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Considering Breeding

First things first. What is known about the kind of fish you are going to try? The thing to do is to read up as much as possible on the fish and their requirements, and if all accounts disagree use a little common sense and set up a tank that will meet as many of the possible contingencies as possible.

What about the tank? Well, if the fish are large, a large tank is a must, but for fish up to about 2 1/2 in. in size there are some advantages in a small tank. It is easier to handle and fertilisation of the eggs is more certain, and it is easier to get food to the fry when they first start to eat. A large tank also has its advantages. There is less danger of pollution of the water through overfeeding and any fry can be kept longer, and there is less danger of damaging fry whilst transferring them to larger quarters at a comparatively early age. Well, whichever tank is selected, it is most certain to need a clean out, and that is the next job, with lots of hot water and perhaps a little cleaning permanganate, so that it will contain eventually nothing except the selected and wanted elements that you are going to put in.

Next we come to a suitable bottom layering. What are the alternatives and the pros and cons of the choice? Well, it is possible to have nothing on the bottom, of course, and this is highly suitable for a soft water tank. However, there is a danger of getting too much light reflection from the bottom of the tank unless precautions are taken, and fish are highly uncomfortable with light coming at them from underneath, and most unlikely to oblige by spawning. Then there is a pebble or marble (the glass variety) bottom. This is highly suitable as an egg trap when the fish lay non-adhesive eggs, which will fail to the bottom and might otherwise be gobbled up by hungry parents. Ordinary aquarium compost is generally suitable for all coldwater fishes, livebearers, anabantids, barbs etc., and is a must for the cichlids, who like to shift it about in order to make a suitable hollow where they feed their eggs will be safe.

The mains of well-washed peat for soil spawners like many of the egg-laying toothcarps cannot be put too highly. It also has an acidifying effect on soft water, although it does little for hard water except turn it brown in colour and discourage some of the unwanted bacteria. It is excellent for preventing light reflection from the bottom of the tank, and provides cover for newly hatched fry of the tetra, rasbora and barb varieties, which lie about on the bottom for a day or two before becoming free-swimming and seem to appreciate the darkness. It is absolutely lethal for sticky fry such as angelfish. Under the limited space conditions we have in the aquarium it is always best to
Breeding Habits

by LAURENCE E. PERKINS

(Photographs by the author)

WHILST browsing through my old copies of The Aquarist recently I came upon an article under the above heading by W. S. Pitt (in the Silver Jubilee number of May, 1949). Reading it again I was impressed by the variety of conflicting reports made by different observers of the breeding habits of bitterling that Mr. Pitt had collected together within the text of his article. It seemed inconceivable that eye-witnesses should be at such variance with one another and I determined to obtain a pair or so of these interesting and enigmatic little fish and to see which of the accounts subsequently reflected my own observations.

Bitterling Carp

A male and three females were duly acquired together with two mussels (*Unio pictorum*) and all were housed in a 12 in. by 8 in. by 8 in. aquarium. One of the females died within 2 days while I was still endeavouring to obtain live food, still in short supply after the severity of the winter. In lieu of *Daphnia Tubifex* was at length secured and the bitterling were fed liberally over a period of about 3 weeks until their fitness augured well for breeding. Before describing what occurred when breeding commenced it may be as well to supply a short description of the bitterling and its known habits.

Symbiosis (in which two different organisms depend upon one another for mutual survival) is nowhere more remarkably exemplified than by the strange partnership of the bitterling and the freshwater mussel. The bitterling, a small European fish of the carp family, uses the mussel as

Betty Roberts

THE AQUARIST
of the Bitterling (Rhodeus amarus)

An incubator for its eggs, which are laid within the mussel by the female. The young bitterling, when they have hatched and are ready to brave the rigours of life among their countless predators outside the sanctuary of the mussel’s interior, emerge and go their separate ways. Clinging to bitterling, as it is said, will often be found tiny young mussels, which adopt this method of wide dispersal in the absence of their own ability to travel far or speedily. So much for what is known of this unusual relationship and now for the more contentious part of the story.

Appearance of Ovipositor

With the coming of spring and the imminence of the breeding season the female bitterling develops an ovipositor or egg-laying tube which hangs from the undersides of the body immediately behind the ventral fins and measures about 1 inch in length or a third of the fish’s total length. The mussel, a bi-valve, possesses two siphons. One is for inhaling water from which to abstract food as well as oxygen for breathing and the other is for exhaling. The inhalant siphon is fringed with tiny tentacles which filter off particles too large to be inhaled, for the mussel subsists on a diet of microscopic organisms. The exhalent siphon resembles a very shortened funnel.

Now it is widely held that the female bitterling inserts her ovipositor into the inhalant siphon of the mussel to deposit her eggs within the mollusk, but there are several perturbing objections to this theory as well as a number of reports by eye-witnesses who state differently. Firstly, the ovipositor is flaccid and appears in no way controllable by its owner and secondly its diameter is barely half that of the eggs it is supposed to convey. Thirdly, it seems...
The male’s ‘mate’ dives seemed to be in a ratio of about seven to one of the females spawning dives, and preceded as well as followed her egg-laying.

The following day both fish were still busily engaged in spawning but by the time I was ready to take my ringside seat once more I had processed the black and white film and made prints. What they revealed entirely altered my outlook and focussed my attention on one particular spot, where, hitherto, I had been trying to watch several facets of the occurrence at once. The speed of the female’s deposition during the first session had defied my sensibility to record what occurred exactly, but the speed of the electronic flash had proved its superiority by enabling the camera to record the position of the female and her ovipositor a split second before making contact with the mussel.

**Bent Ovipositor**

Several successive onslaughts by both male and female were photographed and while two photographs of the female showed her at the end of her dive, where she had landed in the gravel beyond the mussel, some had anticipated her actual contact and all showed the same phenomenon as illustrated in one of the accompanying photographs. The ovipositor was bent sharply back at the point where the auxiliary organ terminated and the ‘elbow’ thus formed was positioned immediately above the exhalent siphon. Subsequently, the ovum film showed the same result.

Armed with a low-power reading glass, I settled down to watch once more and riverted my attention on the exhalent siphon when the female took up her position, before egg-deposition. I had brought the mussel right up to the front glass of the aquarium so that I could enjoy a clear view of the side elevation and was able to see the bent ovipositor enter the exhalent siphon. After each contact was made it was noted that while the inhalent siphon remained untroubled, the exhalent siphon was in a collapsed state, although it quickly resumed its normal position with its peristalsis rising just above the edge of the shell.

Sitting back to ponder after the fourth egg-laying dive (a full 2 minutes had elapsed), I was startled to see a solitary egg forcibly ejected from the exhalent siphon, and I was privileged to see the same thing occur the following evening after the second female (now ripe for spawning) had made an egg-laying excursion. As I write, both females are taking it in turn with the male to pay court to the second mussel, the first mussel having retired to a corner, where it has almost completely buried itself, loaded, it is to be hoped, with a fertile clutch of hatching eggs.

**Previous Descriptions**

The eye-witness accounts previously referred to and quoted by Mr. Pitt are at such variance with one another that it becomes a matter of great perplexity, for the originating party of these accounts and reputable persons in general do not understand whether all hatching behave the same or whether we have here a mutation taking place where some hatching resort to the ovipositor whereas others, more (or less?) advanced, make use of a sub-ovipositor instead of the main one. One account states that the ovipositor is suckled into the inhalent siphon and another says that “a gonopodium-like spiny formation extends along the base of the ovipositor for half an inch, one long flap-like structure did not enter the siphon.” Another report states that the ovipositor is shut into the siphon and one more says that the ovipositor is rendered rigid by the introduction of urine into it under pressure because of an egg awaiting deposition further down the tube.

Had I not taken photographs which told me what to look for, my initial observations would have agreed in every particular with those made by Mr. Pitt, to whose graphic account I am now able to add the above.
Better Colour and Finnage in Betta

by PETER HORN

WHEN I visited England I was surprised how expensive the Siamese fighting fish were, and how frequently they were not even of a very high standard. What are the qualities a good fighter should possess? Attractive colour and large fins. These are the two characteristics that the public appreciate and which are within the control of the breeder, and therefore the accurate measure of his efficiency.

From the breeder's point of view there are more factors to be considered, namely the time taken to produce top-class specimens and the number of really beautiful fish produced per spawning. Fortunately we already know much about inheritance and the possibilities of applying its laws in our breeding activities, so the production of more really good fish with less labour is quite possible.

First let me discuss the problem of colour for the breeder. When mating similarly coloured parents one would expect all the offspring to resemble them. Unfortunately there is only one case where this applies, namely Cambodia mated to Cambodia.

The available fighters at the present are, in the great majority, not pure-bred with regard to colour. Transmission of colour from parent to offspring is complicated by the fact that dominance plays an important and sometimes disturbing part. For example, the green colour is dominant to the cambodia, partially recessive to the wild, completely recessive to the blue. The only means of discovering whether a fish is pure-bred (homozygous) or not, is to see what progeny are produced by it.

It is quite impossible to predict exactly the colour of offspring simply by looking at the parents. In practice this task is even more complicated simply because the great majority of the available stock possesses a 'wild colour' gene. This frequently appears in a cross, resulting in unattractive progeny.

Now let me deal with the other very important characteristic of our fish, the fins, and leave the breeding methods to be described later. Breeding superior fish involves the improvement of finnage as much as that of colour. At present one may find males with fins practically indistinguishable from those of females, and in contrast males with fins that seem rather to be a burden to them. Between these extremes there is a tremendous variation in fin size.

Between the inheritance of finnage and colour there is no link. A pair of fish taken at random and mated produce offspring showing a great variation in the ability to develop long flowing fins. Some show good fins at 3 months, some never do, though the environmental factors they shared were the same. It seems probable therefore that the cause of variation is hereditary.

On the other hand there are strains inside which variation is very small. Very often these strains are the products of long breeding work, and the characteristic is more or less fixed. The illustration shows how two males of unrelated strains, although of the same age (3 months) and reared under identical conditions, may vary from each other. Each male, however, may be a typical representative of its strain.

These are basic biological facts concerning the two most important characteristics, which must be taken into consideration before starting to breed brilliant fighters successfully.

The first thing to do is to decide which colour one wants to breed. I would recommend choosing a pure colour (blue, green, red) and trying to reach uniformity of colour within the strain. The attempt to fix a very pretty colour pattern, which is apparently a combination of others, is bound to fail. Mating two such fish will always produce a large number of unpromising offspring that must then be discarded. Only a very small fraction might resemble the parents.

There are two ways of establishing a pure colour strain. One takes a long time, the other produces good results more quickly.

The first way is to select from each generation the pure coloured specimens for breeding stock. Usually this method takes a long time, and has a great inevitable drawback, which is that the other important quality of our fish (the finnage) cannot be improved sufficiently simply because in selecting for colour, the great majority of the fish might be discarded in successive generations.

It must be noted that the response to selection from generation to generation is dependent on the variation of the characteristic on which selection operates. The more extreme examples can be chosen to be the parent of the...
next generation, thus giving a greater possibility of improving a characteristic in a shorter time. It is obvious that in a larger number of fish greater differences can exist between individuals, and therefore selection of breeding stock should whenever possible be made from large spawnings.

In our case the effectiveness of selection (for finnage) is reduced by the fact that it is practised only on the males. If selection could be made in both sexes the progress would be approximately twice as great. It is therefore of vital importance to have a pure coloured strain on which selection for two characteristics is reduced to one, the ability to develop good fins at an early age.

Establishing a Pure Strain

Let me describe a method by which a pure green strain was established from completely unknown "raw material" in 4 months.

A green male was mated to a wild-type female. The 96 fish obtained from this mating showed three colours: 19 cambodias, 21 green, 26 wild, 30 wild with more green.

The appearance of the cambodias (recessive) progeny indicated that both parents carried a cambodia gene. Six days after the first spawning the same male was mated to a green female. The 325 resulting offspring were all green. This could only be explained by the fact that the female was pure-bred for green colour. As the male (according to the test) was not pure-bred (cambodia, green) half of the offspring had also the cambodia gene, though there was no possibility, simply by observation, of discovering which individual was pure-bred and which was not.

To ensure that in following generations no more cambodias occurred the following procedure was used. When the green family was approximately 10 weeks old the most attractively finned males were separated in jars. As the best male of the selected group began to build a bubble nest, he was mated to a cambodia female. Cambodia fry are detectable immediately after hatching as they are much more transparent. The presence of cambodias amongst the progeny would indicate that the male used is not pure-bred for green, and the second best male should be tested in the same way. If the females were similarly tested with a cambodia male. The mating of the pure-bred green fish produces pure green offspring and there is no need for further colour selection, so that we can focus our attention on the improvement of the other characteristic.

Two very important points should be noted. The first is that the male used at first should show very big fins. If no attention is paid to this it is possible that the ability to develop brilliant fins will be absent from our strain. If this aspect is not taken into consideration even the most careful selection may prove ineffective. There are strains having wonderful colours where this evidently has happened.

The second vital point is to ensure that the females used initially are completely unrelated to the male, as later matings are very close (e.g. brother to sister), which quickly leads to a highly inbred strain.

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**Economy in the Rearing of Fighting Fish**

by J. H. Blakey

I HAVE been breeding Betta for 15 years now, and each year during breeding operations 1 have been searching for a system to keep many males separately without a lot of cleaning-out trouble and to avoid the soaring electricity accounts associated with running large tanks.

Six months ago I devised a system that I now use. It is very efficient, labour-saving and cheap to run. I use a tank size 15 in. by 8 in. by 8 in., an air-lift, 20 2 lb. jars, 15 in. lengths of rubber tubing and one 150 watt heater. All the equipment can be bought very cheaply.

The 20 jars are placed in two rows of ten (two rows of eight are shown in the illustration) and the tank is placed at a level lower than the jars. The position of the tank is determined by placing a 2 lb. jar in the tank. The level of the top of the jar in the tank should be 3 in. lower than the top of the 20 jars outside the tank, which are all level with each other.

**Air-lift.**

After the correct position is found the tank should be fixed securely and an air-lift placed in the tank. The jar in the tank is then filled with water and the tank is filled to within ½ in. of the top of the jar in the tank.

A piece of ½ in. rubber tubing is placed over the top end of the air-lift and directed into the first jar. The tubing must not go deep into the jar but just rest on the lip so that water will drip inside. Fill the first jar with water and cut 20 15 in. lengths of ½ in. rubber tubing. Fill one piece of tubing with water and start a siphon from the first to the
second jar. Then repeat the process of making a siphon from jar to jar along the first row, across the end two jars and down the other row and into the jar inside the tank from the last jar (see illustration).

A check should be made to see that all the siphons are working properly.

The 150 watt heater maintains 82°F (28°C) in the tank and the air-lift is brought into operation so that a steady flow of water is pumped into the first jar. If the air lift is 'gurgling' then too much air is being used, and this should be reduced by use of a clamp. It will be found that when the system is working the level of the water in the first jar will be 1 in. from the top of that jar and the water in the last jar will be 1 in. from the top of that jar.

The difference in temperature between the water in the last jar and in that in the tank will be found to be only 3°F (1.8°C).

A sheet of polythene is placed along the top of the jars to retain heat and to prevent dust entering. There is never any need to clean out the jars as the dirt is siphoned along the system and rests in the jar in the tank and can be removed from there. The jar in the tank is also a safety measure in that if all the water was to run out of the tank the water in the jar would prevent water from leaving the jars containing valuable fighters; this is the reason for placing the tubing from the last jar in the jar inside the tank.

**No Individual Feeding**

When feeding with white worms I do not add them to each jar separately but place a lot of worms in the last jar, and each jar is supplied by the siphon system.

In the illustration only 16 jars are used, but any number can be used provided that the temperature in the last jar does not fall below 75°F (24°C).

The system can be used with confidence and leaves many other large tanks free to be used instead of being cluttered up with jars.

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**Flame Fish (Hyphessobrycon flammeus)**

by JACK HEMS

WHAT a delightful little species this *Hyphessobrycon flammeus* is. Usually referred to as the flame fish, the red tetra, or the tetra from Rio, it is one of the showiest members of the family Characidae you can easily introduce into a community tank and, aside from its peaceful nature and pretty schooling habits, it is almost always on the go, has a life span of 3 years and thrives well on any small live or dried food.

**Colour**

Anteriorly the 1½ in. body is olive on the back shading to greenish-gold on the sides, which, just behind the gill covers, are interspersed with two black vertical bars. Posteriorly it is vivid red. The throat and belly are silvery white. The dorsal, anal and ventral fins are as fiery as the hinder part of the body and marked along some of their margins with black—a adornment more pronounced in a mature male than in a female. Another characteristic of the male sex is a straighter edged and fuller-looking anal fin. The pectoral fins are clear; there is a tiny, rayless, adipose appendage on the back near the tail.

In the wild the fish is found in many of the fresh waters in the neighbourhood of Rio de Janeiro, a fact which gives the clue to one of its common names. Like some other Brazilian species, it does not need a high temperature, but 70°F (21°C) should be regarded as the minimum, for below that figure the fish is quick to contract white-spot disease or swim-bladder trouble.

**Breeding Aquarium**

To appreciate *H. flammeus* fully it should be viewed against a plant-filled or dark-coloured background under a bright overhead light. It is also recommended to give it soft, acid water for its normal day-to-day existence and for breeding. With regard to the latter, it is customary to do this in a scrupulously clean aquarium measuring anything from 12 in. by 8 in. by 8 in. up to 24 in. by 12 in. by 12 in. The only furnishings necessary are lots of leafy foliage vegetation to catch the adhesive eggs, and a thin layer of thoroughly washed compost spread over the glass floor to rob it of its transparency and prevent distracting reflections. Stones or lead bands can be used to anchor the plants to the bottom. A temperature of about 75° to 78°F (24-29°C) should be maintained.

Nothing is more certain to bring an adult pair into spawning condition than separation for a fortnight or so, combined with a generous diet of live food. If live food is hard to come by, offer them as a substitute finely shredded (scraped) red meat, or shredded cooked shellfish such as prawn, shrimp or crab.

As soon as the female shows fuller sides and the male assumes a brighter, spikier appearance, it is time to place them together. If everything goes as planned, it will not be long before the male will start to show off and drive the female all over the aquarium. If she is really ready for mating she will permit herself to be manoeuvred every now and again into the plants, where she will scatter some eggs. Ordinarily about 100 to 200 eggs are laid at a spawning, which may, with rests in between, take up most of a morning or afternoon.

**Separate as soon as Possible**

As soon as spawning is over, it is necessary to remove the parent fish to another tank without delay. Neglect to carry out this instruction will result in all the eggs being eaten in a fraction of the time that it took to produce them. In about 2 days the fry hatch out, and while they are absorbing the contents of the yolk sac, hang head up from the sides of the aquarium and the plant life. Two days later all of them, tiny as the tiniest glass splinters, should be free-swimming and in urgent need for the next week or so of freshly cultivated Infusoria, supplemented if possible with thick green water, blobs of hard-boiled yolks of egg crumbled into a milk-moistened paste, or a branded fry food. Then, forward bring shrimps, micro worms or tiny Daphnia, as well as powdered dried food, can be put on the menu.

With proper care and attention growth is rapid, and under ideal conditions near to full size may be reached within the space of 6 months. The colours in their bodies and fins appear in less than half that time, and a few score of the lively fry in their livery of silver and red and gold makes a truly unforgettable sight.
The Speckled Sleeper (Dormitator maculatus)

by Dr. R. O. B. List

Popular name: Speckled sleeper
Habitat: Atlantic coast of tropical America. Sea and brackish water.
Normal adult size: 8-10 in. (20-25 cm.)
Breeding size: 2 in. (5 cm.)
Family: Eleotridae (gobies)

This is a pleasant fellow among fishes and is what I would call another one of Nature’s oddities. There does not appear to be a great deal of information available on it and I have to thank, once again, those two stalwart friends of mine, Dr. Fugger and Mr. Stempfleif. From information that I have gathered it does not appear that the speckled sleeper has ever been bred in the U.K. but reports are available from the Continent, and to these I must in this instance turn.

Reports are, however, varied on one point. Some people do not regard Dormitator maculatus as a community fish and say that they can be left alone only with large fishes. Others say that it is a peaceful aquarium inmate. So you pay your money and you take your choice. All reports agree that this species is extremely shy and very sensitive to shocks.

Avoid Shocks

The oddity about this fellow is that when shocked, even by a sudden approach or movement in front of the aquarium, the fish immediately begins to gasp very heavily and turns on its back. It also takes a little while for it to compose itself again and the owner may well think that he had lost a specimen! They do, however, gradually recover but sometimes it does take time.

They prefer a very heavily planted aquarium, one giving as much shelter as possible, and like to be disturbed as little as possible. They will accept all forms of live foods. Their full length and maturity is reached not in an aquarium but when free in natural surroundings. A newly caught specimen, when compared with an aquarium inmate, is so different in length and colouring, so clearly diverse, that one finds it difficult to believe that one is comparing the same species.

I can find no reports of the method of spawning, other than that the eggs are laid on rocks and stones, after these have been cleared by both the male and female. The eggs are somewhat smaller than usual but usually very numerous. Eggs hatch out in anything from 20 to 25 hours at 76-78°F (24-29°C), but cases have been known where hatchings did not commence until after 30 hours at these same temperatures.

When fry rearing is difficult, as with some species, one must vary the water factors such as pH and degree of hardness, and possibly cleanliness. Rearing fry of Dormitator maculatus is considered far more difficult than most of the more difficult species, but I can find no hard and fast conclusions. As the species is so little known it could be that it will tax the efforts of some of the more ardent aquarists, and set them a new series of problems for them to get their teeth into. Not many species have caused us to admit defeat, but before we can grapple with these problems we must await a supply of these delightful fish for us to work on.

It is a very colourful fish, with a background of brown grey and having dark horizontal stripes. A very pronounced black band extends from the gill plate to the base of the caudal. A metallic blue spot is also to be found just behind the gill plate. Fins are dotted with blue and black with pale orange edges. The anal fin has a blue edge, and the ventrals are entirely separate from one another. The dorsal fin is in fact two fins, completely separate from one another, with no resemblance of any join between them.

When I saw some specimens abroad I was struck with two points. The brilliant colouring was delightful in both male and female (the latter being just that little bit less brilliant), and these fish would have looked positively brilliant in our usual aquaria. But here comes the snag, for it appears that you just cannot have everything. The fish do not like clear water. It must be just that little bit cloudy and they require more than the average oxygenation. When specimens do become more freely available, this last point might be regarded as a further obstacle for us to overcome.

Cacti in the Fish House

It is not generally known that many cacti can be raised from seed and some caused to flower in the second year. Sow the seed finely on top of John Innes seed compost. Do not cover the seed but just press in the larger ones. Give warmth, moisture and shade. A temperature of 70°F is best and this can be obtained by placing the seed pan on the top of a tropical tank. Keep it covered until seedlings appear, then give air but no direct sun. The early part of the year is the best time as the seedlings get a better chance of growing to a useful size before the winter.

THE AQUARIST
Breeding and Rearing Marbled Newts and Spotted Salamanders

by ROBERT BUSTARD, B.Sc.

(Photographs by the author)

The subject of this article, as the colour pictures show, possess an attractive coloration, and this they combine with a hardy nature. There is no reason why specimens should not survive in captivity for about 20 years.

The marbled newt (Triturus marmoratus), a native of Central and Southern France, Spain and Portugal, grows to about 6 inches in total length and is marked with bright green and black. The green is sometimes suffused with yellow. The ventral coloration is grey-brown. During the breeding season, late spring and early summer, male specimens develop a high dorsal vertebral crest, which dips down at the tail base and is then continued on the tail where it is present ventrally as well as dorsally. The crest of the male is marked with vertical bars of black, green and white. The habits of the marbled newt are similar to those of the great crested newt (Triturus cristatus), which is found in Britain. Each spring the adults return to the water to breed, after which, in mid-summer, they return to the land and hide during the day in damp places.

These two species of newts hybridise quite readily, and this takes place in Nature where their ranges overlap. This is possible because both forms have a similar type of courtship display, which is common to the genus Triturus, in which males develop a crest and during courtship deposit a spermatophore which the female picks up. Fertilisation, therefore, is internal as the spermatophore ruptures inside the female and fertilises the eggs before they are laid. There is, however, no copulation nor embrace in this genus.

Aquarium for Marbled Newts

Marbled newts are best purchased during late April or May. At this time of year they should be placed in a 24 in. by 12 in. by 12 in. aquarium. Although this size is quite suitable for keeping them in, breeding is more likely to take place if a larger tank is available. The aquarium should have 1 to 2 in. of compost in which plants are established. It is always preferable to introduce animals to an established aquarium whenever possible, although this is not absolutely essential.

My favourite plants for egglaying newts are Elodea canadensis, the common Canadian pond weed obtainable from most ponds or slow flowing canals, or, failing this, water starwort (Callitriche spp.). Both have leaves which the newts can easily bend over the eggs. The Triturus news lay eggs singly and each egg is wrapped in a leaf by the hind legs. The eggs are sticky and the leaves adhere to them. In the absence of ideal plants even small newts will successfully fold over the leaves of Vallisneria. The water should be at least 6 inches deep.

If it is hoped to breed the newts the tank should have fairly good illumination. If exposed to too bright light a protective layer of green algae will soon coat the sides of
the aquarium. The newts should be well fed—earthworms are the best food, and hiding places should be provided in the form of suitably arranged stones placed on the compost bottom. The arrangement of the tank has been mentioned in some detail since it is a key factor in achieving breeding success. By careful tank arrangement the author has repeatedly bred the smooth newt (Triturus vulgaris) and the palmed newt (Triturus helveticus) in a 10 in. by 8 in. by 8 in. aquarium. The twin aim must be to provide cover so that the newts are at home and to provide open spaces where courtship can take place and so that the males may be enabled to spot the females.

Courtship is interesting to watch: the male bends his body and curves the tail so that the tip is touching his flanks. He then vibrates the tail tip rapidly. This directs a current of water on to the female, whom he may approach and nudge from time to time. The female remains passive but after the male has laid the spermatophores the female picks this up in her cloaca. When the eggs have been laid (a careful search is necessary to detect them) the parents must be removed in about a week to another aquarium. Several weeks after egg-laying, tiny gilled tadpoles hatch from the eggs and feed on small aquatic animals, which are present in all matured water. Suitable food can be cultured by taking a gallon of pond water and adding in this a pint of “weep” made by placing a lettuce leaf in boiling water and leaving it exposed to the air for a couple of days. After about 14 days the pond water can be added to the aquarium at the rate of a pint every other day. Remove any sizable insect larvae, leeches etc. (but not water fleas such as Daphnia, Cyclops etc.) before adding the water to the aquarium. Newt tadpoles develop their hindlimbs first and after about 3 months the young are ready to metamorphose and measure about 2 inches. At this stage stones that protrude from the water should be provided and the aquarium must be covered to prevent escapes.

After metamorphosis the young newts live on land like the parents. After the breeding season, when my newts are all on stones out of the water (these are provided after breeding is accomplished), I remove them to their summer quarters—a vivarium 30 in. by 18 in. by 15 in. high. This has 2 to 3 in. of damp soil with moss and moisture-loving ferns growing in it. Stones are provided as hiding places. A small pie dish sunk into the soil is the only water dish and a stone allows easy escape from this. This vivarium is ideal also for spotted salamanders, which can live with marbled newts during their terrestrial phase.

The spotted salamander (Salamandra salamandra) is a well-built species attaining a total length of about 8 inches. It has a wide distribution in Central and Southern Europe and Asia Minor. The coloration is conspicuous: it is an aposematic or warning coloration that has protective value to the wearer, as animals learn to avoid it—glossy black with bright yellow or orange blotches or stripes on the upper surfaces. The conspicuous appearance contrasts with the camouflage of the marbled newt, which if placed among grasses would be almost invisible.

Breeding the Spotted Salamander

The spotted salamander is entirely terrestrial, and even the amniotic takes place on land. Many spotted salamanders are gravid when purchased and as female salamanders of this species can retain sperm up to at least 3 years after a single mating to fertilize their eggs, a birth is only a matter of waiting. Unfortunately many salamander owners do not realize that the young are born in the water. A small water dish sunk into the soil is essential and ease of partial access must be provided. When the female is about to deposit young she takes a hip bath, and as the fully developed, limbed and gilled young are liberated in the water. When born the young about an inch. One mating can lead to young being born early each summer for several years and a number of young may be born at intervals in any one year. Up to about 30 young at one time is usual.

When discovered the young should be removed to an aquarium with 3 to 4 in. of water. They metamorphose when 2 inches long, about 4 months. They should be well fed on tiny water creatures and at birth are unable to tackle anything larger than sections of the smallest earthworms. Tubifex and other small aquatic life is ideal. The adult coloration appears when metamorphosis takes place and, like the marbled newts, they take several years to reach sexual maturity.

Adult salamanders thrive on earthworms. They will live with little attention provided that they are never overcrowded. Some collectors who breed their specimens successfully lose all of them from a fungal infection resulting from overcrowding. I make it a rule to provide several hiding places equally suitable so that all do not crowd under one stone. In addition I never keep more than three pairs in a vivarium of the size mentioned.

The specimens mentioned above can be purchased for about 7s. 6d. to 10s. each.
Questions of Interest to Guppy Breeders

with answers by JAMES L. KELLY, Chairman, Fancy Guppy Association

I have four tanks in my fish house that I would like to convert to fancy guppy breeding. A friend says I need more than four. How many would you say? What is the ideal size for them?

There is no fixed number of tanks needed to start fancy guppy breeding. It depends whether you are going to 'rock breed' (all together in one tank) or 'line breed', picking the best from each brood to sire the next. Some guppy breeders I know do well with less tanks than you; it depends on your skill. Small tanks become food very quickly: 18 in. by 10 in. by 10 in. or 24 in. by 12 in. by 12 in. are the most popular.

At different shows I have seen guppies referred to as veiltails, though differing in form. Why is this? I thought a veiltail was one distinct type of guppy.

Each Guppy Society has a shape which each think is the ideal veiltail. In America the term is applied loosely to any guppy with a large caudal fin.

What should I look for when selecting fish to start a breeding programme?

Choose breeding parents for individual desirable traits, but please remember that feeding and good environment are still necessary to develop your fish's potential.

I'm told that tipped *Daphnia* make an excellent fry food. Could you describe an easy way of doing this?

Take a rotary type of can opener (the one that leaves the rim free from jagged edges) and cut out both ends of any medium-sized can. Fasten an old silk stocking over one end with an elastic band. Stand this in your container of *Daphnia* and you will find it will fill up with the finer

*Daphnia*, leaving the larger ones in your container for your bigger fish.

Is there a minimum age at which male guppies can fertilise the females?

This is usually accepted to be about 5 weeks, hence the necessity to sex your fish as soon as possible if you want to keep your females virgin for breeding programmes.

Having saved my fish for an early day I separated them. Now I find some of my females are pregnant despite my efforts to keep them virgin. Why is this?

This can happen for a variety of reasons. Though parthenogenetic (virgin birth) is now accepted as occurring by forward thinking breeders, this type of happening is usually due to perhaps a late developing male appearing unnoticed in your female tank, the unintentional transference of a male when netting your fish, or even to a male jumping from one tank to another. Care and tightly fitting cover glasses are essential to avoid a repetition.

I am told that guppies can give birth to large broods. What is the highest recorded?

My good friend Paul Hahnel in America staked his claim for 170, but now two American breeders have increased this to 181 and 195 respectively. No doubt we shall be hearing of even greater claims. I am satisfied if I can count up to 50!

It seems that different breeders have different names for apparently the same fish: one example is the American half-black veiltail. What do we call this type in Britain?

Most guppy breeders in Britain refer to this as the black

July, 1963
COLDWATER FISH-KEEPING QUERIES answered by A. BOARDER

I have bought a pair of veltail goldfish and they have white slaty patches on them. I can wipe them off and have given the fish a bath in salt water for 4 hours each day for 4 days, but they do not seem to improve. What else can I do?

The fish may have a slight attack of fungus. It is hardly good enough to give a salt bath for 4 hours. The fish need to be in the solution all the time for about 4 days before a cure can be expected. The strength can then be lessened by adding fresh water.

How can I rear goldfish fry?

Read my book, Coldwater Fishkeeping (2s. 10d. post free from The Aquarium) or study the recent articles on breeding fish in this magazine.

I have a pond 16 ft. by 8 ft. and about 28 in. deep. I was thinking of stocking it with 14 goldfish, 2 golden orfe, and 6 goldline orfe. Is that too many?

Your fishes will need space in which to grow, and so do not overcrowd. Try to imagine a piece of water the size of your pond taken from a natural pond, lake or reservoir. In such a piece of water how many fishes would you expect to find there? Maybe one or perhaps none at all. I used to do a lot of angling and have sat for days at times without getting a bite, dangling a live active worm, which should have attracted at least one fish somewhere around. I doubt very much whether a piece of water of this area in the average natural water would hold more than one fish on an average.

I have had tropical fish and now intend to use the tank for moors. Shall I need heat for these or for any other fancy goldfish?

It depends on how the fancy goldfish have been bred. Many imported fancy goldfish have been bred under warm or even hot conditions and so they prefer the same conditions here. Usually they can be acclimatized to normal temperatures in the summer.

I have three ponds; two are quite clear but the third one is very green. Would activated charcoal in a filter be of any use to clear the water?

A filter would take a long time to clear your pond. The one you could soon be clogged with algae and fail to act. I think that you will find that this pond has less healthy, growing plant life in it than the other two ponds. This kind of thing often happens. I have a dozen coldwater cisterns in my garden, concerted over, in which I rear young fantails. One of these tanks is very green whereas all the others keep very clear. I have placed some underwater plants in the tank in place of the few that were there. These were in a sorry state, being partly covered with blanket weed. I had been away from home for a few weeks and this one tank had become foul. If you change most of the water in the green pond and refill you should find a better state before long, especially if you can put some underwater plants in.

Just over a year ago my wife bought six young goldfish and placed them in a garden pond. A month ago I saw several young fish in the pond. Is this very unusual for goldfish to breed in a garden pond?

It is quite a usual occurrence to breed goldfish in a garden pond. Goldfish can breed at any time of the year. In one pond I have several fry which I have not collected, and a hundred fry have been counted so far this season.

I made a small pond in the garden and lined it with a motor car cover. I have put some young trout in but they are dying. What is the cause?

From your description of the actions of your fish I think they were poisoned. This may have been caused by foul gases in the water but more likely through something from the car cover. It would have been better to use concrete for a lining of your pond.

I would be glad if you could tell me how to prevent fish rot from attacking my golden orfe. The pond holds 40 to 70 gallons of water and there are shubunkins and goldfish also in the pond.

Your pond does not appear to be very large and it is probable that you have too many fishes in it for them to keep healthy. Usually golden orfe are very resistant to fish rot. Orfe like plenty of space and very fresh water or they soon suffer. Check the size and number of fishes and reduce if necessary; also clean the pond out and refill with fresh water.

Many fish in my pond, especially the young ones, are attacked by fish lice. Is there anything I can put in the water to kill these?

Fish lice are fairly tough and anything you put in the pond to kill them would probably kill the fish as well. You may have to catch all the fish and give them the Dermal bath treatment as recommended before in these columns. This will clear the lice but another immersion after a fortnight would kill any young lice that hatch out later.

I have just made a pond 4 ft. 4 ins. by 3 ft. 4 ins.; how many fish can I put in it?

This is not very large and so you will need only about half a dozen fish. If you put too many in they will not thrive and grow. It is far better to have a few healthy fish than to try to overcrowd it by crowding many in. Fish about 3 inches long overall will be suitable.
Is it possible for a catfish to attack another fish? I have a moor and one evening it was all right but the next morning its tail was torn in shreds. The previous day I had introduced a catfish to the tank. Could it be that the catfish was hungry and went for one of the slower moving ones?

I have often written about the danger of using catfish (sandwater) as scavengers in tank and ponds. These fish can eat any fish up to three-quarters of their own size with ease. If they cannot get the fish in their mouth they can bite the ends from the tail. The tail of the moor will mend in time and a salt bath given occasionally will help.

I have recently set up a goldwater tank with plants and fish.

My problem is that the two electric lamps, normal bulbs of 60 watts, will make the water too hot for goldfish. What do you suggest?

There is no need to have 60 watt bulbs on your tank: two of 23 watts will be quite sufficient. Even these can warm the top of the water but I have never found that this harms the fish in any way. I have used such lighting for many years with no ill effects. Have a glass covering, and leave about half-an-inch open at each end. Then see that the lighting cover has some holes at the back to let out some of the heat. There will then be no danger to the fish at all even if the lights are on for 8 hours a day.

GOLDFISH BREEDING

A Sure Method to Obtain Fry
by C. E. C. COLE

In my last article I promised to tell you how to obtain lots and lots of goldfish fry—the raw material from which to choose your future breeding stock, in conditions where they would escape most of the normal hazards of survival.

First obtain a large container, a large pie dish or baking tin is suitable, able to hold 2 inches depth of water. Put water into this straight from the tap, not from your pond or aquarium. Leave it for 24 hours or such time as your fish are ready for spawning. You can wait, if you wish, until the males begin to push the females around, or you can previously net them and keep apart from the females until the latter are ready.

Stripping Technique
Both male and female must be readily available so that they can be caught within a minute or two of each other. The order of catching is of paramount importance. First catch the male and hold him so that only his vent is immersed in the water in the pie dish. Stroke his sides with a downward movement, from halfway between his pelvic fins and the base of his dorsal, downward and backward to his vent, at the same time moving him backwards and forwards across the dish. Milk will flow from him in a daily visible cloudy stream. Replace him in the pond or aquarium.

Immediately take the female and hold him in a similar position and stroke in the same place and direction. A stream of eggs will be released quickly and easily. Move her likewise backwards and forwards to distribute the eggs over the bottom and sides of the dish. Then replace her also in the aquarium. If no eggs are released when gentle pressure is exerted, on no account press harder to start a flow. The fish is not ready and should immediately be replaced. Very often her movements within your hand will be sufficient to release the eggs—no stroking on your part will be necessary.

On several occasions when I have netted out the female a number of eggs have been released into the net without my touching the fish at all. As an experiment I once suspend the net with the eggs adhering to it in shallow water. I had previously netted the male fish in the same net. Within 4 days I had a healthy hatching swimming in the net! Unbelievably easy, wasn't it?

Advantages of Stripping
The whole process of stripping fish in the manner described can be completed in less than 2 minutes. Compare this with the length of a natural spawning in a pond, which may take half a day or longer.

In plain water, without woods or compost, the eggs are clean and likely to be free from pests. Remember that

Method of stripping the eggs from a female goldfish. The fish is held partly immersed in a dish of water and the sides are stroked with a downward movement (in the direction of the arrow) towards the vent.
the only part of the parents’ bodies that was immersed in the water was the tiny area around their vents. Body flukes or other ectoparasites could scarcely be introduced except by the most chance and the greatest bad luck. Nevertheless it is as well when stripping is complete to wait only a few minutes to ensure the maximum fertilisation before swirling the water round and emptying it away, replacing with fresh at the same temperature. The eggs will not fall out for they are semi-adhesive.

High Fertility

Moreover, as they are concentrated, and with nothing to obscure one’s view, observation of the eggs is easy and their development can be checked with a hand lens. In the many hand upplings I did years ago the percentage of fertile eggs was often as high as 95 per cent. When I tried stripping the female first the percentage was less than 10 per cent.

When the Goldfish Society of Great Britain was first founded a lot of work was carried out to find out how many eggs would be thrown by a single female at one time. Stripping females was the only reliable way to find their potentiality, I simplified my egg-counting as follows. Before filling my pie dishes with water (I used white enameled dishes) I marked the bottom and sides by drawing pencil lines vertically and horizontally down and across them, producing about 40 small areas, which were then numbered.

After stripping, the number of eggs in each area was counted, and the total noted on a piece of paper against the number of the square. Also noted was the number of fertile eggs and the number of infertile ones, although the count of these had to be delayed until it was obvious which were which.

I can therefore repeat confidently that if all the fry of a single female reached maturity our ponds would be solid with them.

Feeding the Fry

We now have a dish full of fertile eggs—what do we do next? If we have not already done so we can start some cultures of Infusoria going. The classic way to do this is to boil some chopped hay and strain off the water. To this liquid add a little dry, chopped hay. A scum will appear after a few days, and it is beneath this scum that the infusoria collect in quantity. It can be moved aside a little when removing the infusoria for feeding to the fishes, but should not be broken up if the culture is to continue active.

It is unlikely that we can culture sufficient infusoria to satisfy the appetites of our hundreds of fry. Supplementary food should be added in the shape of small quantities of dried egg, or the yolk of hard-boiled egg. Little and often is the rule to be followed. More of the egg is likely to be eaten if it is kept moving near the water surface where the fry tend to congregate.

The suspension of a diffuser stone just beneath the surface of the water, slowly emitting bubbles, will keep the particles of food suspended in the water for an appreciable time—long enough for most of it to be snapped up.

For the first 10 days after hatching the fry will come to little harm if fed in the pie dish, but after this they should be distributed in larger containers—preferably aquariums, but if these are not available, in polythene or enamel bowls. Daphnia, Cyclops and brine shrimp can all be used to give a ration of live food, and great larvae and pupae and many larval all form excellent foods.

As soon as they are large enough to be seen easily, every fry should be closely examined. Amongst such a vast number there will be all sorts, good, bad and indifferent. Choose only the ones that show promise of the characters you most desire to see, and dispose of the rest. To do any good you just have to make up your mind what you want. For instance, you may like deep-bodied fish, or slim, pencil-like fish; fish with pig-like snouts or streamlined head profiles without a bump where the head joins the trunk.

Later you can select the earliest colouring fish and discard the slow or never-colouring kind, or vice versa.

Whatever you decide it will be best if you can ensure that the young fish spend their first autumn and winter in ice- and frost-free conditions, in water of a sufficient warmth to encourage them to keep eating. Then, as soon as conditions permit in the spring or early summer, they can be safely put into a previously prepared outdoor pool, stocked with plenty of fresh live foods, where, accidents barred, they will never look back.

DISEASES OF FISHES

Tape Worms

Tape worm (Digoecidae spec.)

The tape worms (Cestoda) that live in the belly of their host grow to such vast proportions that the internal pressure causes the belly of the victim to split, open. The swelling is quite distinctive from that caused by other ailments such as dropy, constipation etc. as there is a noticeable “cure-up” around the region of the heart. Spiny-headed worms (Acanthocephala) cause the death of their host by perforating the intestine.

Thread worms (Nematoda) cause the death of their host by inducing a serious inflammation of the internal organs such as the intestine, pancreas, liver etc.

There are no apparent symptoms during the early stages of infection, except a loss of colour and general debility, and by the time something serious is suspected, too much damage has been affected for there to be any chance of recovery. The kindest thing to do is to kill the affected fish, for nothing at all will be achieved by keeping the creature alive.

R. E. Macdonald

THE AQUARIST
Aquarium Electrical Installation

by A. Jenno

All aquarists who maintain aquariums heated by individual immersion heaters with thermostatic control need to know how to provide the heaters with a safe and adequate electrical supply, and having provided it in the correct manner, to keep the system in proper working order.

This article will therefore describe a system suitable for a batch of aquariums, with additional supplies for lighting and aeration. Let us begin by stating that the aquarist wishes to provide power for a batch of ten aquariums, each of which will use a heater, a thermostat and a lamp, and in addition power for two pumps that will provide aeration for the aquaria.

The first essential is to know the maximum total current that the circuit will draw from the supply. This is calculated by adding up the wattages of all the appliances in use and dividing this total by the supply voltage. If we assume that the heaters are 100 watts each, the lamps 60 watts each, and the pumps 10 watts each (thermostats, of course, draw no current), then the total wattage for our example will be:

- Heaters: 10 x 100w = 1000w
- Lamps: 10 x 60w = 600w
- Pumps: 2 x 10w = 20w
- Total wattage = 1820w

Assuming the supply voltage to be the normal 240 volts, then the maximum total current will be: 1820w / 240v = 7.575 amperes.

It is normal electrical practice to install a system that will carry more current safely than is actually required, so in this case a 10 ampere supply would be used. The first part of the circuit required then will be a connecting cable from the electricity authority's supply terminals to bring the voltage supply to wherever the bank of aquaria is to be situated. For a 10 ampere circuit this cable will need to be what is termed '10 amp. twin core with earth', which consists of two 10 ampere, insulated, current-carrying wires and an earth wire, the whole cable being covered by a second insulating sheath.

This cable should be run from a position near the aquarium to the electricity authority's terminals but should not be connected to them, for reasons which will be explained later. At the other end the cable should be connected to a switched fuse box, which in this case should contain two 5 ampere fuses, a common neutral point, an earth terminal and a double-pole isolating switch. This switch will allow the aquarium circuit to be switched off safely without causing inconvenience to other circuits in the building, and the fuses will enable us to split the 10 ampere total circuit into two 5 ampere circuits, one for the heaters and the other for the lamps and pumps. By using this method the supply to the heaters will be maintained should a fault occur in the other circuit since only the lamp and pump circuit fuse will be blown.

The heater circuit will be considered next. There are various methods for connecting the heater and thermostat to the supply. One very common method is to use small terminal blocks or connectors to join the leads. This system has its limitations, however, and tends to encourage the use of odd pieces of wire of various sizes and can become dangerous when used by persons whose electrical knowledge is limited. I would like therefore to suggest two alternatives that are much more dependable.

The first method is to substitute for the connector blocks a proper plug and socket assembly. This is a better method but the drawback is that if the plug and socket assembly is allowed to hang freely with the wire, as it normally is, and the wires are disturbed, the plug may drop out and the fault may not be discovered until too late.

The other method, which I strongly recommend, is to use two supply sockets mounted on the wall behind the aquarium and to connect the sockets in such a way (see diagram) that the heater and thermostat can be plugged directly into these. This then eliminates junctions in the wiring between the supply socket and the aquarium.

Thermostat

Heater

Link

Live (red)

Neutral (black)

Twin cable

Method of connecting two sockets to receive heater and thermostat adaptors

One point always to remember when wiring up aquaria or any electrical appliance is that the live side of the mains supply should always be the side which is switched by the thermostat. This is recognised electrical practice and should always be adhered to for safety, as if an appliance has its neutral lead switched instead of the live lead, then the appliance will be 'alive' even though switched off, with obvious possible results. If two sockets are used in the manner described above, the 5 ampere size will be found necessary to make the connections efficiently with the mains cable used in this example, as its thickness prohibits its use with smaller sockets. The sockets should, of course, be fitted to a mounting board and this firmly fixed to the wall behind the aquarium.

When all the heater supply units have been made up and connected together with 5 ampere twin-core cable, the circuit can be joined into the switched fuse box, which
should be mounted firmly on a wall and in a position where it will not be accidentally switched off. The live side of the heater supply cable (that which is connected to all the thermostatic sockets) should be connected to one of the fuses in the switch box and the other side of the cable (connected to all the heater sockets) should be connected to the common neutral point, also in the switch box. The lighting and pump circuit can now be wired up. In this case it will also be a 5 ampere circuit and will also use 5 ampere twin-core cable. It is recommended that a timer and lamp holder be fitted to the wall behind each aquarium and the lead from each reflector connected into this by means of a normal household bayonet plug. This allows a lamp to be inserted when the reflector is removed from the aquarium and provides light for cleaning and other aquarium maintenance.

Two 5 ampere sockets will also be required in the circuit at convenient points to supply power to the pumps, a single-pole switch for switching the current to the lamp and a small junction box so that the pump sockets can be connected into the circuit in front of the lighting switch and thus be supplied with power whether the lamps are on or off. Having wired up the circuit, the live side of the supply cable (that connected to the lighting switch) should be connected to the second 5 ampere fuse in the switch box, and the other side of the cable should be connected to the common neutral point.

The only thing now remaining to complete the installation are the earthing system and the connection of the mains supply cable to the electricity authority's terminals.

It is unfortunate that many aquarists just do not bother to earth their tanks. It does entail a certain amount of trouble, but it is desirable that any article containing water, in which electrical appliances are used, should be efficiently and effectively earthed. (It is recommended that advice should be obtained from the aquarist's local electricity authority before this is attempted.—Editor.) One of the best methods is to clean off the paint from part of the underside of the aquarium frame and also clean off a similar area on the metal supporting stand if one is used. A small copper plate can then be inserted between tank and stand and will be held in position by the weight of the tank. The earth wire should be soldered to each of the copper plates in turn and finally joined into the switchboard fuse box at the earth terminal.

The circuit will now be complete, but must be inspected by the electricity supply authority, who will then join the mains supply cable into their supply terminals. This is necessary because, while the electrical circuits in any building are the responsibility of the owner, the incoming cable and its terminal box are the property of the electricity authority and must not under any circumstances be interfered with by the consumer.

A final point to remember when the circuit is in use is that wherever there are several aquaria, there will probably be a certain amount of condensation present. The circuit should therefore be protected against this as far as possible and all plug sockets and lamp holders not in use should have plugs or 'dead' light bulbs fitted in them to help prevent the entrance of water, and also the aquarist's fingers!

**HOUSE-PLANTS IN THE FISH HOUSE**

*Aphelandra squarrosa*

*Louisae*

This striking plant was first introduced to this country a few years ago and won immediate acclaim for its striking appearance. The upright habit is well illustrated in the accompanying photograph. The leaves are dark green, striped with cream, and the yellow flowers are surrounded by greenish yellow bracts. This Brazilian plant is an ideal plant for the fish house, as it thrives in a warm humid atmosphere, but it prefers diffused rather than direct sunlight. A minimum winter temperature of 50°F (10°C) is necessary if attacks of fungus are to be avoided, for this plant requires more water in the colder months than most other house plants.

*Aphelandra*, like other forest shrubs, needs a good peaty compost. A good mixture is 2 parts of loam, 1 part of peat or leaf mould, 1 part of well-rotted cow manure, 1 part of sand and a little bone-meal. The showy bottle-shaped flowers are produced only when the plant is allowed to become pot-bound, and liquid manure feeds should be avoided until the buds are advanced. *Aphelandra* is a terminal plant and requires re-potting each spring.

Cuttings may be taken from the shoots which develop in the axils of the leaves as a result of the dead flower heads being removed. They mature quickly in a temperature of between 65° and 75°F (18°-24°C), and when a good root ball is produced they should be potted in a 5 in. pot. Small insect pests have a tendency to attack the leaves and stems and spraying with a good insecticide may be necessary if this occurs.

*Barry R. James*

**THE AQUARIST**
A Judge's Thoughts on Judging Fish

Condition and Deportment

by Francis Barratt

Having dealt in previous articles with the more obvious parts of judging, we come to the final part of the 'five twentys'—condition and deportment, and this is the part of judging that is least understood by exhibitors. Indeed, I know that some judges choose either to ignore this section altogether or to use these points as a kind of balance to bring the points to a total decided beforehand.

A lot of thought and many years of judging experience went into the compiling of the standard method of pointing and no part of it can be ignored without impairing the possibility of a fair result. Of the 20 points, it is usual to give 10 to condition, which is soundness of body and fins, and 10 to deportment, which is swimming activity and carriage of fins.

Condition

First we examine for disease. Any obvious diseases will, of course, have been noticed before reaching this stage and the entry disqualified. What we have to do now is to decide if what looks like a slightly frayed fin is actually the first stage of a fish opening eye is due to old age or cataract; if the suspender bud of a female is over-ripe and either early droopy. Though it is generally recognised that there are the diseases of fungus, white spot, velvet, pop-eye etc. cause for disqualification it is very hard to find confirmation in any rules. Exceptions are the Federation of British Aquatic Societies in their Standards for goldfish and the Goldfish Society of Great Britain in their Handbook, who both state that any fish showing signs of deformity or disease shall be disqualified.

Next we look for damage to fins, such as split, frayed ends or pieces missing, taking care not to punish again for faults down-pointed under fins, such as deformed rays or holes. It is very difficult to make a scale of points to be deducted for these faults. A slight split is usually a very temporary trouble and not serious, but a split right to the base of the fin makes a much more undesirable sight, even though it may heal quickly. Frayed ends, being slow to repair, we can treat more seriously.

The body is searched for cuts, bruises and damaged or missing scales. These can be caused by injudicious handling when catching to bring to the show, and are often overlooked by the exhibitors. Fresh wounds of a very slight nature may just merit loss of points, but a cut that is open and showing tissue below the skin must disqualify. It is no exaggeration to say that such wounds will appear in fish at the show tanks; a fish with one eye hanging on its cheek was exhibited some time ago, the eye having been caught in the net on release of the fish into the tank.

Abnormal conditions of the gills are nearly always of a serious nature as far as pointing is concerned. Short gill covers will have been noted under 'body' as being a fault of development, and very bad cases will have been disqualified. 'Gapping', a condition where the gills do not close properly, is usually a sign of age or ill-health and seldom disappears. The appearance of red gill membrane often accompanies this condition as a further sign of trouble. All these faults are ugly, and we cannot allow prizes to go to such specimens even though they have high points in other sections.

When assessing the number of points for condition we should think of all the faults this fish has and decide whether the total effect is 'good', 'fair', 'poor', etc., just as we did for body, colour and fins, but this time only half of the points are given to each grade. If no fault can be found 10 points are given, 9 or 9½ for 'very good', 8 or 8½ for 'good'; and so on, down to no points for 'bad'.

Deportment

Deportment is another source of argument between exhibitors and judges. Often a large, well-shaped beautifully coloured fish will be sitting on the bottom of the tank or jar with fins half-closed. This can cost the exhibit most of the 10 points under this heading, and as the first four places in a good class are often covered by 3 points, there is going to be some controversy if the implications are not properly understood by all.

To get full marks for deportment an exhibit should have all fins extended fully and be moving about the tank in a manner typical for its species. The fin carriage to look for is what we see in courship displays by most males, and mostly the females respond by similar action.

The ideal manner of swimming can vary so much from species to species that no amount of written description can be adequate. Danios are a constant blur of erratic movement; barbs are only slightly more sedate. Cichlids are likely to hang quietly for a spell before moving to a fresh position, gouramis glide smoothly round, with an occasional peck at the surface for air. Catfish are the real problems here, because so many of them are by nature nocturnal, or are shy and retiring. In jars most of them are hopeless, and will sit on the bottom all closed up. We ought not to make allowance for this when pointing, but if one of the less active species is alert, fins well spread and erect, yet not moving about, we can be fairly generous with the points. When the points out of 10 for deportment have been decided, add them to those for condition, and enter the total in the appropriate space on the judging sheet.

We now add up our figures and arrive at the "moment of truth". Has the one we had our eye on for first place got the most points? So often it has not, and so often it is only by the odd point or two it could have had it was swimming about a bit, or had its fins erect. The odds are that we have two or three with the same number of points, and we have to decide which one to take up as winner. The accepted course is then to give a careful look at all the pointing, and if adjustment is indicated by a second look, do so; otherwise give the benefit to the one with most points for size.

If these are equal, continue down the paper until one is found to have the most points for body, colour, fins or condition and deportment. It is very, very rare for two fish to be equal all the way down, and if it is necessary to separate them it is best to come back after a little while, when one will be a bit brighter or a little more active than the other.

If we are satisfied that our points for each factor of

Continued overpage
Our Readers WRITE

Chemicals for the Aquarist

CONGRATULATIONS on Mr. J. D. Loader's article on "The Use of Chemicals for the Aquarist", published in the May issue. There is one point which I think should be made, however.

For the salt treatment, Mr. Loader mentions lump salt and non-iodised cooking salt. For the cut-bump salt the Table of equivalent measures on page 28 is reasonably accurate, but in many parts of the country cut-bump salt is not available, and instead of it cooking salt is sold in 1 lb. and 3 lb. bags. Users of this salt will find that one heaped tablespoon will weigh as much as 4 oz., and even a flat tablespoon will weigh 2 oz., instead of the 4 oz. quoted in the Table. The result might be a solution between 400 per cent and 800 per cent of desired strength.

I think that you will agree that this is important enough to be mentioned.

L. C. Noble,
Nailsworth, Glos.

In your May issue there was an article on "The Use of Chemicals for the Aquarist". As a beginner I had read this, and applied the treatment for fungus, using common salt. In the "Treatment and notes" column it stated that there would be no effect on plants. I found that although I followed the instructions exactly, quite a few of my plants went brown and died.

As a beginner I look to your magazine and articles in it for information and guidance, and I am very surprised and disappointed at this misleading information.

K. J. Nowlan,
Tongham, Surrey.

New Zealand Request

MR. Bill Freeth, public relations officer of the Auckland Aquarium and Pond Society Inc., has written to ask us to solicit the co-operation of British aquarists' societies with his organisation. His idea is for societies to make tape recordings, of 15 to 30 minutes playing time, of members discussing any aquarium or pond subjects, the tapes to be exchanged with similar ones from the New Zealand aquarists. "After use by our Society we would pass the tapes on to the 14 other societies is this country," writes Mr. Freeth, who would also like to know if anyone has films or slides on aquarium-keeping for sale. His address is Box 1578, Auckland, New Zealand.

Condition and Deportment

continued from page 75

judging are fair, then the result will be a fair one. Remember that any fish which has been considered "good" has for each factor received 15 or more points, each time, a total of 75 to 85 points—usually enough to be "in the cards" in a good class. More than 85 is unusual and over 90 very rare indeed.

It may be that some people consider the use of the formula I have given a bit complicated. I find the reverse to be true. The first thing to enter our mind on looking at a fish critically is 'good', 'poor', 'fair', 'very good' and so on, and this formula is simply a table to convert these grades into points. Try it yourself and see what good results you get.

The AQUARIST Crossword

Compiled by L. BRADLEY

CLUES ACROSS

1. One-celled fish food (7)
2. Black men belong to the goldfish group (7)
3. No sea producing gas (5)
4. Minute pond animal (7)
5. Origin of sea caves (7)
6. Rather long among spectacular genera (5)
7. Restore to the original red cut (6)
8. Season before maturity (6)
9. Of Ionia (5)
10. More definitely that it was the last newspaper (7)
11. Activity opus (7)
12. Shepherd (5)
13. The place we live in (5)
14. Baby (7)
15. Palmarosa (5)
16. "W" (5)
17. "Z" (5)
18. "A" (5)
19. "E" (5)
20. "O" (5)
21. "I" (5)
22. "U" (5)
23. "R" (5)
24. "T" (5)
25. "I" (5)

CLUES DOWN

1. Many own this funny man (5)
2. Hibiscus (5)
3. The fume points to the fat (8)
4. Conspicuous chlorophyll, the water variety (6)
5. Spotted a butterfly in a mixed model (7)
6. To make a proposal (5)
7. A present form of snake (7)
8. 12 and 15, "Palmarosa" (7-7)
9. See 12 down. (5)
10. The peaceful earth (8)
11. Used to keep the aquarium at 75°F (5)
12. Lack of gas (2, 3)
13. A gene of a genetic? (5)
14. Strongly enough one can see in it (5)

Solution on page 78

THE AQUARIST
Monthly reports from Secretaries of aquarists' societies for inclusion on this page should reach the Editor by the 15th of the month preceding the month of publication.

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AT the May assembly of the Guest Kent & Southeast's Pond and Aquarium Society the Chairman welcomed visitors from Tipperary, Waterford, and Cork. The meeting was held at the Head of the River, Mallow, and the speakers were "Mr. A. R. E. (The Fisherman)" and "Mr. T. Lowe (A.G.K.N.)". The judges for the competition were Mr. P. Stokes (Winchester) and Mr. R. A. G. (Nottingham). The results were as follows: 1st, Mr. A. R. E. (The Fisherman) with 20 points; 2nd, Mr. R. A. G. (Nottingham) with 18 points; 3rd, Mr. J. T. Lowe (A.G.K.N.) with 15 points.

RECENTLY Newport A.S. were invited to compete in a four-way inter club show held at Llantrisant. Several awards were won by Newport in this competition, including the Best Fish in Show which was presented to Mr. T. Lowe (A.G.K.N.). The prize was for 10 points and 4 points were awarded for the trophy. There was also a Table Show for Guppies for which Mr. J. G. C. (A.G.K.N.) was the judge. The winner was Mr. H. Williams (Wolverhampton) and the results were as follows: 1st, Mr. H. Williams (Wolverhampton); 2nd, Mr. P. S. (Bristol); 3rd, Mr. J. G. C. (A.G.K.N.).

At a table show held in Newport were won as follows: 1st, Mr. J. J. (Bristol); 2nd, Mr. J. G. C. (A.G.K.N.).

THE results of the second Annual Show of the Thame A.S. were as follows: 1st, Mr. F. H. Turner (Derby); 2nd, Mr. E. A. (Southend); 3rd, Mr. T. B. (Bristol); 4th, Mr. J. G. C. (A.G.K.N.).

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AQUARIST CALENDAR

27th July: Bredenhill and District A.S. Open Meeting: Prince Consort Hall, Bredenhill. Details and show schedules are available from Mr. W. B. Bell, 73, Tolleshunt Walnut Road, Bredenhill, Essex.

4th-6th August: Portsmouth A.S. Open Show at The Holiday Inn, Portsmouth. Details and show schedules are available from Show Secretary, Mr. R. Hall, 32, New Road, Portsmouth.

16th-18th August: Midhurst and District A.S. Open Summer Show, R.A.A.S., 71, New Road, Midhurst. Details and show schedules are available from Show Secretary, Mr. R. Halton, 78, New Road, Midhurst.

20th-22nd August: Midland Open Aquarian Show, Prince Hall, Rugby. Details and show schedules are available from Show Secretary, Mr. D. J. Brown, 22, Exhibition Road, Rugby.

22nd-24th August: Ferrand A.S. Open Show at The Church Hall, Newnham Bower, Rugby. Details and show schedules are available from Show Secretary, Mr. D. J. Brown, 22, Exhibition Road, Rugby.

26th-28th August: Blackdown A.S. Annual Show, Details and show schedules are available from Show Secretary, Mr. D. J. Brown, 22, Exhibition Road, Rugby.

7th September: Wycombe A.S. Annual Show, Details and show schedules are available from Show Secretary, Mr. D. J. Brown, 22, Exhibition Road, Rugby.

15th September: East London Aquarian Society Annual Show, Details and show schedules are available from Show Secretary, Mr. D. J. Brown, 22, Exhibition Road, Rugby.

21st September: Leeds & District A.S. Annual Summer Show, Details and show schedules are available from Show Secretary, Mr. D. J. Brown, 22, Exhibition Road, Rugby.

27th September: Three Counties A.S. Open Show at Builth Wells, Details and show schedules are available from Show Secretary, Mr. D. J. Brown, 22, Exhibition Road, Rugby.

27th September: First Annual Ellesmere Aquarian Society Show, Details and show schedules are available from Show Secretary, Mr. D. J. Brown, 22, Exhibition Road, Rugby.

Crossword Solution


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- **Saturdays:** 9.00 a.m. — 6.00 p.m.
- **E.C. Day Thursday**

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We are always prepared to give advice on all phases of fish keeping and typical tanks set up for many different species of fish can be seen in our Harness.

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July, 1963
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The firms listed are wholesalers or retailers or both: in fishes, tanks, plants, appliances and accessories, reptiles and amphibia. Abbreviations: W.—Wholesale only. R.—Retail only. WH.—Wholesale and Retail. C.—Coldwater. T.—Tropical. P.—Plants. AA.—Appliances and accessories. R. & A.—Reptiles and Amphibia.

E.C.D.—Early closing day.

BERKSHIRE
The Reading Aquarist
64, King's Road, Reading
Telephone: Reading 53652
E.C.D. Wednesday. R. C.T.P.A.A.

BUCKINGHAMSHIRE
Grange Pet Stores
Well Street, Buckingham
Telephone: Buckingham 3216
Open every day. R. C.T.P.A.A. R & A.

CHESHIRE
Grasby, Joe., F.B.H.S.
"The Glen" Fisheries, Mobberley, Nr. Knutsford
Tel.: Mobberley 3272 W. C.T.P.A.A. R & A.

DEVON
Plymouth TropicaLs
127, North Road, Plymouth
Telephone: Plymouth 62063
E.C.D. Tuesday. R. C.T.P.A.A.

DURHAM
Matcalf, G. R.
2, High Northgate (near A.B.C. Cinema)
(On main A.1 road) Darlington
Telephone: Darlington 5991
E.C.D. Wednesday. R. C.T.P.A.A. R & A.

Powell, M.C.
The Honey Pot,
Gigpeth, Durham City
Telephone: Durham 2108
E.C.D. Wednesday (All day). R. C.T.P.A.A. R & A.

The Fish Bowl
Burdon, Sunderland
Telephone: Sunderland 71026
E.C.D. Wednesday (All day). R. C.T.P.A.A. R & A.

ESSEX
Goodmayes Aquarium
Shaftesbury Parade, High Road, Chadwell Heath
Telephone: Goodmayes 2594
E.C.D. Thursday. R. C.T.P.A.A.

Skilton, C. J., Aquarist
"Ridgeyway", 139, Gallerywood Road, Chelmsford
Telephone: Chelmsford 56878 W. C.T.P.A.A.

The Hamlet Aquarium
14, Saint Helens Road,
Westcliff-on-Sea
Telephone: Southend-on-Sea 44724 R. C.T.P.A.A.

GLOUCESTERSHIRE
Patricia Precece (Prop. Mr. B. R. James)
10, Suffolke Parade, Cheltenham
Telephone: Cheltenham 24949
E.C.D. Wednesday. R. C.T.P.A.A. R & A.

HAMPShIRE
Arundel Aviaries & Fisheries
241/243, Arundel Street, Portsmouth
E.C.D. Wednesday. R. C.T.P.A.A. R & A.

Wingate Zoological Supplies
7, Market Street, Winchester
Telephone: Winchester 2406

HERTFORDSHIRE
Cura, L. & Sons
Water End, Hemel Hempstead
Telephone: Water End 44
E.C.D. Saturday. W. C.P. R & A.

KENT
Kingsfisheries Aquarium
138, Croydon Road, Beckenham
Telephone: Beckenham 3710
E.C.D. Wednesday (all day). R. C.T.P.A.A.

Sherwood Pet Stores
(Proprietors, Fairbairns Aquarius, Ltd.),
252, Sherwood Park Avenue, Sidcup
Telephone: Bexley Heath 7217

LANCASHIRE
Hornby's
Trafford Bar, Old Trafford, Manchester. 16
Telephone: Trafford Park 2989
E.C.D. Wednesday. R. C.T.P.A.A. R & A.

Letty Krenmer
13, King Edward's Building,
Cheetham Hill Road,
(opp. Woolworths.), Manchester. 8
Telephone: Cheetham Hill 3246
E.C.D. Wednesday. WR. C.T.P.A.A. R & A.

Liverpool Aquarium Company
21, Sir Thomas Street, Whitechapel, Liverpool, 1
Telephone: Central 4891
Closed Wednesday. R. C.T.P.A.A. R & A.

LONDON (North)
Philip Castang Ltd.
91, Haverstock Hill,
Hampstead, N.W.3
Telephone: Primrose 1842 and 9452
E.C.D. Saturday. W. T.P.A.A. R & A.

Paramount Aquarium
99, Haverstock Hill,
Hampstead, N.W.3
Telephone: Primrose 1842 and 9452

LONDON (South)
Aquatic Suppliers Co. Ltd.,
7, David’s Road, Forest Hill, S.E.23
Telephone: Forest Hill 3816
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WR. C.T.P.A.A.

Fairbairns Aquarius, Ltd.
15, Well Hall Parade, Etham, S.E.9
Telephone: Etham 5859
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R. C.T.P.A.A.
South Western Aquarists
2, Glenburnie Road, Trinity Road,
Upper Tooting, S.W.17
Telephone: Balham 7343
E.C.D. Wednesday.
R. C.T.P.A.A. R.&A.
Tachbrook Tropica
244, Vauxhall Bridge Road, Victoria, S.W.1
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Wr. C.T.P.A.A. R.&A.

LONDON (West)
Aquapets
17, Leeland Road,
West Ealing, W.13
Telephone: Ealing 2748
E.C.D. Wednesday.
R. C.T.P.A.A. R.&A.
Owen Reid's, Aquarium Dept.
12, Spring Bridge Road, Ealing Broadway, W.5
Telephone: Ealing 3299
E.C.D. Wednesday.
Wr. C.T.P.A.A. R.&A.

NORTHAMPTONSHIRE
The Aquarium
192, Wellingborough Road,
Northampton
Telephone: Northampton 34610
E.C.D. Thursday.
R. C.T.P.A.A. R.&A.
The Pet Shop
120, Kettering Road,
Northampton
Telephone: Northampton 841
E.C.D. Thursday.
R. C.T.P.A.A.

OXFORDSHIRE
The Goldfish Bowl
6, East Avenue, Cowley Road,
Oxford
Telephone: Oxford 41825
E.C.D. Thursday.
Wr. C.T.P.A.A. R.&A.

STAFFORDSHIRE
Walsall & Wolverhampton Aquatics
46, Stafford Street, Walsall and
147, Horsley Fields, Wolverhampton
Telephone: Walsall 21783 and Wolverhampton 24147
E.C.D. Thursday.
W.T. AA. R. C.T.P.A.A. R.&A.

SURREY
Thameside Tropica and The Pet Shop
Bracey House, New Zealand Avenue,
Weybridge-on-Thames
Telephone: Walton 24076
R. C.T.P.A.A. R.&A.

SUSSEX
Fin and Feather
14, Oakridge Road, Eastbourne
E.C.D. Wednesday.
R. C.T.P.A.A. R.&A.
Preston Aquarium
44, Beaconfield Road, Brighton
Telephone: Brighton 20620
(Open all week).
R. C.T.P.A.A.

Regency Aquaria (Prop. R. A. Basnett)
49, Surrey Street (outside Brighton Station),
Brighton
Telephone: 29940.
R. C.T.P.A.A.

WARWICKSHIRE
The Coventry Aquarist (Prop. W. Dymond)
43, Melbourne Road, Earlbrook, Coventry
Telephone: Coventry 72772
E.C.D. Thursday.
Wr. C.T.P.A.A.

WORCESTERSHIRE
The City Aquarium, Bird and Pet Supplies
(Proprietor: Mr. M. Hemming)
34, Friar Street (opposite Union Street), Worcester
Telephone: Worcester 22005
E.C.D. Thursday.
R. C.T.P.A.A. R.&A.

YORKSHIRE
The Corner Shop (Prop. J. Wilde)
526, Abbeydale Road, Sheffield, 7
Telephone: Sheffield 54172
E.C.D. Thursday.
R. C.T.P.A.A. R.&A.

SCOTLAND
Aquarists' Rendezvous
104/106, Albert Drive, Pollokshields, Glasgow, S.1
Telephone: South 4258
E.C.D. Tuesday (1 p.m.)
Wr. C.T.P.A.A.
Forbes, James L. (Prop. P. N. Greening)
176, Blackness Road, Dundee, Co. Angus
Telephone: Dundee 66409
E.C.D. Wednesday.
R. C.T.P.A.A.

NORTHERN IRELAND
Ulster Aquatics
19, Montgomery Street, Belfast
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OF SIAM

By F. N. Ghadially
(with illustrations in color)
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### Plastic Aquarium Cleaning Appliances

<table>
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<th>Item</th>
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<td>Automatic Syphon</td>
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### Standings

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### Pumps

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<td>Proctor</td>
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This catalogue is a new and complete price list of all aquarium requisites including aquariums, covers, stands, heaters, thermostats, thermometers, air pumps, ornaments, books, cleaning equipment and all other accessories. Available by return of post. Send 6d. to cover postage, etc.
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BARBS
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