

The AQUARIST AND PONDKEEPER

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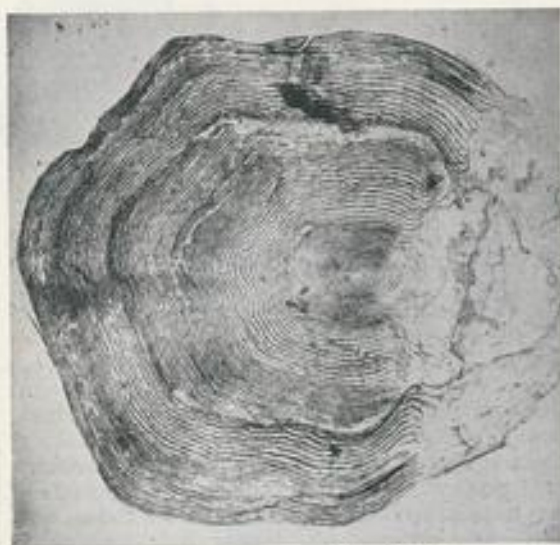
Editorial

FROM the Steinhart Aquarium in the U.S.A. comes news of an attempt made to provide verisimilitude to an exhibit of life in a swamp. Three carefully concealed speakers in the lush tropical vegetation continually relay sounds made by insects and amphibians, and bird calls, into the steamy air. These all originate from recordings so arranged that the sounds sometimes are heard all at once, sometimes separately, and occasionally, for periods of five seconds or so, brief interludes of silence occur. There is also a volume control permitting the sounds to be boosted when numbers of noisy human visitors surround the exhibit.

What, we wonder, are the reactions of the captive inhabitants of the swamp to all this? For a dozy alligator who has spent all his life midst the noise of a natural swamp the quiet of the Aquarium may well have seemed like heaven on earth before the advent of the electronically disbursed cacophony. To frogs robbed of some of their natural insect diet by captivity the sudden introduction of noises made by choice items of past feeding orgies may be nothing short of a gastronomic insult. Again, to be forced to listen to the attractions of amorous calls of one's own kind, in the knowledge that only a cold and sexless speaker will be found after busy hours spent tracing the provoking sounds, cannot be anything other than frustrating. The fishes are luckier, for such noises as they make, being unappreciated in any sense of the word by the human ear, are unlikely to be included in the recordings.

We would not be surprised at news of formation of a resistance group within the swamp, or at stories of persistent blockage of the speakers with well-placed masses of sphagnum moss. Discontent with the system might also be registered by concerted and organised action of the swamp's inhabitants during the silent periods of the recording system. Giving the system the raspberry, as the vulgar used to put it, might be beyond the abilities of the animals concerned, but it cannot be denied that it could form an effective method of showing disapproval of this intrusion of automation into their lives.

Tales of Fish Scales



Single scale of Atlantic salmon (magnified $\times 15$) showing spawning and other marks discussed on page 94

WHAT aquarist is not intrigued by the beautiful colours of his pets in the tank? What is it that makes them so pretty? What is it that gives them these intricate patterns, that makes them glitter and shimmer at every turn in the water? We could get an answer if we would take a closer look at their scales. However, it wouldn't be a good idea to pluck a scale from a live fish. Here our fishmonger at the street corner comes in handy. He lets thousands of these little disks go down the drain every hour, unsuspecting that they have quite an interesting story to tell.

Fish scales in themselves are beautiful objects for the magnifying glass. A microscope is preferable but not absolutely necessary. And they are easy to handle. There is no fixing or staining required. Just put a scale flat on a slide with a little water, cover it with a cover glass or another slide to prevent it from curling up, and arrange the light so that it passes through the specimen.

There is little sense, though, in collecting scales from the working table of the fishmonger. It would be like taking a book from which important pages have been torn out. Scales are set in a fold of the fish's skin; they are partly covered by skin tissue, and if they are forcibly removed the skin is destroyed and we miss half of the story. It is, therefore, always advisable to secure a piece of fish which has not been worked on.

A flounder is a good specimen to start with. If we look at a flounder scale under low magnification we shall notice a multitude of black spots of different sizes. Some will be nearly round, some will appear like ink-blot with numerous radiating processes. These are so-called chromatophores, pigment-containing cells that are the basic structures of coloration in any fish.

If we happened to examine a grey flounder we shall find on its scales only black-pigment cells, or melanophores, so named after the substance melanin, which forms the pigment granules. But maybe we picked up a brownish

by ERIC V. GRAVE

(New York)

Photographs by the author

specimen, and on this one we shall discover another type of chromatophores, known as xanthophores, after the substance xanthophyll which goes into them. These xanthophores are visible as small irregular spots of orange colour. Other species of fishes have yellow or red xanthophores, or a combination of them. The green colour of the sardine, for instance, is achieved by a mixture of black and yellow chromatophores. And if chromatophores of several colours are distributed over the skin, concentrated here, lacking there, an infinite number of patterns and shades is possible, as in some tropical fishes.

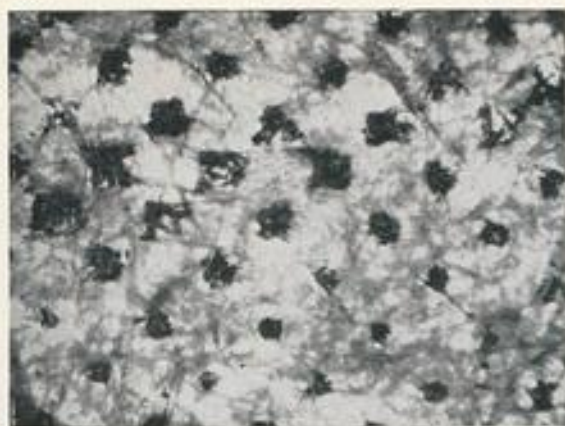
Guanophores

But the exquisite colours of fishes are not only due to the presence of pigment. There is another substance, called guanin, distributed mainly underneath the scales, which is responsible for the iridescent effect so many fishes display. Guanin is in itself colourless matter, but it has the property of breaking up the light with a prismatic effect. Our goldfish in the aquarium is generously supplied with guanophores, as these light-reflecting structures are called. But since we wish him a long life and do not want to wait until he expires, we can take any other fish with a silvery appearance for examination. We may ask our fishmonger for a piece of salmon, and again we insist not to scrape off the scales.

After we cautiously remove a scale we put it on a slide, but this time upside down. We then add a drop of water but no cover glass and adjust the lamp so that the light falls obliquely on the scale. If we now agitate the scale gently with the point of a needle, we shall have a beautiful



Crystals of guanin (magnified $\times 200$) removed from the scale of a whitefish and illuminated obliquely under the microscope

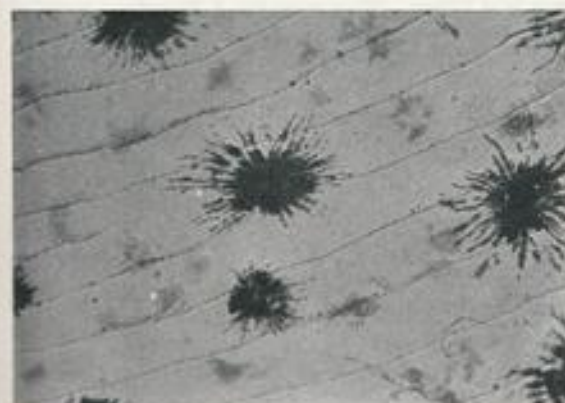


spectacle. To quote an enthusiastic microscopist who did this little experiment 100 years ago and described it in lively words: "The water around the mass is seen to be full of an infinite number of flat spicula or crystals, varying much in size, but very constant in form, a flat, oblong prism with angular ends. By reflected light they flash like plates of polished steel. But what appears most singular, is that each spiculum is perpetually vibrating and quivering; and independently of the rest, so as to convey the impression that each is animated with life. Every spiculum, as it assumes or leaves the reflecting angle, is momentarily brightening or waning, flashing out or retiring into darkness, producing a magic effect on the admiring observer."

Colour Pattern

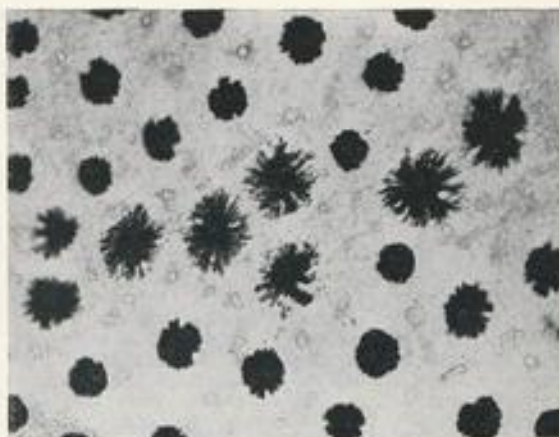
Most fishes have a given coloration pattern and keep it for life. The surface feeders are all dark on the back and light on the belly; this gives them a certain protection against fish-eating birds which may attack them from above, as well as against predatory enemies from below. And because the catfish from the Nile has the peculiar habit of swimming upside down, it is its belly which is pigmented and gradually shading off to a white back.

But many fishes have the ability to change their colour, and some among them reach a surprising virtuosity in this respect. The flounder, already mentioned, is one of those



Magnified view ($\times 400$) of melanophores and xanthophores from the skin of a sardine

August, 1956



Left, above, is a magnified ($\times 50$) view of part of a half-tone newspaper picture illustrating how the varied size of dots produces variations of intensity to the naked eye, in the same way as pigment cells (melanophores) in the skin of a flounder (right, above, magnified by 400)

virtuosos. Put a live flounder in a tank with a draught-board as the bottom and it will try to imitate the pattern. It will not be able to produce geometric squares on its skin but there will be very dark and very light patches all over its upper side. Black disks on a white background or white disks on a black one will be easier for it to reproduce.

How is the flounder doing this? The answer is that the chromatophores of the flounder are not stable. They have the remarkable ability to contract or to expand. If contracted they give the skin a light, if expanded a darker, shade. Here the flounder has applied for millions of years a simple principle our newspaper printers thought out recently. For instance, if with the help of a hand lens we scrutinise the newspaper picture of a girl whose "engagement has been announced" we shall notice that its overall impression is achieved by numerous dots of different sizes. The lighter regions of her pretty face are made up of tiny dots, the darker regions of heavy dots, which even melt together. The skin of a flounder shows in the same way chromatophores in different stages of expansion.

Changes of Colour

The stimulus to change its colour or pattern is received through the eyes, and when the fish is blindfolded no colour response results. If the flounder is kept with its head on a black background and with its body on a white one it will change to black. And here we have to stop for a moment and think of the intricate nerve system and the apparatus of tiny muscle fibres which is required to make possible the spreading or contraction of thousands of pigment cells according to what the fish sees. The response is unconscious and automatic and even occurs when the fish is asleep, provided that its surroundings suddenly change.

The colour change of flounders has a definite purpose: it helps this fish to hide from its enemies. But there are other fishes in which the reasons for colour changes are not so obvious. Some of the tropical fishes, especially those inhabiting coral reefs, have up to seven different liveries. They change their colour and patterns as they swim along, by no means always in accordance with their background. And, what is even more wonderful, they are able to effect the change within a few seconds. Are they doing it merely for pleasure? Experiments which

were made in the New York Aquarium many years ago indicate that the colour changes of these fishes are apparently for emotional reasons, and depend on their moods and activities. The colour changed when food was thrown into the tank, when the animals were frightened, when the electric light was turned on, when air was driven into the tank, or when other kinds of fishes were introduced.

Fish scales are of interest in still another respect. It is on its scales that a fish writes and carries around—in hundreds of copies—its personal life story, for us to read if we are able to decode its scribbling!

When a fish hatches it has no scales, but when it is one or two inches long—depending on the species—tiny plates appear, and their number at this early age remains constant throughout its life. The growing fish does not develop more scales, but the scales once formed on its body grow with it to cover a greater surface. The individual scale increases in size through the addition to its edge of microscopic amounts of a bony substance. As a tree adds concentric rings to the trunk every year, which in cross-section tells us its age, so each scale adds rings which can be seen when viewed with transmitted light through the microscope. There is, however, one difference: a fish adds several rings yearly to its scale and the number added depends on the life conditions it has had to face.

Summer and Winter Zones

In summer time, life is relatively easy; food is abundant, the temperature high, so fishes usually grow rapidly at this time of the year and numerous and widely spaced rings are added to the scales. In winter time, on the other hand, with temperatures dropping, the rhythm of life is considerably slowed down, food is scarce, the rate of growth is reduced, and this fact is reflected by the addition of few and narrow rings to the scales. So, by counting summer and winter zones we can estimate the approximate age of a scale and its owner.

A fish from the aquarium hasn't very much to tell us, of course. It leads a lazy life, is fed regularly and at constant temperatures. The rings on its scales will be seen fairly uniformly spaced and regular. But an adventurous fish such as the salmon has a great deal more to relate—as anybody who does a lot of travelling.

To the experienced scale reader the scale from an Atlantic salmon, like the one pictured in the photograph, gives these particulars: that the fish spent two years in the river where it was born; that it then went out to sea to spend a year in the ocean; that it returned to its river in order to spawn; that it went out to sea again, where—alas—it was caught.

The two river years can be recognised in the two zones of narrow rings in the centre of the scale; during this period the fish grew slowly owing to the scarcity of food in the river. The year in the sea is revealed by the sudden widening of the rings; under greatly improved food conditions this fish put on weight at a fast rate, and a larger body surface had to be covered by rapidly growing scales. Next to the sea-life zone we notice a ragged line which goes all around the scale. This is another autobiographical inscription: it tells us that the fish has spawned, and it is called the spawning mark. In the process of spawning the fish's girth is considerably reduced. Suddenly the scales have to cover a much smaller body surface. Consequently they become compressed and their edges ragged and frayed. When the fish resumes its growth, a scar remains.

The ladies among us should consider themselves fortunate that nature didn't provide them with scales which could reveal more about their intimate life than they would care to tell! It is not known how the mermaids feel about this subject.

Aquarium Cinema—

by MASON SMITH

SEVERAL factors have to be considered when photographing tropical fishes with a cine camera: first, the amount of light required; second, the type of tank; third, the layout and type of plants; fourth, the species of fish, and last, the type of film, i.e. black and white or colour. I shall therefore deal with each of these factors in turn.

Lighting

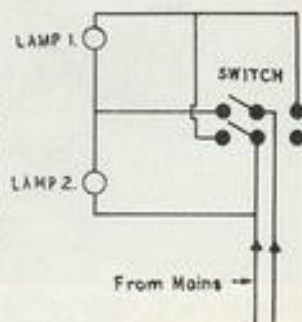
This is perhaps one of the most difficult problems so far as fish photography is concerned. Sunlight is the best and most effective form of lighting, but as far as we are concerned in this country the chances of having the right amount of sunlight when we require it are very remote indeed. In any case it would mean that the tank would have to be set up outside, and that when the fishes were doing what the photographer expected of them the sun would need to be shining. Of course, filming during the winter months is definitely out if one is going to rely upon sunlight. Therefore the only solution to the problem is to use artificial light by using a special type of bulb made especially for photographic purposes.

These bulbs are called Photofloods and are made in two sizes. The No. 1 Photoflood bulb costs 2s. 6d., and although only the size of a normal 60 watt bulb, it actually consumes 250 watts and gives light equal to a 750 watt bulb. Their life is limited to approximately two hours. They have a normal bayonet-cap fitting. The No. 2 Photoflood bulb is usually fitted with an Edison screw thread, although a bayonet-cap type can be bought. It consumes 500 watts and gives a light output equal to 1,200 watts approximately. I do not recommend it for aquarium use as it produces too much heat in one spot. The No. 2 bulbs cost 6s. 6d. each and have a life of about six hours.

Water has a great capacity for absorbing light, and the amount of light required to light a small 24 in. by 12 in. by 15 in. tank would almost be sufficient to light a small amateur film-studio set.

My method for lighting a small 24 in. by 12 in. by 15 in. tank is as follows. First three No. 1 Photoflood bulbs of the correct mains voltage should be purchased from the local photographic dealer. These three bulbs should be

Wiring diagram showing "series-parallel" arrangement for two Photoflood lamps with a double-pole throw switch, suitable for use in aquarium cinematography



THE AQUARIST

tography Technique

wired in series-parallel in an aluminium unpainted aquarium cover which has a polished surface on the inside to give the maximum reflection into the tank. The normal Photoflood reflectors made of aluminium can be used instead of an aquarium cover. They are simply laid face down on top of the angle frame of the aquarium.

Wiring the bulbs in series-parallel is most essential, as this means that they can be used as the normal aquarium lighting, and then by the flick of a switch brought up to full power directly the opportunity for filming occurs. Otherwise the tank cover will have to be fitted with two sets of bulbs, one set for normal lighting, the other for photographic lighting. When I made my film, "The Fighting Fish of Siam," I used to sit at my tanks for three or four hours at a stretch just to get a particular sequence in the "can." If my lights had not been wired in series-parallel, I should have found the bill for Photofloods rather heavy!

The above lighting should give sufficient light to film in colour with the lens open to an aperture of $f/3.5$, and more than ample for one of the faster monochrome films like Kodak Super X.

Type of Tank

A tank of the 24 in. by 12 in. deep or 12 in. deep type is of sufficient size, and in fact a tank of larger dimensions would only complicate matters so far as lighting is concerned. The front glass, that is the glass through which one will be actually filming, should be of the best quality one-quarter inch English plate glass. This is necessary to avoid distortion. Normal window glass can be used as a last resort, provided that it has no ripples in its surface. An aquarium with a front glass which has been scratched by cleaning implements should definitely be avoided, as the smallest blemish picking up the light from the tank will be magnified many times on the screen.

The back glass of the tank should be painted either dark blue or black. Either of these colours will show up the fishes and plants to their best advantage. Of course, if one has the facilities to make a background such as I described in an article in *The Aquarist* (July, 1953), the effect will be even more realistic. The aim should be to give the impression that one is actually filming in the natural habitat of the particular species and not in an aquarium.

Aquarium Layout

The planting of the tank should be kept as simple as possible and the plants should conform to the habitat of the fishes in their natural state. Plants should be planted mainly to the sides of the tank and an attempt made to hide the side panes and back angles. The plants chosen should be of the shorter species if possible, i.e. *Cryptocoryne*, dwarf *Sagittaria*, etc., for it must be borne in mind that any plants which reach the top of the tank will eventually be wilted by the terrific heat from the lamps. Trailing or surface plants will also prevent some of the available light reaching the fishes. Rockwork introduced into the set-up should suit and fit into the colour scheme; white rocks should definitely not be used, as in the finished film the glare from them on the screen will detract a viewer's eyes from the subject matter.

Compost is a very important item and should be a light-coloured sand if possible. Sand has a fairly high reflective value and will help to reflect the light back on to the fishes and plants. The compost should be so arranged in the tank that it starts at a level with the front-bottom angle and slopes gradually to a depth of three inches at the back



Single frame enlargement from an 8 mm. Kodachrome colour film made by the author. Subject is *Cichlasoma nigrofasciatum*

of the tank. Heaters and thermostats if required in the tank should be skilfully hidden so that they will not intrude into the picture. Any mulm on the bottom of the tank should be carefully siphoned off, as the movements of the fishes will make this rise. On film suspended mulm looks as if a miniature storm is raging! The water should be old and crystal clear; this is most important.

Species of Fish

For the beginner to cinematography the best types of fishes to photograph are undoubtedly those which exceed two inches in length and whose movement is not too rapid. Most of the cichlids fall into this category. A point to bear in mind whatever species of fish is to be used is that the water temperature at the surface is going to rise well over the 100° F. mark when the lights have been on for more than 10 minutes. This is particularly important when filming anabantids because of their need for atmospheric air.

When making my colour film, "The Fighting Fish of Siam," I found that on occasions the fighters depicted in this film were going through a variation of temperature which was 75° F. at the bottom of the tank to 110° F. at the water surface. The most difficult sequence to film was the one which shows the building of the bubble nest. The heat from the bulbs was bursting the bubbles almost as soon as the male had blown them! However, by judicious use of the series-parallel switch I was able to get some fairly decent shots.

Whatever species of fish is used they will have to be acclimatised to the tank in which they are to be filmed, and also to the sudden brightening of the lights when filming commences. There is also the close proximity of the person and camera to the tank, which to say the least is rather disturbing to its inmates. I will explain how this is overcome in my next article in this series.

Types of Film

In my first article I gave approximate film prices, so at this stage I will deal with the types available in 8 mm. and 16 mm. Black-and-white film has one great advantage over colour—it is available in much faster emulsion speeds; this means that a smaller aperture, or less light, is required. With the smaller aperture one gets a greater depth of focus and, of course, the advantage of using less light is evident to anyone. In cinematography you have not usually, except on the very expensive cine cameras, such a range of shutter speeds as the still photographer. You rely simply upon aperture opening and film speed. Filming at the silent-film speed of 16 frames/second the shutter speed is

usually 1/30 of a second. Sound films are shot at 24 frames/second and the shutter speed is 1/45 of a second.

8 mm. Reversal Films

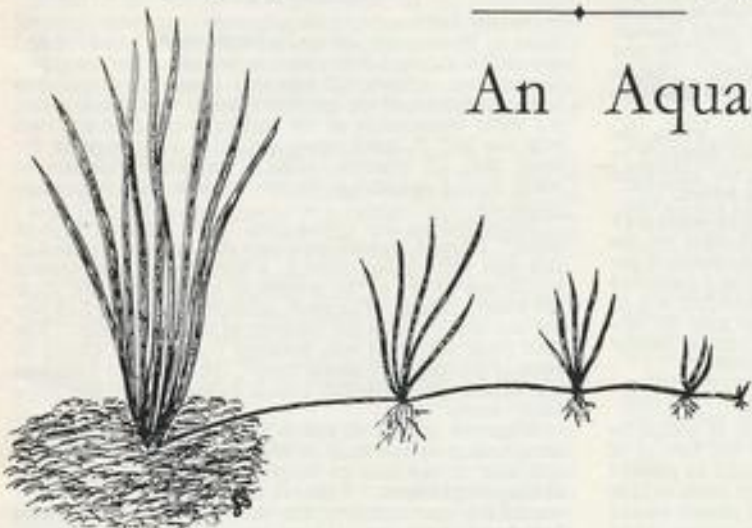
Type	Make	Name	Weston photo-electric meter speed	
			Daylight	Artificial Light
Colour	Kodak	Kodachrome	8	12
"	Agfa	Agfa Colour	12	16
Black-and-white	Kodak	Panchromatic	10	Not suitable
"	Kodak	Super X	40	32
"	Gevaert	Macro	10	6
"	"	Super	20	12
"	"	Ultra	80	50

The table above gives some details of 8 mm. films which are available in this country. They are all reversal, which means that you do not have a negative. The film comes back as a positive, already to put on the projector. Processing charge is included in the price of the film; there are no extras to pay for. It should be noted that artificial-light type Kodachrome can be used in daylight by fitting a gelatin filter in front of the lens (Wratten 85, price 2s. 6d.); daylight Kodachrome cannot be used in artificial light.

It will be noticed in the above table how the meter value rises for the black-and-white film, making it particularly suitable for filming in poor light conditions.

Cacti in the Fish House

As the weather gets warmer it is possible to increase one's collection of cacti by taking cuttings. Practically any piece of a cactus plant can be rooted and even from the small tubercles of a *Mammillaria*, if properly treated, small plantlets can be obtained. Some types such as the *Echinopsis* (hedge-hog plants), have small off-sets upon them which can be taken off and rooted in sharp sand to make fresh plants. Some species are slow to make off-sets and may never do so. These kinds are usually propagated from seeds. When taking any cutting from a plant it is well to take it from a position that is partially hidden from view, to avoid causing obvious disfigurement. Once the cutting has been taken it should be placed in the sun to dry off. The cut portion will form a dry skin and from this new roots will form. If the cutting is not allowed to dry off before it is set then it may rot and never grow. A box or large pan can be used for cuttings. The box can be half filled with the usual potting compost and the top part can be all sharp sand. If this is placed in a warm position and water is given sparingly the cutting will soon make roots. These will penetrate the sand and become established in the soil below. After some months the cuttings will have formed a good root system and can then be potted up separately.



An Aquarium Dwarf

(*Sagittaria subulata*)

by JAS. STOTT

A number of young specimens developing along a runner from the parent *Sagittaria*

A DWARF among the *Sagittaria* species, *S. subulata* is a delightful little plant for the small tropical tank. Conditions do, of course, have some influence on its eventual height, but it seldom exceeds six inches, and when this occurs the leaves tend to lose their normal strong appearance as if the plant has been "drawn" because of insufficient light.

The leaves are an attractive shade of dark green, narrow but strong and surprisingly thick of texture for the size of the plant. It multiplies itself by means of runners from which the young plants develop. Once a plant becomes established in a tank where conditions are to its liking, runners are soon put out and young plants quickly formed, eventually to produce attractive thickets in which the

smaller fishes love to browse.

Some charming effects can be obtained in the furnished aquarium if a little thought is given to the planting position of *S. subulata*. It always looks well when placed at the base of some prominent rockwork, especially if the stone is a light colour.

It is a useful plant to get established in a tank containing among others, livebearers, for some of the youngsters of these species of fishes may successfully save their lives by finding refuge in the thickets provided by *S. subulata*.

To retain the true characteristics this plant should be given a position where it can receive full light and have at least an inch of gravel in which to root itself adequately.

African Fish of the Genus *Distichodus*

by ALBERT J. KLEE

Photographs by the author

AMONG the aquarium fishes recently imported from the Stanley Pool region in Africa the fishes of the genus *Distichodus* have rekindled an interest for those aquarists who are always seeking something new.

Distichodus are essentially characins, although some specialists place them in a different family, the Citharinidae. In any event, they are characterized by a strongly compressed body and a mouth that is placed on the underside of the snout. The location of the mouth is quite opposite to its location in fishes like *Anostomus*, where it is located topsides. The *Distichodus*'s head, viewed from above or below, is broad and rounded. This detail seldom is apparent in the usual tropical fish photograph. In addition, small scales cover the whole or greater part of the caudal and adipose fins.

Anatomical details such as these hardly serve to popularise an aquarium fish, but many of the species are brilliantly coloured or otherwise possess pleasing markings.

The following compendium, with the exception of *D. noboli*, provides a brief description of the species imported into the United States this year. *D. noboli* has been listed in German aquarium books for some time and is often confused with *D. affinis*. A scale and fin-ray count has shown our specimens to be *D. affinis*. Other errors have been made in the identification of these fishes and are discussed below.

Synopsis of Imported Species of *Distichodus*

1. *Distichodus affinis* (Günther). The photograph illustrates this fish very well. Its basic coloration is silvery. The dorsal fin is very striking, with the anterior half jet-black and the posterior half a bright red. Ventral, anal and caudal fins are red. There is a black spot at the root of the caudal fin. Length, up to 3 inches. Altogether a very pretty and satisfactory aquarium fish.

2. *Distichodus atroventralis* (Boulenger). This fish has been confused with *D. sexfasciatus* (a basically reddish-



Distichodus affinis

coloured fish). The young are greyish to purplish-brown above, white below with six to nine dark vertical bars and a black spot is present at the base of the caudal fin. The adult displays a uniform brown colour. As might be expected from the extremely large eye of the young specimen in the photograph, this species grows to a large size. The adult reaches a length of 17 inches, at which size its head loses some of its roundness.

3. *Distichodus fasciolatus* (Boulenger). Similar to the preceding species, but possessing 18 to 20 dark vertical bars. The young sometimes have a dark brown spot at the base of the caudal fin. There are small blackish spots in the dorsal fin. Length to 14 inches.

4. *Distichodus lutosus* (Schilthuis). This fish is probably the prettiest of the genus. Younger specimens resemble *D. sexfasciatus* quite closely, but they grow to a much larger size—15 inches. Basic coloration is orange or red with six to eight blackish bands across the body. The dorsal fin is blackish in the young. A striking aquarium fish.

5. *Distichodus maculatus* (Boulenger). Very similar to *D. fasciolatus* but for large blackish round spots, forming a



Distichodus atroventralis



Distichodus sexfasciatus

rather oblique series across the body, replacing the vertical bars. Each series contains five or six spots. Length, up to 12 inches.

6. *Distichodus noboli* (Boulenger). Closely resembles *D. affinis* but lacks the red markings. Length, up to five inches.

7. *Distichodus sexfasciatus* (Boulenger). Almost as pretty as *D. hassasi*, but in the latter the scales have a lustre lacking in the other. Coloration is red or reddish-brown with a silvery-white belly. Six or seven broad blackish vertical bars decorate the body. A very beautiful fish. Length, up to eight inches.

In aquaria, *Distichodus* behave in a manner resembling barbs. Quite often they can be seen nibbling the new shoots of tender plants but they cannot be classed as plant-eaters. The specimens under my observation have eaten frozen *Daphnia* and brine shrimp, white worms and dry foods, thus presenting no feeding problems. In general they are peaceful fish; however, one specimen of *D. sexfasciatus* was seen to bully several *D. affinis*. When this troublemaker was removed to a tank containing larger fishes, including scats, no more difficulty was encountered.

Members of the genus are quite expensive at the present and attempts to breed them have not met with success. Sexing is not easy, but a tankful of *D. affinis* indicated some fish with fuller or deeper body shapes than others, suggesting these as females.

Since *Distichodus* are related to *Namaethiops mitaeniatus* and *Neolebias ansorgei* they may be expected to breed in a similar manner. Both *Namaethiops* and *Neolebias* are Congo fishes and lay adhesive eggs upon aquatic plants. All these fishes, including *Distichodus*, come from waters that are very soft and acid, and although in aquaria they do well in a variety of waters, it may be that for breeding, natural water composition must be duplicated.

The breeding of any of the *Distichodus*, with its resulting distribution of these fishes on a wider and less expensive scale, should do much in making them a most desired aquarium fish.

The Flame and I

by JOHN LONG

HAVING a mature female flame fish which appeared to be full of roe, I decided to pay a visit to a friend who I believed might have a mate for her. Although I was a little late leaving my place of work one evening, so keen was I to obtain a male flame fish that I went out of my way to visit my friend.

When I arrived and told him of my requirement he shook his head and said, "Well, I've only one male flame fish left, and that's only got one eye!"

"That doesn't matter," I replied, brushing aside his remark, "I want it for breeding, not showing."

So into my pocket went the wrapped jar in which I carry odd purchases like this one, and off I rode on my bike. Was it some feline intuition that made a big black cat streak across the pavement and under the front wheel of my bicycle? I tried to avoid it, swerved, lost control and over the top I went!

Fearing for the fish in my pocket I felt carefully for the dreaded broken glass, but thankfully found the jar was intact; not so my hands, which had suffered from their contact with the road. I remounted my bike and rode slowly home—a rather shaken but undaunted fishkeeper.

On arriving home I went to the shed which houses my

Fish in the Lantern



Photo: Wolverhampton Express and Star

Goldfish in the lantern pictured above is to be seen in the window of a shop in Wolverhampton. Once the lantern served to illuminate a Birmingham street by gas, but Mr. Jesse Bennett, owner of the shop and vice-chairman of Dudley and Stourbridge Aquarist Society, has modified it to make an aquarium which forms an eye-catching shop window-piece. An electric lamp mounted in the top lights up the "tank," which is also fitted with an air-line and diffuser.

tanks to float the jar containing the flame fish in one of them. However, the shaking-up he had received must have made him frisky, for as soon as I took the lid off the jar he flipped out of the water and on to the bench. I scrambled frantically among the dust and dirt on the bench and a little later found a begrimed fish lying there. I quickly scraped it into the jar, and was relieved to see it immediately begin to swim. Its one eye seemed to reflect its owner's opinion of me in a very old-fashioned way!

Now, with the jar floated in the tank, I began to look for the female for whose maternal fulfilment I had already suffered so much. She was there all right—dead on the bottom of the tank!

So if anyone wants a one-eyed male flame fish who for all his short existence has "lived"—or maybe one of you has a one-eyed female?

Serpae Tetra

(*Hyphessobrycon serpae*)

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

FAMILY:—Characidae, from Greek *charax*—a sea fish.

SPECIES:—*Hyphessobrycon*, from Greek *hyphes*—little, and *brycon*—tear in pieces; *serpae*—from Serpa, a town on the Amazon, where the fishes were first found.

THE serpae tetra is one of the small characins, seldom exceeding one and a half inches in length, and an ideal size for a 24 in. tank. In such a home, well planted and with good strong overhead lighting, it has a beauty all its own and a very strong appeal. Better kept in a small shoal of its own species, it nevertheless can be safely introduced into a community tank where, unless completely starved of small live foods, it will prove a peaceful and decorative inhabitant.

To the breeder it is not the easiest of fishes to propagate; some have little trouble, having by luck or judgment hit upon just the right conditions, others try season after season without success. One unsuccessful aquarist once said to me: "D'you know—I'd give almost anything to know what I do wrong with them—they'll live in my tanks for years, but they just live—they won't breed."

"What's the pH of your water?" I asked.

"Oh, I don't mess about with that," he said. "It's about 8, I think."

"And hardness?"

"It's jolly hard," he replied. "This is a shocking district for hardness. Soap won't lather, or anything!"

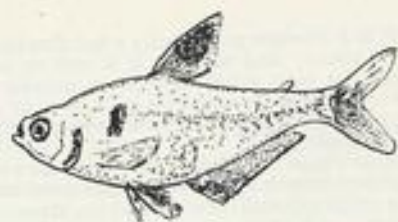
"See if softening the water or lessening the alkalinity or both has any effect," I advised him. Later, in a fish exhibition, in the breeders' class, he was showing a very nice half-dozen of young *H. serpae*, but I could never persuade him to tell me exactly the hardness or the alkalinity he had removed to cause the change!

There is probably some latitude, but it certainly seems as though experiment along the lines of pH and hardness is indicated to get better results. George S. Myers, of the American *The Aquarist* Journal, says the water for spawning must be very soft, but that even so, the fish is not easily bred.

Sexing young fishes is difficult, if not impossible, but as they reach maturity, the females fill with roe and become noticeably rounder in body than the males. The dorsal fins of the latter are a trifle broader than the females'. Some say that, if carefully examined, all the male fins are slightly broader than the females', and that the black-and-white markings in the anal are much more distinct.

In condition, the whole of the bodies of the fishes become suffused with brick red, and take on a sheen and sparkle. Fins are carried erect and well spread, and the fishes look as though they are on top of the world—a little cocky and proud as they fuss around the tank.

They are dainty and with small mouths, so it is useless to feed them huge pieces of earthworm, although they are equipped with teeth and could tear little pieces off. More often than not, however, they just won't bother if there is anything else of more suitable size in the vicinity. *Daphnia*, *Cyclops*, small gnat larvae, micro worm, brine shrimp—all these are excellent and will soon bring them into tip-top condition.



Successful breeders report that the courtship of *H. serpae* follows a similar pattern to that of the flame fish, a close relative. The female may sometimes make the first advances, but when roused the male dances round the female, fins vibrating, and makes sudden dashes in her direction. She then moves into a thicket of fine-leaved plants, and the male follows, coming to rest at her side, and sometimes actually butting her abdomen with his own. Clusters of semi-adhesive, amber-coloured eggs are periodically released until 2-300 have fallen upon the plants. Many of these, even under the cleanest conditions, are infertile, and this argues for the use of an additional male. I know of no one who has tried using two males with a female, and it could be that it might not work—only experiment can show. Remove parent fishes upon completion of spawning—always a wise precaution to take.

At a temperature of 80° to 82° F., development of the eggs is rapid, the fry emerging in about 24 hours, to remain clinging to the plants or making slight fluttering movements from place to place until they have absorbed their yolk sacs and developed their swim bladders—a matter of three to four days.

After this, the tiny creatures need feeding with the smallest of foods, and green algae water is recommended, together with fresh cultures of infusorians. Fresh cultures contain the smallest infusorian species, which later on are wiped out by larger species.

These are good show fishes if in a planted tank with strong overhead lighting. Otherwise they tend to fade in colour and look worth only sixpence a dozen.

Twenty-Five Years Ago

A PATHETONE sound film has been made of the submarine world as seen, and heard, at the Brighton Aquarium. It is probable that by the time these notes are published some hundreds of readers of *The Aquarist* will have seen this "picture" of captive aquatic life. It was interesting to note how the differing species of fish reacted to the abnormal conditions existing during the time the "talkie" was being taken. Although certain fish remained quite unperturbed, others were terribly frightened by the unaccustomed blaze of concentrated "sunlight" that flooded their tanks, coming, as it did, from an unnatural angle—from below instead of above the surface of the water. A number of the most popular spectacles, provided regularly at the official feeding times, had to be abandoned, as the "stars," apparently suffering from stage-fright, resolutely refused to "perform." Perhaps the fish least perturbed of any, were the pugnacious three-spined sticklebacks. Although bathed in the fierce glare of two enormous floodlights at the front, and from a vivid spotlight above them, the pert little fish attacked their meal with no less vigorous intent than under normal conditions.—From *"The Aquarist,"* August, 1931.

Starting a Tropical Aquarium—8 ^{by} AQUARIUS

HOW is it possible to recognise a fish that has become "off colour" and sickly? It is well to be able to pick out such a fish as soon as possible; where corrective treatment is advisable it is best to give this treatment before the fish becomes so weakened that a cure may not be possible.

The behaviour of the fishes will generally give an indication as to their health. As long as they swim about with their fins erect, especially the dorsal one, there is little to worry over; and as long as the fishes eat well and are active there is probably nothing wrong with them. If a fish dashes about and rubs itself against rocks and plants it is possible that a parasite is present which is worrying the fish. Such a fish should be removed to the hospital tank for treatment. Remember that there is a great difference between effects of pests on a fish and effects of diseases. Pests can be killed and the fish can be none the worse after the treatment, but with disease the fish may become so weak in constitution that it is not worth curing.

With older tropical fishes the signs of old age should not be taken for disease. It must be realised that many fishes do not live very long in a tropical tank; three years is the limit one can expect in many cases. The warm water causes the fishes to grow and breed quickly, and their life span is shortened considerably by the fact that some can breed at a few months of age and many are mature at three or four months. Although some tropicals can live for a greater number of years the majority will be worn out after three years. If only young fishes were bought when a start was made you will be more certain of enjoying them for the maximum number of years. Mature fishes may be almost on their way out when you buy them.

If you know that your fishes are fairly young and they develop symptoms which give the impression that they are suffering from a disease it is well to remove affected fishes from the community tank for isolation, and treatment if necessary, elsewhere. It is quite impossible to treat a sick fish in the tank with other fishes, and a hospital tank should always be on hand, even if this is only a small one. This tank is better left empty of sand, rocks and plants; aeration may be necessary, and, of course, a heater must be able to maintain the same temperature as that from which the sick fish has come.

Certain troubles which may occur can be cured, but if the fish appears to be always listless and is obviously not thriving it is better to destroy the fish instead of wasting time trying to effect a cure. The fish you may be treating may not be a very strong one and in nature such a fish would soon be killed by enemies; thus the survival of the fittest is ensured. Do not try to cure an ailing fish just because you think it is a show specimen and you would like to breed with it. Only the healthiest fishes should be used for breeding purposes.

If you notice a fish off colour do not immediately rush to give it every treatment out of the book. It is not of much use treating a sick fish unless you have a very good idea as to what is the matter with it. It may be some simple trouble which will clear up if the fish is isolated for a time and fed on live foods. I have known aquarists give their fish all kinds of treatment, from salt baths to immersion in T.C.P., Dertol, mercurochrome, quinine and potassium permanganate, without having the slightest idea from what disease the fish is suffering. One is familiar with the suggestion that involves inserting a hypodermic needle into a fish supposedly suffering from dropsy. I wonder how many amateurs have ever been able to cure such a fish by this treatment?

One of the worst troubles which can beset the tropical fishkeeper is white spot. This becomes apparent when small slightly raised spots appear on the fish. This subject has been dealt with at length recently in *The Aquarist* by Dr. F. N. Ghadially, and I refer any reader to his admirable articles on the subject (February and March-April issues). This trouble is usually introduced into the tank with fresh fishes that have not been placed in quarantine or with water containing live foods.

Where a fish has difficulty in keeping on an even keel the trouble is probably arising from the swim bladder. This trouble can be hereditary, or may have been caused by a chill or wrong feeding. If a fish persistently falls victim to this bladder trouble there is not much use in trying to cure it. It is from such cured fishes that your fish may have been bred. Signs of bladder trouble are when a fish stands on its head for long periods, lies on its side on the bottom, has difficulty in swimming to the surface or turns over and is generally unable to swim in a normal manner. If the fish has suddenly contracted this trouble it may recover if placed in a shallow container, with water rather warmer than usual, and fed with *Daphnia*, white worms and small pieces of garden worm.

Some fishes suffer from a form of tuberculosis, when they become thin and emaciated, going off their food and becoming very sluggish. Such a fish is better destroyed. If the body becomes distended and the scales stand out it is probably dropsy and a cure is, in my opinion, not only unlikely but attempts at one are a waste of time. It is usually only the older, worn-out fishes which develop this complaint. The signs of fungus (*Saprolegnia*) are usually well known, and the salt treatment is generally successful as a cure. It must be realised that some tropical fishes do not take very kindly to salt treatment; some of the catfishes for instance. It is always wise to place the fish in a container and then gradually raise the salt concentration whilst keeping the fish under observation.

If fins are seen to be split or torn there is every chance that the damage will soon mend, as long as the damage has not been caused by another inhabitant of the tank which may repeat the attacks. Lost scales can grow again, but it is as well to examine the rockwork in the tank to see that there are no projecting sharp pieces which could injure the fishes. Where the droppings of the fishes are filled with bubbles and a long string hangs from each fish, this is generally a sign of wrong feeding and a course of live foods usually soon puts this right.

Should you notice that most of the fishes in your tank appear to have lost their activity and have gone off their food you should make an immediate examination of the tank and contents. Have the fishes grown and become overcrowded? They will gasp at the surface if this is the case. Has something polluted the water? It will have a bad smell, and may look milky in colour, and the fish will again be at the surface. Have so many of the water plants died that they are no longer giving off oxygen for the fish, but decaying and causing pollution instead? Has the compost at the bottom gone foul through too much uneaten food having decomposed there?

Remember that fishes do not suddenly become ill without there being some fault in the set-up, and the sooner you find the trouble and right it the sooner will they recover. Remove most of the water and replace with fresh. The idea that all tropical fishes must be kept in the same water year after year is ridiculous; it can become foul and unwholesome, and the fishes will always benefit from a partial change.

Microscopy for the Aquarist—2 I by C. E. C. COLE

WE have now reached the stage in our pursuit of this fascinating subject at which we can call a halt, for months if desired, while we examine the hundreds of macroscopic creatures and objects, both aquatic and terrestrial, with which we are surrounded. Summer months bring a host of insects, eggs, seeds, etc., which well merit further study, and which do not require much time to discover.

Have you, as a breeder of fishes, ever watched the development of embryo fish during its period in the egg? Particularly interesting and easy to observe under low power are the eggs of zebra and pearl danios, or those of the common goldfish. Place one or two in a shallow glass dish in sufficient water to submerge them. They can be examined uncovered at frequent intervals, and if you are able to draw, an accurate portrayal of them at each examination will speedily show you a marked difference between first and last drawings.

The "quickenings" of the embryo is always a thrill, as is first sight of blood circulation and heart beating. When eventually the embryo struggles free from the egg shell and lies stretched full length on its side, the flow of blood can be seen all over its body. The corpuscles look like tiny cars streaming along an overcrowded arterial road. There even seem to be periodic road blocks where speed is diminished while the traffic sorts itself out.

Do you know what a newly-hatched brine shrimp really looks like? Believe me—it's nothing like its parent. Have you seen baby micro worms freely moving up and down within the bodies of the adults? Have you witnessed the startling beauty of the moss animalcules so common in tropical fish tanks? When, if ever, did you observe the development of snails in snail spawn? How many eyes have the various species of leeches? All these, and thousands of other things, will fully occupy you for months while you are preparing to go further—preparing to enter the world of really microscopic subjects—inhabited by the hundreds of different infusorians, the host of free-swimming algae, etc.

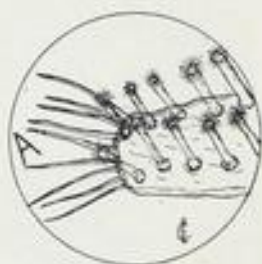


Sucker of a male water beetle (*Dytiscus marginalis*) as seen with a 2 in. objective and a $\times 5$ ocular. Portion A is shown further magnified on this page.

While you continue to examine anything that takes your fancy, start saving cash to purchase additional objectives. For reasons that will be made plain as we proceed, the low-power objectives so far in our microscope box are incapable of resolving sufficient detail to enable us to use them for every subject. Here we come to a possibly unsuspected obstacle.

What prevents us from purchasing high-power eyepieces and using them with our low-power objectives in order to get a greater magnification? Oculars are so much cheaper than objectives that it might be a good idea on the grounds of economy. And there we have it! Only on the grounds of economy can we entertain the idea—for the sake of

Part of the sucker of a male water beetle (*Dytiscus marginalis*) as seen with a $\frac{1}{2}$ in. objective and a $\times 5$ ocular



efficiency we must scrap it immediately. You have been warned. The following explanation should make the reasons apparent.

It is the objective and not the ocular which is responsible for the image of the object being examined. Any detail not reproduced in the image will fail to appear in the magnified image. Like getting a quart out of a pint pot, it just cannot be done. Magnification needs to be sufficient for the details of the image to be comfortably made out—and no more. Beyond this the image may deteriorate and appear fuzzy.

How many and what power objectives will we need? That depends how far we intend to go with this subject. I have prepared a table of what I consider necessary to enable us to go the whole hog—right down to the smallest inhabitants of the aquatic world, and have included the characteristics of the lenses and prices as a guide. The latter frequently change and may be a little different by the time this article appears in print. They can be purchased separately or together. I feel that it is better to have all the set made by the same firm rather than one by one firm and the others by another. When using an odd set together on a revolving nosepiece very real danger of damage to one or the other exists through a momentary lapse of concentration.

It is possible to obtain good secondhand objectives of the powers specified, but care in their selection has to be exercised. Modern objectives all specify the "numerical aperture" (N.A.); it would be better not to buy one which does not. I will have more to say about N.A. next month, for a very great deal depends upon it.

Desirable High-power Objectives

Maker	English designation (in.)	Focal length (mm.)	N.A.	Magnification (approx.)	Working distance (mm.)	Price £ s.
Baker	1/3	8	0.5	20	—	5 18
Beck	1/3	8	0.54	20	—	6 10
Prior	1/3	8	0.5	18	1.9	6 1
Baker	1/6	4	0.73	40	—	6 5
Beck	1/6	4	0.65	38	—	8 0
Beck	1/6	4	0.85	47	—	9 10
Prior	1/6	4	0.7	42	0.22	6 1
Prior	1/6	4	0.85	45	1.0	7 14
Watson	1/6	4	0.7	40	—	6 0
Oil immersion						
Baker	1/12	2	1.3	100	—	12 13
Beck	1/12	2	1.3	100	—	12 15
Prior	1/12	2	1.25	92.5	—	9 18
Prior	1/12	2	1.3	105	—	12 13
Watson	1/12	2	1.25	100	0.23	10 0
Watson	1/12	2	1.28	100	0.23	12 10

One objective of each group above is all that is needed.



"Labyrinth Fishes"

This article is the substance of a lecture recorded on tape by Mr. C. Wright, of Kingston, Surrey, earlier this year and sent to the Winnipeg Exotic Club in Canada, where it was heard at a club meeting on 19th March. The author is shown making the recording, in the photograph on this page.

by C. WRIGHT

THIS group, although not the most popular of our aquarium fishes, is certainly one of the most interesting. The breathing organs of the labyrinth fishes are radically different from those of other fishes. They are equipped with an auxiliary "lung" that makes it possible to take oxygen directly from the outside atmosphere; of course, the fish must rise to the surface to do this. Because of this fact they survive conditions in the home aquarium that would be fatal to other fishes in the same tank.

Another use of the auxiliary "lung" is to construct nests. The labyrinth fish nest consists of a mass of bubbles that adhere to each other, and sometimes the mass covers an area of over six inches square. The bubbles are made by the male fish, who rises to the surface and takes quantities of air into the "lung." He then submerges, releases the air in bubbles that rise to the surface. This may go on for ten to 20 hours, until the female approves of the result, for, during all this time the male seems repeatedly to consult her as to whether it is good enough. All this time his colouring assumes a brilliancy beyond belief, and his courtship is very interesting.

He manoeuvres his body into peculiar contortions and gives imitations of an aviator's falling and tumbling stunts, and if the female does not show the appreciation due to her lord and master, he does not hesitate to take forcible means of conveying his ideas to her. In all the varieties of this group the males are frequently very severe in their treatment of unresponsive females, so severe in fact that a female is often injured to an extent that may prove fatal; but there are a few gentlemen, even in the fish world!

When the male has made the female understand that it is her duty to produce the eggs from which the future family will arise, he persuades her to accompany him to a position directly beneath the nest. Then he shines: as a lover he has few equals—he embraces the female by wrapping his body around her middle and literally squeezes the eggs from her, fertilising them as fast as they are expelled, anything from two to 36 at a time. After each embrace she is exhausted and has the appearance of a dead fish.

While she is recovering, he is busy picking the eggs up from the floor of the tank, not to eat, but to place them one or two at a time in the nest, and to blow more bubbles to hold them there. If the female recovers in time she will often assist him in this job. (In the gouramies the eggs are light, and float into the nest, saving the male a lot of work.) This operation is repeated many times until many hundreds of eggs are laid.

This task finished, the male drives the female away from the vicinity of the nest, and, whichever variety of fish in this group is being bred, it is advisable to remove the female when spawning is completed, otherwise a new female may be wanted for the next time.

The male now assumes paternal duties by guarding the eggs, which will start hatching in from 36 to 48 hours; he will then guard the fry. After the hatching, his job is to keep the tiny fry near the surface, where the pressure is lowest, and any that drop below the safety line are promptly picked up in father's mouth and returned to the nest, where he will tuck them up with some more bubbles. Believe me, for the next two or three days he is kept very busy, because, as fast as he picks one up, half-a-dozen will fall down, and he would definitely lose the battle if he were not able to pick up several at a time. I have seen a male pick up 22, one at a time until, all in his mouth, they were returned to the nest.

This goes on for three days, until the fry are free swimming; then I do advise removing the male, because, seeing so much live stuff swimming about, he is liable to forget they are his youngsters, since he is feeling very hungry after his five-days fast (he will refuse most foods while he is guarding the eggs and the young).

First Imported Labyrinth

I believe that one of the first of these fishes to be introduced into this country was the paradise fish (*Macropodus opercularis*). A full-sized specimen is about two-and-a-half inches long (exclusive of tail). The tail, in a good specimen, is about half the length of the body, and terminates in long appendages (streamers). The entire body is crossed with alternate bands of brilliant red and green. The common name was applied by the Chinese, in whose country the fish is native, and must have been given for its appearance, not because of its nature, which is far from heavenly as the name implies. The fish is usually very vicious and is not to be recommended as a community fish. Although I have personally kept them in a tank with guppies and had nothing to complain about, I have also had others not so gentle. The paradise fish is a prolific breeder.

Now comes my own personal favourites, the fighting fish (*Betta splendens*). First, the cambodia *Betta*: its body shade and colour are unusual, and the formation and colour of the fins are marvellous. The body of the fish is about two inches long and is almost white, and the fins are velvety

a Transatlantic Lecture

scarlet. We now have specimens with entirely blue fins and others that combine blue with red. Some of the red and blue combinations are truly magnificent. Cross breeding has given us a colour scheme on the body as well, but I prefer the clear colours myself.

Other varieties have been produced with blue bodies and fins of the same colour, others have a purplish-red body with bright-red fins. The tail and other fins of this fish, in the many variations of colour, are long, drooping veil-like formations. The value of a specimen is determined by its size, colour and length of fins.

As the names given to the varieties of fighting fish are confusing to most beginners, I will try to give a classification of them. Fish with a flesh-coloured body, regardless of fin colour, are known as cambodia *Betta*. Fish having a blue body and blue fins are called blue *Betta* and sometimes cornflower-blue *Betta*. Those having a bright-green body and fins of the same colour are called green *Betta*. Those having a body colouring varying from purplish-red to a brownish-red are known as *Betta splendens*. All the *Betta* are bred without difficulty, and in the majority of cases can be kept in a community aquarium provided that there is only one male present.

The life of fighting fish rarely exceeds two-and-a-half so I don't consider it advisable to buy adult specimens; rather secure smaller, undeveloped fish which are less expensive and will develop and breed in the purchaser's care. Many inexperienced aquarists have been discouraged at the loss of a beautiful well-developed fish shortly after purchase at considerable expense. Reliable breeders and dealers know their stock well enough to tell which of their young stock will develop into good specimens with proper care.

Next in popularity in this group come the gouramis, brightly coloured fishes from two to six inches in length. The smallest is the dwarf gourami (*Colisa lalia*), a great favourite rarely exceeding two-and-a-half inches, but, what colour! It is broad of body and is banded with blue and red. Both colours being brilliant and perfectly blended to make a most beautiful fish, although, as usual, the female is rather plain. It is a fish that is most desirable in a community aquarium, but sometimes is apt to be very shy, and if the tank is thickly planted is often to be found hidden in a thicket of plants. In a breeding tank it is fairly easy to breed, but hard to feed in the early fry stages. It is difficult to supply the young fry with Infusoria small enough for them to take, and in the fry stage, it is very



Photo:

Laurence E. Perkins

Pearl gourami (*Trichogaster leeri*)

susceptible to even a few degrees in change of temperature; 80° F. seems to be ideal.

The male of this species is also different in that it will strip fine-leaved plants to mix with his bubble nest, and when finished, it is possible to pick the nest up as a solid mass. Compared with others the nest is small, rarely exceeding two-and-a-half inches in diameter, but built into a mound often over an inch above the water-line and half-an-inch below.

Gourami Species

Next we come to the two-spot gourami (*Trichogaster trichopterus*), sometimes known as the three-spot (counting the eye as the third spot) not to be confused with the blue variety (*T. trichopterus* var. *sumatranus*). The two-spot is also known as *Osphronemus trichopterus*, thus relating it with the only true gourami, *O. goramy*, which in its natural state reaches a length of 24 inches and is used by men as a food.

Then there is the pearl gourami (*Trichogaster leeri*) with a body covered with a pearly pattern. The male, in breeding condition, has a magnificent colouring of red on the underside of the fore part of the body. This is not such a hardy breed as others of the same family. There is also the kissing gourami (*Helostoma temminckii*). Not only does the male favour the he-man embrace typical of the species, but also, this species has a peculiar habit of kissing one another. Another very brightly coloured gourami, but one not so often seen, is the thick-lipped gourami (*Colisa labiosa*). I think it is well to breed these fish before they are fully grown.

Another matter to bear in mind when attempting to



Aquarists of the Winnipeg Club photographed at their meeting place [when the lecture on labyrinth fishes by Mr. C. Wright was played to them on the tape recorder]

breed *Betta* is that they are rather backward in learning just what is expected of well-mannered parents. A young prospective father will do the most peculiar and exasperating things; for no reason at all he will construct nest after nest, and then destroy them as soon as they are completed; he will eat the spawn at times; he will let the eggs remain at the bottom of the tank instead of putting them into the nest; he might let the fry get below their depth and drown; in fact he will do any number of ridiculous things that tend to aggravate you. But have patience, and he may prove a wonderful father that will spawn a female at any time you decide. I have proved this on several occasions by declaring that I would spawn a pair of fish at a certain time and date over a week hence; I have been laughed at, but have had the last laugh!

A question often asked is: how often shall I breed the

fish? Some aquarists breed them every three or four weeks during the summer; I personally like to give them two spawnings fairly quickly and then a couple of months rest. Four spawnings a year is enough for any aquarist to attend to, especially if he has three or four pairs to play with.

Another good thing to know about the fry of this group is that they put on size in spasmodic jerks. They may grow very rapidly for the first weeks and then seem to stop growing for a period; then they decide to be "real fish" and make another spurt. This development is noticeable almost overnight. It often discourages the less-experienced aquarist to notice that for some unknown reason the fry have stopped growing, but it is well to know that this spasmodic growth is characteristic of all the fishes in this group.

Coldwater Fish Menace—*Argulus*

by WILLIAM J. HOWES

ENTHUSIASTS who keep coldwater aquaria need to take special care with any wild stock which may be introduced to their tanks, for there are a great many parasites that infest fishes. One common one is *Argulus*, which is known as the fish louse. This belongs to a group of crustaceans called copepods, and the name louse is rather misleading, for in its structure *Argulus* is far removed from the true louse.

This external parasite attaches itself to any part of the fish's body, but mostly in the region of the gills because here the blood on which the parasite feeds is more readily accessible. To enable it to suck the blood *Argulus* has its mouth furnished with a piercing and sucking organ. Since *Argulus* attaches itself to the outside of fast-moving fishes, its tiny body is specially adapted to prevent it being washed off by the strong currents of water created as the fish travels swiftly about. The body is shaped like a disk, and it is flat so that there is little projection from the fish's body. On the lower side of the creature there are two powerful suckers, and these take a firm grip on the skin of the fish. In fact, even the antennae are equipped with strong hooks and bristles which penetrate and grip the fish's skin as soon as the argulid feels itself being moved by the water currents, and the faster the fish swims the stronger will the parasite grip.

It does not always remain attached to a fish, however, for it is a strong swimmer and often leaves one fish to attack another. The parent parasite will also leave its host to deposit its eggs on a stone or similar object, and when the young ones hatch out they make their own way to find their first host. *Argulus* is not confined to one or two species of fishes, for one *Argulus* may attack several species during its life.

An adult *Argulus* may quite easily be seen with the naked eye, and when swimming away from its host it may easily be distinguished because of its unusual shape and a pair of moderately large spots resembling eyes.

This parasite can be rather difficult to eradicate from aquaria and ponds once it has established itself, for it can live in unfavourable conditions and can survive for a fortnight or so without food. Even a change of salinity from



Drawing of the fish louse as seen from above when magnified approximately 50 times

fresh to salt water (or vice versa) seems to have little effect on it.

The attacks of *Argulus* cause its fish host to become much distressed, for it is believed that an irritant fluid is injected into the wound made when the parasite bites; this fluid apparently induces the flow of blood on which it feeds. The fish shows its distress by leaping out of the water, or by turning over on to its side to scrape itself on the gravel or against a rock in an attempt to rub off the parasite.

Such activity on the part of the fish will ultimately cause fraying of the fins, loss of scales, and possibly serious damage to the gills, so it is vitally important to remove the parasites from any fish which may have them attached to it. For these injured fishes are susceptible to fungus infection of the wounds, and this complaint often results in death.

Treatment of Infested Fish

Aquarists are advised, therefore, to pick the parasites off their victims carefully with a small pair of tweezers or fine forceps, and particular attention should be paid to the gills and the gill cavities. When the *Argulus* have been removed the fishes should be given a salt bath to guard against fungus.

Usually, it is with a fresh addition of fishes and plants that the parasites make their entry into the aquarium. Therefore it is a wise precaution to have a quarantine tank, into which any new fishes or plants may be kept for a couple of weeks, during which time careful observation may be made for any signs of this parasitic fish louse. This is the best way of keeping the main aquaria free from the marauding *Argulus*.

AQUARIST'S Notebook



by

RAYMOND YATES

FOR various reasons there are not many shows this year. The total will not exceed 25, which means that only about 7 per cent. of the 400 or so clubs in Britain are showing, and almost all of these are in the Midlands and the south of England. With this in mind I went along in June to the second annual show of the North Staffs Aquarist Society, which was held in Hanley, Stoke-on-Trent.

The conglomeration of towns which form the city of Stoke-on-Trent lie in a pocket of the south Pennines which cuts them off from the Midland centres of Derby and Nottingham. To the west lie some rather bucolic areas of Shropshire, Cheshire and the Welsh mountains. Southwards the Pennines fall away to the Midland plateau and the Birmingham area. It is, therefore, with the north that there is most affinity, and Stoke people are as much at home in Manchester (40 miles away) as any Lancastrian. Aquarists in the Stoke area have felt very keenly the fact that they are so remote, but this has not prevented them from entering fishes in various shows in S.E. Lancashire and north Cheshire. Distance is no object if you are keen. The nearest club is Macclesfield, which is also running a show this year. Owing to the difficulties of getting judges these two clubs arranged to judge each other's shows—a very satisfactory get-together arrangement.

Stoke has probably many aquarists but the local club has at present a mere 15 members, although this did not prevent them putting on a fine three-day show comprising 80 tanks for individual fishes, nine breeders' entries, 18 coldwater tanks, eight furnished aquaria and a very well set-up garden pool. Some excellent fishes were on view and the club must be congratulated on such a fine effort with so few members. It is obvious that all these members are keen and all pull their weight.

I was interested to note a large black shark sharing a tank with a diminutive *Costella* tetra. Both were in excellent condition and no chasing took place or had taken place. I mentioned this and discovered from the owner that these two fishes always shared the same quarters. There was also a fine set-up showing all the well-known aquatic insects, plants, newts, etc., and microscope slides, one of these being of perch fry just hatched. Potteries hobbyists interested in the club should contact Mr. K. Barker, 24, Cannon Street, Hanley.

Stoke is not the only club which suffers somewhat from isolation and consequent difficulties in entering shows, obtaining speakers and getting hold of good fish stock; most clubs outside the larger areas of population find these difficulties. Some have banded together as a matter of course, such as Kettering, Corby, Bedford and Peterborough, and also Oxford, Reading and High Wycombe. It is a pleasure to visit a club like Stoke who make light of difficulties when one hears so many groans and grumbles from other clubs much more favourably placed.

For the greater part of 1956 I have enjoyed very indifferent health and have been unable to bother so much with the hobby or to get about as much as I have done in the past. This has meant that my fishes have had to look after themselves for the most part, a task they accomplished with considerable success. Many aquarists worry about leaving their fishes when going on holiday, but in most instances they need have no cause for alarm. For my part I relaxed all cleaning, reduced feeding to a minimum of whatever was available (take it or leave it) and expected the worst. The overall result was that most of the fishes appeared to enjoy the changed conditions and proved to have better health than when I am fussing over them in my so-called expert way.

Of course we give fishes too much attention. We all feed too often, clean too frequently and top up when there is no immediate need. Left to themselves the fishes soon adjust themselves to changing conditions. Only one fish died on me, a flying fox which absolutely refused to eat anything but *Tubifex*, a live food I had often fed but was now without for some months. It actually died of starvation, but a companion was less fussy and avidly took what food was presented, mainly dried foods plus table tit-bits such as raw meat, liver, ham, tongue, raw and tinned fish, crab and even bread pellets.

The plants did not run riot or rot away, but stayed just right. I realised why they had done this; I had been too "off colour" to bother much about artificial lighting and this way had found the happy medium required. Too many hobbyists tend to overdo the lighting and I have always been one of them. It is not unusual to find out that after all one does not know all the answers, but there is some satisfaction in finding out your own errors.

Most of my fishes had been used to heavy aeration which allows you to crowd tanks and has several other advantages but which upsets the fishes when they are moved to un-aerated waters. I could not be bothered with pumps, however, so aeration was stopped. I thought heavy losses would result—actually one large cichlid died. True the fishes hung around the top for several days, breathing rapidly, but gradually they became accustomed to the change. The intense clarity which followed was also a great gain. Aeration agitates sediment, which means more frequent cleaning when it settles on plants, rockery and on algae.

Last of my surprises came from a large, female black swordtail, the only livebearer I had. This fish must have had a batch of young, all but one of which had been eaten by my understandably hungry fishes. One, however, survived and I did not see this until it was three-quarters of an inch in length; I was astonished to find a bright-red swordtail in the tank! Wonders never cease.

Recent horrific type films with a scientific background of sorts are "The Creature from the Black Lagoon" and "The Revenge of the Creature," both issued by Universal. These films have thrills enough for anyone but are particularly interesting to aquarists. The first film deals with the adventures of some scientific explorers in a backwater of the Amazon, who find the missing link between the fish and land animals. This creature (the gillman) is rather human in shape, with the head of a fish with exposed gill rakers and lizard-like limbs. The intelligence is definitely anthropoid.

The second picture deals with the capture of the creature and its exhibition at the famous Marineland in Florida. Both films provide excellent underwater shots of fishes of all types, freshwater and marine, in very large numbers, and also of aqualung divers and harpoon work. In one instance rotenone is used to force the creature to leave the water, and later on it is fought with a spray gun (of rotenone) and by dynamiting the water. The shots of the porpoises doing their stunts at Marineland are grand and marine enthusiasts will be delighted in the close-ups of many of

the best-known marine tropicals as well as large rays, swordfish, barracudas and sharks.

Some time ago I bought some neons but discovered I was one short on arrival home. I remembered having watched the dealer catch each specimen, and I had even pointed out each fish in turn which I wanted. Small fish in a large net are easy to miss and it is quite possible for a dealer to think he has put the fish in your jar when it is still in a fold of the net. A transparent container is easy to check for purchases but it is not so simple to ascertain what you have got in a Thermos-type jar. The buyer tends to be careless and leaves it to the dealer and, although errors are rare, they are none the less annoying when they occur.

At the same establishment I decided to buy a small *Labeo bicolor*, a fish which is nothing like the more drab *Labeo chrysophekadion* as a chaser of community fishes. However, the dealer was honest and he told me that this fish was one of the worst chasers of its type. It chose this moment to demonstrate its very bad trait in no uncertain fashion. Real damage is not done except that the pursued fish in worn out, cowed and miserable and community life is destroyed.

The majority of public libraries contain a great many books of interest to aquarists, a fact which many fanciers fail to realise. Some time ago I looked through a few such books to get an idea of how often they were taken out by borrowers. The results were interesting, as in every case the number of readers drops considerably with each year the book is available. I took some notes of the number of times a book had been borrowed over succeeding periods of twelve months—Hervey and Hems: 25, 16, 10; *Tropical Fish as a Hobby*: 21, 17, 9; *Right Way to Keep Pet Fish*: 19, 14, 10; *Reptiles as Pets*: 5, 2, 1; *Keeping Reptiles and Fishes*: 15, 5; *The Aquarium Book*: 13, 4; *A Study of Fishes*: 16, 6; *Life Story of the Fish*: 14, 6, 1, 1; *Fishponds and Aquariums*: 12; *Indoor Aquaria*: 19; *Livebearers*: 11; *Egglayers*: 9; *Labyrinths*: 2.

Most libraries allow books out for a fortnight, so that there are about 23 periods yearly when a book can be taken by a borrower, allowing for holidays and the like. Aquarium books seem to be the most popular, those dealing with reptiles and fish biology being in much less demand. It is also interesting to note the lack of interest in *Labyrinths* as against the other breeding books. At first glance one might expect the number of borrowers to diminish each succeeding year, but I am not sure that this follows. After all, we have had many newcomers to the hobby in the last few years and one might expect a more steady reading demand. I think the main point is that too many hobbyists just don't realise that many books on the hobby are waiting to be read on library shelves. Look in your local library and see what they have and tell your aquarist friends. Several clubs have issued lists of aquarium books in their local libraries but there are still many who do not realise what they are missing.

Of course, they have to be hunted down under all sorts of weird disguises, such as "Pets," "Pastimes," "Hobbies," "Biology," "Natural History," "Games," "Gardening," "New Books," "Zoology," and so on.

The film "An Alligator named Daisy" was very entertaining but it seems unlikely to boost the alligator as a household pet, at least judging from the remarks of the audience. Crocodiles are rarely offered for sale for the ordinary hobbyist and the alligator is rare in Britain. Those usually on sale are the South American caiman, a very nasty-tempered specimen which is not easy to tame like "Daisy." Crocodiles grow to twice the size of alligators but these reptiles have at least the redeeming feature that

they do not fight each other normally. They have no real tongue and swallow their food more or less whole. In captivity they require warmth and sunshine (or artificial light) to bask in and are prey to varied fungoid troubles. A baby alligator just hatched is immediately able to fend for himself—if only fish fry were so accommodating!

A popular question with newcomers is "What is the minimum number of tanks needed to keep most tropicals?" Frankly, I always feel like telling them that a single tank will be quite adequate. Beginners who start off with more than one tank are asking for trouble. But if one looks further into things what is the position? It all depends on what you want to keep. A minimum of three tanks covers many possibilities, namely: 1, for large fishes; 2, for small fishes; 3, for hospital purposes; or 1, for acid water; 2, for alkaline water; 3, hospital tank; or 1, soft water; 2, hard water; 3, hospital. Again one could have 1, community-tank fishes; 2, aggressive fishes; 3, hospital tank; or 1, community tank; 2, breeding tank; 3, hospital tank, or even 1, freshwater; 2, marine, and 3, hospital. This could be carried on *ad infinitum*, the only common factor being the hospital or isolation tank for newly purchased fish which is needed always if trouble is to be avoided. Leaving out breeding needs most hobbyists can do very well indeed with three tanks: 1, for small tropicals (acid); 2, for large tropicals (acid), and 3, hospital tank. With care most of the popular fishes of to-day can be kept in this set-up, especially if the tanks are large. Soft and acid water is wanted; the fishes which cannot put up with this are very few indeed.

A contributor (Castle Rock) to the Kettering Club's magazine tells the pathetic story of an aquarist who was raising some young leeri gouramies. Unfortunately, he discovered that his wife had thrown away his Infusoria culture under the mistaken impression that it was only dirty water. Having no commercial substitute on hand (stupid fellow) he found some pea flour, which proved successful. One day, whilst he was at work, his little daughter decided to feed the fishy babies and emptied about two pounds of the flour into the tank. It was no use crying over spilt pea flour and the aquarist, a resourceful chap, decided to make the best of a bad job and make a bit of £.s.d. out of this disaster. Accordingly, he siphoned the tank contents into a wash boiler and boiled it for two hours, after which he contacted the chef of a large hotel in the district and sold him 10 gallons of superb pea soup. Now he breeds nothing else but leeris, not that he is now much interested in this particular anabantid, but he has to keep the chef supplied with 10-day-old leeri fry. This is the only way to keep the unique flavour in the hotel's very famous pea soup.

The use of polythene bags is now no novelty in the hobby for carrying fishes. Most aquarists, however, have not considered the topic beyond this stage, which is a pity as this material is now available in sheet or bag form (any size) at very reasonable prices. A polythene cover for tanks helps to keep off dust and insulates, and sheet polythene can be used for insulation purposes in fish houses. Bags made of this material can be kept in a pocket and are ready when one wants to carry home plants, water life, live food or even dry food. All one needs is a rubber band to seal up the top portion of the bag, which can be carried in the pocket. I remember giving a lecture to the Sheffield club when a gallon of first-class *Daphnia* was brought in by a member. I had a large polythene bag with me, and I shall always recollect the happy look on the face of the member who carried home the whole gallon catch in my polythene bag.

OUR EXPERTS' ANSWERS TO TROPICAL AQUARIUM QUERIES

I have an angel fish which I feel sure is blind. It never seems to see its food, and to make sure it gets enough to eat I have to feed it by hand. Other angel fish living in the same aquarium seem to bully it. Should I destroy this blind fish rather than let it live a life of misery?

Like human beings, blind fishes can usually adapt themselves to a life of darkness, and learn to feel their way about and even find their food without much difficulty. As you may know, fishes are very sensitive to vibrations in the water. But partially blind, or blind fishes are best kept by themselves to preclude their being bullied and ill-treated by other normally sighted fishes. If you cannot give an afflicted fish a home to itself, it is probably kinder to put it out of its misery.

During the last few days some of my fishes have been moping about close to the bottom of the water. Although they accept food, they look unwell, and keep their fins folded close to the body most of the time. Please can you give me some idea as to what is wrong with them?

The symptoms you described in your letter are indicative of a chill. Perhaps the heater went out of action for a short time (accidentally switched off) and there was a sudden fall in the temperature, too sudden, that is, for the fishes' health; or perhaps there has been too rapid a rise and fall in temperature. We suggest that you check up on your heating arrangements, and for the time being keep the fishes off starchy dried foods, but feed live food only or finely scraped lean red meat. Try and keep the temperature a few degrees above normal, and as constant as possible. If you reduce the depth of the water by a few inches you will help the fishes in their illness. Badly chilled fishes seldom recover and if their condition does not improve within about a fortnight it is kinder to put them out of their misery. A chill is often followed by an attack of white-spot disease or fin-rot. Keep a watch on the fishes' general condition for the next few days.

I made a large aquarium which remained watertight for about a week, then I noticed a slight oozing of water along one of the edges where the glass joins with the frame. Is there any cement or adhesive on the market which will enable me to make this joint leakproof from the outside?

If you have sufficient patience, and are willing to mop up the drops of water which will run down the side of the aquarium every so often, the leaking edge may seal itself as dust-fine particles of sand, sediment and so forth become bedded into the porous mastic. On the other hand, you may try and hurry up the process of sealing the mastic by painting along the freshly wiped edge with aluminium paint, which dries very quickly. You will find that moisture will soon seep through the freshly painted surface, but do not despair—just keep applying fresh coats until complete sealing is obtained. We must point out, however, that there is a big difference between a slight oozing of water and a genuine leak. In the latter case, the aquarium will have to be emptied and the frame, or part of it, entirely re-glazed.

Sometime ago I purchased a pair of cichlids which the dealer informed me were Galilee mouthbreeders. I cannot find any information about the fish in magazines I have read recently, and this fish is not mentioned in a book on tropical fishes which I bought a few days ago. Please will you tell me whether there is such a fish as a Galilee mouthbreeder, and will it prove suitable for my community aquarium?

We think the fish you have is *Tilapia nilotica*, a species found in Lake Galilee, the Jordan river, and the river systems of the Niger and Senegal rivers. The shape is that of a typical mouthbreeder, and the general colour is greyish to olive-green overlaid with violet blue. Young fish show several dark bars on the side, and the gill-plate is adorned with a dark spot outlined with coppery gold or metallic red.

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.

T. nilotica attains a length of about 18 inches; but only when placed in a very large aquarium would it reach anywhere near this size. Young Galilee mouthbreeders should flourish very well in a community tank, but as they pass the two or three inches stage, it would be unwise to trust them in the company of smaller fishes. Not many cichlids live at peace with other fishes when they grow out of the "baby stage" and begin to develop in size and strength.

At various intervals over the past three months I have been transferring my gravid mollies to another tank in order to save the fry from being eaten by other fishes. Although the female mollies have given birth to large broods, in every case most of the babies have died very soon after birth. An aquarist with more experience than myself has told me that it is unwise to transfer a gravid molly female to another tank. Is this true?

The information your friend gave you is quite correct. A gravid female molly should not be disturbed or transferred to another aquarium. The shock sustained by being caught in a net and placed in a different environment usually results in the babies being born dead or so underdeveloped that they die soon after birth; and in some cases, the mother fish will die herself as the result of the shock.

Please will you tell me the best way to grow angel fish to a large size?

The fish need plenty of swimming space in a deep aquarium maintained at a temperature of about 78° F. The fish should be given more than two meals every day and any food left uneaten should be removed from the bottom in order to keep the water clean and wholesome. Food should consist of small living creatures such as baby fishes, tiny woodlice, water fleas, white worms, blood worms and the like. When live food is unobtainable, give the fish chopped raw lean meat, chopped cooked heart, washed, minced liver and similar butcher's offal.

I have read that it is always safest to prevent droplets of water on an aluminium hood from falling back into the aquarium. I have used both a polished tin and an aluminium hood on my tank containing guppies, and breeding has not been very successful, added to which the adult fish never live for a very long time. Is the water formed by condensation on a metal surface bad for the fish?

A large number of metals are toxic to fish. Copper, brass, bronze and galvanized zinc are a few of the more dangerous metals. Aluminium is fairly safe, but over a long period of time the effect of water dropping from a bare aluminium surface might prove inimical to a fish's health. It is always best to paint the inside of a metal hood with a high-class quick-drying lacquer or enamel paint. But give the painted hood several washings with clean water before placing it over the top of the aquarium.

Sometime ago I bought several young rosy barbs. How may I distinguish the males from the females?

It is easy to tell the sexes apart when these fish attain a size of about two inches, and become interested in courtship and raising a family, for the male develops a bright coppery red breast, and his whole body seems suffused with a rosy glow. In addition, his dorsal fin shows more black in it than the dorsal fin of the more sombre-coloured female. And when in breeding condition, the female shows a distinct plumpness on the sides.

Are tiger barbs suitable for placing in a community tank housing a collection of small fishes such as guppies and flame fish?

We have always found tiger barbs rather untrustworthy. When they are young they look remarkably attractive, and appear to be just the fish for a community tank. But as they become older they often develop into persistent fin-nippers and bullies, and worry smaller, timid fishes to death.

I do not appear to be very successful in my fishkeeping. I have tried several different species of tropicals including guppies and zebra fish in my aquarium, but after a short while they become hollow-chested and die. I have noticed that a lot of the fishes rub their bodies and gill-covers against the plants and sides of the aquarium. Although the water remains clear, the sides soon become coated with brown algae. The water is chalky in my district, and I have some lumps of white rockwork in the tank for

decoration. Can you give me some indication where the trouble lies?

It is not unlikely that the rockwork may be the seat of the trouble, for if it is calcareous in content, its effect on an already alkaline water may be such as to make it unsuitable for fishkeeping. Most species of tropical fishes prefer to live in slightly acid water. We advise you to remove the rockwork from the aquarium, and gradually to replace the water in the tank with boiled tapwater, or water strained through peat. If you care to go to the trouble of re-setting up your aquarium, it would improve matters if you layered the bottom of the tank with a half-inch carpet of moist peat, covering this with the usual two or three inches of coarse sand or proprietary aquarium grit.

COLDWATER FISH-KEEPING QUERIES *answered by A. BOARDER*

I have a pond 6 ft. by 3 ft. and 2 ft deep. There are 12 goldfish in it and until recently all went well. Now I find that every three or four weeks they become coated with a white fur. I have no plants except a water iris. What is the cause of the trouble?

You do not give the size of the fish. The pond might be overcrowded, and then the fish would not keep in good health. The trouble is fungus, and this can cause the death of the fish. It can be cured by the salt treatment, but whatever you use I do not think that you have much chance of success with a cure if the fish is too badly affected in the first place. When only the fins or a slight patch on the body are affected it is fairly easy to cure the fish but once a fish gets a bad coating all over, it is much more difficult. When the gill membranes are affected there is little hope of a cure. I hear of all sorts of cures for fishes affected by fungus but the extent of affected parts makes all the difference whether a cure can be permanent or not. The water iris is of little value in the pond as an oxygenator. I suggest that you introduce some underwater growing plants which will improve the conditions in the pond.

On 4th May I planted and re-filled a new pond (600 gallons). On 2nd July I took 42 goldfish fry from an outside tank and put them into the new pond. I also took nine fry from an old pond. None of the fry was bigger than half an inch. On 5th July I netted four fish which were an inch and an eighth long. Surely fish do not grow as quickly as that, so how did they get there?

I hardly imagine that the fry grew as quickly as you say, although if a few were larger than the others when they were put together the larger ones could eat the smaller ones and would soon grow. I think the likely answer is that when you placed the plants into the new pond there was either some eggs thereon or a few small fry entangled among the leaves.

Soon after I had set up a new tank a kind of scum formed on the surface of the water. It seems hard to get rid of. What do you think it is?

It is possible that the scum is coming from the glazing compound, although if the tank were correctly glazed there should be little of the compound in actual contact with the water. If there is anything decaying in the water this may cause a scum to form, and dying water plants could cause this. If you take notice of the oily substance which can come from a decaying water lily leaf you will see what I mean. Wash the tank out well and start again with growing plants.

I have a small pond in the garden well stocked with plants. It is stocked with a fair number of dace and minnows. Just recently some of the dace and nearly all of the minnows have died. What could have been the cause of this?

Both the dace and minnows are river fish and usually prefer a running water. During the recent hot weather your pond may have got too hot for them. My own pond was just over 80 degrees one day in July. If water gets too warm some fishes are soon in trouble and if too much dried food is given the uneaten portions can soon make the water

poisonous. You had better change a great deal of the water in the pond and do not try to keep too many fishes in it.

I have a London shubunkin and a common goldfish. One has slight reddish streaks on the tail and they both swim with their dorsal fins contracted for some time. They also flick their fins as if trying to shake something off. They then dash and rub their sides against the plants or rocks. Is this a form of parasite troubling them?

The symptoms are certainly those of fishes attacked by parasites. There are three well-known ones which can attack the fish. First are leeches, which would be quite obvious as they attach themselves to a fish and could be seen hanging down, wormlike in shape but flatter, and usually brown in colour. Secondly, the fish lice, argulids, can get a firm hold on a fish and suck the juices from it. They are large enough to be seen easily and the red spot which they usually make is also a sure sign. Then there are the flukes, which are generally so small as to be invisible to the naked eye. It is only when one knows the symptoms that they can be detected. With a fairly strong magnifying glass they can be seen, especially on a surface such as along the back. They are transparent and so very difficult to see when on the body or gills of a fish. The cure is to place the fish in a bowl of water with one-quarter of a teaspoonful of Dettol to the gallon of water. The fish should be left in for 15 minutes and then placed in fresh water. Treat the tank with some disinfectant before allowing the fish to return. A second dosing can be given after about a week or ten days. Some aquarists use a stronger solution than that stated and only leave the fish in a short time. Be very careful, however, and keep the fish in a net whilst it is undergoing treatment, as it must be removed immediately it turns over. It will soon recover when in fresh water. I have never known this cure to fail if correctly carried out.

About two years ago a crack developed in my pond when I removed the fish and left it. I would now like to repair it if possible. It is an eighth-inch crack, right across the pond, which is 16 feet long by 6 feet wide. Would it be possible to clean out the crack and fill it with concrete or must I re-make it completely?

The pond appears to have "broken its back." If this was caused by a sinkage underneath it may be difficult to repair. However, if the crack has not altered in two years it may be possible to repair it. There is no harm and very little expense in trying and so the following may do the trick: clean out all the loose concrete and well wash out the crack. Then while it is still damp, force into the crack some fresh cement mixed with two parts of fine sharp sand. The sand must have been sifted through a fine sieve, such as a tea strainer, and if you dry the sand first this can soon be done. See that the mixture is used as soon as mixed and use plenty of force to ensure that the compost is sent well home into the crack. Do not let the concrete spread out wide of the crack over the surface of the old concrete, as it will only peel away in a short time. If the base or

foundations of the pond are weak then your repair job may not last through the winter, but if it lies nice and solid there is a very good chance of your making a good repair job. If a severe winter comes there is no knowing how the pond may be affected, of course.

I am setting up a coldwater tank, 24 in. by 12 in. by 12 in. and should like to include paradise fish and black-banded sunfish with a moor and a fantail. How many fishes would you suggest and would it be advisable to have male or female paradise and sunfish?

Your tank will hold 12 inches of fish and so you must work out the number of fish according to their size. I suggest for a start that you try one two-inch moor, a two-inch fantail, a male paradise fish and two black-banded sunfish. The sunfish are not easy to sex but as you are not likely to breed them in a community tank it does not matter much. You might like to have a pair of paradise instead of the two sunfish. In this case it is quite possible to breed the paradise in the tank with other fish. I have done so with no artificial heating. In the summer the water of an indoor tank can often be in the lower eighties, which suits the paradise fine. Have a good lot of water plants in the tank and all should go well.

I am trying to rear some goldfish from eggs taken from the pond. How long must I keep them at 70°F. and how long shall I keep a light over them at night? At what size can fry go into the pond?

The fry can gradually be exposed to ordinary temperatures without artificial heating once they are over a month old. There is no need to keep a light over them at night, this is not natural. They could go into the pond when they are an inch long.

Can you tell me of a book which tells everything to know about breeding goldfish?

It is my opinion that to give you all the necessary information would take volumes. The longer one breeds fishes the more one realises what there is to learn. In any case I do not think any one man knows it all by a long way. Any book on the breeding of goldfish could only give the general details but to include all the small details, the things which

might happen and the things there are to do, would take up so much space that no publisher could be found brave enough to publish such a book. There are several good books on the market and a list has been sent to you. Digest these and then you will have a good groundwork on which to build up your experience. Fish breeders have never done learning, although you might not think so when you hear some people talking as if they know it all. One thing you may be sure of is that if you use plenty of common sense in your approach to fish rearing and try to imitate nature as much as possible you are not likely to go far wrong. The very young like warmth, they must be fed on suitable foods at frequent intervals and they must have well-oxygenated water. Sufficient space must be given to allow for growth and then you have the basis of successful fish breeding.

I have two common goldfish, one shubunkin and a fantail. I am having trouble with the fantail as it appears to fall ill soon after being placed with the other fishes. Please can you give me some advice on keeping fantails?

As you are the one-thousandth enquirer I have answered by letter for *The Aquarist*, I am sending you one of my books entitled *Coldwater Fishkeeping*. This book tells you all you need to know to be able to keep the fantail. These fish are varieties of the common goldfish and require the same treatment. You did not say how large the tank is or how big the fish are. It may be that you are trying to keep too many fish in the tank for its size. If this is the case the fantail would soon show signs of trouble if placed in an overcrowded tank.

Could you let me have a recipe for making food for young goldfish. I have had a lot bred in an open pond and as they are fairly tame I would like to be able to feed them.

In a fairly large pond the fry would be able to obtain a fair amount of food, but if you would like to feed them yourself you could do so with any of the fine packet foods advertised in this journal. You could also grind up some Bemax and dried shrimp and even add a little rolled oats. Do not feed with too much of these foods once the autumn

(Continued at foot of next page)

FRIENDS & FOES No. 48

SPONGILLIDAE

It may surprise many of you to find that freshwater sponges are animals, just as marine sponges are, although there is little, if any resemblance between the two groups, as far as appearance goes. There are only two known British species, one living in rivers (*Spongilla fluviatilis*) and one in ponds (*Spongilla lacustris*).

They may be found coating the stems of underwater vegetation or covering the surfaces of stones. Unless the help of a microscope is enlisted, however, little can be made of their detailed structure after collection. They do not move from place to place, being content to remain in one spot, constantly adding new growth to their bulk. Kept in an aquarium they will live a long time, but are never beautiful objects and consume a great amount of oxygen.

Sponges have two methods of reproduction: sexual and asexual. Sperms from one sponge are released into the water and drift or swim around until they are drawn into the body of another sponge, fertilising the eggs found therein. Larval sponges are free-swimming for a few hours, presumably to

Freshwater Sponges



Spongilla lacustris on a plant stem. The finger-like processes are sometimes absent.

enable them to swim a safe distance from the parent sponge. Otherwise overcrowding would ensue, and race suicide result.

Freshwater sponges form a refuge for quite a number of different aquatic organisms, and one is never certain exactly what creatures may be discovered harbouring therein. If in a light situation, the sponges are frequently green, owing to the chlorophyll contained in tiny unicellular plants living in symbiosis with them. *S. lacustris* is brighter green, and characterised by finger-like outgrowths from the main body of the sponge.

C. E. C. Cole

Decorative Fighting Fish in Research



Photo:

Gunter Senft

The fighting fish *Betta splendens* is the subject of our front-cover picture this month, and it illustrates the light-coloured cambodia *Betta* (top) and the iridescent fish of Dr. Schmidt (bottom)

DECORATIVE fighting fish have long served man by their constant predation upon the hordes of mosquito larvae. Now their usefulness as a laboratory animal in cancer research is being evaluated.

A unique strain of extremely iridescent *Betta* was bred by Hans-Rudolph Schmidt in Frankfurt, Germany. At first the fish were highly regarded for their unusual colouring, but the pigment cells responsible for their bright colouring continued to grow unabated. The patches of iridescent cells thickened the skin so that it became rough and warty. Eventually many of the fighting fish developed iridescent tumours. Since the tumours were produced by the overstimulated growth of guanophores, cells that carried guanin crystals and imparted an iridescent quality to the body, they were diagnosed as guanophoromas.

In 1951, Hans Breider, a German fish geneticist, and his medical colleague, Dr. Eduard Schmidt, described the guanophoroma's remarkably rapid growth in the cambodia fighting fish. Within four weeks after the tumour was first seen as a shiny pin-point on the base of the tail it grew to the size of a large pearl. The cancerous growth eventually grew over the entire caudal peduncle of the fish, destroyed the normal body tissues of that area, and killed the fish.

Some cancer specialists regard a tumour with greater respect if the abnormal growth is capable of being successfully transplanted into another individual. If the transplanted tumour continues to grow in the new host and eventually destroys it, the tumour cells demonstrate their ability for autonomous growth. They are a race of cells not subject to ordinary control. A tumour capable of being transplanted successfully and growing without control in the second animal is generally regarded as a malignant cancer. It is a probable rather than a potential killer.

H.-R. Schmidt found the original pigment-cell tumour in a strain of the light-coloured, or cambodia, *Betta*. When

by Dr. MYRON GORDON

Geneticist to the New York Aquarium

tiny fragments of the original tumour from the cambodia were transplanted into each of its 30 normal siblings, 80 per cent. of the pieces of tumour grew in their light-coloured sisters and brothers. When similar bits of the guanophoromas from the cambodia were transplanted into unrelated dark-coloured *Betta*, none of the tumour fragments took hold in their hosts.

These results are not surprising, for tumour cells usually require host tissues in which to grow quite similar biologically to the kind from which they developed. Theodor Ricardo Marcus, a graduate student working in the Genetics Laboratory of the New York Zoological Society, has had a similar experience with another kind of fish tumour. He transplanted fragments of a melanoma, a black-pigment-cell tumour that developed spontaneously in a swordtail hybrid, into its normal siblings. The fragments of the black tumour continued their growth in the closely related hosts. When Marcus attempted to transplant the tumour into less closely related individuals, the melanoma fragments did not grow at all.

Studies like this illustrate the fact that heredity plays an important part in the growth of cancers. And for the study of cancers, particularly of cancers developing from pigmented cells, fishes are prominent as living tools. Their organs, tissues and cells are much like those of man. Under the microscope it is often impossible to distinguish between the malignant cells of melanomas of fish, mouse, and man. Greater use of fishes in medical and biological laboratories could hasten the attainment of the knowledge urgently needed for our understanding of the fundamental principles governing those abnormal pigmented growths which lead to cancer.

Coldwater Fishkeeping Queries

(continued from the preceding page)

comes, as the fish will not require anywhere near as much food and that which they leave will turn the water sour.

I wish to set up a community tank of coldwater fishes in an aquarium 36 in. by 15 in. by 15 in. It will be in a dark hall; can I have a top light and how long should I keep it on? What species of fishes can I put together?

You can use two 60-watt lamps over the tank and the time you have to keep them on will depend on the amount of light available to the aquarium in its position and the prevailing weather. On dull days you must provide more light. Experiment with the times of lighting according to the growth of the plants and the clarity of the water. Most water plants like a fair amount of light but too much will encourage algae and the water may turn green. You can use any of the goldfish varieties such as common goldfish, shubunkins, fantails, veiltails, moors, etc. Also green or golden tench, golden rudd and small bleak, dace or some minnows can be kept in aquaria. Do not have too many fishes or use specimens that are too large, and your tank should flourish.

In the Water Garden in August by ASTILBES

SO many pondkeepers have had trouble with blanket weed in the pond this year that a few notes on the matter may be of assistance. If most of the pest is cleared away now there is not likely to be much more trouble from it this season. The blanket weed is the thread alga known as *Spirogyra* in which the small filaments are joined together to form strands of fine green, or a similar one known as *Vaucheria*, which grow in such masses at times as to choke out any other plant life with which they come in contact. Any small portion of this plant can grow on, and so any attempt at clearing it from the pond must be continued at intervals of a few days to make sure that no small pieces have been left behind to start another infestation. Actually, blanket weed is quite a good oxygenator in the pond during the hours of sunlight, but when left unchecked it is likely to get out of hand and spoil many of the water plants.

Few ponds are free from this trouble at some stage of their development. It can be kept in check, however, and unless this is done fairly frequently the pond may become so choked that the fishes have difficulty in swimming about. It is especially dangerous when there are any of the double-tailed fishes in the pond. Such kinds as fantails, veiltails, moors, orandas, lionheads and celestials, may get their tails caught up in the blanket weed. Their efforts to get free often entangle them more, as they twist the stuff firmly around the caudal peduncle, and if they are not killed they can be badly damaged.

When the blanket weed is first seen much of it can be pulled out by twisting a broken green stick into it. Once a piece is pulled it will be found that a continuous string of it can be removed. Any underwater plants which have become badly covered with the weed can be destroyed, but if the plant is needed it is possible to get a great deal of the blanket weed away from it if it is placed in a bowl of water. The weed then becomes more apparent and can be pulled off. You must remember though, that if only a small portion is left behind this can easily grow and cause plenty of trouble for you later on. It would be practically impossible to clear all the blanket weed at one go, but if the task is persevered with most of it can be cleared away.

"Choking out" the Weed

It will be noticed that once a pond has a good healthy growth of water plants the blanket weed does not seem to thrive. It can, therefore, to a certain extent, be "choked out", by good cultivation of the other plants such as water lilies, etc. Certain conditions in the pond appear to encourage a vigorous growth of all the types of algae, the free-swimming type and the anchored types. Once the water in a pond becomes rather foul the algae seem to flourish. It will be found that when the water appears to lose its sparkling clarity the algae are likely to appear. The old trouble, overfeeding with dried foods, will encourage algae as much as anything. If the surface of the water has a fair covering of leaves the algae seem to weaken and can then be entirely eliminated.

If the pondkeeper continues to feed the fishes in the pond there is almost sure to be some food left to waste and then decay. If the pond is of a fair size and is not overcrowded with fishes there should be sufficient food always in the pond at this time of the year. A well-balanced pond should be quite self-supporting and there should be no need whatever to be always feeding the fishes. Most of the species usually kept are omnivorous and so can eat vegetable matter as well as meaty foods. This should be

borne in mind. Many fishes have been caught on rod and line with nothing but a small bunch of blanket weed as a bait.

I am not suggesting that the fishes will eat all the blanket weed in a pond, but if they are not fed too much they can do a lot to assist in its control. As long as the weather keeps warm they can eat quite a fair amount, and types like the goldfish are almost always browsing about around the sides of the pond and among the water plants. If any food is given see that only a little is offered at a time, and it is a good idea to give this in the same place always, so that, if necessary, it will be easier to catch any fish at this spot. If fishes are required to be caught for any purpose it will be found that at night time they are usually quieter, and so with the aid of a torch and a good-sized net fishes can be caught which are too shy and quick to catch during daylight.

One of the plants which appears to be very prone to attacks by blanket weed is the water soldier (*Stratiotes aloides*). This grows, sometimes unanchored, with a top similar in shape to that of a pineapple. The rosette of pointed leaves floats just at or just below the surface, with the roots hanging down. If such a plant is badly attacked with blanket weed it can be removed from the pond into a pail of water, where the weed can be pulled off. The flowers of the water soldier are white, and male and female flowers are found on separate plants. It will root at the bottom of the pond and then float up to the surface to flower. Once having done this it will generally sink down again. There is a variety known as *Stratiotes aloides* var. *rubifolia* which has reddish leaves.

Dangers of Insecticides

When there are ordinary plants growing at the pond-side it is necessary to take great care when watering such plants that fertilisers are not washed into the pond in quantity. Also take care that any spraying of insecticides is done at a safe distance from a pond. Many of the present day insecticides contain D.D.T., and some contain Gammaxane. These can be deadly to some fishes even in very small quantities. A number of fishes were killed in a tank when it was refilled with water from a water can which had been used for mixing an insecticide, although the can had apparently been well washed out after this use.

When any of the pond-side plants have finished flowering it is a good policy to cut away the dead flower stalks before they have a chance to droop into the water and decay. Although some may not cause any trouble it is well known that some kinds can be poisonous to fish if their leaves are allowed to decay in the water.

Many small fishes may now be seen in the pond if the conditions were right for breeding. It is possible that many have been in hiding in the dense plant life and have only appeared to swim around now that they have reached a safe size. What this size is depends a great deal on the types of fishes in the pond. Most types of goldfish will ignore small ones once they are over half an inch long, but if you have introduced some European catfish into the pond it is possible for these to grow to a large size and then they can make a meal of goldfish two inches or more in length.

If the young fishes are over an inch long by this time of the year there is no need to catch them up to try and keep them in small tanks all the winter. They are quite able to go through the winter as long as the pond is in good condition and the water is pure. Size is not so important as the fact that the water must be well oxygenated throughout the cold weather. Foul water kills more quickly than cold.

our readers

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



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

Detergents in Aquaria

IN course of correspondence with Dr. F. Earle Lyman, zoologist at the Southern Illinois University, he has mentioned the use of some of our modern detergents for cleaning aquaria and sand. The measures used are one-quarter to one-third of a cup of the powder type, or two tablespoons of the liquid type, to a small amount of water, for a five-gallon aquarium. The mixture is water rinsed until no more suds are produced. The ultimate results appear to be, immediate clarity of both aquaria and water, with an immense time saving, and complete harmlessness to fishes.

Frankly, I am sceptical, and would be glad to hear if any of your readers have any evidence for or against the use of our modern detergents.

R. O. B. LIST,

Secretary, Federation of British Aquatic Societies.

Rasbora daniconius

I REFER to Rodney Yorke's article in the June issue, under the heading "Rasbora daniconius and its Relatives." *R. daniconius* is very, very sensitive to chill and I fear that the author has not stressed this sufficiently. I have had several hundreds of these fish in community tanks (unheated) in Malaya (no tropical tank is heated in that country) and invariably *R. daniconius* produced a fine crop of white spot. They, together with *R. kalachroma*, gave me endless trouble in this respect, and eventually I gave up. I strongly advise potential buyers of this very handsome fish to make sure that their tanks are not liable to draughts and would recommend a temperature of not less than 78° F. Personally, I would have it at 80° F.

A. H. DUTTON, Birmingham 23.

Tropical Plants in Temperate Waters

I WAS most interested to read Mr. Gorman's article (*The Aquarist*, June) about finding hair grass growing wild in temperate waters near Rugby. It may interest readers to know that I have propagated hair grass for many years in my outside pool at only 9 in. depth throughout the year. Propagation is most prolific and plants are very robust. The plants regularly get frozen in for weeks at a time with no ill effect. Another "tropical" I have wintered in the open in ponds is *Aponogeton undulatum*. This should be planted in at least 18 in. and this year a plant has flowered!

There seems to be a new field of experiment along these lines. Most aquarists are scared to try, I think. I have just bred some guppies in a coldwater tank (max. 60°

min. 50° F.) and have lost only six females so far. The only thing to note here is a dwarfing in size. They are delightfully miniature. Females are about half inch long. Protracted acclimatisation of the original parents was the answer. They have since been "warmed up" and are now back at work at a temperature of 73° F. (bottom temperature) with no ill effect.

It would be interesting to know what the water temperatures really are in the so-called "tropicals" habitat. When I was in India during the war I did take note of some temperature ranges and found, during the early stages of the monsoon, water temperatures could vary as much as 20 degrees! After a heavy shower, ponds and pools took up a quite considerable amount of cold rainwater, which chilled the surface layers rapidly. Around Christmas the Ganges Plain can be very cold at nights, whilst day temperatures get quite reasonably high. Shallow waters, such as those in which our little pets live, must go through a wide range of temperatures in 24 hours.

E. A. HIGGINS,

Welwyn Garden City, Herts.

Netting Fishes

I CANNOT agree with the notes entitled "Shortening the Chase" (*The Aquarist*, July). To wear fishes down by swirling the net around is the sort of thing that one expects from youngsters catching tiddlers in the stream. Please do not suggest that aquarists do it! For instance, a gourami of any sort will not stand it—the smaller ones die of fright if not damage. Much the same goes for angels, in fact I think all the larger types of fishes will stand less chasing than the smaller ones.

My method is to use a large net which just fits the tank, front to rear and depth, to move it across the tank gently, bring it up and lay it across the top of the tank, place one hand beneath the net, and then pick out which fish is required by hand, or with a smaller net. I moved a spawning of lace gouramis in this way when they were only two weeks old and didn't see a dead one afterwards.

S. WATERMAN, Colchester, Essex.

Speakers Wanted

IN reply to Mr. A. G. Francis (*The Aquarist*, June) of Lowestoft Aquarist Society I would like to state that I, as an amateur producer of tropical fish films and speaker, have always been willing to travel any distance, if possible, to visit societies and give them a film show and talk. This I have always done without making a profit from my services.

But even so I realise that with the cost of rail travel, meals, accommodation and a small charge to cover myself for the wear and tear on the films and equipment I use, the cost of such a visit is usually beyond the reach of the majority of societies. I have found most of them do not have an active membership of more than 15 persons.

Some societies I have visited have paid their expenses for the evening by inviting other societies from surrounding districts, then before the beginning of the show having a raffle for a decent prize. By this method at least a shilling a head can be collected. Mr. Francis' idea of speakers being accommodated at a member's home I also think an excellent idea. Hotels are always very impersonal for a one-night stay.

I am sure there must be other speakers who feel the same as myself, that the enjoyment and experience gained through visiting these societies more than compensates them for any monetary loss they suffer through taking time off from their business. If there are other speakers willing to do the same let us hear from them and so give the small society a chance.

MASON SMITH, Cambridge.

IN the letter in your issue dated June, 1956, headed "Speakers Wanted," Mr. Francis makes the statement that Lowestoft Aquarist Society do not belong to the F.B.A.S. because they cannot afford to do so. Then he makes the offer to speakers prepared to make the journey to Lowestoft, and here I quote, "... rail fare, and expenses, etc., plus a small fee... with accommodation... arranged... to include the speaker's wife." In view of the above, I do think that it would be to the advantage of Lowestoft A.S. if they were to join the F.B.A.S. and make use of the Federation's panel of speakers, the fees charged for same being as follows: 25s. for each engagement up to the first four booked annually, and 15s., plus expenses, for each subsequent engagement. In passing, I would point out that these fees have remained at this level since 1948.

LESTER COATMAN,
Services Secretary, Federation of British
Aquatic Societies.

Experiments with Fishes

I WAS rather disappointed in reading the third and fourth paragraphs of Mr. Bracegirdle's article "Experiments with Fishes" in your July issue. In the third paragraph he says that there must be precision in the measuring of quantities, especially of drugs. I fully agree with him, but in the next paragraph he says, "One fluid ounce would contain one-fortieth of an ounce, or 12 grains." One-fortieth of an ounce (437.5 grains) is 10.94 grains. It would appear that he meant an apothecary ounce (480 grains). If so, he should say so. Precision in terms is just as important as precision in quantity.

I cannot accept his statement that kitchen scales are quite suitable for the technique which he describes, which is an accurate technique. The average kitchen scale of the "two pan" type of 7 lb. capacity is rarely sensitive to less than 2 drams (one-eighth of an ounce) and the 1 oz. weights usually supplied with this type of machine I have found to vary in weight from $\frac{1}{4}$ oz. to $1\frac{1}{4}$ oz. Thus one ounce of a

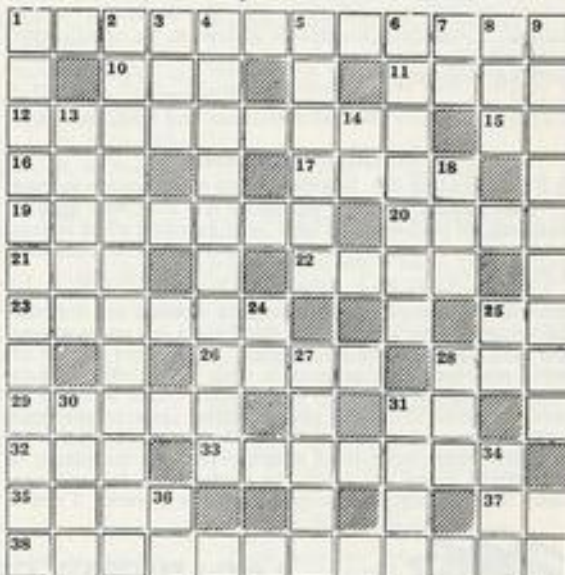
(Continued overpage)

PICK YOUR ANSWER

- The missing word in the proverb: "... and sermon have their season in Lent" is: (a) chub; (b) roach; (c) salmon; (d) trout.
- A barbel adjacent to the snout of a fish is called: (a) labial; (b) mandibular; (c) nasal; (d) rostral.
- The female Robson guppy should have a grey body, and a caudal and dorsal fin that are: (a) black; (b) blue; (c) gold; (d) red.
- Symphodon discus* (the pompadour fish) was named by: (a) Heckel; (b) Lönnberg; (c) Steindachner; (d) Volz.

The AQUARIST Crossword

Compiled by J. LAUGHLAND



CLUES ACROSS

- The work of a plumber, a juggler, or an expert aquarist (8, 4)
- Before the end of the mere (3)
- I ran for royal consort (4)
- Parasitic worm which attaches itself to 31 down by means of suckers (9)
- The Spanish of tail of a barbel (2)
- Half the tarpon is black and bituminous (3)
- Depot to a T but confused with drug (4)
- This fin is the fatty one (7)
- The ant and I see in opposition (4)
- Describes the one that got away (3)
- Useful planting medium for aquaria, if rather fine (4)
- Often a less misleading word than is tropical when applied to warm-water fishes (6)
- Confused type (2)
- Cast (4)
- May be used for heating tanks or may be generated in dirty ones (3)
- Insect in stage between egg and chrysalis (5)
- Repeat for a good laugh (2)
- Angelina loses her *Pterophyllon emekli* (3)
- Description of morphological correlations of the early adolescent stages of living creatures (7)
- Settle for the night outdoors (4)
- You cannot say this is a bit off (2)
- Dainty aquarium plant with white flowers (6, 6)

CLUES DOWN

- Siamese fighting fish (5, 7)
- Alias pearl or mosaic ditto (5, 7)
- Limb (3)
- Net a lion, pa, for the Italian citizen (10)
- Gnaws away (6)
- Sea slug or *Beche-de-mer* (7)
- Wind direction (1, 1, 1)
- One of the Cyprinodontidae (9)
- A root or primitive source (5)
- Do you see the answer at the start? (2)
- Tail in a way (3)
- Small company (2)
- Father of the *Panchax* (2)
- Fish eggs (5)
- Implement for holding a fish's jaws apart whilst a hook is removed (3)
- This fin is the one by the vent (4)
- To the aquarist this means the unwilling victim of parasites (4)
- At a distance within view (3)
- Appropriately, this is an afterthought (1, 1)

- The saddle cichlid is the popular name of: (a) *Aequidens latifrons*; (b) *Aequidens maroni*; (c) *Aequidens portalegrensis*; (d) *Aequidens tetramerus*.
- Betta macracanthus* (the clown loach) has: (a) two barbels; (b) four barbels; (c) six barbels; (d) eight barbels.

G. F. H.

(Solutions on page 115)

(Continued from the preceding page)

drug as weighed on a scale of this type may be actually anything from 10 drams to 20 drams. This hardly seems to be precision.

I am heartily in agreement with the remainder of the article. I wish Mr. Bracegirdle success in his experiments and look forward to seeing further articles from him detailing their results.

H. S. BUTTLE,
Walsall Aquarium and Pool Society.

White-worm Culture

AFTER reading Mr. Boarder's reply to a question in your June issue I have the feeling he is a man who likes to do things the hard way! I have been breeding white worms for a couple of years now and find the most effective method is as follows:

I use the bottom of a plastic sandwich box with about one inch of peat (I have also used a wooden box but the sides warped after a time). In this I put a few white worms and then damp the lot with water. Next I get a crust of bread and soak the inside of it with milk; this I place whole, upside-down on top of the peat. After a couple of days the bread dries, the worms retreat into the peat and I can change the crust for a fresh one in a matter of moments (there is no smell whatsoever). As the plastic is transparent I can see when the peat is too dry and can damp it accordingly—usually about once a week. I never

cover the box in any way (the only time I did so all the worms died), neither do I keep it in a dark place.

When I need to remove some worms I merely put a little of the peat in a small dish and leave it in a very gentle heat. After a few minutes the worms form an easily removed bunch on the top of the peat.

E. W. QUICK, London, S.E.6.

Thanks to the Judges

I SHOULD like to make mention through your columns of the sterling work done for aquarists' societies at this season of annual shows by those skilful, experienced and hard-working people—the F.B.A.S. judges. Our small societies, with their limited classes often containing a "glorious selection" of fishes, must make the judges' task a real headache, yet we see them giving constant care and attention to detail, just as they do at the really big shows.

At our own annual show we delayed the judge because of last-minute staging difficulties, yet his unhurried and painstaking care made the awards based on his judgment most worth while, and members felt that their exhibits were receiving the same kind of attention as do those at the finest shows in the country—as indeed they were. It is very gratifying to be treated in this manner, and we are happy to record our thanks to the gentlemen (and ladies) of the F.B.A.S. who do such a good job for us.

JOHN LONG,
Secretary, Dunstable and District
Aquarists' Society.

News from AQUARISTS' SOCIETIES

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

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

AT a meeting of the **Bristol Aquarists' Society** last month, Mr. W. L. Mandeville of Birmingham gave an interesting talk. There was also a table show for coldwater fishes, judged by Messrs. E. K. Blunsden and N. O. Grimston.

ALTHOUGH membership has dropped considerably during the last two years, the acquisition of a permanent club room has increased the interest of the remaining members of the **Chester and District Aquarist Society**. Several members have given lectures on their breeding activities, e.g. "Heating and its Problems" by an architect member, and outside visits, quizzes and table shows have been well received. Chester Cacti Society have suggested a joint show, and after discussion it has been decided to hold this later in the year. At the recent A.G.M. the president, chairman, secretary and treasurer were re-elected, and there were slight changes in the committee.

THEIR first table show was held by the **Mansfield and District Aquarist Society** on 5th July. It was judged by Mr. D. McCann Pullon of Nottingham. The winners were:—1, Mr. R. Howarth; 2, Mr. J. Turner; 3, Mr. R. Heath. In June, a visit was made to the Dukeries Aquarist Society, at which two prizes were won, the winners being Mr. J. Blake and Mr. J. Revill.

AT a recently held meeting of the **Stourbridge and District Aquarists' Society** the guest speaker was Mr. T. L. Dodge, who gave a talk on "Fish Diseases." Also present were visitors

from **Dudley Aquarist Society** and **Kidderminster Aquarist Society**. The meeting finished off with talks by Mr. W. T. Smith on identification of coldwater fishes, and by Mr. J. Bennett on "Trials and Tribulations of Jim Nockerimus."

MEETINGS of the **Southend, Leigh and District Aquarist Society** are now held on the first and third Wednesdays of each month at the County Hall, Clarence Road, Southend-on-Sea.

THE **Southport Aquarist Society**, now hold their meetings on the second Tuesday of each month, 8 p.m., at St. Andrew's Hall, Part Street, Southport. Aquarists visiting Southport are invited to see the display of 15 tanks of tropical fish at the Zoo which have been set up for the summer months by the society.

N. W. London News

ON 27th June another inter-club competition between the six North-West London societies was held. This time it was the turn of the coldwater "fiends." It was originally intended to bench all four coldwater classes on this date but Willesden and District A.C., the hosts for the evening, were only able to find sufficient space for two classes (common goldfish and shubunkins) in their comfortable headquarters, The Court Restaurant, Harlesden. As it was, the meeting was a very full one and every available seat was taken.

In the quiz, which was based on the questions appearing monthly in *The Aquarist*, Willesden



The Aquarist's Badge

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

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

and District A.C. gained the first place. The judges of the show were Captain Betts and Mr. Meadows, the latter being accompanied by his wife. Other notables there were Mr. Mellish, chairman of the F.B.A.S., Mr. Costman, F.B.A.S. services secretary, Mr. Stone, an F.B.A.S. councillor and Mrs. Robertshaw of Hendon.

Several aquarists had asked for the up-to-date position of their club in the points league and this was given at the end of the meeting:—Hendon and District A.S., 30 points; Willesden and District A.C., 28; North London A.S., 13; Arnold Aquarists, 12; Hampstead A.S., 9; Independent A.S., 8. As there is a total of 260 points to be won (or lost) during the course of a year, the foregoing positions may not bear much relation to the ultimate results, especially as some of the societies have specialist members who concentrate on just one or two species of fishes which they may not yet have had an opportunity of showing.

Southampton A.S. Show Results

Inter-club competition (furnished aquaria): 1, Hendon; 2, Portsmouth; 3, Southampton; 4, Basingstoke.

Tropical aquaria: 1, Mrs. W. J. Smith; 2, Mr. S. Brown (North London); 3, Mr. S. R. Molyneux.

Coldwater aquaria: 1, Mr. F. G. Lush (Portsmouth); 2, Mr. H. Gilbert; 3, Mr. L. L. Knight.

Novices: 1, Mr. L. Phillips; 2, Miss D. Cooper.

Schools (furnished aquaria): 1, Woolston sec. mod.; 2, Portwood sec. mod.; 3, Tanner's Brook juniors; 4, Millbrook sec. mod.

Guppies—Male: 1, Mr. D. L. Edmonds (Basingstoke); 2, Mr. R. Forest-Jones (Basingstoke); 3, Mr. W. H. Lock-Bowers (Basingstoke). Female: 1 and 3, Mr. M. Clarke; 2, Mr. D. L. Edmonds.

Swordtails: 1 and 2, Mr. M. Clarke; 3, Mr. D. E. King.

Mollies: 1, Mr. S. Brown; 2 and 3, Mr. H. G. Rundle (Basingstoke).

Platys: 1 and 2, Mr. F. G. Lush; 3, Mr. R. Forest-Jones.

Barbs: 1 and 2, Mr. H. G. Rundle; 3, Mr. R. A. Keeping (Basingstoke).

Danios, white cloud mountain minnows, etc.: 1 and 3, Mr. D. L. Edmonds; 2, Mr. W. J. Smith.

Fighters: 1, Mr. H. G. Rundle.

A.O.V. Labyrinth: 1, Mr. H. G. Rundle; 2, Mr. S. R. Molyneux; 3, Mr. S. Brown.

Characins: 1, Mr. A. S. Long; 2, Mr. H. G. Rundle; 3, Mr. W. H. Lock-Bowers.

Cichlids: 1, Mr. R. A. Keeping; 2, Mr. R. Forest-Jones.

Catfish: 1, Mr. J. E. Stickleland (Poole); 2, Mr. E. C. Goleworthy; 3, Mr. K. L. Poole.

A.O.V. tropicals: 1, Mr. H. G. Rundle; 2, Mr. R. Forest-Jones; 3, Mr. D. E. King.

Breeders—Livebearers: 1, Mr. F. G. Lush; 2, Mr. W. H. Lock-Bowers; 3, Mr. H. G. Rundle.

Egglayers: 1, Mr. R. A. Keeping; 2 and 3, Mr. R. Masley (Poole).

GOLDFISH

Common: 1, Mr. F. G. Lush; 2, Mr. L. Harvey; 3, Miss J. Spragg.

Cornets: 1, Mr. H. Gilbert; 2, Mr. R. Skipper (Hendon).

Shubunkins: 1 and 2, Mr. D. Paul (Bristol); 3, Mr. H. Gilbert.

Fantails: 1, Mr. H. Gilbert; 2 and 3, Mr. W. W. Angell.

A.O.V. fancy goldfish: 1, 2 and 3, Mr. D. Paul.

A.O.V. coldwater: 1, Mr. L. Hawkins (sunfish); 2, Mr. L. Hawkins (sunbass); 3, Miss C. Yetman.

Breeders—coldwater: 1 and 2, Mr. D. Paul.

Aquatic plants: 1 and 2, Mr. R. Skipper; 3, Mr. E. C. Goleworthy.

B.A.F. 1956

THE British Aquarists' Festival this year is to be held on Saturday and Sunday, 6th and 7th October at the Belle Vue Zoological Gardens, Manchester 12. At a recent meeting of the council of the **Federation of Northern Aquarium Societies**, at which the B.A.F. was discussed, it was decided to limit entries to member societies as was done last year, but classes are to be extended so that individual entries from members within a society can be made.

Rugby A.S. Show

OVER 800 visitors attended an exhibition staged by **Rugby Aquarist Society** in conjunction with the local branch of the National Cacti and Succulents Society at the end of June. Judging of fish entries was by Mr. K. Cave, a former chairman of the society. Results were as follows:—

Tropical section: Best tropical fish of the show—1, Mr. C. Bennett (catfish); 2, Mr. J. Bedford (glowlight); 3, Mr. J. Bedford (head-and-tail light). Best furnished aquarium, 1 and 2, Mr. P. Kempe; 3, Mr. J. Bedford. Coldwater section: 1, Mr. B. Courts (blue shubunkin); 2, Mr. L. Burton (goldfish); 3, Mr. B. Courts (golden orfev).

Breeders' section: 1, Mr. S. Hunt (Berlin swordtails); 2, Mr. P. London (black mollies); 3, Mr. P. London (sail fin *col/era* mollies).

New Society

Poole Aquarists' Association. Secretary: Mr. C. R. Macdonald, 3, Chatsworth Road, Parkstone, Dorset.

Secretary Changes

CHANGES of secretaries and addresses have been reported from the following societies: **Basingstoke Aquarist Society** (Mr. D. L. Edmonds, 1, Brook Terrace, Basingstoke, Hants.); **Bridlington and District Aquarists Society** (Mr. L. Wardill, 6, Westmorland Grove, Bridlington); **Canford Aquarist Society** (Mr. L. Wallis, 46, Thornbeach Road, London S.E.6); **Glasgow Eastern Aquarium Society** (Mr. J. Wylie, 16, Fauldhouse Street, Glasgow C.5); **Kirkcaldy and District Society** (Mrs. Thomson, 107, Duncarn Drive, Kirkcaldy); **Reading and District Aquarist Society** (Mr. W. R. Dolton, 73, Stockton Road, Reading, Berks.); **Thameside Aquatic Society** (Mr. R. W. Woodsworth, 28, Braemar Gardens, Hornchurch, Essex); **Welsh National Aquarists' Society** (Mr. R. B. Kennedy, 31, Blue House Road, Llanishen, Cardiff).

Crossword Solution

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

PICK YOUR ANSWER (Solutions)

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

Aquarists' Calendar

4th-6th August: **Southall Aquarist Society** annual show in conjunction with Southall Horticultural Show at Southall Grammar School.

7th-8th August: **Leicester Aquarist Society** display in the horticultural marquee at Leicester Abbey Park Show.

9th-11th August: **Portsmouth Aquarists' Club** fifth annual open show at the R.A. Drill Hall, Commercial Road, Portsmouth.

10th-11th August: **Chelsea Aquarium Society** show "The Aquarium in the Home and Garden" at the Chelsea Community Centre.

11th August: **Romford Aquarists' Society** open show at Wycombe Hall, Romford Market Place, Romford, Essex.

16th-18th August: **Corby and District Aquarists' Society** second annual show at the Church of Scotland Hall, Occupation Road, Corby, Northants.

17th-18th August: **Welsh National Aquarists' Society** Welsh Aquarists' Show at the Cory Hall, Cardiff (opposite Queen Street Station).

17th-26th August: Guppy show in Berlin. Details from overseas secretary of the Federation of Guppy Breeders' Societies, Mr. H. Pearson, 41, Highshore Road, Peckham, London S.E.15.

22nd-25th August: **Midland Open Show (Midland Aquarium and Pool Society)** at the Minor Hall, Bingley Hall, Birmingham. Opening times: first day, 2 p.m.-10 p.m.; other days, 10 a.m.-10 p.m. Show schedules available from secretary Mr. T. L. Dodge, 48, Dunsmore Road, Hall Green, Birmingham 28.

25th August-1st September: **Weymouth and District Aquatic Society** Show.

29th August-1st September: **Association of South London Aquarist Societies** annual show at Sutton Adult School, Sutton. Show secretary is Mr. A. Sayle. Society secretary Mr. H. J. Vosper, 23, St. Asaph Road, Brockley, London, S.E.4, will supply details.

30th August-1st September: **Bath Aquarists' Society** annual open show at St. Mary's Church Hall, Grove Street, Bath. Hours of opening: Thursday and Friday, 2.30-9.30 p.m.; Saturday, 12-6 p.m. Show secretary, Mr. D. Mathews, 3, Burlington Place, Julian Road, Bath.

31st August-1st September: **Walthamstow and District Aquarists' Society** exhibition of

tropical and coldwater fishes at Hawthorne Road, Walthamstow, E.17. There will be no limit to the number of entries. Entry forms and further details can be obtained from show secretary Mr. D. E. Goodbody, 54, Somerset Road, Walthamstow, London, E.13.

7th-8th September: **Bethnal Green Aquatic Society** annual open show. Schedules and details available from show secretary Mr. L. G. Coombs, 14, Granville Square, London W.C.1. Closing date for entries, 6th August.

8th-9th September: **Willesden Aquarists' Society** annual show with open classes.

8th-9th September: **Chester and District Aquarist Society** annual show in conjunction with Chester and District Cactus Society at St. Peter's Hall, Hamilton Place, Chester.

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

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

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

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

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

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

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



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