

# The AQUARIST AND PONDKEEPER

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Photo:

Laurence E. Perkins

This two years old veiltail (twintail) goldfish is a specimen bred by Mr. N. E. Perkins, who writes about his progress with this variety on page 140

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## Editorial

AN indication of the complexity of conditions which may be necessary for some fishes before they will breed in artificial surroundings has been given by some work undertaken at the Pitlochry Brown Trout Research Laboratory. From observations of the situations selected on the gravel beds of rivers by spawning trout and salmon it has been found that the fish choose the regions where a marked flow of water is taking place beneath the gravel to deposit their eggs. Regions where the gravel is relatively compact and where the conditions of water flow and aeration are less perfect are ignored at breeding time.

In the report of this work given in a recent issue of *Nature*, Dr. T. A. Stuart describes experiments carried out in a six-foot tank with water flowing over a bank of gravel. Using special water flow measuring apparatus it was possible to record the strength of the water currents beneath the gravel at different points, and the results reveal that the strongest flow occurs in the gravel below the highest point of the sloping bank. Towards the centre of this artificial pool the water currents through the gravel are less forceful. These variations are the result of physical forces, but their importance to fish life is best judged by Dr. Stuart's announcement that in his tank with its flowing water and gravel bank he has been able to spawn and rear minnows successfully.

To the best of our knowledge this is the first report of British minnows breeding in an aquarium, so it appears that the conditions supplied, which simulate those found in natural spawning grounds, are essential to encourage these fish to breed. Eggs laid at the surface of the gravel bank become lodged within it as a result of the water currents, and then, in enjoyment of surroundings providing maximum aeration, the fry develop and hatch. The currents through the gravel of natural sites apparently depend mainly on the slope between pools and not on the rate of flow of the main stream; this encourages the hope that ingenious aquarists may develop fairly simple methods of studying this new factor with other bottom-spawning species in home aquaria.

## The Brown Acara

(*Aequidens portalegrensis*)

ORDER:—Percomorphi, from Greek *perke*—perch, and Greek *morphe*—shape.

FAMILY:—Cichlidae, from Greek *Kichle*—a kind of sea-fish.

SPECIES:—*Aequidens portalegrensis*—from Latin *aequalis*—similar or equal, Latin *dens*—tooth. *Portalegrensis* is named after Porta Alegre, on Lake dos Patos, in south-eastern Brazil.

WHILE the popular name of *Aequidens portalegrensis* is brown acara, it might equally well be green acara, for in some lights this admirable little cichlid reflects more green than any other colour. At other times it appears extremely dark, or its sides are mottled with dark patterns. Almost always, however, there is pale blue in the throat region and on the opercula.

The fins are the most colourful portions, with variegated small spots of blue, brown and reddish-brown. The dorsal fin is long compared with its height, and reaches along almost the whole length of the back. The front rays are short, strong spines, but softer and more flexible branched rays support the rear quarter of the fin. In mature males the dorsal and anal fins are rather more pointed than in the females, but the difference is not so marked as in some other species of fishes, e.g., the fighting fish, the blue gourami, and the paradise fish.

Reaching a maximum size of five inches, it can hardly be considered a suitable inhabitant for a small aquarium. Nor can it be considered safe in a community tank unless the other occupants of that tank are too large for it to swallow. Yet for a cichlid it is of an extremely equable temperament, until breeding time approaches. This is usually signified by a display of strength on the part of both male and female, who indulge in wrestling matches and tugs-of-war all over the aquarium, gripping each other tightly with their jaws, pulling, twisting, and rolling with every appearance of savagery.

Mutual respect for each other is established in this way, and once having decided that they are evenly matched, the couple set about spring cleaning the aquarium, polishing flat pieces of rock or stone in preparation for the actual spawning. This takes place in the region of 77° F. A few hours before eggs are due to be laid, both male and female develop short, stiff tubes, called ovipositors, through which the eggs and sperms are passed. Each egg is laid so that it does not touch or overlay any other egg, and up to two thousand or more may be deposited in a single spawning.

Now comes the testing time. If the instincts of the parents are well developed—if they have been well fed previously on live and tasty food, they will leave the eggs alone. If not, be prepared to see them devour part or the whole spawning. But do not be hasty and remove them if they are seen to move up and down the rows of eggs, selecting one here and there for consumption. These are the infertile ones—a possible source of danger to the rest, or so the parent fishes believe—and best removed.

Normally the breeding fish will vigorously fan the eggs, causing a current of water to flow over them. The current no doubt serves to freshen the water, and keeps all dirt from settling on the eggs. Any other fish or object approaching the eggs is vigorously attacked. It is foolish



Brown acara

to keep demonstrating this to interested onlookers, as eventually the fishes may become so excited that they will eat the eggs to protect them from real or imagined danger.

At 77° F. hatching will begin in about four and a half days. For some time before this the parents will have begun to scoop mouthfuls of sand from the bottom, making a series of depressions in it. When the babies begin bursting the eggshells they are taken into the mouths of their parents, and carefully spat into one of the depressions. It is their nursery, and always either the male or female fish will watch over them while they are in it. But again the strong instinct of personal hygiene manifests itself.

The children are not allowed to stay long in the nursery. Within a few hours they are taken once more into the mouths of their parents and transferred to another depression. This goes on for several days, until the egg sacs have been absorbed. Then the fry start swimming in clouds about the parent fishes' heads, and there are few finer sights than a school of these little creatures busily swimming round the comparatively huge bulk of their parents.

### Removing the Parents

It is now a fifty-fifty chance as to whether the parental instinct will subdue the carnivorous instinct, and it is wisest to remove both parents, who have done an excellent job so far in producing a healthy, vigorous family. Don't try them too far. The young are now large enough to feed on large rotifers, baby *Daphnia*, micro worm, brine shrimp, or any other small live food. Those aquarists who can obtain no live food at all are recommended to try powdered dry fish food, moistened with juices from pulped earthworms. When this stage has been reached, the young are as good as raised. For fine, large specimens space is necessary, so do not try raising 200 youngsters in a 15 gallons aquarium and expect specimen fishes. Over-crowding causes bad tempers to develop early, and as these fishes are equipped with teeth, much trouble will result.

Hybridising between the different species of *Aequidens* has been attempted, but so far no reports of any marked success in this direction have been received. This has been attributed to possible differences in the genetical make up of the various species—development in the egg stops almost before it has begun.

*Portalegrensis* shows a marked aversion to plants. Any placed in its aquarium will be uprooted, or torn to shreds. At the same time it is not a nervous fish, and does not hide from photographers or onlookers. This attribute renders it a suitable subject for exhibitions. Unfortunately it does not appear to be bred in sufficient numbers in this country to make it a regular entry.

# Hereditiy in Siamese Fighting Fish

by Dr. MYRON GORDON

(Geneticist, New York Aquarium)

IN the course of his genetic analysis of the *Betta*, Eberhardt studied the  $V-v$  gene for the steel-blue, blue and green iridescence in relationship to the  $C-c$  gene for the dark brown colouring in contrast to the light golden of the Cambodia variety. He did not indicate the preliminary steps nor the parents which produced the following population:—

Colour Types	No.	Ratio	Gene Combinations
Dark-brown, Steel-blue	67	1	$Cc VV$
Dark-brown, Blue	118	2	$Cc Vv$
Dark-brown, Green	58	1	$Cc vv$
Cambodia, Steel-blue	59	1	$cc VV$
Cambodia, Blue	112	2	$cc Vv$
Cambodia, Green	51	1	$cc vv$
Total	465	8	6

On the basis of the results indicated above, what must have been the colours and genetic constitutions of the parents? (Perhaps the reader may want to work out the answer.)

1. If we study the results, focusing our attention upon the frequencies of the dark-brown and Cambodia fish which depend for their distinctive coloration upon the phase of the  $C-c$  gene, we will observe that there are just as many dark-brown or  $Cc$  fish as there are of the Cambodia type,  $cc$ . To produce the 1 to 1 ratio observed one parent must have been heterozygous for the golden gene,  $Cc$ , dark-brown in colour, while the other must have been homozygous recessive  $cc$  or Cambodia. To put it genetically,  $Cc \times cc = 1 Cc : 1 cc$ .

2. If we study the ratios again we will also observe that, with respect to the  $V-v$  gene, there are two times as many blue individuals (heterozygous  $Vv$ ) as there are of steel-blue (homozygous dominant  $VV$ ) or as there are of the green (homozygous recessive,  $vv$ ). The most probable parents which are capable of producing a ratio of this kind are two blues, because each is genetically  $Vv$  and because  $Vv \times Vv$  gives us the ratio,  $1 VV : 2 Vv : 1 vv$ , which matches the one involved in the problem.

3. Thus the genetic constitution of the parents that produced the  $1 : 2 : 1 : 1 : 2 : 1$  ratio, which involves the two pairs of genes,  $C-c$  and  $V-v$ , must have been as follows:

Dark-brown, Blue ( $Cc Vv$ )  $\times$  Cambodia, Blue ( $cc Vv$ )

## A Modified 9:3:3:1 Ratio

Ordinarily when two pairs of genes are involved, and one parent is homozygous dominant for one and recessive for the other (let us say  $AA bb$ ) while the other parent is just opposite ( $aa BB$ ) we expect the first generation offspring to be heterozygous for both genes, that is,  $Aa Bb$ . When the first generation offspring are crossed ( $Aa Bb \times Aa Bb$ ) we would expect that in the second generation there would be the following four phenotypes:

$9 AB \quad 3 Ab \quad 3 aB \quad 1 ab$

Now let us take an actual case in which two genes are similarly involved in the *Betta*. What would be the results

in the first and second generations if the following types of fighting fishes were mated?

Parents	
Dark-brown, Green $CC vv$	Cambodia, Steel-blue $cc VV$
Dark-brown, Blue $Cc Vv$	Dark-brown, Blue $Cc Vv$

In order to determine the number of the various colour variations in the second generation, there is a more direct and shorter technique than the usual Punnett Square system. The shorter method is based upon well-known Mendelian principles of inheritance as follows:

1. We know if we were concerned with the recombinations of the  $C-c$  gene alone, that when a heterozygous dark-brown fish is crossed with a similar type (expressed genetically,  $Cc \times Cc$ ) we should get in the next generation:

$1 CC$ , Dark-brown } or,  $3 C^*$ , Dark-brown  
 $2 Cc$ , Dark-brown }  
 $1 cc$ , Cambodia }  $1 cc$ , Cambodia

Since the genotype  $CC$  and  $Cc$  are indistinguishable, it is proper to rewrite the  $1 CC : 2 Cc : 1 cc$  ratio as  $3 C^* : 1 cc$ .

2. We know also if we were concerned with the recombinations of  $V-v$  gene alone, that when a  $Vv$  fish is crossed with another  $Vv$ , we should obtain in the next generation as follows:

$1 VV$ , Steel-blue;  $2 Vv$ , Blue;  $1 vv$ , Green.

We cannot recombine the  $VV$  and  $Vv$  genotypes in the same manner as we did in the case of  $CC$  and  $Cc$  because  $VV$  differs from  $Vv$  in its visible effect, that is, phenotypically.

3. Now in the final step we need but to multiply the ratio of  $3 C^* : 1 cc$  by  $1 VV : 2 Vv : 1 vv$ . This may be accomplished in a visual way which gives us the ratios in the  $F_2$  directly.

Second Generation	
$3 C^*$	$\left\{ \begin{array}{l} 1 VV = 3 C^* VV, 3 \text{ Steel-blue on Dark-brown} \\ 2 Vv = 6 C^* Vv, 6 \text{ Blue on Dark-brown} \\ 1 vv = 3 C^* vv, 3 \text{ Green on Dark-brown} \end{array} \right.$
$1 cc$	$\left\{ \begin{array}{l} 1 VV = 1 cc VV, 1 \text{ Steel-blue on Cambodia} \\ 2 Vv = 2 cc Vv, 2 \text{ Blue on Cambodia} \\ 1 vv = 1 cc vv, 1 \text{ Green on Cambodia} \end{array} \right.$

The ratio  $3^* : 6^* : 3 : 1^* : 2^* : 1$ , at first glance, may not resemble the familiar  $9 : 3 : 3 : 1$ , but if the first two starred items (3 and 6) and the fourth and fifth starred items (2 and 1) were grouped together, as they would be if the heterozygote  $Vv$  was similar phenotypically to the homozygote  $VV$ , then the two ratios would be identical, as follows:

Modified ratio in  $F_2$  :  $3 + 6 : 3 : 2 + 1 : 1$   
Usual ratio in  $F_2$  :  $9 : 3 : 3 : 1$

## 3. Gene $b$ for Blonde Coloration

The dark-brown colouring of the wild *Betta* was, as we have seen earlier, changed to a lighter type by the action of the Cambodia mutation. This change was referred to the recessive gene  $c$ . In accordance with this notation, the wild dark phase was indicated as  $C$ . The effect of the recessive mutation  $c$  was practically to eliminate all melanin pigment from the small black pigment cells, making them invisible. This produced a whitish yellow variety or the Cambodia type.

Recently Dr. H. M. Wallbrunn, working at the University of Chicago, announced the discovery of another recessive gene which also lightens the colouring of the wild *Betta*. He gave the symbol  $b$  which may, like the gene  $b$  in

Table 1

## Colour varieties in Fighters based on their Gene Combinations

In Non-Cambodia Fighters				In Cambodia Fighters			
C	B	Ri	VV = 1. C B Ri VV = Steel blue	c	R	Ri	VV = 9. c R Ri VV = Silver
		Vv = 2. C B Ri Vv = Blue	Vv = 10. c R Ri Vv = Purple				
		vv = 3. C B Ri vv = Green	vv = 11. c R Ri vv = Green, light				
		VV = 4. C B ri VV = Dark-brown	VV = 12. c R ri VV = Red, light				
	Vv = 4. C B ri Vv = Dark-brown	Vv = 12. c R ri Vv = Red, light					
	vv = 4. C B ri vv = Dark-brown	vv = 12. c R ri vv = Red, light					
	b	Ri	VV = 5. C b Ri VV = Mauve		Ri	VV = 13. c r Ri VV = Silver, light	
		Vv = 6. C b Ri Vv = Purple	Vv = 14. c r Ri Vv = Blue, light				
vv = 7. C b Ri vv = Light green?		vv = 15. c r Ri vv = Green, light					
VV = 8. C b ri VV = Red		VV = 16. c r ri VV = White					
Vv = 8. C b ri Vv = Red	Vv = 16. c r ri Vv = White						
vv = 8. C b ri vv = Red	vv = 16. c r ri vv = White						

C	= Non-Cambodia	c	= Cambodia
B	= Non-Blonde	b	= Blonde
Ri	= Iridescence	ri	= Reduced iridescence
Ri VV	= Steel blue	ri VV	} No effect
Ri Vv	= Blue	ri Vv	
Ri vv	= Green	ri vv	} No effect
R	= Red on Body	r	

guppies, represent *blonde* colouring. The gene *b* does not eliminate all production of melanin but reduces the number of visible melanophores to about one-third of the normal amount as represented by the wild dark-brown *Betta*, *B*. It is hardly necessary, at this stage of the analysis, to outline the mechanism of inheritance of the *b* gene for it is similar in details to gene *c* for Cambodia and gene *dl* for bald top.

## Blue-printing the Colour Scheme of Your Betta

Fish fanciers who know the principles of genetics have this advantage. Starting with known hereditary factors, they can, within a matter of minutes, work out the blueprint for new colour combinations which previously did not exist, or for types which are at the moment rare and desirable. We now know the effects of five independent genes; (see Table 1).

<i>c</i>	Cambodia	<i>C</i>	Dark-brown
<i>b</i>	Blonde	<i>B</i>	Dark-brown
<i>dl</i>	Bald Top	<i>dl</i>	Dark top
<i>Ri</i>	Iridescence high	<i>ri</i>	Iridescence weak
<i>v</i> ( <i>Ri</i> )	Green iridescence	<i>vv</i> ( <i>Ri</i> )	} Iridescence weak
<i>Vv</i> ( <i>Ri</i> )	Blue iridescence	<i>Vv</i> ( <i>ri</i> )	
<i>VV</i> ( <i>Ri</i> )	Steel-blue iridescence	<i>VV</i> ( <i>ri</i> )	

## Unfinished Research on Colour Inheritance

The above list is still incomplete. Dr. Henry M. Wallbrunn (now at the University of Florida) says there are two additional inherited colour factors that have not as yet been worked out in a precise manner. One is for *red* colouring on the body versus *whitish-yellow* body colouring; the other is for the degree of transparency of the fins. Until those are known, any blue-print written is somewhat limited in its scope. Apparently all *Betta* have red fins unless they are overlain by iridescence, but some *Betta* have yellow or white body colouring while others are red. Those geneticists who have tried to find the solution to the method of inheritance of red body colouring and the transparency of the fins say that they are complex. It is probable that each condition is inherited not by one gene but by a combination of genes, perhaps somewhat like the various kinds of

iridescences, for which it will be recalled green iridescence requires the inter-action of a dominant gene *Ri* together with the recessive gene *v*.

The length and breadth of the fins of the highly cultivated and carefully reared *Betta* are far greater than the ordinary wild fighting fish. All attempts to determine whether the short-tailed trait is dominant over the long form or vice versa have been inconclusive. The nature of the problem indicates that the hereditary factors for fin length will prove to be most difficult to solve. This is so because there is a strong and intricate interplay of environmental and hereditary factors involved in the development of the flowing, veil-like tail of the domesticated *Betta*. To solve the problem all animals must be maintained under identical environmental conditions, the same size of aquarium, same food, and same conditions of light and temperature. Yet it is difficult to keep all these conditions of life uniform over a sufficient length of time to cover three or four generations of fighting fish without considerable expense of money and effort.

Finally, there is the tantalising problem of the albino *Betta* which has reappeared after a period of 26 years. It is likely that albinism will prove to be a simple hereditary factor in the fighting fish, just as it is in the swordtail, guppy and the paradise fish. There is now a good chance that before the end of the year, we may have the solution to the problem that has baffled fish culturists for a quarter of a century. The strange history of the albino will be told in a later article.

## Post-Mortem Examination of Fishes:

W. Harold Cotton, F.R.M.S., F.Z.S., 39, Brook Lane, King's Heath, Birmingham, 14. (Phone: Highbury 1693)

Specimens should be sent direct to Mr. Cotton with full particulars of circumstances, and a fee of 3s.

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

# Aquarium and Pond Goldfish Varieties

## 9. Fantail Moor

**T**HE fantail moor is quite a popular fish these days, and as many are seen on the show bench as veiltail moors. Many aquarists appear to favour the fantail type because as a rule they are much more active and certainly show off their points better when in a show tank. They are also a little more hardy as they have less flowing fins to get into trouble during cold spells when in an open pond. Not that I consider they are quite suitable for leaving out of doors all the winter, as the telescopic eyes make these fishes rather delicate subjects at any time in the pond.

The body of the fantail moor should be as for the fantail, that is ovoid with a good even rise from the nose over to the caudal fin with the highest point at the commencement of the dorsal fin. The dorsal fin should be three-quarters the depth of the body in height with the outer margins gently incurved. The caudal fin or tail should be in length three-quarters the length of the body and joined at the beginning for a quarter of its length. It should be deeply forked and carried stiffly at about the horizontal line of the body. The pectoral and pelvic fins are as for the fantail. The anal fins must be paired and be held quite separately. The colour should be a sooty black all over with no trace of bronze or brass. The eyes should be greatly enlarged and protruding from the head; the cornea should be undamaged and quite clear; they are clear of any colour. All moors are visibly scaled.

The general faults seen at exhibitions are that there is too much tendency to bronzing. The desired colour is similar to that of a good mollie, a real dull black like soot. Another fault is that the caudal fin shows too much of a rounded edge

which is a throw-back to the veiltail. The deep forking must be there and there must be no tendency for the tail to droop. As these fish usually move about much better in a show tank than do veiltail moors they are easier to judge and can get more points for deportment. This is not all, as the mere fact that a fish is on the move does help the judge to see all parts of the fish, including the anal fins.

These fishes can be bred in a similar manner to the ordinary fantail, but I advise that no rocks are placed in the tanks where these are kept or bred. The protruding eye is easily damaged, especially in the breeding season when the fishes rush about excitedly. They can be kept in an open pond during the summer but show specimens are better kept under cover all the year round. I have sometimes been of the opinion that if these fish are kept at too high a temperature during their early stages of development they tend to become too brassy.

A fairly deep tank appears to suit them best and their food can be well varied with frequent feeds of earthworm among other live foods and Bemax, dried shrimp and scraped liver as a change. To breed a good strain of these fish it is essential that care is taken in the first selection and the parentage should be well known. Throw-outs from a veiltail moor strain are always likely to throw a large number of fish which are neither one nor the other, and then it may be almost impossible to breed out the bad trait for many years. Although in a well set up tank of fancy goldfish the fantail moor makes a good break in colour from the normal colours they should not be allowed to remain with other types during the breeding season, as many runts would be produced.

*A. Boarder*

## Keeping Aquarium Frames Free from Rust

**M**ANY aquarists at one time or another have had difficulty in trying to keep aquarium frames free from rust. They sandpaper down a rusty frame, add one or more coats of paint, yet in a very short time the paint blisters or scales away exposing more rust. It is not proposed in this article to suggest that the rusting of iron or steel can be entirely prevented but with proper processing of the metal rusting can be delayed for a very long time. It will be useful to deal briefly with the causes underlying rust on ferrous metals.

After exposure of iron or steel for an appreciable length of time to water, moisture, salt water solutions, and highly contaminated industrial atmospheres containing organic and other impurities, the formation of red rust will be accelerated. Rust will be formed as a loose powder which is easy to remove but in time the surface of the iron or steel thus affected will be distinguished by deep and unsightly pitting. The depth of such pitting will depend upon the corrosive agent and the duration of exposure. The presence of rust has always betokened a serious state of affairs in industry.

Rusting is considered to be electro-chemical in origin and action but whether rust development is due to electro-chemical characteristics or not, or whether they lead to the deposition of simple iron oxides or the more complex iron salts, it can only occur if a supply of oxygen is present in the surrounding atmosphere. It is obvious that the primary object of using paint is to protect, and the decorative aspect should be of secondary consideration.

Unfortunately the adhesive properties of paint or enamel

on metal surfaces are not good, and a breakdown in the paint film through chemical action or abrasion soon exposes the metal to attack. It is necessary in every case to use a primer paint on the bare metal. An excellent method is the following.

The aquarium frame should be scraped absolutely free of old paint and rust (the covering of rust with paint will not stop it creeping). When the frame is perfectly clean it should be given a light coat of wash primer, e.g. self-etching primer. This primer etches itself into the metal and has greater adhesion and rust-inhibiting properties than red lead or aluminium primer, and none of the disadvantages of red lead. Self-etching primer is a pre-treatment for any clean metal, its function being to passivate the surface and to provide a good key for the subsequent paint coat. It has been formulated for the bottom of new ships and has excellent adhesion on any metal such as zinc or aluminium.

The primer is purchased in two containers, one the primer base, and two the catalyst (phosphoric acid). Four parts of the former should be mixed with one part of the latter, and used within four to eight hours. One thin coat is quite sufficient, and after eight or so hours the frame should be painted with, preferably, synthetic enamel, of the colour desired. Aluminium or any type of good quality paint can, of course, be used, but synthetic enamel is used chiefly for outside weather conditions. Any of the big paint manufacturers' agents supply this material.

*C. W. Massey*

# Growing "Water Ferns"

by WALTER BERTHOLDT



Indian water fern,  
Sumatra fern or water  
sprite

Photo: Lionel E. Day

**W**ATER ferns are very popular aquarium plants. Their scientific family name is Parkeriaceae, named after their discoverer C. S. Parker, who first found the plant in the year 1824 in British Guiana. We know three different species of this family, which are as follows:

1. The *fine-leaved* water sprite, with its scientific name *Ceratopteris thalictroides*.
2. The *broad-leaved* water sprite, with the same scientific name.
3. The *floating form*, called water fern, with its scientific name *Ceratopteris cornuta*.

*Ceratopteris* species have a wide distribution in the tropical countries of the world, especially in the Orient. The plant is found as a terrestrial form, i.e., a bog plant, as for instance in temporarily flooded regions, where after short overflowing a marshy ground is left. A second modification is found in very shallow waters, half submerged. Then we have the pure underwater form, which we call the water sprite. The next form is a floating form with the leaves folded over the surface of the water but with roots still in the ground, and finally we have the pure floating variety with only water roots.

As almost all aquarists know water sprite and water fern, it is not necessary to give here a detailed description of them. I have been cultivating the water ferns for many years now, and they still belong to my favourite aquatics. Let us first discuss the fine-leaved water sprite.

Big, fully grown specimens of this variety make an ideal centre-piece in large tanks. The fresh, light green leaves are fascinating to the spectator. Typical of the plant is its extraordinary quick growth. A young water sprite of four inches height, for instance, placed in a 20 gallons tank, fills out the receptacle within two to three months. I cultivate water sprite in tanks with pure medium coarse gravel and the leaves reach a length of 17 inches. No earth sub-layer was applied, but the ground was well saturated with fish and snail droppings. A disadvantage of the species is that the single leaves are not long-lived. After six to eight weeks, generally, they begin to fade, lose their shining, bright green colour and turn yellow-brown. Such leaves should be pinched off.

The development of new leaves is typical for ferns. Each of us has observed in spring the young fronds of the terrestrial form unrolling from the ground. Just so it is with the underwater species. Propagation is very easy. Numerous "daughter plants" sprout from the old leaves. These can be taken off once they have developed roots, and placed in sand. But they can also be left floating at the surface of the water.

As already mentioned above the leaves of water sprite lose comparatively quickly their bright green colour and

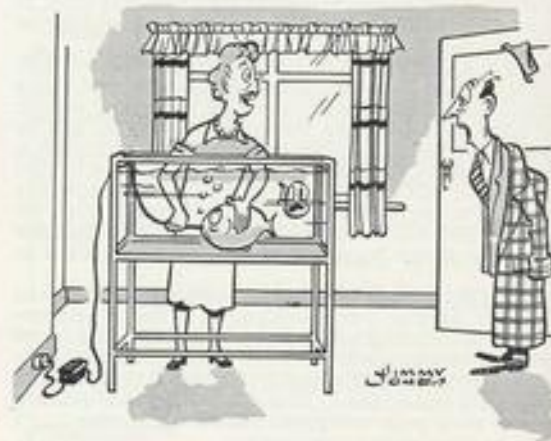
decay. It is not a long-lived aquatic and when kept in good surroundings it quickly outgrows a medium size tank. When the single strands become too long, the plant turns unsightly. Then it should be removed and replaced by a fresh and vigorous new runner.

Water sprite needs much light. It grows in both bright day- and artificial light. But when it gets too much artificial light the leaves turn yellow green and lose their fresh and juicy light green colour. Then it becomes unsightly. The leaves of the plant are very tender; hungry snails like to nibble at them and eat holes in them. Therefore keep only few snails in tanks where water sprite is cultivated. As *Ceratopteris* is a tropical plant it thrives only in water of not less than 68° F. The ideal temperature is 77° F. I have cultivated water sprite in both hard and soft water.

## Centre-piece Sprite

The two other species, the broad-leaved and the floating form, require the same conditions as the fine-leaved form. Of the three kinds I like best the broad-leaved form. It is more plastic and beautiful than the fine-leaved sprite, and you cannot find a better centre-piece. I kept this form for several years in the middle of a 25 gallons tank. It was fenced by three large rocks, which were overgrown with dark green algae. The contrast between the dark algae and the light green leaves of the fern was most charming. Another ideal combination is the compact sprite with fine-leaved *Myriophyllum*. Also in the neighbourhood of dark green willow moss it does very well.

The floating form is ideal for shading outdoor ponds from too strong sunlight. Its dense water roots give a splendid spawning ground for egg-layers and shelter the young fry. Also labyrinth fishes prefer it for the construction of their bubble nest. The floating kind is an enemy of green water and keeps the tanks clear. In conclusion one can say that these aquatics are very beautiful and attractive plants, which produce in our tanks a truly tropical atmosphere by their luxuriant growth.



"Henry—the aerator's arrived!"

THE AQUARIST

# AQUARIST'S Notebook



by  
RAYMOND YATES

THE use of the anti-malarial drug *mepacrine hydrochloride* has recently been advocated in some quarters as a means of curing white spot. It certainly has the advantage of being relatively cheap, 100 tablets costing about five shillings, or approximately one halfpenny per tablet.

I have tried this drug out on several occasions in conjunction with aquarist friends and found that one tablet every 12 hours in a 25-gallon tank over a period of two days removed all traces of white spot in instances where the disease was in its infancy. When used against the more stubborn form of white spot, however, against which quinine had failed, it proved quite useless, even when used in the proportion of three tablets every 12 hours to five gallons of water.

The fish showed no signs of being inconvenienced by the chemical but prolonged treatment would probably weaken them. No effect on plants was observed except in the case of *Vallisneria* which was killed outright. Aeration was used throughout, due to the similarity between this treatment and that with quinine.

Each tablet of mepacrine hydrochloride contains roughly one and a half grains, and boiling water should be poured on to the crushed tablet, which dissolves instantly, producing a bright yellow dye which has strong staining properties. When emptied into the aquarium the tank water becomes a pale yellow and this does not disappear with the passage of time. The only advantage this treatment appears to have over the use of quinine is in its cheapness.

The subject of the unexpected death of one or more of their fish is a sore point with many aquarists. We all know the vexation felt on finding an excellent specimen dead when we first inspect the tank in the morning, when the fish had appeared to be in the pink of condition the night before. These deaths all come under one of three headings, viz.—accident, illness or unascertained. Accident cases are usually obvious, frequently due to some form of carelessness on the part of the aquarist himself. Illness takes toll but it is of a sort which shows no sign of its presence until it is too late to do anything.

Angel fish come under this category, as large specimens often die overnight for no apparent reason at all. The experienced eye, however, can usually tell when angels are "going home." For a week or so before death occurs large angels colour up very vividly indeed, refuse food, remain motionless near the surface and have a trick of now and again flickering their tails. The probable reason is that they are suffering from internal parasites to which this fish is very prone, and little can be done. The great majority of aquarium fishes give long warning of their approaching end by appearing listless, folding all fins, losing appetite, showing signs of disease or hump back or wasting symptoms, or by gasping at the surface.

There are a few varieties who have a habit of dying on their owner overnight and in the morning all that is found is the body, more than half eaten away by the other fish in the tank so that it is impossible to conjecture the cause of death with any certainty. Zebra danios and guppies frequently shock us this way whilst the mollie and the leeri gourami seem to affect "heart attacks" and die before your very eyes.

Some fish have an enquiring turn of mind and wedge themselves fast between slabs of rockery or between rockery and glass or even the heater. Unable to extricate themselves they die and are not always quickly found or even missed by their owner. The worst nuisances in this direction in my

experience are *Barbus schuberti* closely followed by neons and glowlights. The last two varieties should never be kept in any tank where they can trap themselves in any way.

Of course, a large number of these unascertained sudden deaths are due to old age and nothing more. Tropicals have short lives at any time and in unsuitable conditions this is reduced still further. Many hobbyists only buy large, mature fish. This is all very well but it must be borne in mind that these adults have relatively only a short time to live. Many large tetras of show size have perhaps only six months' life before them. Dwarf cichlids have very short lives, and livebearers cannot stand the pace of producing too many families, particularly where high temperatures are maintained.

Some time ago when I was in Derby I called in the local art gallery and was surprised to find there a number of furnished aquaria which had been installed by the local aquarist society. There were four tropical and three cold-water tanks on view and there were plenty of viewers. Another club (in Lancashire) has its headquarters in the Town Hall and they are installing furnished tanks in the Rates Department where the rates are paid in over the counter. Although an advertisement for the club in the first place, no doubt these tanks will have a soothing effect on irate ratepayers. Some years ago Liverpool had a display of about 20 tanks in the basement of the City Museum but this disappeared in the blitz. Bolton has a fine civic aquarium in the town hall extension. The best advertisement any club can have is not a poster or an annual show but a tank or tanks on view to the public the whole year through. Some clubs are realising this and acting accordingly.

There are dealers and dealers. Some are very large concerns but the vast majority are small firms who have only entered the business in the last few years, attracted by the undoubted boom in the aquarium-keeping world. Some confine themselves to the needs of the fish keeper only, whilst others include other side lines in birds, reptiles and pet store goods. Like tax-collectors they have few friends, and their ears are continually burning. The reason is that the fish-keeping public as a whole does not bother to understand their difficulties, thinks only of its own side of the counter and makes few, if any, allowances.

Many people look in a dealer's shop but not all buy. Quite a few expect the dealer to answer numerous questions at length and are annoyed when he fails to give them the attention to which they consider they are entitled. He hears many tales of heavy losses of fish and is accused of lack of sympathy, but what customer is interested in hearing the dealer's story of his losses? He may mention some such thing in a foolish moment; if he does he can be sure of getting a sarcastic rejoinder from his clients. There are people who buy a single tank and the equipment therefor who consider themselves ever afterwards to be priority customers and make no bones about saying so. Many dealers are pestered by fishkeepers who demand rebates and reductions because they are members of such and such a club. Some clubs even "request" donations or prizes for their club with a veiled hint that the club will take its business elsewhere if nothing is forthcoming.

The dealer has to keep a large stock or his custom fades,

and this has constantly to be changed. Fads in fish are notorious and he must beware of being left with a large stock of some unsaleable variety on his hands. Every dealer keeps what are called "bread and butter fish," meaning those which never lose their popularity and are in demand such as zebra danios, angels, fighters, livebearers and tiger barbs, but he is taking a chance with less popular types. He has constantly to be on the alert against disease and must take care (if he values his customers) never to sell a sick or ailing fish. Electrical equipment and gear must be constantly checked and some dealers wisely clear out old equipment at second-hand prices and install new equipment at definite periods. The hardest job of all is keeping the tanks clean. If he has a large staff well and good, otherwise he has to do the job himself. Holidays, if any, are a headache. If fish are left in the care of inexperienced persons anything can happen, and does.

Many fishkeepers grumble that when they offer fish they have reared to a dealer he offers them a very poor price indeed or even refuses to bother with them at all. In the main most aquarists breed fish which are fairly easy to breed and which are therefore fairly common and already low priced. Usually he is offered very small fish which are unsaleable, and many dealers would take larger fish . . . the trouble is that the amateur breeder cannot wait to grow his fish to sizeable proportions; either he has not the room

or he wants the room. In any event, the dealer is well aware that he is being offered the poorest fish of the batch, the better specimens having already been disposed of elsewhere.

The dealer also has to face the fact to-day that there is too much business opposition. Apart from business lost to him by the activities of club members auctioning fish and equipment it is true to say that there are now too many dealers for the existing fish-keeping population. Those dealers who are both wholesale and retail have noticed for some time a falling away in the wholesale business, and this seems to indicate that some of the mushroom types of dealer are leaving the business.

Aquarists who possess a magnification screen for use with the smaller television sets should try the effect of this in front of their furnished tanks. The smallest fish suddenly approach that large size so much desired by most fishkeepers and the size and depth of the tank seems enormous. The effect is reminiscent of underwater scenes from films such as "Under the Red Sea" and visitors rarely fail to be thrilled. A demonstration of this aquatic magnification could well be adopted at a show. Some dealers have in the past attached circular magnifying lenses to show tanks as a novelty, and I know at least one dealer who offers his customers a large magnifying glass to inspect his fish before purchase.

## FRIENDS & FOES No. 18

### NOTONECTA

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

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

**N**OTONECTA is a powerful aquatic insect which reaches a maximum size of almost three-quarters of an inch. It is often referred to as the "water-boatman" and it certainly bears a remarkable resemblance to a small boat when viewed from directly above. The third pair of legs are long and equipped with many swimming hairs, and this pair of legs are the "oars" of the boat. Nevertheless, as the whole of its under-water life is spent on its back, "back-swimmer" is a better name for it. Moreover, there is another insect, very similar in appearance, which does not swim on its back, and which is also known as the "water-boatman," or "lesser water-boatman." This leads to unnecessary confusion.

During the spring and summer months, *Notonecta* fly from pool to pool, seeking mates and suitable environment in which to breed. They are usually the first visitors to any newly constructed garden pond. Immediately they penetrate the water surface they are turned onto their backs, and cannot remain other than just below the meniscus without vigorous strokes with their oars or by anchoring themselves by a claw to an underwater plant or leaf.

The female back-swimmer lays numbers of eggs, beginning in March or early April. These are passed separately through a pair of ovipositors, and



NOTONECTA (ADULT)

affixed to aquatic plants. In appearance they are like half grains of rice. They hatch into minute creatures, about the size of large *Daphnia*, which bear little resemblance to the adults, except that they, too, swim on their backs.

Young *Notonecta* (larvae) have backs which are a pretty shade of green or egg-shell blue. This makes them almost invisible from below the water, and at the same time their very dark ventral surfaces renders them difficult to see from above the water. After several



NOTONECTA (LARVA)

## Water Boatmen

moult their wing cases begin to develop, and they are then known as nymphs.

Every *Notonecta* is carnivorous throughout its life. Each is equipped with a long, tapering, flexible proboscis, containing extremely sharp stylets. Normally this proboscis is carried close under the thorax, but in feeding it is inserted into the tissues of its luckless victim, whose struggles avail it nothing when securely held by the first two pairs of the back-swimmer's legs.

Starting with *Cyclops*, and *Daphnia*, the larvae and nymphs work their way up, through *Asellus*, *Gammarus* and bloodworms, to fish fry. A mature specimen can tackle and destroy a female guppy four times its own size. When small, they often escape notice in a catch of *Daphnia*, and are introduced with them into a tropical aquarium. In such a favourable environment they grow rapidly, and can wreak havoc in a very short time!

In a garden pool they frequently hide beneath the water-lily pads. They can dive at express speed, and the aquarist who would catch them should quickly slip the net under them so that they dive into it.

There are four different species of British *Notonecta*, but to the casual observer they will all appear the same. Their habits can be observed if they are kept in a jam jar, but they will need to be fed. If starved they will soon turn on each other, and only one will survive.

C. E. C. Cole

THE AQUARIST



# Rhythm in the Underwater World

by

DR. J. L. CLOUDSLEY-THOMPSON

**R**HYTHMICITY is characteristic of nature. Summer follows winter, new moon follows old, day follows night. "So do flux and reflux—the rhythm of change," wrote Thomas Hardy, "alternate and persist in everything under the sky." Rhythm too is one of the more striking properties of living matter, whether it is considered on the level of cells, tissues, organs or whole organisms. A rhythm is apparent in the bursting of the contractile vacuole of *Amoeba*, in the lashing cilia of *Paramecium*, in the secretion of pancreatic cells and the beating of a human heart. Even in the deepest sea where all is still and silent, living organisms have their rhythms of hunger and feeding, growth and reproduction, life and death.

In a recent article (*The Aquarist*, vol. XVII, page 142, October, 1952), I discussed the diurnal rhythm of activity and sleep, of colour change and of retinal pigment migration in aquarium fishes: and in correspondence (page 149) suggested that a 24-hour cycle of temperature fluctuation may be of considerable ecological importance not only in accelerating development but in maintaining normal health. Since then there has been some support for my views. In this article I hope to extend these ideas; to show how fundamental to life is rhythmicity, and to emphasise its ubiquity. The aquarium is no exception to nature and consequently it presents us with many kinds of vital rhythm, the recognition of which can be of significance to the aquarist. Some of these are responses to external stimuli and are called "exogenous," while others are the innate periodicities of living matter and are known as "endogenous" rhythms.

## Cilia Rhythm

The ciliate *Paramecium* is a tiny unicellular animal (Protozoa), one of the main constituents of the Infusoria on which young fishes feed. It swims by the lashing of the little hair-like cilia with which its body is covered. These move independently of nervous impulse, for the stimulus that induces them to beat arises endogenously in the protoplasm of the cell. Cilia are found throughout the animal kingdom with the exception of certain groups such as the insects, and even occur on the cells of our own nasal tracts. In every case they beat in a regular manner known as "metachronal rhythm": the beat of the first cilium is followed by that of the one next to it, and so on.

Each bends slightly after its neighbour, the first one setting the pace like the stroke of the Cambridge "eight," the others following in time but increasingly out of phase. The effect is similar to that produced when a row of "toy soldiers" at the Royal Military Tournament falls to the ground; or when a gust of wind blows across a field of corn. There is a limit however, to the size of an animal that can move by means of cilia, and this limit must nearly be reached in planarians, which are sometimes to be seen gliding on the under surface of the water film. (See *The Aquarist*, vol. XI, page 276-277, December, 1946).

Larger animals, such as mussels and other bivalve shellfish, feed on small particles drawn into their bodies in the current set up by the beating of cilia on their gills. The size of the animals is limited here by the amount of food that can be obtained and transported in such a way, for only

small planktonic plants such as diatoms and desmids can be eaten. Consequently none reach a size exceeding that of the giant clams of the Great Barrier Reef. There are no exact figures for the amount of water filtered by our common mussels, but in a larger Californian species measuring some four to five inches in length, about 4½ pints of sea-water pass through the gill chambers every hour. So it is not surprising that even small bivalves do not survive for long in aquaria.

Turning aside from these lowly creatures, we find innate rhythms in plants which grow with little pulsations or jerks caused by rhythmical changes within their cells. The rhythm of the seasons is shown by the growth rings of trees no less than by the lines of growth on the shell of the freshwater mussel *Anodonta*, or the otoliths and scales of a fish. By counting these rings the age of the tree, mussel or fish can be approximately ascertained.

Lunar rhythms are of particular importance in the lives of marine animals on account of the effect that the moon has upon the tides. Molluscs, crabs and sea-urchins, for example, vary with the phases of the moon which determines the cycle of development of their reproductive organs. The "grunion," a small smelt that occurs on the sandy coast of California, comes ashore on the top of a wave to lay its eggs, and is carried out to sea again by a succeeding wave. The fishes appear in great numbers on the second, third and fourth nights after the full moon during the months of March to June, and are caught in thousands by people who assemble on the beaches for this purpose.

## Swimming of Fish

It is in the swimming of fishes that aquarium rhythm becomes most apparent. Fish swim by means of regular lateral undulations of their flexible bodies. The effect of these movements is increased by the median and paired fins which exert considerable leverage on the water and prevent side-slipping. This can be illustrated by comparing the swimming of an eel with that of a grass snake; the latter makes some progress, but much of the energy of its movements is wasted. Similarly an eel can move easily across a slippery board only if there are small projections present to give leverage to its body. Thus the propulsive forces that move a fish through the water are produced by the longitudinal muscles in its body. Only in exceptional cases is propulsion derived from the movements of the fins, whose function is normally to give stability and to control the direction of movement. In forward swimming the contraction of each block of muscles takes place after that of the muscles in front of it, and the rhythm can clearly be seen in long-bodied fishes such as eels, catfish and blennies. In other fishes the waves are not so obvious, but can be analysed by means of serial photographs. The number of these waves varies from 54 per minute in the dogfish to 170 or more in the mackerel.

The isolated spinal cord has been shown to initiate rhythmic swimming in the dogfish, and after transection of the nerve cord behind the brain, the posterior portion of the fish will exhibit continuous swimming movements for many days; for the rhythm is apparently controlled and inhibited by the brain. Dogfish and sharks (Elasmobranchs) do not possess air-bladders, and consequently are heavier than the water in which they swim. Their pectoral fins are relatively immobile, set at an angle to the horizontal and act as aerofoils, forcing the head upwards when the fish is in motion. This is compensated by the heterocercal tail whose lower

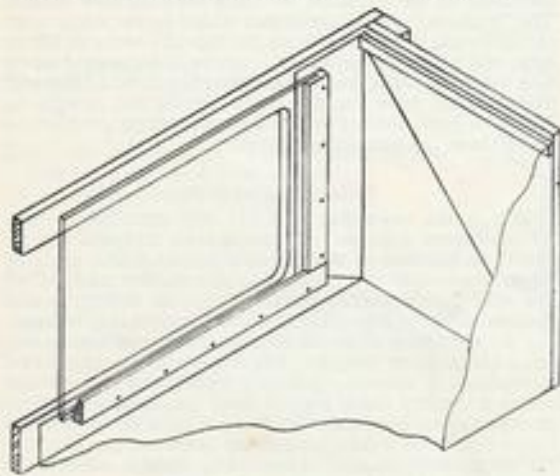
(Continued over page)

# Utilising Plastic for Aquarium Making

by G. B. HUGHES

HAVING read with interest a recent article on wooden aquaria I wondered whether anyone had tried a plastic aquarium. An all-glass aquarium for an alcove seemed a waste of good plate, so after some thought I hit on the following idea—why not make a plastic-lined box serve as an aquarium? The idea seemed a good one. I experimented and made an aquarium which served its purpose admirably. After several months I found the faults which as a beginner, I had made. The description below has been modified to remove these faults. If the instructions are carefully followed a perfect aquarium will be the result.

The materials required are:—Strong wooden box,  $L \times B \times H$ ; sheet of plate-glass ( $L-4 \text{ in.} \times H-2\frac{1}{2} \text{ in.}$ ); perspex, 1—( $L-4 \text{ in.} \times \frac{1}{2} \text{ in.} \times 1\frac{1}{4} \text{ in.}$ ), 2—( $H-2\frac{1}{2} \text{ in.} \times \frac{1}{2} \text{ in.} \times 1\frac{1}{4} \text{ in.}$ ); Alkathene sheet\* ( $B+2H \times B+H+3 \text{ in.}$ ); putty (metal frame); tile lath; screws, nuts and bolts.



A view inside the aquarium from the back showing plastic-lined interior and glass fitting

First the window is cut out of the wooden box. A clearance of three inches at each end, one at the top and two at the bottom is ample. For appearance rounded corners are best. The inside should now be painted with two or three coats, finishing with a gloss paint. This will prevent warping if and when condensation occurs. The plastic sheet should now be cut to shape—a paper pattern is a good safeguard here. The sheet should not be cut at the corners but folded so that the spare is on the side nearest to the wood. The diagonal line shown on one side in the diagram is the bottom of this fold, the other goes from the bottom of the corner of the window to the other corner. Pin this in place with drawing pins above the water line.

Now cut the perspex to the required lengths. A rebate should be cut on one face, the thickness of the glass deep

\* Alkathene Sheet (Poly-vinyl Chloride) is used for making plastic raincoats.

and three-quarters of an inch wide. Drill holes in both the box and perspex to keep the perspex in place. If two holes are drilled first and the perspex bolted in place, the following holes are sure to coincide in both materials. The holes should be just wider than the bolts, placed every three inches along the face, countersunk to receive the nut in the wood and the bolt head in the perspex. When this has been done we are ready to fix the glass.

## Fixing the Glass

Freshly paint the inside of the box around the opening, place a thin layer of putty on this, paint the putty and place the plastic sheet on this. For  $1\frac{1}{4}$  inches round the edges paint the sheet, cover this with a layer of putty and paint the putty. Paint and putty the rebate and one face of the three pieces of perspex. Lightly bolt the perspex in place, slide in the glass and tighten up the bolts. Leave for some days to allow the putty to harden.

When the putty is hard, trim away the putty and plastic from the outside of the frame and the inside of the glass. A tile lath is placed round the top edge of the box to keep the plastic sheet in place. The outside of the box can now be smoothed off, the nut holes filled with putty and the whole given a gloss finish.

When the tank is set up, place the thermostat and heater leads so that they are hidden by the wooden facing. Glass rods placed in the back corners prevent fry or small fish slipping behind the fold whence they cannot return. My tank is placed on one cupboard and below another, the two being in a recess. The spaces at the top and side are screened off with curtaining. Placed in this position it makes a very attractive wall tank.

## Rhythm in the Underwater World

(Continued from the preceding page)

lobe is the more flexible, and produces a vertical lift force in swimming.

Teleosts however, have evolved swim-bladders with which their density is regulated so that they can maintain themselves at any given level in the water without muscular effort. The pectoral fins are therefore freed from their lifting function and can be used as brakes and for more delicate control. Also in some fishes they may become secondarily adapted for locomotion and other purposes which I hope to discuss in a later article.

## Rhythm and Beauty

From this it can be seen that the swimming of fishes is essentially rhythmic; which explains why it is so fascinating to watch. In his Reith Lectures for 1950, Professor J. Z. Young pointed out that nerve impulses arriving at the central nervous system in a disorderly way produce sensations of pain. Conversely rhythmic stimuli are associated with pleasure and relaxation. This no doubt is why aquaria are so much appreciated for the relief they afford to patients in hospitals and others who are suffering from mental or physical anguish. It is worth remembering that aesthetic pleasures arise from causes that are essentially rhythmic: light and colour, music and poetry. For the essence of beauty lies in its rhythm and harmony. Fishes are beautiful on account of their symmetry and the rhythm of their movements. As Penelope (in Homer) said of her geese: "It cheers me to look at them."

## AQUARIST AT HOME:

Mr. J. Grice

(BURNLEY)

Interviewed by JAS. STOTT

I LOOKED in at the annual show of the Burnley Society which was held in June and whilst browsing around the exhibits I was attracted by a *Copeina arnoldi* which gained a second prize in its class. It was a grand fish showing good colour and development. Upon consulting the lists I noticed that this exhibit was by Mr. J. Grice of Burnley, Lancs. This immediately aroused my curiosity because I had heard rumours that Mr. Grice, who I have known for a few years as a keen guppy enthusiast, had begun to concentrate his attentions in a serious way on one or two other species. Was *C. arnoldi* one of these I wondered?

My curiosity now thoroughly aroused, I turned my attentions away from the exhibits and concentrated on the task of running friend Grice to earth; not an easy task by any means because this aquarist is the show manager of the Burnley A.S. and, when in action during a show is a restless soul, forever on the prowl in an attempt to keep the wheels of showdom turning smoothly. Possessed of definite ideas about how his job in this capacity should be undertaken he also has the determination and drive to see that they are carried out with proficiency.

Eventually, I succeeded in my task, and finding a quiet spot we exchanged news and then got on to the subject of *Copeina arnoldi*. What Mr. Grice had to tell me about this caused me to reach for pencil and paper and jot down some notes. So this month it is really a case of "Aquarist Not at Home" but in a quiet corner behind the scenes at an exhibition.

### Copeina arnoldi Breeding

It appeared that Mr. Grice is now breeding *C. arnoldi* seriously as a speciality and with repeated success. He has a range of breeding tanks for this purpose which are in size 18 ins. by 10 ins. by 10 ins. and fitted in two banks of four so staged as to allow a length of fluorescent tube lighting to be fixed vertically between the two banks, thus providing end lighting to each tank and a percentage of top lighting shining through the cover glass at an angle. They are planted with *Vallisneria* which has previously been grown in other tanks containing very shallow water to obtain shortened, matted growth.

The water used in the breeding tanks at a temperature of 80° F., is old, matured and slightly acid. A depth of six inches is allowed. One piece of rock is provided, offering a slightly inclined, rough surface and this must be large or long enough to protrude clear of the water depth and well up to the top of the tank. It is placed at the far end of the tank close up to the end panel away from the light source.

Several adults are run together in a large tank and conditioning is commenced by feeding heavily with small white worms. The fishes are kept under observation and natural selection is permitted by the sexes. When it is seen that pairing has taken place and the females are heavy with spawn the breeding pairs are placed into the prepared breeding tanks, one pair to each tank of course. This is carried out in the evening and spawning usually occurs the following day. Before spawning the males generally make what may be described as a few practice leaps above the surface of the water, a sign that the actual spawning is imminent.

The eggs are deposited on the sloping surface of the rock above the water surface and the entire spawning of eggs usually covers an area no larger than a half-penny piece. After the spawning is completed the breeders are left in the tank and the male, in particular, will splash the eggs with water from time to time—an essential action for the well-being of the eggs. When the fry are about to emerge from the eggs the young can be seen quite easily, vigorously moving about inside the egg case. Shortly after hatching the young will commence to gradually move their way down the sloping surface of the rock getting nearer the water line over a period of time. When they reach the water surface they slip away from the rock and enter the water, after which they sink to the bottom to remain hidden among the plants and gravel for three or four days; at this stage Mr. Grice removes the adults.

Infusoria and green water feeding is commenced two days after hatching. Mr. Grice considers that green water is as essential, with early feeding, as Infusoria for successful rearing. The fry are usually freely swimming around and shoaling in about a week. Towards the end of the second week the youngsters are given micro worms and, as growth indicates, are gradually moved on to brine shrimp. Mr. Grice informed me that in his opinion they are not what one may consider as fast growers, but good feeding will keep up a steady growth and the temperature should not be taken above 80° F., in an attempt to force the rate of growth. After the first month the temperature may be gradually reduced to around 75° F., which is a reasonable temperature for stock tanks containing *C. arnoldi*.

## Aquarium Picture



Reduction in black and white of "Veiltail Goldfish"

THE scene reproduced above in black and white has been photographed from a picture in colour by the artist, Mr. Cedric Chater. Its title is "Veiltail Goldfish," and the picture shows three adult veiltails in an aquarium planted with *Vallisneria*, *Ludwigia* and *Nuphar*, with a small *Cryptocoryne* plant in the foreground. The general effect and colour portrayal are most natural, the vivid orange-red of the fish contrasting beautifully with the varied greens of the plants, and the picture is one which would form a very attractive home decoration, especially in the home of an aquarist. Best effect is given by mounting the picture in a deep section frame so that it is set back from the glass, the result under artificial illumination being particularly "aquarium-like." Prints of "Veiltail Goldfish" (size 18 ins. by 14 ins., on a sheet 25 ins. by 20 ins.) are obtainable from The Medici Society Ltd., 34-42, Pentonville Road, London, N.1 (reference number MAS 183), price 20s. 8d. each.



1. Adult male twintail goldfish aged 3½ years



2. Adult female twintail goldfish aged 2 years



3. Young veiltail goldfish aged 9 months

## Pedigree Twintails?

by N. E. PERKINS

(Photographs by Laurence E. Perkins)

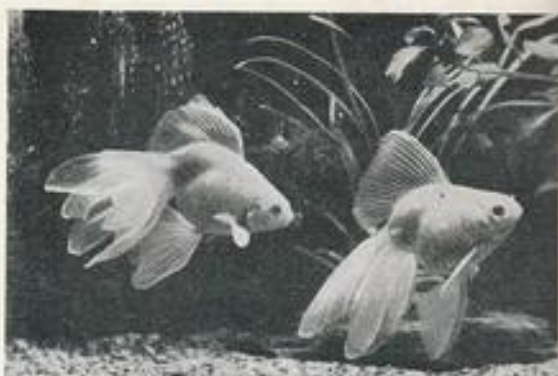
OF those people who like to do things (there are others, of course) it may be said that they always strive after the unattainable and are never satisfied with their achievements however successful these may appear in the eyes of others. Actually, if they were to think about it they would not have it otherwise for it is the journey that is important and enjoyable to us humans; the goal is but the reason for the journey.

The breeding of twintail goldfish amply covers these requirements. It is the most disappointing and, at the same time, the most enthralling hobby—certainly not to be attempted by anyone expecting quick results. My first experience with these fish was with specimens of unknown parentage and their subsequent offspring led me to believe that they were not of a pure strain. After many years, during which time I have introduced specimens of known lineage, I realise that my first fish were not so bad after all but that, however good the strain, the percentage of specimen offspring is astoundingly low.

### What is a Twintail?

Some breeders can be heard to remark that their twintails produce 50 or 75 per cent. true offspring. Well, that all depends, of course, on what one is prepared to consider a twintail. Personally, I have had many spawnings where all the fry were double-tailed, nymphs being entirely absent, but it was soon apparent that many of these fish would be but poor apologies for the real thing, and the final number that could truthfully be described as twintails has brought the percentage down to as little as 5 per cent. Of these, many could only be described as poor, with the body too long, the back too flat, dorsal too small or, perhaps, with the two anals set at different angles. This, by the way, suggests another point: a fish with but a single anal fin is not a show fish in the true sense. Admittedly it can be shown and will, in many societies, be penalised by only a small loss in marks. To the keen breeder, however, it is a sign of retrogression and should not be used for breeding.

I have deliberately not mentioned colour as a fault. I do



4. Adult pair of self orange fish aged 2 years

not consider that these fish are sufficiently good in shape and finnage as yet that we can afford to penalise an otherwise good specimen because of its colour. In any event, practically nothing is known of the mysteries of colour in goldfish and having had blue and black fish turn pink and pink fish become mottled and quite dark, I, personally, am not prepared to discard a specimen merely because it is pale in colour.

After culling the poorer specimens of a spawning so that the original number has been reduced to a mere two dozen, the interest rises as the chosen few develop. Frequently some of the best are ruined by attacks on their fins by a type of fluke. The activities of this trematode can cause large pieces of the caudal fins to shear off, the fin rays having been partially severed by the ravages of these creatures. Curling of the fin-tips, including those of the caudal, is usually hereditary but can be caused by flukes.

As the fish approach adult size, the breeder realises that the early signs of promise have not altogether been manifested and the specimens, although passable, do not approach that perfect type which exists solely in his mind's eye. Gone is his enthusiasm for those youngsters but in its place come schemes and plans for the following ones. He will now dream of the youngsters which may be obtained



6. Group of young veiltails, all about 8 months

from crossings made from these youngsters and may decide to mate some back to their parent in order to accentuate some desirable feature.

Some breeders think it a bad policy to breed from yearlings but if ready to spawn, spawn they will even if they have to knock out their own ova by dint of wild dashes around the tank. Females kept together will assist one another in this operation whilst males kept together will alternately chase one another also. This being so, if I find a youngster ready to breed then I see that it breeds according to plan unless I am disinterested in its offspring. The idea that this stunts the growth of the fish I have not found substantiated in fact.

To attempt to produce so many varied characteristics to a standard, especially when all are at variance with natural tendencies, is obviously no mean task. The result, so far removed from the original *Carassius auratus*, must, necessarily, be a fish of less powers of resistance and practically incapable of survival, in that form, under natural conditions. The breeder should, therefore, pay particular attention to the virility and constitution of his stock and to attempt, at all times, to harden rather than coddle them.

It is stated in many books on the subject that these fish require a constant temperature of from 60° to 65° F. This is only true if you allow it to become so. Properly



5. Adult female metallic goldfish aged 2 years

handled and selected they will winter under ice and even long periods at very low temperatures will affect no greater percentage than would be the case with common goldfish.

The point to remember about wintering any fish out of doors is that the pond must be deep. My pond is 4 ft. 6 ins. in depth and, were I more fortunately placed, I will say, without hesitation, that I should increase this to 6 ft. The lower regions will not fall below 37.5° F. even though there be a foot of ice on the surface.

Looking through the illustrations, which are numbered in order of precedence, I suppose I have made some small progress and can say that my present stock is a great deal more hardy than was the case when I first started. My only regret is that the photography does not extend over the full period.

I have found the photographs of inestimable value, for our memory of things long past is really very poor. Sometimes I have mislaid a print and in its absence have assessed some youngster by comparison with that particular fish only to find, when eventually the print turned up, that my assessment, based on memory, had been useless. When I hear remarks concerning the wonderful twintails which existed between the wars I often think what a pity it is that we have no photographic record of these amazing specimens.



7. Aquarium of mixed adult veiltails aged from 1 to 7 years

# Visual Aids for Aquarists' Society Meetings

by ROY WHITEHEAD

THE term "visual aids" is to-day generally considered to embrace the following mechanical contrivances: (1) The Episcopes; (2) the Diascope; (3) the Epidiascope; (4) the film-strip projector; (5) film projectors, silent and sound.

Few clubs or societies are able to own any of these equipments, as the cost ranges from about £12 for the simple strip projector up to several hundred pounds for a sound-equipped film projector. Fortunately, local education authorities are usually very helpful in these matters and it is possible to borrow or hire equipment at nominal charges. For instance, the writer has arranged on several occasions for the loan of a 16 mm. sound projector together with the services of a skilled operator for the most reasonable fee of £1. This particular authority has also loaned its simpler equipments at no charge whatsoever.

Many education departments also own small libraries of films, film-strips and slides and it is well worth while to enquire if any are suitable for your purpose. In this way considerable savings can be made both on equipment and film hire charges. When dealing with a commercial film library it is customary for the hirer to pay return postages and registration fees on all films borrowed. For an evening's entertainment postages and registration might amount to 15s., which together with the various hire charges can be a formidable item to a small society working to a tight budget. Local microscope and film societies may also have suitable material and these sources should not be disregarded.

## Projection Equipment

*The Episcopes.*—The episcopes project a reflected image and it is therefore necessary for the room to be completely blacked out. The one great advantage of this instrument is that any photographs, drawings, pictures from books, etc., can be projected. A speaker using these to illustrate his talk does not have to wait until everyone has seen the particular illustration and the flow of his talk is not interrupted.

*The Diascope.*—The diascope, or "magic" lantern, is almost universally known and is used for the projection of lantern slides. Sets of slides can be hired or borrowed but the writer has no information on slides suitable for exhibition to the aquarist. Slides can be made by those with a photographic turn of mind and simple diagrammatic slides are quickly produced with the medium of photographic opaque. A clear sketch or diagram of the subject should first be made and then carefully traced on to a glass slide using a fine pen and the opaque. Many lecturers possess sets of slides illustrating their pet subjects and enquiries should be made about this point when making arrangements for visiting speakers. The diascope has the advantage that it can be used in normal daylight.

*The Epidiascope.*—This instrument consists of a combination of the diascope and the episcopes. Although it is useful to have the two combined in the one apparatus it does not make for an easily transportable equipment, being both heavy and bulky.

*The Film-strip Projector.*—The advantages of this apparatus are that it is not heavy to carry, it is simple in action, complete blackout is not necessary, and as the picture can be projected on to any light surface a special screen is not essential. Film-strips are not normally

available for hire but have to be purchased at prices ranging from 3s. 6d. up to about 15s. The film is in the 35 mm. size and shows a number of "frames" or still pictures. Strips are obtainable dealing with setting-up an aquarium, and pond, stream and sea-shore life. Notes are usually provided, divided into sections, one for each frame. It is advisable that the person who is entrusted to read the notes should carefully study them together with the film so that he is prepared to answer any questions that may arise.

## Films

*The Film Projector.*—A fair selection of sound and silent films suitable for exhibition to aquarist societies can now be obtained at hire charges of between 5s. and 10s., depending on the running time. Films available are almost always of the 16 mm. size and have running times of 10 to 20 minutes. Subjects include pond life, marine and coldwater fishes; the writer has yet to find one dealing with tropical fishes with the possible exception of the Harrow Aquarist Club colour film, which includes some very fine shots of various tropicals. (A fine film on breeding the brown acara has been made by Dr. F. N. Ghadially—*Editor*.) One disadvantage in the use of the film projector is the need for an almost complete blackout. It is therefore a good plan to arrange film shows for the winter months of the year. Where there is a choice of silent or sound films on the same subject it has been noted that those with the sound track are much more enthusiastically received and are well worth the few shillings extra hire charge.

Visual aids can be a valuable asset in the activities of an aquarist society but they should be used with foresight and intelligence. Thus, the episcopes, the epidiascope and even the film-strip projector are best when used in conjunction with an expert lecturer. Sound and silent films should be carefully chosen, if possible advice being sought from a society experienced in these matters, as film titles can be very misleading.

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## Albino Fighting Fish

NEWEST addition to the list of albino fishes amongst aquarium species promises to be the Siamese fighting fish, if breeding efforts in the U.S.A. are successful. Amongst the fighting fish stock of Mr. Gene Wolfshelmer of California, appeared by chance a fish with red eyes, a pinkish-red body and silver-streaked fins. From colour pictures made of this specimen it was identified by Dr. Myron Gordon, geneticist to the New York Aquarium, as a true albino fish.

In a report to *The Indian Aquarist* Mr. Wolfshelmer describes his attempts to breed from this albino fighting fish. Difficulties arose because the fish, a male, possesses poor vision; although it built bubble nests females did not remain within its field of sight long enough to stimulate the male to mating activity. This problem was overcome by confining the pair in a small aquarium to the area immediately beneath the nest by a glass partition, and a fertile spawning resulted. From this about 50 fry were obtained. No albino fish are present among these first generation offspring of course, but it is hoped that in them or in later young from the albino male parent will be fish which will again produce albino second generation young when mated brother to sister or back to the male.

## OUR EXPERTS' ANSWERS TO READERS' QUERIES

I have decided to construct a wooden aquarium in which to keep tropical fish. Please can you tell me what sort of wood I should use?

We advise you to choose well-seasoned mahogany, teak, oak or elm. Do not paint the inside of the frame, but make sure that the aquarium is given a good soaking and many changes of water before any fish are introduced into it.

I am thinking of using a two-foot fluorescent tube to light my aquarium. Will the plants grow well under the bright white light?

Plants and fish always seem to look better and flourish better under the yellow light given by ordinary electric lamps. If you intend to use fluorescent lighting, choose a tube that emits a soft yellow or pinkish light rather than one giving a cold-looking white light.

My aquarium turns green however much I clean it out and change the water. Can you please tell me how to get the water clear?

Green water is usually caused by too much light entering the aquarium from the top or sides. New water often turns green, and every time you add fresh water from the tap you make matters worse. Our advice to you is to plant more rooted plants along the back and ends of the aquarium, and refrain from adding new water from a tap. In time, the water will clear of its own accord. Meanwhile, keep the bottom clean, and do not feed the fish with too much dried food. Sometimes sheets of tissue paper stuck to the back and ends of an aquarium will help to get rid of green water within a week or so.

I should very much like to breed some albino swordtails. Can you please tell me the best way to achieve my ambition? I am a beginner in tropical fishkeeping.

Place the fish in a tank by themselves. Provide plenty of bushy-leaved plants, and keep the water on the shallow side, say, about six or seven inches deep. Feed the fish with live food or scraped red meat, and maintain a temperature of about 78° F. You will know when the female fish is going to have some young by her plump appearance, and a dark patch showing in the region of the vent. When the fry have been dropped, it would be wise to remove one or both of the parent fish to another aquarium. The baby fish will need dust-fine dried food, powdered hard-boiled yolk of egg or small live food such as micro worms.

For some months now I have kept a female fighting fish in my community aquarium, but lately she has behaved so badly towards the other fishes that I have had to remove her to fresh quarters. A friend has told me that the fish is not a thoroughbred. Would this account for her unruly behaviour?

Fighting fish, paradise fish and the like are well known for their erratic tempers and untrustworthiness in a community tank populated by small fishes. Fighting fish are best kept on their own, or in an aquarium containing species as large or larger than themselves.

I have a 24 ins. by 12 ins. by 12 ins. aquarium heated by a 100-watt heater. At the side of this aquarium I have a smaller tank, measuring 12 ins. by 9 ins. by 9 ins. This is heated by a 25-watt heater. When I connected a thermostat up and placed it in the large aquarium the small one became too warm. When I reversed the order, the large one became too cool. Can you tell me how to get over my difficulty?

You must adjust your thermostat so that it keeps the small aquarium at a temperature of about 78° to 80° F. That is, use the small aquarium as the control tank. If you do this you will find that the water in your large aquarium will keep within a range of about 75° to 80° F. You must remember that the small tank will warm up more quickly than the larger one, and consequently the thermostat will click on and off quite frequently during the course of a day. But so

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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.

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long as the temperature of the large tank does not fall below 72° F. or so there is no need to worry.

I have a 20 ins. by 8 ins. by 12 ins. aquarium. Can you please tell me how many tropical fishes I could keep in it without running the risk of overcrowding?

Your aquarium should support about 20 fishes of medium size, or say the size of full-grown neon tetras. Artificial aeration would allow you to keep a larger number, but a lot of fish in a small aquarium gives little chance for the fish to reach their maximum size or show their best colours.

The heater in my aquarium is controlled by a thermostat. The water temperature fluctuates by about six degrees. Will this fluctuation prove harmful to the fish?

A variation of a few degrees in every 24 hours is good for fish. It is a sudden rise or fall in temperature which does harm. In their natural surroundings, fish often experience a drop of several degrees after sundown. Fish kept at one temperature week in and week out seldom survive a power-cut or short sojourn in cool water.

I should like to try and breed my neon tetras. Can you tell me the sort of conditions they like, please?

We must say at once that neon tetras are not easy to breed, and even aquarists with many years of experience in breeding tropicals are not always successful with them. They prefer shady conditions, acid water, a clean bottom and a temperature of about 75° to 78° F. Water depth should average about eight inches. Plants such as fine-leaved willow moss or dwarf sagittaria should be grown in clumps at both ends and about the middle of the aquarium. Condition the fish before placing them in the breeding tank by feeding them with plenty of *Daphnia*, brine shrimps or small white worms.

I should like to have the water in my tropical aquarium coloured blue such as is seen in tropical waters. How can I achieve my wish without harming the fishes?

We do not like to disillusion you, but very few, if any, tropical freshwater fishes inhabit blue-tinted waters. For instance, the Amazon river is clayey or muddy coloured for much of its length; most of the forest pools and streams are clear or amber-tinted; while quite a number of our popular fishes come from waters which are definitely muddy. The blue waters of the tropics are usually those which are salt—the coastal waters just off-shore of Florida, for instance, or California, or Haiti and similar palm-fringed or coral-ringed regions of the world. If you want to go forward with your idea, try inserting a sheet of blue-tinted glass between your top-light and the surface of the water. But you will soon discover that a blue light in the aquarium does not suit the plant life, and the fish do not look anywhere so attractive as they do under a yellow light. In fact, blue light makes an aquarium look very cold and far from "tropical."

A few months ago I bought a pair of swordtails. The female was larger than the male, and I was looking forward to the time when she would give birth to some young ones. But before long the bottom rays of her caudal fin lengthened into a "sword" and her anal fin changed its shape. From all appearances, my

female appears to have changed into a male. Is this a rare event in the aquarium?

Some fishes often change their sex. But so far as we can ascertain, the change is always from female into male, and not the other way about. Mollys, swordtails, platys and *Heterandria* are well known for changing their sex.

As a beginner in tropical fishkeeping I should appreciate your views on treating white spot disease. When this disease attacked the fish in my aquarium I treated the water with several different chemicals, but the fish died. Now I have been told that sometimes chemicals added to aquarium water upset the fish. Is this true?

In the hands of a beginner certain white spot "cures" can be a source of danger to fishes. An overdose of any one of them may harm the internal organs of a fish, or damage the gill membranes. Heat alone will usually cure white spot disease; that is, if extra heat is given the moment the tell-tale spots are seen on a fish. Just raise the temperature a few degrees above normal and keep it that way for a fortnight or so. If the spots do not clear away quickly give a little more heat—but do not boil the fish. In the meantime, keep the bottom of the water siphoned of all sediment, and feed

the fish with a much-liked live food to build up their resistance against the disease.

I have a tank measuring 36 ins. by 15 ins. by 12 ins. glazed with 24 oz. glass. I have been told this weight of glass is too thin for a tank holding so much water. Is this correct?

The information you have been given is right. You need 32 oz. glass or thicker. Thin glass is likely to crack with a sudden change of temperature, when rockwork is placed in the aquarium, or even at the slightest jar of the stand or table on which the aquarium rests.

I have some species of cichlids which have been fed for several weeks on pieces of earthworm. Now, although they look perfectly healthy, they seem uninterested in their food. Do you think there is anything wrong with the fish?

Cichlids often go off their food for short periods of time, and no harm results. It is possible that they get tired of the same food day in and day out and need a change. Stop feeding them for a day or two, and then resume with something entirely different such as tiny pieces of lean red meat, cooked mussel and the like.

## COLDWATER FISHKEEPING QUERIES answered by A. BOARDER

I took a number of eggs from my pond and have hatched out a number of goldfish. The fry were placed in a tank but most of them were destroyed by *Hydra*. Can I do anything to kill the *Hydra*?

There is no doubt that *Hydra* can eat many fry soon after they are hatched. You say they do not appear to harm the older fish, and I know that this is correct, but at what age the fry have to be safe from attacks I am not sure. As soon as they have reached about half an inch in length over all I consider that the *Hydra* would not be able to harm them. It is possible that the fish could eat the *Hydra* when they grew up a little. *Hydra* were undoubtedly introduced with the water plants and it is not easy to get rid of them, especially in a tank where you have fry. Anything strong enough to kill *Hydra* would probably also kill the fry. I have found that the best method of rearing goldfish fry which have been hatched in a tank from eggs laid on water plants, is to remove the fry from the hatching tank as soon as they are free-swimming.

You should thoroughly cleanse and disinfect a fresh tank and fill with tap water as soon as the fry hatch. Leave to mature for a couple of days and then transfer as many fry as you can to the new tank. They may be caught by dipping an enamelled bowl under them. Pour off as much water from them as possible and examine carefully to see that there are no free floating *Hydra*. These will look like tiny bits of brownish jelly which are capable of extending small tentacle-like feelers with which they catch their prey. At the same time see that there are no other pests present, such as newt larvae, larvae of dragon flies or water beetles. By this method you should be able to see that the fry have a safe start. When you do introduce some water plants see that they have been sterilised well by placing them in a solution of Dettol and water, a half teaspoonful to the gallon of water.

I should be obliged if you could identify a form of life which has appeared in my tank after the death of a fish from fungus. It is in the form of an arrow head and swims with a flitting movement. Is it safe to introduce fresh fish to the water?

The organism in the tank would be *Cyclops*. These look something like small barrage balloons and jerk about in the water as you describe. They are harmless to fish out of the fry stage and in fact are quite good food for fishes large enough to take them.

I have a shubunkin which has a large black eye, do you think that it is blind in that eye and can I do anything about it?

Many shubunkins have black eyes and they are not blind. The eye of the shubunkin should be normal, that is, with a coloured iris. There appears to be a tendency for some fish to develop this all-black eye, especially those which are very pale in colour. It is not a desirable feature but there is nothing you can do to alter it. The fish should not suffer in health because of this, but should not be used for breeding.

I had a goldfish which had fin-rot. I put it in a solution of salt water but after a minute or so it started shivering and so I took it out. Was the salt too strong?

A good solution of salt for fin-rot cure is a tablespoon (heaped) of sea salt to a gallon of water. You should place the fish in the water and then add the salt. Do not stir the water after you have added the salt but allow this to dissolve gradually. By this means you are making the solution more saline over a period and the fish will not be as likely to be affected as if you had placed it straight into the salt solution in strength.

Our club is about to start a series of table shows and as we are far from any known judges we wish to get some information as to the pointing of the fish. What can we get which will help us?

Strangely enough yours is the third query of a similar nature to reach me by the same post. I quite understand your difficulty as I know how hard it is to obtain judges, especially for table shows. In my own case I have to travel about so much now lecturing and judging that my own fish are absolutely left to their own devices; although this may be all right for adult fish, I find it impossible to rear fry unless I am with them most of the time. Your best plan is to send for the booklet *Standards for Cultivated Fish*, which you can get for 2s. 8d. post paid from Mr. R. O. B. List (Hon. Secretary), Federation of British Aquatic Societies, 1 Coronation Court, Willesden Lane, London, N.W.6. This booklet gives the pointing for the various types of goldfish recognised by the F.B.A.S. and also the other coldwater fishes which have been cultivated or are not as natural. Also the tropical livebearers and the fighting fish are dealt with. When you have studied this book well, get a number of fish in tanks to be judged and ask some of your older established breeders to judge them. By comparing the fish with the line drawings in the book and pointing up as directed it is surprising how soon a good aquarist can make a good show at judging. It is a great help if the judges have been successful exhibitors to start



with, as I am certain that once a man has had plenty of practice showing and winning with his fish he is in a much better position to judge others. It is also a big advantage if the judge has had actual experience of keeping and breeding the types of fishes he has to judge.

**Would you please give me some advice on the breeding of meal worms?**

The meal worm is the larvae of a small beetle (*Tenebrio molitor*), and it can be fed on such cereals as bran. The beetles pair and then lay the eggs. From these the meal worms hatch out and then feed on bran or flour. After feeding for a considerable time the larva pupates or turns into a chrysalis from which emerges the beetle. You can buy some meal worms for a start and place them in a box of bran. Keep it covered and the worms will grow. It will take you some time to breed enough worms to be of use; however, if you have plenty of patience that is the main thing.

**I am moving into a new council house in the near future. Will the tap water from newly laid pipes be injurious to my fish?**

It is impossible to say for sure as I do not know what types of metal are used for the pipes. If the water has to run through copper pipes it can be deadly. Never mind what other people may try to tell you about this, I have had actual experience of water from copper pipes killing fish, and I am not the only one by any means. That some cases have not been harmful I am well aware, but one of these days something may happen to upset the water and then trouble can come quickly. If the pipes are the usual ones I do not think that there will be any harm from them. I always think that it is a good plan when drawing water from pipes for fish, to use water after a considerable quantity has been run off. Water lying in a new pipe might get fouled a bit but if this has been run off the water should be all right. If there is a hot water circulating system it is better to take the water after it has gone through this.

**Do you recommend any form of compost for plant life in aquariums; if so of what type?**

For the set-up tank I certainly consider that some form of compost should form the base of the tank. For a breeding tank I do not think it necessary or even advisable. In the latter case hornwort can be used as a spawning medium as this makes no roots. For a set-up tank I suggest that you use a fairly coarse sand, such as Leighton sand. This is sharp and not too fine. It is there for effect as well as anchorage for the plants. Place sufficient of the well-washed sand to cover the base with the depth about three inches at the back and level with the top of the frame in the front. Do not pile it up against the front of the glass as it looks bad and reduces the available picture from the front view. The sand is not supposed to provide the plants with nourishment, as this will come from the droppings of the fish and perhaps from decaying foods. If you feed the plants too much they will not do their job of helping to keep the water clear.

**I am considering building an outdoor pond and wish to have a plate-glass window in front for inspection purposes. The pond will be a raised one. What is the best method of fitting the glass?**

When making the front side of the pond you must make a strong frame of wood to set in the concrete, which can be removed when the concrete has set. This frame must have a ridge to it for the glass to fit into as it does in a tank. Paint this piece of timber with oil (old car oil is good for this), so that the concrete does not stick to it. See that there is sufficient space left above the window for a strong cross-piece of concrete, like a lintel. When the concrete has set fix the glass in position with one of the mastic or bitumastic composites which are on the market. You can then fill the pond and the weight of water pressing on the glass will make a good seal.

**What is a safe temperature for coldwater fish? I find that since the warmer weather my tank has gone up to 70° F. in an unheated room. There are golden orfe, bitterling and catfish in the tank.**

I do not think that your fish will come to any harm if the temperature does not go much above 70° F. It is difficult to give a safe margin as you request as so much depends on the size of the fish and the tank and also how many fish are in it. It is a well known fact that water loses some of its oxygen when the water temperature rises and it is quite possible to kill fishes by gradually raising the temperature of the water above the eighties. Golden orfe are the first of your fish to suffer from lack of oxygen and they are not at all comfortable in a tank once the water warms up to 75° F. or over. If your tank gets no direct sun and the room is unheated you should have no trouble as long as the fish are not overcrowded.

**My coldwater tank contains three varieties of snails which appeared to be thriving. About a week ago I purchased three red ramshorn snails and I now notice that almost all the snails have small whitish worms on their flesh. They are quite small and are embedded in the soft part of the snails' heads and feet. The worms appear to be able to withdraw into the snail and then reach out again waving about in all directions. Will they harm the snails and what can I do about them?**

These worms appear to be a form of leech or flat worm and I think that they may prove harmful to the snails. They are going to be difficult to clear as I have found that most water snails are soon in trouble if the water is at all impure. Therefore any disinfectant which you might add to kill the worms might easily kill the snails. I would be inclined to kill all the snails and thoroughly disinfect the tank before introducing any more. In any case I cannot see that the snails can do much good. They take some oxygen from the water, eat some of the fishes' food and some kinds eat the water plants. The little value from eggs or newly hatched young as food for fish is very small.

**I have a pond in the garden with about two inches of sand at the bottom. All my attempts to grow plants have failed and the water turns green in no time. Will you please tell me which plants to grow and how much loam to use?**

I do not advise that you place any loam or sand in the bottom of the pond. I think that it is better left clear so that it can have a good scrub out each autumn. A better plan is to plant the water plants in pots or similar receptacles so that they can be easily removed when the pond is emptied. A good strong growing plant for your purpose is *Egeria densa* and another is *Lagarosiphon major*. These usually make rapid growth once they get established. There can be a little loam in the pot but cover this with large stones so that the fish cannot root about in the soil. The plant will soon send out plenty of roots outside the pot into the water when these roots will be able to do their job of using up some of the waste matter in the pond. Once the plants are growing they will tend to crowd out the algae which is making the water so green.

**When I came from holiday my goldfish had turned quite silver with only a trace of gold on it. Will it stay silver or can it regain its colour?**

I have found that when a scaled fish turns from gold to silver it rarely goes back to red again. I have noticed with some fishes that a patch of silver appears one year but the following year this has greatly increased in size. Each year these fish get more silver and less gold; I have not had a fish turn from silver to gold again. I have a strain of red fantails and sometimes a few youngsters will have a small piece of silver on the tail or dorsal; sometimes a patch is shown under the chin. This silver never disappears but often extends. I have bred a fish from my strain which is completely silver except for a slight touch of gold on the tail. This shows how fishes can throw back and this is what has happened to your fish, unless of course it has come from a shubunkin stock, when there would be every tendency to turn pale.

## IN THE Water Garden—by Dr. W. E. SHEWELL-COOPER

AS the Director of the Horticultural Educational and Advisory Bureau, it can be imagined that I receive letters from all parts of Great Britain, and sometimes from much farther away. Very often I am asked to give the names of plants which will be permanent. People tell me they don't want to be sowing seeds every year, or to be having to replace specimens that have died during the winter. They naturally want their garden to give as little trouble as possible.

It isn't, of course, advisable to look upon any plant as permanent, other than of course the trees in the garden, or the larger shrubs. It is true that water lilies may go on for generations, but after some time they are apt to be a nuisance, for they so mass in the pool that nothing else will grow. I was at a garden only a few days ago when the owner begged me to tell him how he could get rid of his water lilies! However, one can say that some plants are more permanent than others, and those who want to have a beautiful border near their pool, or who have ideas about herbaceous drifts leading down to the water, should certainly consider planting the dwarfier types of perennials, because these need no staking and they will last in the border for a large number of years without being disturbed.

I want, therefore, to choose the plants which are easy to manage. They'll be selected from all the varying types and some will be more suitable for limey gardens and others for those which have the normal acid or almost acid soils. Take the irises as an example. There's *Iris tectorium*, which only grows nine inches high, and loves to grow in rich limey soil in sun. The flower is crinkled, purple and crested. *I. unguicularis* will bloom from October to March if it's given a nice warm spot, say at the base of a wall where there's shelter, and it produces lovely flowers on stems 18 inches tall.

### Something for Acid Soil

If you've acid soil that is rather on the light side, you must grow lupins. They make a wonderful colour display in May and June. Susan of York is a terracotta and yellow; Lady Wilfred Thompson is a clear rose pink with a pale yellow standard; Josephine, on the other hand, is a powder blue, while City of York is a flame red tinted with orange. There are lots of different kinds of the Russells to choose from, and it's very interesting to study a catalogue and make your own choice.

The dwarf hybrid asters will grow in almost any garden and make their show in September and October. None of them grow higher than a foot and varieties like Victor, a lavender blue, are only six inches high. Blue Baby is another that is no taller, and is a semi-double deep blue. There's Little Red Boy, a bright red, Nancy, a flesh pink, Remembrance, a lilac, Snowsprite, a white, and Countess Dudley, a clear pink with a yellow centre.

You never get any trouble from the Catananche with its rich blue everlasting life flowers. With me the plants are in flower from the middle of July until the 20th September, and though it is true the stems are two feet tall they do put up with tremendous winds, and yet stand up straight. Quite close to it is a rich blue mountain cornflower, which grows 15 inches high. It is the *Centaurea montana*, which is at its best from the middle of May till the middle of July, and so precedes the Catananche quite happily.

When you think of delphiniums you always imagine plants growing six feet tall or more, but there are the Bella Donna varieties which don't grow higher than three feet. I am thinking in particular of Lemantine, dark blue, and Pink Sensation, which hardly seems like a delphinium at all



Photo:

Formal pool set in a Hertfordshire lawn

H. & V. Joel

because of its colour. In some gardens this variety may grow to four feet. For the end of the season, and one must think of late summer subjects as well as earlier types, there is the *Physostegia*, now called the *Dracocephalum virginiana*. I like its rosy crimson flowers, which are on stems about 18 inches tall. Some people say it is difficult to grow, but I've never found it so.

Most people know the geum, Mrs. Bradshaw, which is the ordinary double scarlet, but for some reason or another few had met with the orange scarlet variety, which grows about 12 inches high and is called Dorisi. Rivale is no taller and has coppery red flowers. It is in flower in May and is grand for the pool owner because it likes a moist condition. Another of the late flowerers is the Helenium, and a good dwarf variety is Pumilium, a golden yellow. The Bishop is usually in bloom in August. It is the yellow with a dark centre, but the golden yellow shaded bronze known as Windley, is usually flowering well in September.

Some people think that the borage should only go in the herb border. I disagree. There is one whose Latin name is *Lindifolia spectabilis* which is very beautiful indeed from early in May till late in July. It never grows higher than 18 inches and is a gorgeous deep blue. Somehow I always fall for blues, and that's why I like the *Linum alpinum*, which is a pale blue and very dwarf indeed, and the *Linum* which I call Moreland is a very dark blue and grows about 18 inches high. If one wanted to add yet another blue, one would include the *Mecomopsis baileyi*, the blue poppy, which is truly a glorious colour and loves to grow in half shade and moist soil. It will usually go on flowering through June and July, bearing stems about two feet to three feet long.

In a sunny position there's the Kansas Gay Fairer (*Liatris pycnostachya*), which has deep purple spikes from August to October. They are about three feet tall. It is quite an unusual plant and that's why I include it. The tradescantias are not difficult and especially James Weguelin, the soft, almost slimy variety, which grows two feet tall. And then what about the royal blue Veronica, which is such a profuse flowerer from June to August, and never needs staking at all, or for the front of the border Maggie Mott, the lavender blue viola? I've only picked here and there, but there are some different varieties here to make a magnificent show.



A page for  
the beginner  
contributed  
by  
A. BOARDER

THE weekly servicing of a tank appears to present some difficulty for newer aquarists and some do not seem to know what it means. Once a tank has been set up and stocked with fish it is necessary once a week to give it certain attentions without which conditions may soon go wrong. It must be realised that although a lake or pond in nature may have to go along without any assistance, the indoor tank needs something extra in the way of care. In the confined space of an ordinary tank, say 24 ins. by 12 ins. by 12 ins., many things can go wrong if the water is left without care on the part of the aquarist. A few simple tools are essential. They consist of a safety razor blade in a holder, a planting stick or two, and a four-foot length of about half-inch rubber tubing with at least a foot of glass tubing inserted in one end. A couple of pails or water cans will be about all else that is required.

#### Servicing Procedure

If the tank is lighted from above see that the lights are on whilst you are cleaning up. If you have them fixed in the usual cover, this can be placed across the top of the tank so that some illumination enters it. Now scrape the front of the inside of the tank until all algae and scum are cleared away; even a small patch will be noticeable at night-time if not removed. Next place the end of the glass tube well down into the water and suck quickly at the end of the rubber tube, place it over the pail and the water will flow through into this. By passing the glass end over and just clear of the bottom, most of the free mulm will be sucked up. If a rotary motion is given to the glass this will cause the mulm to rise and so enter the tube. Whilst working, keep the thumb and forefinger of one hand across the rubber tube so that if a fish gets too near, pressure on the tube will stop the flow and prevent the fish from being sucked against the end of the glass tube. In a fairly large tank there is likely to be so much mulm that it will be necessary to remove up to three or four gallons of water before the bottom is fairly clear. Do not try to remove all the mulm, as some should be left for the plants. I find that if all the mulm is removed from the front half of the tank, that which remains behind the rocks may be ignored.

If any snails have died they must be removed as they soon turn foul. If blanket weed has grown on the rocks you can clean this by running the siphon tube over it, when most of the dirt will come away. Do not try to remove this blanket weed, for it serves a good purpose by attracting the mulm and dirt, as does willow moss (*Fontinalis*). Once a quantity of water has been emptied out any rocks or plants that need attention can be dealt with. Any pieces of water plants which have broken away or have floated up to the surface should be taken out or re-anchored if required. If your tank has been set up for a year or two without having been emptied you may find that the sand at the base looks dull or may have become too shallow through some having been siphoned out. To smarten all up again get about two cups full of sand and place this in a pail. Run a strong jet of tap water on this and stir well. Empty the dirty water a few

times and the sand will then be clean enough to place in the tank. Do this so that the whole of the front of the base has a fresh covering and you will be surprised how much brighter the tank will look.

The old water removed must be thrown away and fresh tap water added. If this can be taken from a hot water system it will be better than from the ordinary tap. Place a thin piece of wood on the surface and pour the water on this. The wood spreads the water and prevents it disturbing the sand. Fill up to the top frame, so that the surface of the water is not visible from the front of the tank. Remove any pieces of leaf or other rubbish from the top and if there appears to be a film of dust on the top, run a sheet of paper quickly across the surface from end to end. The flat paper will pick up the film. Replace the cover glass and then clean the outside of the tank. During the summer do not clean the inside of any glass except the front, but in the winter it may be advisable also to clean that end glass near the window so that some extra light enters for the plants.

#### Water Boatmen

The open pond does not need this weekly servicing but that does not mean that the pond should not be carefully watched for pests. There are a few small pests which, although they may be harmless to adult fish, can cause serious losses among fry or fairly small fish. One particularly dangerous one is the water boatman (*Notonecta glauca*). This bug swims quickly about in the water but comes to the surface often for air. It swims upside down and has wings which enable it to go from one pond to another, making it difficult to keep the pest from a pond in the garden.

I have always treated this pest as dangerous as I found one with a small dead fish in its grasp. I could not be sure whether the boatman had actually killed the fish or had found it dead and was making a meal of it. The other day, however, I saw a small commotion on the surface of my pond and saw a water boatman with a small live fantail in its grasp. I caught both, and found the fish was still alive and able to swim away slowly. This was definitely proof to me that boatmen can catch a small live fish.

The best way to catch these pests is to visit the pond at night with a torch; then the boatmen can be seen at the surface, when they can be caught with a net. If missed at first they soon return to the surface. The pond skaters, which skim over the surface of the water, do not seem to me to do much harm. They feed mostly on flies which alight on the water and whether they are able to pierce the skin of the water or not I cannot say for sure. I have often watched small fry in tanks with pond skaters above them but have never seen the fry attacked. They appear to be useless as food for fishes as I have never seen a fish attempt to take one from the top.

I suppose that if I were to include water snails as pests I should bring about my ears a storm of protest, but I have found from experience that snails are of little value and can

(Continued overpage)

# Breeding the Lyretail (*Aphyosemion australe*)

by JOHNSON H. HOOD

A FRIEND of mine once said lyretails were easier to breed than guppies. Of course it is true that any fishes are easy to breed once the technique is mastered, even though his statement was an exaggeration. I hope my experiences will stimulate more interest in this most beautiful family of fishes and enable more aquarists to keep and breed them, for once understood their wants are quite simple and they are surprisingly hardy.

At this year's National Aquarium Exhibition I noticed the lyretail gained first prize in the "Egg Layers" class, and strangely enough *Aphyosemion* filled second and third places also. Evidently the *Aphyosemion* must collect a goodly number of points in the "difficulty of breeding" scale!

Sexing is quite simple. The male being much the handsomer with his distinctive tail, elongated dorsal and anal fins, and brilliantly coloured pectorals. His ground colour is brown, varying from light to chocolate, the sides blue-green, and the body spotted with red. The dorsal is brown at the base, spotted with red, then a margin of red, topped by an edging of blue and tipped with white. The anal is similar without the red spots. The caudal is most distinctive, being blue spotted with red in the centre, outlined in red, and edged with brown. The exterior edges are elongated into enamel white points. Truly a beautiful fish. His wife is quite overshadowed by this splendour, being merely brown with red spotting on body and fins with faint tinges of colour in the anal fin. The eye is green. The caudal is rounded without any suggestion of the "lyretail" of her husband.

## Feeding Requirements

In their natural African habitat their chief diet is mosquito larvae, but in aquarium life they will take *Daphnia*, white worm, ghost larvae, mosquito larvae and, dearest of all to their hearts, bloodworms. A word of warning though! Do not feed bloodworms too often or you will find *Aphyosemion* will eventually refuse all other food and you will be landed with a feeding headache. Mix the diet as much as possible.

Regarding breeding habits, they lay one egg at a time (on an average five per day) and can spawn continuously three weeks or more on rich feeding. The eggs are ignored by the parents and hatch in about 10 days at 75° F. The fry are about an eighth of an inch long at hatching and grow rapidly. They can be sexed in three weeks and are capable of breeding at 10 to 12 weeks old.

They are not nearly so particular about water conditions as we are sometimes led to believe, and I have bred them in quite a variety of waters. I have used rain water; half rain, half tap; half rain, half distilled; half distilled, half tap; and one-third each of rain, tap and distilled. I have always acidified the water when necessary with boiled peat, and the pH has ranged from 6.2 to 6.9. The water hardness has varied from 1° to 7°. Added to all water used was a level teaspoonful of sea-salt per gallon. In all cases the spawnings have been successful and the fry reared.

It may be of interest if I give details of the last spawning that took place in June this year.

*Water:* Two parts rain, one part tap, with a level teaspoonful of sea-salt per gallon added. Depth six inches.

*Water hardness:* 5° of hardness.

*pH:* 6.7. Obtained by adding boiled peat. No sand used.

*Mineral content:* 4.4 per hundred thousand parts.

*Plants:* Large clump of Indian Fern floating. Roots trailing the bottom.

*Temperature:* Ranged from 74° F. to 78° F.

*Fish:* One pair. Male 1½ in. and female 1¼ in. Reputed to be wild caught. Eggs visible in female when viewed through strong light.

*Feeding:* *Daphnia*, chopped earthworm and bloodworm.

*Spawning:* Male chased female. Kept cutting across path of female and waving or rapidly vibrated the closed-up caudal fin in front of the female's head. Took up position side by side, male trembling violently and a single egg laid on roots of the plants. Spawning continued with eggs laid every day, sometimes on plants, sometimes on peat at the bottom.

## Spawning Diary

10th June. Fish placed together. Observed spawning the same day. Egg unaffected by light.

21st June. Young fish observed. Length ½ in. No food added for fry. Not attacked by parents. (Parents probably too well fed).

25th June. Brood fish removed. Pond Infusoria added.

7th July. Many young fish noticed, greatly varying in size, so all were removed to larger tank owing to difficulty of feeding. Total count 68 fish.

14th July. Food offered varied in size from *Cyclops* nauplii to half-grown *Daphnia*. Several of the larger fish distinctly showing male characteristics in finnage.

In conclusion, there are one or two points that may be helpful. Too much white worm results in many infertile eggs. Unsuitable water can cause this trouble also. It is wiser to remove parents on the ninth day as they are quite capable of eating the fry. Aim at a lower hardness reading at the first attempt; preferably about 3°. Have no qualms about the peat on the bottom; it never goes sour, and settles very quickly after being disturbed. If the young are not well fed the large ones will eat the smaller ones. Do not overload the tank with *Daphnia* or they may die and pollute the water. *Cyclops* are much better to use if obtainable. If you are successful with lyretails remember there are many more *Aphyosemion*, all with their own particular beauty, to tickle your palate and test your skill.

## Stepping Stones

(Continued from preceding page)

be a menace. Most beginners have the idea that snails keep the water and the glass of a tank clean. A happy thought, but a false one. Snails eat fish food and water plants. They use oxygen from the water and help to pollute the water with their excrement. They eat fish eggs, and what I consider their most dangerous feature, they can be the hosts of flukes, or at least of their carriers. Most experienced breeders of fishes will not have snails in their tanks at any price, and I am sure they can be done without.

Water beetles and the larvae of dragon flies are also dangerous to small fishes. The former can be netted as they swim about but the latter are very difficult to catch as they spend most of the time at the bottom of the pond or among the weeds. They often crawl up the plants at night, when they may be caught, or if the base of the pond is uncovered concrete it is possible to draw a net along the bottom and so catch these larvae.

## OUR READERS

### Write—

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



#### Plant Cultivation

**F**OLLOWING my article entitled "My method of aquatic plant culture," in the July issue of *The Aquarist*, numerous people have written to me questioning the advisability of leaving the lights on for days on end. Strange to state all were worried about the well-being of the fish, but none worried about the possibility of plants suffering or excess of algae appearing in the tanks. The suggestions made were that fish would not be able to sleep with lights on and that it might damage their eyes.

As a matter of fact these points were raised by some of my colleagues in the Sheffield Society even before publication of this article. I personally felt that though leaving lights on day and night would be a gross deviation from natural conditions the fish would soon adapt themselves to this change in environment. Hence I decided to try a simple experiment, i.e., to leave the lights on day and night and see what happened. For approximately six weeks now the immersed lights have not been switched off for a moment, but no detrimental effects to fish or plants have been observed. On the other hand, at a casual glance at least, no striking advantage can be seen in such a procedure either.

On theoretical grounds one would, I think, be justified in expecting an increased rate of plant and fish growth due to prolongation of the hours of activity in the former and of feeding in the latter. The important thing at the moment is that aquarists should not get unduly distressed if they forget to switch off the lights one night!

F. N. GHADIALLY, M.D.,  
Pathology Dept., University of Sheffield.

#### Aid and Advice Scheme

**O**UR Society has inaugurated what I believe to be the only service of its kind in the country—at least we have heard of no other. Through the local press we have announced a free aid and advice scheme which is available to any member of the public. We have invited applications for assistance from those who have trouble in their tanks, those who seek advice and assistance. We have already been called in several times, including once by a local trader who has just started to sell fish, etc.

Another trader ceased to sell goldfish bowls after one of our members, a journalist, wrote in the local paper criticising their use. Some members have tanks ready to receive fish from "customers" who have sought treatment for their pets. We think such a venture as ours will do much to popularise the hobby and see that the many pitfalls are avoided.

R. L. VINCE (Secretary),  
Keynsham and District Aquatic Society.

#### Club Disappointment

**W**ITH reference to the letter in *The Aquarist* (July, 1953), from the Wembley Aquarist Society, drawing your attention to the disgusting conditions prevailing in some aquatic establishments, I feel that I must confirm their complaint. Our Society made a journey of five hours, trusting that we were to be treated to an interesting two hours at a breeding establishment.

The dozen or so show tanks were quite interesting, but on passing to the fish-houses we were treated to similar sights as that experienced by the Wembley Society. Some of our coldwater enthusiasts were almost to the point of tears to see the thousands of fish dead and dying in the outdoor pools—or should they be called trenches?

Something must be done to stop this state of affairs—surely dealers must realise that this does more harm to the hobby, and consequently themselves, than anything else. We consider the suggested "star system" would be excellent, providing they were awarded with no "graft" involved, but this line should be pursued. In the meantime we can only hope that conditions are better elsewhere.

H. A. G. BLACKWELL (Secretary),  
Winchester City Aquarists.

#### Lamp Eyes Confused

**T**HE description given in the article on "Lamp Eyes," by Edward Lee (*The Aquarist*, August), is that of a fish known as *Oryzias javanicus*, except that *O. javanicus* has a faint delicate blue edge on the fins—anal, dorsal and tail. *Aplocheilichthys macrophthalmus* differs in the following ways: a distinct line through most of the body gives off a brilliant metallic green blue in the adult fish; the fins and tail are spotted with red and green-blue spots; the fins of the male are pointed, those of the female are rounded; the body is long and slim rather than rounded, and the body organs are not visible. Seen in a side light these fish have a metallic lustre enhanced by the brilliant body streak.

I have bred both *O. javanicus* and *A. macrophthalmus* in quantity; the former develops a larger number of the eggs attached to each side of the vent at once; *macrophthalmus* seems to drop one egg at a time. This has been my experience with these fishes. Incubation is about the same in each case—13 to 14 days, and the eggs, developing slowly, can be quite easily studied. I have kept parents of *A. macrophthalmus* with young and eggs without losing these. I know a number of *O. javanicus* are being sold as the true lamp eye, but W. T. Innes's book differentiates the fishes and your picture gives something of the true lamp-eye shape.

R. MACKRELL,  
Sowerby Bridge, Yorks.

THERE appears to be some confusion over the exact species dealt with in my article (*The Aquarist*, August). Your illustration does not compare with my fish, which have a different finnage and are devoid of any markings save for a narrow dark line on the side of the body. I now find that the illustrations and descriptions in Hervey and Hems "Freshwater Tropical Aquarium Fishes" for *Aplocheilichthys macrophthalmus* do not compare exactly to my fish either.

I referred the matter to the dealer from whom the fish were obtained and he tells me that he understood the fish to be lamp eyes (*A. macrophthalmus*), and that although this species is native to Nigeria, these particular specimens were imported from Calcutta, where, he says, they have been established for some time. The illustration shown in W. T. Innes's book of *Oryzias javanicus* is much more like my fish. The species I possess has become quite common here in the north and is known and sold widely under the name lamp eye.

E. LEE,  
Wilmslow, Cheshire.

From the foregoing letters it is clear that the fish described in the article written by Mr. Edward Lee are *Oryzias javanicus*, a species known to be established in India for many years. The picture used with the article was of the true lamp eye, *A. macrophthalmus*.—EDITOR.

#### New Food

I WOULD like to draw the attention of readers to a new source of dried food, which would appear to be a useful adjunct to the diet of some fish. The products are "Distafeed" brand Animal Feed Supplements, marketed by The Distillers Company (Biochemicals) Ltd.:—Riboflavin Supplement and Vitamin B12 Supplement are freely available, each providing many vitamins and first-class protein. I have used these on a limited scale and so far find them satisfactory.

E. GRAY, Ph.C.,  
Sutton, Surrey.

#### Cage Birds—No Thanks!

I HAVE in the corner of the living room of our small flat a coldwater aquarium housing six fancy goldfish which is most decorative to the room and most interesting to all our friends. But the care and interest I take in our fish often invited friendly taunts and sarcasm from my dear wife.

Recently she had cause to look after a budgerigar for friends of ours. After a week of daily cage cleaning, picking up seeds from the carpet, suffering ill-tempered pecks on her hands and persistent chattering, she says: "Fish every time for me—no noise, no mess, no trouble—a pleasure to look after." Her desire for a budgerigar for her birthday has died a quick death.

W. D. ROLFE,  
Maidstone, Kent.

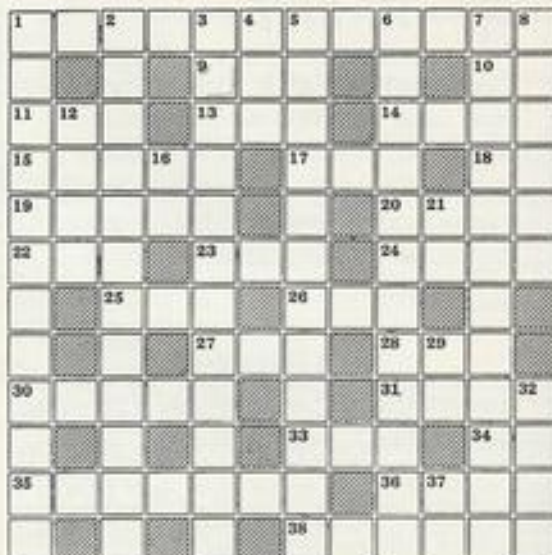
#### School Aquarium

A FEW years ago your readers generously supplied our school with a number of tropical fish which became school favourites. Unfortunately the tank has gradually lost its fish and is now nearly empty. I wondered if a further appeal to the generosity of your readers would be permissible. The school has no funds whatever which could be used to replenish our aquarium and therefore our only hope of obtaining stock is by an appeal such as this.

R. W. EDWARDS,  
C. of E. Primary School,  
Windsor End, Beaconsfield,  
Bucks.

## The AQUARIST Crossword

Compiled by J. LAUGHLAND



#### CLUES ACROSS

- Registers of heat (12)
- Anger recurs in *Aerina* (3)
- Denotes presence (2)
- Admired roe (3)
- fish is a scavenger (3)
- Wading bird upset in den (4)
- The horse with a certain gait is little more than a muddled carp (5)
- A one spot (3)
- Cold wind (1, 1)
- Latin prefix, inwardly (5)
- Weeping noises (4)
- Unspirited char (3)
- Sound of a dove (3)
- and of more doves (4)
- Very cold (3)
- Tetra from — (3)
- Seed (of the pipe-fish, one way) (3)
- Turn the tap! (3)
- Reef returns in less restriction (5)
- Organs of balance in fishes (4)
- Roe upset again (3)
- Vulgar call of tortoise (2)
- Salt solutions (7)
- Belong to you (4)
- The octopus: — *sepia* (6)

#### CLUES DOWN

- Warm favourites of many aquarists (8-4)
- Shockingly slimy fish (8, 4)
- Order of the live-bearers (12)
- *pro nobis* (3)
- To change, as a tadpole does to a frog (12)
- Fancy goldfish. The blind one in Nelson's case (9, 3)
- Variety of Californian salmon gloriously coloured; hence the name (7, 5)
- Strain (6)
- Order of frogs (4)
- Hesitant sound of the adder (2)
- and the astonished exclamation of the moonfish (2)
- Motoring body (1, 1)
- Gentlemen (4)
- Company commander (1, 1)

#### PICK YOUR ANSWER

- Which one of the following species is popularly known as the blue catfish: (a) *Corydoras arcuatus*, (b) *Corydoras kneri*, (c) *Corydoras nattereri*, (d) *Corydoras spilura*.
- Aequidens tetramerus* (the saddle cichlid) attains a length of about: (a) 6 ins. (b) 8 ins. (c) 10 ins. (d) 12 ins.
- Synodontis nigriventris* (the upside-down catfish) has: (a) Two barbels, (b) Four barbels, (c) Six barbels, (d) Eight barbels.
- The dorsal fin of the Robson guppy is similar to that of the: (a) Lyretail, (b) Pin-tail, (c) Round-tail, (d) Spear-tail.
- Prosopisaca* is popularly known as: (a) Bugle weed, (b) Mermaid weed, (c) Pigmy weed, (d) Swan weed.
- The flower of *Labella dormana* (water lobelia) is: (a) Blue, (b) Red, (c) White, (d) Yellow.

(Solutions on page 152)

G. F. H.

FIFTY-SEVEN entries were made at the September tropical table show of Aylesbury Aqualife Association it is announced in the Association's September news sheet, which also gives a detailed points analysis for each fish in the show. A chequered barb, belonging to Mr. W. G. Walters, won the award for best fish.

LIVE reptiles accompanied Mr. Robert Jackson when he visited members of Altrincham Aquarist Association to give a talk on herpetological subjects. Boa constrictors and other snakes, together with numerous lizards, were shown at the meeting.

AT the annual show of Blackburn and District Aquarists' Society (judged by Messrs. T. Legge and H. Loder), the following awards were made: Livebearers—1, R. Yates; 2, T. Wood; 3, J. Grice. Haglayers—1, S. Walsh; 2, A. Hoyle; 3, G. Ainsworth. Furnished aquaria—1, J. Shortrock; 2, E. Abbott; 3, A. Willan. Mr. S. Walsh's exhibit was credited best fish in the show.

MEMBERS of the Bexhill and District Aquatic Society have presented a fully furnished tropical aquarium to the Church of England Children's Society Home at Bexhill. This is the first of the "Cocoonation tanks" to be given by the society, which have been purchased with money collected by displaying furnished aquaria in local shops and cafes.

ANNUAL General Meeting of the Bourne-mouth Aquarists' Club was held last month, when, after election of officers and committee members, the 1952-53 points trophies were awarded to Mr. B. Combes (coldwater fish) and Captain E. Howarth (tropical fish). A fund has been created by the club for the purchase of show equipment.

NEW session of the Brixton Aquarist Society commences on the 3rd October at Effra School, Effra Parade, London, S.W.9, with a meeting at 7.30 p.m. At each weekly meeting on Friday a qualified judge and lecturer will be present, and new members are invited to attend.

CHANGE in meeting place of the Chelsea Aquarium Society is announced—to "The Rose," 86, Fulham Road, London, S.W.3.

An aquarium has been installed in the children's ward of Stobhill Hospital, Glasgow, by members of the Glasgow Northern Aquarium Society, to the particular delight of Master Bobby Trotter, who has been in this ward for over seven years. Meetings of the society are now held on the second Monday of each month, 7.30 p.m., in the N.B. Loco. Hall, Adamswell Street, Springburn, Glasgow.

FOLLOWING a talk on the tiger barb to members of the Halifax and District Aquarists' Society Dr. F. N. Ghadially showed some of his own films of tropical fishes. The society has recently made a visit to rivers and ponds between Grassington and Burnall to collect specimens.

CHANGE of editor of the Nottingham and District Aquarists' Society Monthly Bulletin is announced in its August issue. Mr. A. L. Kirchen, who has edited the Bulletin for five years, is handing over to Mr. H. Lightfoot. Last month the society's annual show was held in Nottingham.

#### Southall A. S. Show

Display of aquaria featured as part of the Southall Borough Show by the Southall Aquarist Society is shown in the picture. Tanks were masked with hardboard frames sprayed with light blue paint and given a dark blue edging. Each section was self-contained and could be set up in a short time. The exhibits comprised tropical and coldwater furnished aquaria together with the society's trophies and awards.

# 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.

OVER 420 aquaria were on show at the exhibition staged by Portsmouth Aquarists' Club when judging was carried out by Mr. C. Creed and Mr. T. Saunders. Both judges commented on the high standards of the fishes exhibited. Prizes were presented by Mr. Jack Froggatt, the English international footballer.

DESPITE difficulties encountered when tanks were sought on hire, the third annual open show staged by Romford Aquarists' Society was highly successful in display, entries and local reception. Two hundred aquaria were specially purchased to complete the show with loans and guarantees provided by members. Best fish in the show was a blue acara owned by Mr. L. A. Lane.

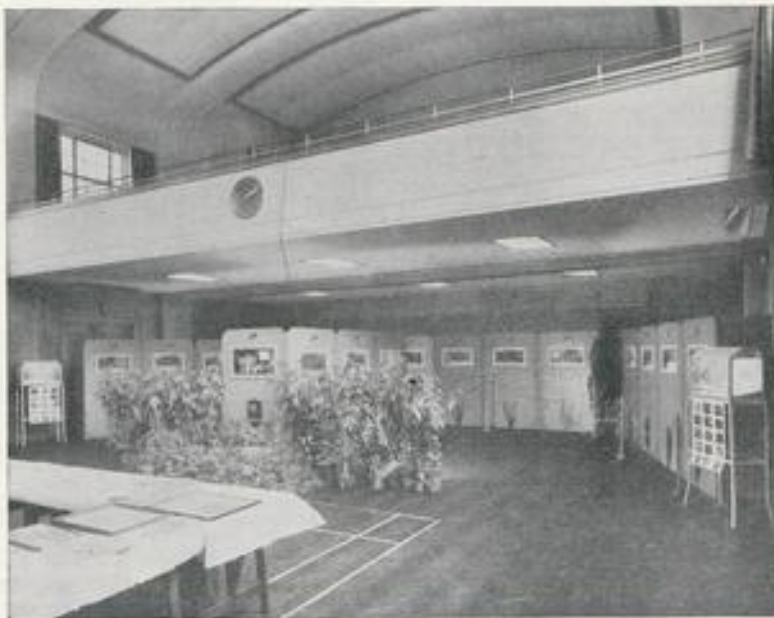
CATCHING and keeping marine fish was the subject of a talk given by the president, Mr. C. D. Roe, to Shirley and South Birmingham Aquarists' Society last month. Lectures this month and next month will be on electrical apparatus and fresh water biology.

A TABLE show of aquarium plants, water snails and gadgets was held by the West Middlesex Aquarists' Society last month. One second award, two thirds and a fourth award were collected by the society at the open show held in Kingston, Surrey, earlier in the month.

UNIQUE presentation of a display of aquaria at the Worcester Horticultural Show by the Worcester and District Aquarist Society resulted in the award of a gold medal to the society. Members had arranged a centrepiece waterfall and goldfish pool lighted by concealed coloured bulbs, with a large painted "mechanical fish" which opened and closed its eyes and mouth and also wagged its tail, surmounting this. Flanking the exhibit were furnished aquaria.

APPROXIMATELY 1,000 people viewed the Welsh Aquarists' Show, held under the auspices of the Welsh National Aquarists' Society in Cardiff. Five Welsh aquarium societies competed in the furnished aquarium section for clubs, where the award was made to Newport A.S. Best fish in the show was a moor goldfish owned by Mr. J. Martin.

AT an evening meeting devoted to experiences related by members, the West Surrey Pond-keepers' and Aquarists' Club was given a warning not to be too hasty in dismantling breeding aquaria. This followed an account by Mr. A. Patrick who, after emptying and refilling a large breeding tank which had housed a pair of zebra cichlids was later surprised to see dozens of baby cichlids swimming in the new water.



FURNISHED aquaria were staged by Ashton-under-Lyne and District Aquarists' Society members as part of the town horticultural show in September. A cup and special prizes were awarded. The society's "Beta splendens Trophy" was recently awarded to Miss J. Williamson.

A BREEDERS' show was held by the Brighton and Hove Aquarists' Society last month, and it was judged by Mr. R. Ayton. Miss A. Morris took first prize in the cold water section and the corresponding award in the tropical section went to Mr. M. Sparshott. Meetings of the society now take place at the Emerys Hotel, Queens Road, Brighton, Sussex, on alternate Fridays.

### Oakwood Hospital A.S.

ANNUAL show of the Oakwood Hospital Aquarists' Society was held in conjunction with the Hospital Flower Show and judging of the aquatic entries was carried out by Mr. C. W. C. Creed of the F.B.A.S. Six societies were competing for a shield in an inter-club class for furnished aquaria. In the picture are seen Mr. R. J. Tye (chairman), Mr. C. W. C. Creed and Mr. R. T. Shilling (treasurer) and some of the competing aquaria. Results were: Inter-club furnished aquaria class—1, West Kent A and P. Association; 2, Gravesend A.S.; 3, Oakwood Hospital A.S. Individual cold-water furnished aquaria—1, D. Whittaker; 2, L. Swanborough; 3, (Mrs.) J. Tye. Individual tropical furnished aquaria—1, W. Fish; 2, R. Tye; 3, (Mrs.) R. Tye.

### F.B.A.S. Insurance Scheme

THE Federation of British Aquatic Societies have made arrangements with the Union Assurance Society Ltd. of London, for insurance of fish and aquaria against loss or damage in the homes of aquarists. The scheme is open to all aquarists in Britain and Northern Ireland, and the necessary forms and further information are available from the F.B.A.S. secretary, Mr. R. O. B. List, 1, Coronation Court, 31, Willesden Lane, London, N.W.6. Insurance for societies to cover trophies, etc., is also available.

### New Societies

**East London** aquarists interested in keeping and breeding tropical oviparous fishes are invited to write to Mr. F. King, 14, Lonsdale Avenue, East Ham, London, E.6., who is acting secretary of a new society.

**Lancashire Aquatic Breeders' Society.** Secretary: Mr. M. Close, 23, Jaunsey Street, Bolton, Lancs. Applications for membership from fish breeders invited.

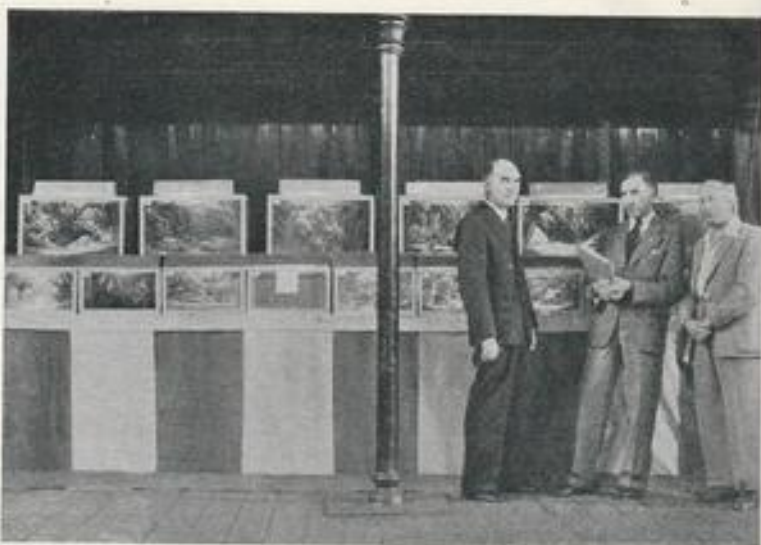
**Llantwit Major Aquarist Society.** Secretary: Mr. R. S. Wigg, 17, Ham Lane South, Llantwit Major, Glamorgan, S. Wales. Meetings: Second and fourth Wednesdays each month, 7.15 p.m., at the Cross Keys Hotel, Llantwit Major.

**Northants Aquarist Society.** Secretary: Mr. L. Bell, 92a, Rockingham Road, Corby, Northants. Meetings: First and third Sundays each month, 10.30 a.m., at Odeon Building, Corby.

**Northolt and District Aquarist Society** is a new society inviting local aquarists to contact Mr. D. S. Ross, 78, Kingshill Avenue, Northolt, Middlesex.

**Skipton, Yorkshire,** aquarists interested in becoming members of a society in the area are invited to write to Mr. F. Cherry, 88, High Street, Skipton, Yorkshire.

**Vivarium Society.** Secretary: Mr. G. M. Barbrook, 23, Eric Street, Oldham, Lancs. Meetings: Holly Bank Nurseries, Grove Lane, Hale, Altrincham, Cheshire.



### Secretary Changes

CHANGES of secretaries and addresses have been reported from the following societies:

**Feltham and District Aquarist Society** (Mrs. M. Aldridge, 174, Uxbridge Road, Feltham, Middlesex); **Hounslow and District Aquarist Society** (Mr. G. Vance, 7, Abinger Gardens, Isleworth, Middlesex); **Maldstone and District Aquarist Society** (Mr. N. Puttock, 38, Beaconsfield Road, Tovil, Maidstone, Kent); **Medway Aquarists' Society** (Mr. R. Brittain, 161, Searia Road, Chatham, Kent); **North Surrey Guppy Breeders' Society** (Mr. J. E. Edwards, 42, Berrylands Road, Surbiton, Surrey); **Peterborough and District Aquarists' Society** (Mr. R. Whitehead, 32, Low Cross, Whiteley, Nr. Peterborough, Northants); **Portsmouth Aquarists' Club** (Mr. W. E. Smyth, 3, Strode Road, Stantham, Portsmouth, Hants.); **Redhill and District Aquarist Society** (Mr. R. E. Shead, 125, London Road, Redhill, Surrey); **Slough and District Aquarist Society** (Mr. S. G. Lake, Westfield Cottage, Eton Road, Datchet, Bucks.); **Tottenham and District Aquatic Society** (Mr. R. Browett, 37, Oakdale Road, Finsbury Park, London, N.4).

### Aquarist's Calendar

2nd-3rd October: **Bristol Aquarists' Society.** 1953 Coronation Open Show at the Y.M.C.A. Hall, Bristol. Schedules obtainable from Mr. R. Woodbine, 18, Grantham Road, Kingswood, Bristol.

4th October: **Federation of Northern Aquarium Societies** Twelfth (Autumn) Assembly. Lectures, film show, trade stands. Zoological Gardens, Belle Vue, Manchester. Tickets (2s. 6d.) from Mr. H. Ashbrooke, 38, Broady Street, Stretford, Lancs.

11th-17th October: **York and District Aquarist Society** first annual show of tropical and coldwater aquaria and water gardens. Details from Mr. J. S. Field, 45, Woodlea Avenue, Acomb, York.

26th October: **British Herpetological Society** London Group meeting, "Crocodiles and Turtles," 7 p.m., at Meeting Room,

Zoological Society of London, Regent's Park, London, N.W.8.

31st October: **Warrington Aquarist Society** first open show at the Norton Arms Hotel, Warrington, Lancs.

12th-14th November: **Gloucester and Cheltenham Aquarists' Society** second annual show at Empire Hall, Cheltenham.

14th November: **Lancashire Aquatic Breeders' Society** first annual open show in the Spinners' Hall, Bolton. Show schedules available from Mr. J. Duckworth, 534, Plodder Lane, Bolton, Lancs.

### October Lectures

A SERIES of lectures on aquarium-keeping to be given by Mr. A. Boarder has been arranged by the Borough of Wandsworth at the following libraries in the Borough on the dates given: 2nd October: West Hill; 8th October: Balham; 15th October: Tooting; 22nd October: Clapham; 29th October: Streatham.

### Crossword Solution

T	H	E	R	M	O	M	E	T	E	R	S
R	L	I	R	E	E	A	T				
O	R	E	C	A	T	L	A	I	R		
P	A	C	E	R	A	C	E	N	E		
I	N	T	R	O	M	S	O	B	S		
C	A	R	C	O	O	C	O	S			
A	T	C	Y	R	I	O	W				
L	C	P	I	P	P	A	T				
F	R	E	E	R	H	E	A	R	S		
I	E	I	O	R	E	O	I				
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H	S	I	E	E	J	E	C	T	S		

PICK YOUR ANSWER (Solution)

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