majority hung (or grew) downwards away from the surface and the light. The temperature of the water was generally around 72° F., and it is possible that aquarists keep this plant at too high a temperature.

Some varieties of fish insist on having old, matured water, and this can be a headache for the aquarist when a large tank needs cleaning up, as the quantity of mulm is enormous and must be removed. Where several gallons of water need to be siphoned off to remove dirt and detritus this is done into clean buckets and the water allowed to settle. Then take a wire strainer (about four inches in diameter) and fit under this an old sock or the lower end of a nylon stocking. Using this as a strainer the water you have siphoned out can now be siphoned again, this time through the strainer into another bucket or enamel two gallon jug. It will be quite clear and can now be returned to the original aquarium with no ill effects to the fish or the appearance of the tank. The wire mesh of the strainer serves to break the force of the water before it falls into the sock. Some small amount of water must be lost in the course of this operation but topping up with raw water need worry nobody so long as the main body of the existing tank water is returned.

When visiting clubs to give a lecture I invariably take with me a large handgrip to carry books, magazines, pictures and exhibits, chemicals, pickled fish and the hundred and one other things which one takes when lecturing. I found another good use for these popular handgrips, namely, carrying fish in uninsulated cans. The small Thermos jars are excellent but do not hold many fish for long distance trips, and the large (gallon) size Thermos jar is very heavy indeed before any water has been poured in. It is easier to use large cans, wrapped up with thicknesses of paper and felt or other suitable material. If these are carried in a handgrip, they get additional insulation as no draught can reach them once the zip fastener top has been secured, and they are easy to carry.

The diminutive *Rasbora maculata* is a very beautiful fish but is rarely kept by fanciers because they fear it needs to be kept in a tank on its own to save it from the unwelcome attentions of larger fish. It reaches roughly one inch in length, which seems small when compared with other fish, and its bright colouring would appear to be a disadvantage in so far as it would seem to have no chance of hiding from its enemies. Small as it is, it has a remarkable turn of speed and can disappear in a trice in the aquarium plants. However, it rarely shows any sign of fear and is quite cheeky in the way it swims in front of much larger fish without a care in the world. I have found it gets on very well in a tank with full grown *Pristella*, mollies, platys, catfish (*Corydoras*), *Copeina arnoldi*, pencils, neons, glowlights, *Aphyosemion australe*, blind cave fish, zebras, red-lined *Rasbora* and similar fishes. It is always wiser to keep large and small fish apart, as the smaller ones are never really happy, but *Rasbora maculata* need not be kept in solitary confinement.

A Liverpool dealer shows his fighters to advantage by using a small tank with roughly 12 glass divisions. The space between divisions is only two inches at most and the fighters are in such close proximity to other fighters that they continually display their best colours and finnage. At the Birmingham show fighters were enclosed in polythene bags immersed in a tropical tank. Polythene being transparent the effect was similar, but with the added advantage that they were ready to be carried away by the purchaser.

Unusual Goldfish Varieties

Photographed in the Aquaria of the London Aquarium, South Bank

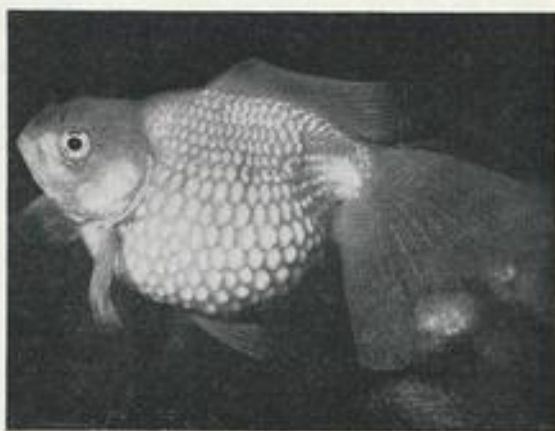
by LAURENCE E. PERKINS



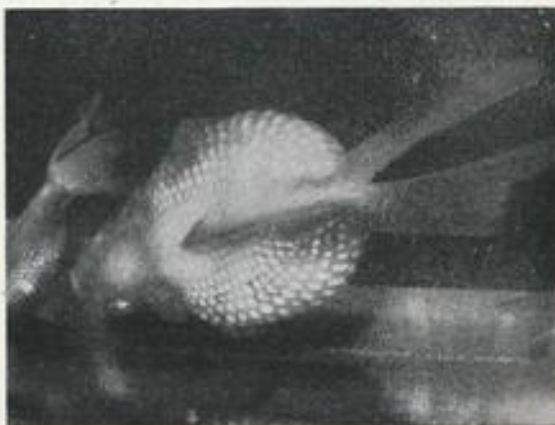
Similar in body shape, but alike in that feature only, are the celestial goldfish above and the large globe-eyed veiltail shown in the photograph at the top right of this page. The upturned eyes of the celestial are responsible for its name, seeming as it does to be always contemplating the heavens



Experienced goldfish breeders have declared that seldom have been seen such fine specimens of the lion-head goldfish as those at the London Aquarium. The all-important head growth, usually likened to a raspberry in appearance, is sometimes disappointingly under-developed in exhibited specimens



In the pictures above and below are shown views of the pearl-scaled fantail goldfish. The raised characteristic scales, the divided caudal or tail fin and the healthily rotund body outline are particularly emphasised in the lower photograph, which was taken from above the fish



Puffer Fishes for Your Aquarium

by JACK HEMS

GENERALLY speaking, the Tetraodontidae (puffer fishes) is a family native to the seas and brackish waters of the tropics and sub-tropics. But a few species inhabit rivers a long way from the coast—one species, for instance, is said to be found a thousand miles up the Amazon; another species frequents the upper reaches of the Nile, and other rivers of North and West Africa.

As will be readily realised, the species taken from freshwaters are the ones most usually imported by dealers in tropical aquarium fishes, and there are a lot of puffer fishes in this country at the present time.

Puffer fishes make excellent occupants for the home aquarium, for they are handsomely coloured, long-lived, extremely active in all levels of the water, and a couple of them will settle down very well in a medium-sized tank maintained at a temperature of 75° F., with a range of about ten degrees either way. Like mollies and scats, puffer fishes thrive best when some evaporated sea-salt is added to their aquarium water, say, about a teaspoonful to every gallon.

Unfortunately, all the puffer fishes have one failing—that is, from the aquarist's point of view: they are addicted to fin-nipping; and they never seem satisfied until every fish around them has had its caudal fin reduced to a ragged stump. So it is just asking for trouble to introduce these fish—even small ones—into the community aquarium.

The mouth of a tetraodon is ideally constructed for biting pieces out of a fish's fins, for it is provided with fused teeth (two above and two below) which form a sort of horny beak with razor-like edges. The aperture of the mouth itself is small, and young puffer fish cannot swallow anything larger than half-grown white worms.

In the wild state, fully-grown puffers use their strong, sharp teeth for cracking open the shells of crustaceans and molluscs, which form their chief diet. In the aquarium, however, they will take small earthworms, white worms, *Tubifex*, tiny woodlice, baby water snails and the like. They are quite fond of scraped lean meat and shredded white fish such as cod or haddock, but they never seem to take to dried food. The reason why tetraodons are commonly called "puffer" fish is because when they are alarmed they can inflate their bodies with water or air.

If a puffer fish inflates itself at the surface of the water, it does so by taking air into the mouth in noisy gulps. When completely inflated, it becomes ball-shaped and floats belly-upward. If the fish inflates itself when submerged, it fills itself with water, the weight of which keeps it quiescent on the bottom.

It is not good sense to frighten a puffer fish into "blowing" itself up for the entertainment of oneself or one's friends, for the energy expended during every inflation tends to weaken the fish and may possibly shorten its life.

In the wild, however, this gift or power of sudden inflation is very often the means of saving its life, for the bobbing, rounded form scares away most attackers, and, in any case, an inflated fish makes a most awkward mouthful to swallow. And as though inflation were not enough, some species of puffer fish can erect a whole armoury of

spines from the blown-up body to add to the protective mechanism.

But though the puffer fish is so well equipped to ward off the unwelcome attentions of aggressors inhabiting its own watery world, sudden inflation often leads to its downfall at the hands of humans, for an air-filled puffer is at the mercy of winds and waves, which may carry it right into the hands of observant natives.

Native peoples often put captured puffer fish to all sorts of undignified and cruel uses. From some species they extract a poisonous juice from the gall-bladder. They use this poison to smear on the points of their spears and arrows. From other species they manufacture headgear, lampshades for "civilised" whites, or vessels for storing dried beans and herbs. Native children sometimes seize inflated puffers and use them as footballs, kicking them about the sandy shores or coral reefs until the tortured fish explode with a crack. Although the flesh of some puffer fish is edible, not a few species are highly poisonous; and one species used to be eaten by depressed or dishonoured Japanese gentlemen as a means of committing suicide.

Best-known Puffers

Of the puffer fishes seen swimming about in dealers' tanks, the following are the best known: *T. cutcutia*, *T. erythrotaenia* and *T. fluviatilis*. The first is native to the fresh waters of Orissa, Bengal and Assam. It reaches a length of between three and four inches, and has a leathery, slimy skin coloured greenish-olive shading down to creamy-white on the belly. Some dark reticulations ornament the dorsal surface. A dark-eye spot with a pale edge is present just behind the pectoral fins. A few blotchy markings break up the pale green of the sides.

T. erythrotaenia comes from the East Indies. It is a small species, and has the usual dark spots or blotches on a light ground. It was introduced to aquarists in Europe (Germany) in 1935. *T. cutcutia* and *T. fluviatilis* have been known as aquarium fish for several decades.

T. fluviatilis is found in the rivers of India, Ceylon, Burma, Siam, the East Indies and beyond. It reaches a length of about six inches and most specimens are greenish-olive, lightening to white on the underparts. The back and sides of the body are ornamented with dark markings which range in size from mere dots to large blotches.

Little is known about the breeding habits of puffer fishes. What is known is that the female deposits her eggs on the bottom—on stones or other flat, smooth surfaces—and the male guards the eggs, and later the fry until they are large enough to take care of themselves. The writer has not heard of puffer fish being bred in the home aquarium; and he has not heard, or discovered for himself, of a way to tell the sexes apart.

USEFUL FISH JARS

A new fruit bottling jar is now on the market which is very good for aquarist purposes. These are made by the Fowler-Lee Co. Ltd., of Reading in four sizes, 1 lb., 2 lb., 5 lb. and 7 lb., the respective prices being 1s. 1d., 1s. 4d., 2s. 5d. and 4s. 6d. These are not screw top types but have a rubber washer and metal top held in position by a clip spring. They are clear glass and have no neck; they are ideal for showing fish or using for specimens in the fish-house. The largest size is roughly 12 inches high and six inches in diameter. The larger stores all stock them.

OUR EXPERTS' ANSWERS TO READERS' QUERIES

I have a pair of angel fish which have spawned twice during the last few weeks, but on both occasions the eggs have been eaten by the parent fish. Is this a common occurrence, and, if so, can you suggest a course of action which will enable me to raise some, if not all, the fry?

Some cichlids, angel fish among them, will eat the first two or three batches of eggs before finally settling down to raise a family. On the other hand, most cichlids like privacy when breeding, and will often eat their eggs if the light is too bright, if the aquarist keeps looking at them or disturbing the aquarium, or if conditions are not to their liking. Try screening the aquarium with tissue paper—or brown paper if there is a good top light—having a small peephole cut in it so that the fish may be observed without their being aware of it. Just before, and immediately after spawning, introduce a much-liked live food. If the fish persist in their unnatural behaviour, the best thing you can do is to remove the fish immediately after spawning, and keep the water circulating around the eggs—to prevent sediment settling on them—by providing a gentle stream of bubbles from the end of a small bore glass tube connected to the air-line of an aerator.

I recently introduced into a well-planted and suitably heated aquarium a number of fishes of different species. Within a few days, I lost all of them for no apparent reason. Thinking that the fishes might have come from poor stock, I obtained several guppies, barbs, and black widows, but after a few days I found them dead on the bottom. Can you please tell me what is wrong with my aquarium?

There must be something seriously wrong with your aquarium water, and poisoning may be suspected. This might be brought about by too much uneaten food being left on the bottom, or metal objects such as brass tubes, wires or the like being in contact with it. Please check up on such things. A lot of metals such as copper, bronze, zinc or brass spell disaster to "tropicals"; that is, if the metals come into contact with the water. Some rockwork can cause no end of trouble by making the water too hard for fish life. Pieces of marble or lumps of concrete placed in the water soon cause trouble. So, too, will freshly painted surfaces, from which drops of water fall back into the aquarium. We advise you to draw off most of the water in your aquarium, and refill with boiled water allowed to cool down to a normal temperature.

Can you suggest a treatment for fin-rot, and what usually causes it, please?

Fin-rot is often caused by dirty conditions, or improper feeding; that is, a poor diet—too much dried food, for instance. It may also be caused by other fishes nibbling at the fins and fraying them. Overcrowding may also lead to fin-rot. Sometimes a fish whose fins are rotting or splitting will respond favourably to change of environment, say, a sojourn in another tank and a diet of live food or finely minced raw meat or washed liver. If the fins are badly diseased try swabbing them with a piece of cotton wool dipped in salt water or a solution of permanganate of potash. Sometimes it is a good idea to cut the diseased portions away with sharp scissors or a razor blade, and paint the stump with Friar's Balsam or acriflavine. After treatment, return the fish to the water as quickly as possible.

A friend of mine has seen a tropical aquarium with sunken galleons, treasure chests and such like as decoration. Can you recommend these novelties for the tropical aquarium, and, if so, can they be bought at aquarium shops?

Personally, we do not care for such ornaments in the aquarium. They look most unnatural unless they are well coated with mossy algae. And besides, cheap novelties are often made from materials which gradually dissolve and alter the pH of the water. On the other hand, some of

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

these ornaments are well made, and, for those who like them, quite safe to use in the tropical aquarium. They may be obtained from many of the larger dealers in aquarium requisites, particularly the aquarium dealers in our large cities.

I wish to breed black mollies, and would be obliged if you would give me some information about their requirements, that is to say, likes and dislikes.

Mollies breed best in slightly saline water. So add about one level teaspoonful of sea salt (Tidman's, for example) to every gallon of water in the aquarium. But once the correct amount of sea salt has been added, do not introduce any more or else you may kill all the plant life and turn the aquarium into a brine bath. The next thing is to provide the aquarium with plenty of fine-foliated plant life such as *Myriophyllum*, dwarf *Sagittaria*, hair-grass and the like. Some floating vegetation should carpet most of the surface. Rather shallow water is better for breeding than deep water, for the baby fish grow more quickly and are happier in a few inches of water than when they are dropped in an aquarium filled to the top. But plenty of space is needed, and a single pair of adult mollies need at least a 24 ins. by 12 ins. by 12 ins. aquarium to swim about in. The female fish should not be moved or frightened when she starts to fill out on the sides, or shows signs of being gravid. If a gravid fish is moved to another tank, she often gives birth to her young before time (with their resultant death) and dies shortly after the event. A fairly high temperature should be maintained, say, between 75° to 78° F. Plenty of live food should be offered at all times. Chopped earthworms are a good food to offer. If live food is not easily obtainable, use finely minced washed liver, "lights" or heart. Mollies need green food in their diet, and if there is no algae on the glass for them to nibble at, then the next best thing is to feed at least once a day with Bemax or some similar proprietary food sold for human consumption.

I have a culture of white worms, but experience great difficulty in separating the worms from the compost. Can you please tell me the best way to remove the worms, and what is the best food to give them?

If the food is placed in small depressions made in the compost, and the whole is covered by a sheet of glass screened from the light with a piece of sacking or brown paper, then when you lift the cover off, you will find the worms in masses adhering to the underside of the glass immediately over the depressions. The food most liked by enchytrae worms is cooked potato mashed to a creamy consistency by the addition of milk. If potato is not available, use small cubes of white bread soaked in milk.

My harlequin fish and zebra fish have gone off eating *Tubifex* worms and live *Daphnia*, although in the past they have eaten these foods with great relish or eagerness. Can you explain why my fish have gone off these foods? Do you think they are ill?

Fishes often go off a food they have previously enjoyed. Perhaps they grow tired of the same diet day in and day out, for it must be remembered that in their wild state, the majority of fishes have a large choice of small live food

to eat in the rivers, lakes and streams which they inhabit. We advise you to try your fish on white worms, chopped earthworms, or, if these are unobtainable, on finely minced shellfish or butcher's offal such as liver, "lights," heart, and so on. If the fishes do not seem to eat any of these things with any relish, try changing some of the water in their aquarium. A quart of water drawn off the bottom, and the loss made good with boiled water allowed to cool down to the same temperature as the aquarium, often acts as a tonic for fishes which have gone off their food.

I have recently purchased a 18 ins. by 12 ins. by 12 ins. tank and keep it to the required temperature with a 150 watt heater governed by a thermostat. Do you think the heater is too powerful for the size of the aquarium?

Your heater is really too powerful for your aquarium. If the thermostat stuck or in any way failed, the water would soon become overheated. If your aquarium is situated in a warm living-room, a 60 watt heater would be powerful enough to maintain a temperature of at least 72° F. during the coldest days of winter, and the thermostat would prevent the temperature rising above 80° F. during the summer months.

A short time ago, one of my harlequin fish developed a pop-eye. I was advised to drop two parts of glycerine to one part of iodine on the affected eye. I did this, but on returning the fish to the aquarium, it turned over on its side and died within a few minutes. Do you think the treatment killed it?

Perhaps you kept the fish out of the water too long. Many fishes cannot tolerate exposure to the atmosphere for more than a minute or two, and die of shock. Next time you have to treat a fish out of water, cover most of its body, especially round the gills, with a piece of soft cloth, made moist by dipping in tepid water.

Sometime ago I bought two mollies with the idea of breeding them. After a short while, the female dropped some young, but instead of these baby fish resembling the parent fish, they were mottled all over with red patches similar to the markings seen on a Berlin swordtail. I am very puzzled to know how two mollies could produce such gaily coloured fish. Is there any explanation, please?

Your female molly must have been fertilised by another fish—probably a red swordtail—before she came into your possession. Such a fertilisation could have taken place in a dealer's tank, or even in a can of fishes being sent on a journey.

Can you tell me the names of the best sort of plants to use for successful breeding of livebearers?

Choose plants with bushy foliage such as *Myriophyllum*, *Fontinalis gracilis*, *Heteranthera zosterifolia*, *Cabomba* and similar plants. When the baby fish are born they will keep hidden in the tight clusters of foliage, and so remain comparatively safe from the large parent fish.

My community aquarium contains two angel fish. About six weeks ago I noticed them "kissing" each other. Now one of them keeps chasing the other into the plant life, and following it around. Is this behaviour a sign that I have a pair, or is it merely a sign that one is a natural bully?

The behaviour you describe in your letter is often indulged in by angel fish. Sometimes it is mere playfulness; sometimes it develops into definite bullying on the part of the fish which takes the initiative. On the other hand, you might possess a true pair. Watch them carefully, and if you notice one or both of them cleaning a leaf of a plant or nibbling at a small patch of rockwork or the glass side of the aquarium, it would be as well to prepare for a spawning.

COLDWATER FISHKEEPING QUERIES *answered by* A. BOARDER

Would quarter plate glass be strong enough for glazing a tank, 36 ins. by 15 ins. by 12 ins.?

This size glass will be all right for your purpose. Glass of a smaller thickness might suddenly crack on a sudden jar or knock. When glazing a tank of this size it is better to have very strong glass than to attempt to use glass which is too thin. Trouble would almost surely follow if you did.

We have a fairly large pond some 20 yards by 50 yards, from shallow to about 5 feet deep. It was stocked with golden orfe, bigoi, shubunkins, bitterling, green tench and catfish. The fish have grown well and appear to be quite healthy. However we have never been able to see any young fish and have thought that they may not have spawned. However last season we saw the shubunkins spawning and following them were a number of sticklebacks which appeared to be eating the spawn. How can we prevent this, and how big have golden orfe to be before they will breed?

There is no doubt that the sticklebacks would eat the fish spawn, and also many of the other fish in the pond would do likewise. The orfe would eat many young fry when newly hatched, as would even the shubunkins themselves. I would not have advised the introduction of catfish in a pond such as yours. They can grow to a large size and would be capable of eating fairly large fish. Even if you cleared all the sticklebacks out of the pond it is possible that the great majority of fry or eggs would still be eaten. It is only in ponds or waters with a dense mass of plants somewhere for the fry to take cover that you can expect many fry to reach maturity. Eggs would have to be removed for hatching elsewhere. Few orfe will breed under one foot in length.

I have constructed a large pond in my lawn and wish to disguise the concrete rim. Can I place turves all over the bottom of the pond or would the grass die and pollute the water?

I do not advise that you should place turves under the

water. A large quantity such as you suggest would certainly cause trouble when the grass decayed. If you were preparing a pond for the purpose of rearing fry it would be ideal, as the dying grass would assist the formation of Infusoria necessary for the food for the young fishes. I realise that the edge of the pond will look rather unsightly for a time but if you leave it alone the concrete will soon weather up and the grass verge will soon grow out to meet the water. Actually roots will soon form and spread to the edge of the pond and this will be much better than if you try to hide the edge with pieces of flat stone in the form of a path. This latter method will make the mowing of the grass near the edge a very difficult matter. By next year you will find that the pond will look quite natural and you may find that you will have to trim the edge of the grass back so that the water does not soak up into it.

My iron-framed tanks are rusting at the top frame. Can I do anything to prevent this and what is the best paint to use?

The old rust should be cleaned away and any loose scale removed. You can then paint either with galvanising paint or flat aluminium paint. Once a good base is laid you can paint with any colour you prefer. See that the under-side of the top frame is well treated as this usually starts the rust formation. To prevent the rust from forming you should see that the top glass cover does not lie flat on the frame, as the condensation from the water will in time cause more rust to form. I use a strong small hook hanging from the back top frame to hold my cover glasses and the front edge of the glass rests on a strip of rubber on the top of the front frame. As the back of the glass is lower than the front the water runs back into the tank.

I have a small tank 12 ins. by 6 ins. in which I am keeping two goldfish, each about two inches long. Can I add another fish?

Your tank would hold three inches of fish only. It is no use trying to overcrowd any tank. If you put another fish in I am sure that it would not live long. The latest fish introduced is the one which generally suffers. The former ones appear to get used to the small area but even they will not thrive once the maximum capacity has been reached. If you want to keep more fishes you must get a larger tank.

For some time now I have been interested in the judging of tropical fish at aquarist shows and wondered if you could give me some idea of the qualifications necessary to be a judge of tropicals at local annual shows?

I will give you my own personal opinion as to the qualifications necessary for you to be a judge of fishes at a show but they may not be the same as other people's. First of all I consider that you should have had a good deal of experience at breeding several kinds of tropicals and have a very good knowledge of all types usually found at the shows. In addition you should have done a fair amount of showing yourself, as the more successful you have been with your fishes on the show bench the more likely are you to make a good judge. I do not think anyone should be allowed to judge unless he has had experience at exhibiting for a few years. The Federation of British Aquatic Societies have held courses for judges, and they then appoint them as "B" judges until they have had sufficient experience at judging club shows, when they may be raised to "A" judges able to judge open shows. Even with this I am of the opinion that all aquarists are not likely to become good judges, any more than all people can become expert musicians, etc. A good method to learn to judge is to have a club table show. Then get a panel of experienced members to judge the fish. A qualified judge should then judge the fish and explain his reasons for the placings, and the panel can then compare their own findings. In this manner it is easy to pick out those who come nearest to the expert's placings and much experience can be gained. All the live-bearers among the tropicals have had standards decided on, and these are shown in the book of standards obtainable from the above Federation. Many others will be dealt with in the near future; meanwhile a copy of the booklet will be of great help as it gives the outlines of the fish together with the maximum points allotted.

I have been trying to breed from a pair of paradise fish, so far without results. They were originally coldwater but I have gradually raised the temperature of the water to 75°F and have tried taking the male away for a time but still they do not breed. What else can I do?

I suppose that you have a true pair of fishes? At the temperature you quote I should expect the male fish to be almost always making bubble nests. This would show that he was in breeding condition. Perhaps you have two females. The male paradise has a longer anal fin than the female, is usually a bit larger and has brighter colours, especially when in breeding condition. You ask if an extra male would help. I am afraid that there would probably be a fair amount of "scrapping" if you did, but you could try a different male to the female, as some fish do not always get on with others and a change sometimes brings the desired results. I do not think that you need have raised the temperature of the water as the fish were cold water bred. The temperature of the water in most tanks during the summer months will rise according to the weather and I have found no difficulty in getting paradise fish to breed under these conditions.

I have a wooden cover for my tank. Is it advisable to paint it?

I certainly think that it would be a good idea to paint the cover. If there is any plywood used in its construction this would definitely benefit from a coat of waterproof paint.

Some types of plywood soon peel off if untreated. Also ordinary wood would be liable to soak up moisture from condensation and may warp. Give the wood a good undercoat with a red lead primer, making sure that the wood is quite dry before painting. A good gloss paint of the desired colour can be added direct to this or another coat of flat paint could be used first.

I have had a pond in my garden for some years and I have cleaned it out, re-filled it, stocked it with fish and plants for the first time for years. Although the water looked clear before I placed the fish in they have all died. Can you tell me the reason why the fish have died? There was no sign of fungus on them.

Fungus is not the only cause of death among fishes. There may have been several reasons why the fish died but I can only guess at some of them. Healthy fish do not just die overnight for no reason at all. They may not have been in good health when you bought them. Some fish keep alive for some time when in a shop where they may have running water or strong aeration. When they are taken from these conditions they do not always take kindly to the change and succumb. Providing the fish were healthy then there must have been something the matter with the pond. Any copper in contact with the water may prove fatal to fish. If any D.D.T. insecticide had been blown into the water during spraying this could cause trouble. Another possibility is that something has caused the water to become polluted, such as dead mussels, dead snails, decaying uneaten food or polluted water draining into the pond from the surrounding garden. You must check up through all these points and see if you cannot find what was killing the fish. A post mortem service is advertised in *The Aquarist* each month and you could have sent a fish as described for examination. (By the way, I do not do post mortems and I would thank all aquarists if they would refrain from sending dead fish to me. By the time specimens reach me they are decomposing and just a nuisance.)

I have a concrete tank in which I have about 200 shubunkin fry. If I fill it up and cover about two thirds of the top with glass shall I be able to bring the fry through the winter safely?

There is no reason why you should not be able to bring the fry through the winter quite safely. You wrote in August and the fry will be quite a good size by the end of October. I have proved that the size of the fish does not matter at all as to the amount of cold they can stand. I have wintered fantail goldfish which have not been more than an inch in length overall. They were kept out of doors in coldwater cisterns which had been floated over inside with cement. Although the water froze very thickly the fry were quite safe and I did not lose one youngster. I have seen it written that young of goldfish must be three inches long before they can be safely brought through the winter. This has been repeated by subsequent writers but I have found no truth in the statement.

Is there any considered age of a fish when it is best for breeding and how can one tell the age of a fish?

It is said to be possible to tell the age of a fish by the number of irregular rings on the scales. It would be very difficult to tell the age by the appearance of the fish alone. A well-kept fish of ten years could look much younger than another fish in bad condition even if years younger. Some fishes grow at a much faster rate than others even of the same brood, and so size alone is not always a safe guide for judging ages. I don't think there is a best age for breeding. I have bred from fish under a year and others over seventeen years of age, and these are fantails. As long as a fish is in good condition I never worry how old it is when breeding is being considered. If I had to give a stated preference as to the best breeding age I would say three years old, but this does not mean that fishes of other ages do not breed well.

A Moisture-Loving House Plant

SEVERAL months ago, I wrote in this magazine about a distinctive house plant—*Mousteria delicosa*—which loves moisture so much that it may be treated as a sub-aquatic, and permitted to trail its snaky roots in the water of the tropical aquarium. Now, among my steadily increasing collection of house plants, I have discovered yet another plant which simply glories in the humid heat arising from the top of a heated tank, and which may be used most advantageously in room decoration.

Its name is *Scindapsus aureus*, and it has heart-shaped leaves which grow alternately along a lemon-green stalk. The leaves are shiny, rich green, about three inches long—larger when conditions suit it—and mottled and blotched cream or pale yellow. *S. aureus* is a very accommodating plant, for it may be trained up a piece of moss-covered bark, or allowed to root itself in a shallow pan of peaty soil. The roots, which are produced at short intervals along the stalk or stem, are used to cling to rough, fibrous surfaces and for absorbing nourishment. I have trained my own plant, which I grew from a tiny cutting, to spread itself along the

top bar of a three-foot aquarium, so as to form a pleasing green canopy.

Although *S. aureus* needs some bright light, it does not need much of it at a time; so it will settle down quite well in a position several feet removed from a lightly curtained window facing south-east, south, or west. It can be grown under electric light alone. But when it is grown under artificial light, do take care that the leaves are not dried out or scorched by the heat. The compost or branch along which this plant creeps must always be kept moist—wet during the summer months, or when the plant is grown in a warm, dry room—and an occasional sponge or spray with tepid water keeps the leaves in a healthy, open-pore condition.

In its natural state in the Solomon Islands, the plant attaches itself to trees and shrubs, and is said to reach an overwhelming or strangling size. It would make an excellent subject for growing in a warm vivarium housing a collection of tree frogs or exotic toads.

Jack Hems

Young Aquarist in LAGOS

A tropical fish-keeper whose charges are caught near his home



Shallow and weed-choked sluggish waters form the natural habitat of many tropical freshwater fishes



TO receive these pictures at this time in frozen Britain has been like having a dose of bottled sunshine, and it is hoped that readers will be interested to see the sort of territory in which some of their tropical fishes are hunted. The pictures are also of interest in presenting Mr. Anthony Strawe, who claims to be the only aquarist in Lagos. Mr. Strawe recently entertained a member of Hendon Aquatic Society visiting Lagos, and is a regular reader of this journal. Some of his catches which he has forwarded to Messrs. Calrow and Robertshaw of the Hendon society have proved to be species of *Aphyosemion*, and they surprised their new owners by breeding in their aquaria at the first attempt. Exact identification of the species is now being made. (Reported by Mr. B. Fredericks, Hendon A.S.)

our readers

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

A Typographical Error

DUE to a type-setting error in the December, 1954 issue of *The Aquarist* our special offer in your Prepaid Advertisement columns read "2s. 6d. worth of fish or plants all orders for plants and fish"—the vital words "over £1" having been omitted. We decided to honour the offer as it read, and where requested, 2s. 6d. worth of fishes or plants were given with each order sent.

The results of the offer were interesting—over 85 per cent. of orders received were for more than 10 shillings, while all those below this amount (except for two) were obviously from juniors who quite rightly considered they were on a good thing! The smallest order?—11d. from a young man who ordered one plant, plus 6d. postage and six *Ambulia* plants for the 2s. 6d. "free offer." His country of origin?—awa' wi' ye, we canna say!

THE KINGFISHERIES,
Beckenham, Kent.

Our apologies are given for the error, and we consider that The Kingfisheries are to be congratulated on their consideration for their customers.



Mr. Anthony Strawe of Lagos examining his catch of *Aphyosemion* fishes. (Story on opposite page)

February, 1955



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

Hard or Beautiful?

IN the series "Tropical Fish-keepers' Refresher Course" I notice that "Pisces" derives the name *Callichthyidae* from the Latin *callus* (hard skin) and the Greek *ichthus* (fish). It would be interesting to know what his authority is for this.

It appears to be most unlikely. The generic name *Callichthys* was first suggested by Von Linné and, although modern biologists have little hesitation in mixing Latin and Greek, a solecism of this nature was unlikely to have been committed by Von Linné, who lived at a time when men of science were also classical scholars and wrote their books and papers in Latin. Furthermore, if the name is meant to imply that the fish has a hard skin the construction is wrong, and Von Linné would certainly have known better.

Some years ago I discussed the matter with Mr. Theodore H. Savory, M.A., the author of *Latin and Greek for Biologists*, an exhibitioner of St. John's College, Cambridge, and the biologist of Malvern College. He agreed with me, for the two reasons stated in my previous paragraph, that the name could hardly mean the fish with a hard skin, and must mean the beautiful fish, from the Greek *kallos* (beauty) and *ichthus* (fish). It is confirmed by the *Encyclopaedic Dictionary*, and other reliable sources. Why Von Linné should consider the fish beautiful is altogether another matter and largely beside the point.

GEORGE F. HERVEY,
London, N.W.8.

Eggs by Post

FOR over a year my fish house had been used solely to propagate one type of fish, *Aphyosemion australe*, and various successes have been recorded. The outstanding case was with this fish, after I had set up 12 separate tanks, each with entirely different water, in an effort to find out which water suited most. These various water set-ups were identical in tank size, and each with water ranging from distilled to strong, salty tap water. Some were pond water, and most were combinations or mixtures of these. The result after many months, using in each case as many alike pairs as possible, was fairly evenly spread, so that I would say that it matters very little what type of water is used.

During the latter stages of these experiments, I was introduced to Lieutenant Lloyd Bell of the U.S. Navy, now stationed in London, and watching these, he was struck by my method of bottling up *Aphyosemion* eggs and putting them away in the shade for a couple of weeks. He suggested that we should one day have some sent on to his father who is also an aquarist in Okmulgee, Oklahoma. The idea was hardly conceived, when an opportunity

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occurred, and an urgent telephone call from Lt. Lloyd Bell two days later told me that he had a friend going to Washington by air next day. I hastily gathered my newest eggs from the parents' tank and these were placed in a two ounce glass jar, filled with distilled water to which a faint trace of flavine had been added.

This was the Sunday evening of 4th December and the eggs in the screw topped container had started their journey, like most of our fishes have at some time or other, in the inside pocket of Lt. Lloyd Bell's jacket. Unfortunately, next day after they had been handed over to the person who was to take them on to Washington, the plane was delayed one day. This meant that they had not left London until Tuesday mid-day. During the waiting period they had been packed in their jar, into a small wooden box, which had been labelled ready to forward on for the long journey from Washington to Oklahoma. The eggs did leave London on Tuesday and arrived in Washington on Wednesday.

There they were taken to the post office and dispatched as ordinary post to Mr. B. F. Bell, and were received by him on Saturday, which was a seven days' journey from my fish house. In the meantime, Lt. Lloyd Bell in London had written to his father asking him to set up a tank using old water, and with a peat bed, and describing in detail all the precautions necessary when transferring the eggs. As a matter of side interest, the temperature of the water on arrival was 68° F., and had been 70° F. when it had left London. There was no report of a fungussed egg on arrival.

Now, after a period of three weeks, we have the news that the fish are free swimming—West African fishes, spawned in Hendon, hatched in Oklahoma. We are now considering the possibility of further consignments, and have already good stocks of *hivittatum*, and blue gularis eggs when the next trip is on. No doubt many more eggs could have been successfully sent over, and probably then perhaps there will be some failures. However, it does seem as though there is room for some normal inter-club egg "lease-lend," and when one considers the time involved by air travel, and the miles covered in this experiment, i.e., London-Washington per messenger and Washington-Oklahoma (approximately 1,700 miles) by parcel post, a total of 5,000 miles, it does seem as if distance is no object.

B. CALROW,
Hendon Aquatic Society.

Fireman Save my Fish

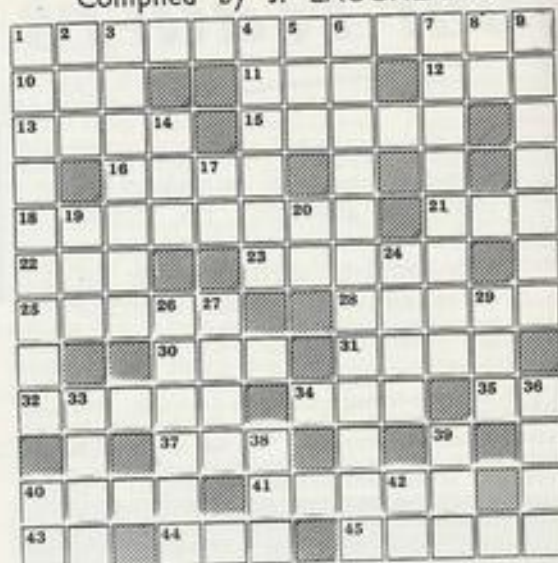
THE following extract from the American technical journal *Wastes Engineering, Sewage and Industry*, may be of interest to some of your readers.

"... did you ever hear of the fireman's role in rescuing fish? When fish in a pond near Philadelphia began to die because of oxygen depletion of the water this past summer firemen from Huntington Valley Volunteer Company aerated the three acre body of water by pumping liquid out of the pond and spraying it back in the form of man-made rain. Someone donated several cakes of ice for the stagnant lake and the firemen worked through the night in their mission of mercy. Pretty versatile fellows, these firemen. They snuff out fires by blanketing our oxygen; then they save fish by providing oxygen."

V. H. LEWIN,
Secretary, Oxford Aquaria Society.

The AQUARIST Crossword

Compiled by J. LAUGHLAND



CLUES ACROSS

- More than one "Manassa Mauler." Or, *Cichlasoma bicellatum* (4, 8)
- An isle not surrounded by water (3)
- Meadow starts leakage (3)
- This fish trap is the reverse of across (3)
- Creek, or candle core (4)
- Species of iris, root much used as perfume base (5)
- Poisonous metal, aquarists please note! (4)
- Goldfish variety of leonine appearance (8)
- Fish tail is a caudal this (3)
- Dan-ly (3)
- Gourami goes for Spanish friend (5)
- Insect loses a hundred (5)
- Male arceonics (5)
- Fish eggs (3)
- Gray's rugged trees (4)
- Freshwater polyp and menace to small fry (5)
- Newt (3)
- Soporific slug, a speciality of the original I across (1, 1)
- Orfe (3)
- Idea of planarians (4)
- Relatives of the horse, silly fellows (5)
- Reverse of 35 and all right (1, 1)
- Fish trap, perhaps (3)
- Pull just short of the implied abode of angels and paradise fish (5)

CLUES DOWN

- Gem of the tank? (5, 4)
- That Baba chap from the Calliope (3)
- One-eyed crustacean named after mythological giant (7)
- Old name for *Eigeria* (6)
- Beche-de-this is trepang, alias sea-slug (3)
- Macropodus opercularis* (and no angel) (8, 4)
- Describes the caudal fin of *Xiphophorus helviti* (3)
- First half of year (2)
- Useful things when pulled or for making or mending 12 (7)
- Half broken for the Scot to know (3)
- Ah! (2)
- One of the components into which an electrolyte is broken up under electrolysis; a factor in determining pH. (3)
- Part of bream is also part of day (1, 1)
- Popular but not scientific name given to fishes with gold spots (4)
- Decapitated herring is going astray (6)
- May be common or ratter-lack (4)
- Lochleven's Scottish river (3)
- Vitellus of a seed (4)
- Lé (4)
- Bring forth young (3)
- Country in which fish-keeping has enjoyed tremendous vogue (1, 1, 1)
- Great Chinese river; large Italian river (2)
- Loch Leowide a Lancashire exclamation (2)

PICK YOUR ANSWER

- The first photograph of a living fish was taken in the year: (a) 1844, (b) 1854, (c) 1864, (d) 1874.
- Apisgrammus ramirezi* is native to: (a) Bolivia, (b) Guatemala, (c) Nicaragua, (d) Venezuela.
- Chameleon fish is a popular name of: (a) *Cichlasoma coryphaenoides*, (b) *Cichlasoma cutteri*, (c) *Cichlasoma fayerum*, (d) *Cichlasoma tetraodon*.
- Melanotaenia virgatus* (the Australian rainbow fish) attains a length of about: (a) 2 ins., (b) 4 ins., (c) 6 ins., (d) 8 ins.
- The genus *Isobrya* contains some 200 species, but the number of aquatic species is: (a) 1, (b) 3, (c) 4, (d) 7.
- Isotripla rubra* is popularly known as: (a) Water carpenter, (b) Water conch, (c) Water puerlane, (d) Water thyme. G.P.H. (Solutions on page 243)