

# The AQUARIST AND PONDKEEPER

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Editor: ANTHONY EVANS

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Photo:

Laurence E. Perkins

This apparently healthy angel fish found among the stock of Kingston Exotic Fisheries has a neat small hole through its back, seemingly fitting it for use on a watch chain!

## Editorial

IN the relatively small volume of an aquarium some materials dissolving in the water can produce effects far more serious to fish life than is to be expected from the nature of the materials. Metals, for example, although entering solution in minute amounts, are not infrequently causes of trouble. Unfortunately, it is not always possible to forecast accurately the results of bringing a metal into contact with aquarium water.

Like all living things fish show considerable variation in their tolerance of toxic substances. Not only are there marked differences between the effects on various species of fish but within a species, to a more limited extent, there are found differences between toxicity tolerances of individual fish. Add to these variations the observation that some metals have more poisonous effects in soft than in hard water, and the fact that the presence of other metals can influence the degree of toxicity shown by the metal being considered, then the complexity of the problem can begin to be appreciated.

Fishery research biologists Peter Doudoroff and Max Katz in America, have studied metal toxicities for fish in some detail, and among the factors they have found to affect the toxicities are acidity of the water, temperature, dissolved oxygen concentration, the nature of the metal salt formed, and water hardness. They list silver, mercury, copper, lead, aluminium, zinc, nickel, chromium and gold as metals of high toxicity for fish. Copper and zinc together can be more rapidly fatal than either alone, so that brass, which is an alloy of the two metals, can be assumed to have particular risks for the aquarium. A point worthy of note too, is that manganese added in the form of permanganate to water soon attains lethal concentrations for fish.

Despite its long association with fish-keeping therapeutics, permanganate should be used with care if it needs to be used at all, which is by no means certain. Cautious aquarists will also avoid exposed metal surfaces of any kind in their tanks.

# The Aquarium on the Rock of Monaco



Main entrance to the Monaco Aquarium

THE Musée Océanographique et Aquarium de Monaco was founded by H.S.H. Prince Albert I of Monaco. Himself an oceanographer of note, he dedicated it to the oceanographers of the world. The foundation stone was laid on the 25th April, 1899. It was officially opened on the 29th March, 1910.

It is a very imposing building. It stands, close to the Palace of the Prince, on the Rock of Monaco. The front faces the beautiful Gardens of St. Martin (which occupy much of the Rock); the back overhangs the sea with which it is so closely linked. The architect, M. Delefortrie, was faced with a number of difficulties, and, indeed, it was no mean triumph of architectural skill to erect a large building at the very edge of a perpendicular cliff.

The Aquarium itself is situated in the basement, and is only a very small part of the whole Museum. To-day, it is about three times as big as it was originally. All the tanks (63 in all) are large; the largest hold about 8,000 litres (1,750 gallons) of water.

The majority of tanks are unheated; for the main purpose of the aquarium is to display a representative collection of Mediterranean fishes and other sea-fauna. Only a very few tanks are heated, and the aquarist who visits the aquarium expecting to see some of his favourites will be disappointed for the aquarium is strictly confined to marine species.

## Tropical Marine Exhibits

When I visited the aquarium, at the end of October, the heated tanks were stocked with a number of species fairly well known to aquarists. I was much impressed with a collection of full-sized scats (*Scatophagus argus*). They were accompanied by some equally large monodactyls (*Monodactylus argenteus*). It was hard to say which were the more handsome, for these fish, when kept under good conditions, are really very beautiful. The caudal fins of the monodactyls really were yellow, and there was a lovely purple sheen in the region of their anal fins.

In the adjoining tank were some orange clown fish (*Amphiprion percula*). These fish, I was told, breed quite readily in captivity. The eggs are protected by the male. In its natural habitat *Amphiprion* lives in symbiotic relationship with an anemone. A black clown fish (*Amphiprion polyommus*) was doing this in the neighbouring tank. The species is a particularly beautiful one. It is similar in appearance to the better-known orange clown fish, but its coloration is black and lemon with sky-blue (not enamel-white) barring.

Altogether the aquarium could boast a very fine collection

by G. F. HERVEY

of demoiselle (or coral) fishes. Among them I recognised *Pomacentrus sudestis*, which is another of this group that spawns in the aquarium. Unfortunately, the fry never live. In the same tank was a fish that may well be considered the gem of the collection. Known as the king fish (*Pomacanthus annularis*) it thoroughly deserves its popular name, for its brilliant colours and vivid markings quite literally defy description. So beautiful is it, that it inspired the poet, J. -M. de Heredia, to write:

*Et brusquement, d'un coup de sa nageoire en feu,  
Il fait, par le cristal morne, immobile et bleu,  
Courir un frisson d'or, de nacre, et d'émeraude.*

As far as I know, the fish has never been seen alive in England. Indeed, it is possible that it never will be; for it is a fish that is very intolerant to life in captivity.

The puffer fishes (*Tetraodon*) were in evidence. The species on exhibit, however, were not the rather drab *T. cinctus* and *T. fluviatilis* of fresh and brackish waters, but the bigger and more colourful marine species. One of the species on show, *T. reticularis*, was a really handsome fish, with bright yellow fins and lips, and a body heavily reticulated in brilliant red.

But, of course, the main display was of local species. These were not so colourful as the tropical species, but were not without interest. One could, in fact, spend hours in front of each tank discovering something new the whole time.

There was a fine collection of local sea-horses (*Hippocampus guttulatus*), golden mullet (*Mugil auratus*) and castanet fish (*Chromis castanea*). One large tank was occupied by Roman eels (*Muraena helena*) whose small beady eyes and ever-moving mouths betrayed their legendary ferocity. It was to them—or to be precise to their ancestors—that the ancient Romans sometimes threw

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Photos:

Gillett

Back of the aquarium, overlooking the sea

# Albino Fighting Fish—Legend or Reality?

by Dr. MYRON GORDON

*Geneticist to the Aquarium,  
New York Zoological Society*

THE albino, a pale, ghost-like fish, lighter than the lightest Cambodia, is the most legendary colour variety of the fighting fish. The first total albino *Betta* was reported by the old veteran German aquarist, Wilhelm Schreitmüller, who spotted one back in 1927 in the tanks of a Herr W. Glaschter, a dealer in tropical fish in the city of Leipzig. It was a true albino, with rose-coloured flesh, so transparent that its internal organs were visible. It had red, bloodshot eyes. Typical of a true albino it was quite weak, slow in its movements and delicate in health. Despite every care it lived only a few days in Schreitmüller's aquarium. Schreitmüller put the rare specimen in a preserving fluid and presented the fish to the Magdeburger Museum. Up to 1953 that was the last record of an albino we had.

## The Albino Appears Again

After a lapse of more than a quarter of a century, the legendary albino *Betta* reappeared in an aquarium of Mr. Gene Wolfsheimer of Sherman Oaks, California. The circumstances of its rediscovery were announced by Wolfsheimer in a letter dated 28th March, 1953, to Dr. George S. Myers, Editor of *The Aquarium Journal*:

"Here is the colour photograph of the albino *Betta splendens*. This is the climax to my *Betta* breeding career. For the record, you might like to know exactly how this discovery came about.

"I had not spawned any *Betta* for some time. I had disposed of most of my adult stock except for a few specimens of each colour strain (red, blue and Cambodia). Recently, I decided to make one spawning of each of these colours because this breeding stock was getting older and less virile all the time. The red spawning was accomplished. The blue was set up and under way. All that remained was the Cambodia. After looking over my remaining stock I noted that I had only one half-way decent specimen of the Cambodia strain. My *Betta* stock is kept in the dimly lit rear section of my hatchery so that algae does not form too easily in their glass jar containers. For this reason I have not been able to examine the fish too minutely. I did note that the Cambodia was an extremely light-bodied and light-finned specimen and let it go at that. I set up this *Betta* for spawning in a more sunlit portion of the hatchery. Then while giving him a more detailed examination, he turned so that the sunlight reflected properly off his eye and as you can imagine, I almost jumped out of my skin when I noted that it was reddish pink."

Dr. Myers sent me a copy of Wolfsheimer's letter and when I wrote for further information Gene replied saying that after his discovery he had given the albino fighter special attention. He said:

"I have provided him with a Cambodia female, probably one of his sisters, as a mate. If they mate they may possibly start a true strain of albinos. But the male albino is extremely nearsighted. Live food can be bouncing all

around him but he cannot see it until literally hits him between the eyes. It takes time, but eventually he does fill up. With all this good care he has responded by building a really fine bubble-nest and keeps it mended and in good shape. Unfortunately, he cannot see the female so he has little incentive to spawn. For a moment, when she comes up within a half inch of his vision, he flares up but this quickly passes as she goes on her way. Although I have given him every opportunity, and the female is most co-operative, I have not been able to spawn him yet."

On 5th July, 1953, Gene wrote me saying:

"After three failures, I finally realised a different technique would have to be used if I was to succeed. I put the fish in a five gallon tank with only three-and-half inches of water. They were separated till the male blew his nest. The glass partition was then used to confine the two fish together in extremely small area immediately around the nest. I felt this was necessary because the male couldn't see the female unless she was right on top of him. He never chased her and the full aquarium to roam in was not conducive to getting them together. When they finally started spawning, there were many false starts. It was fortunate to have an extremely co-operative female. She always returned to the male to hang expectantly in front of his nose. His spawning was quite clumsy. Often instead of their vents coming together, the female's back faced his vent.

"As the eggs dropped I noticed the male paid absolutely no attention to them. The female, on the other hand, couldn't wait to get at the eggs. I watched to see if she would put them into the nest as I have often observed other females to do. Instead she ate them.

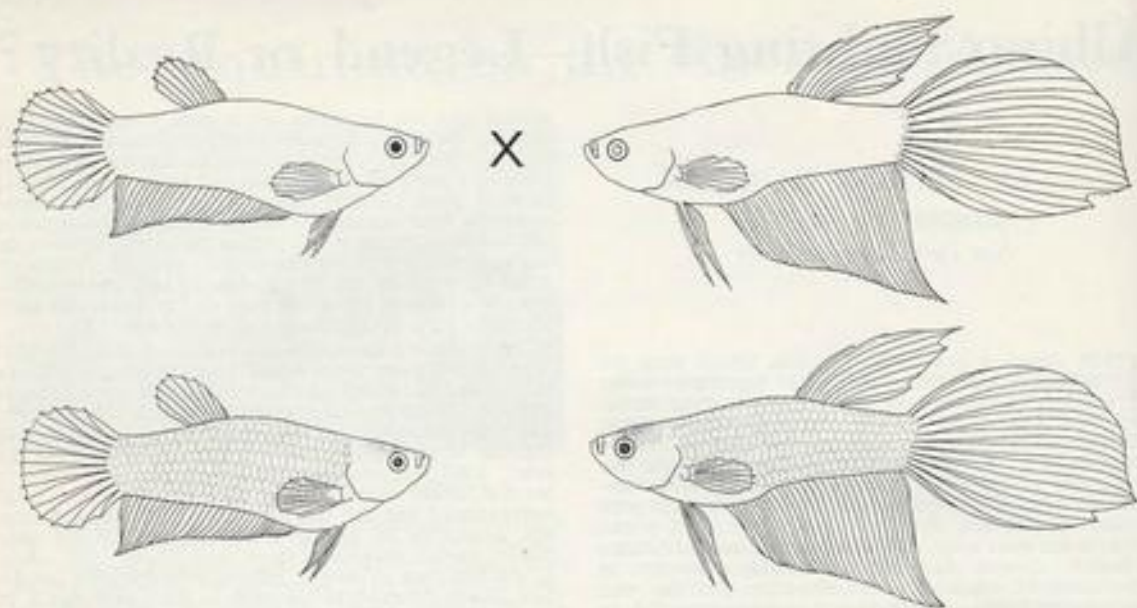
"I immediately got out some Petrie dishes and with a piece of plastic tubing as a pipette, I transferred the eggs to the dishes. After about four hours of this, the spawning was over. I had to literally beat off the female who was fiendishly insistent in her attempts at making a meal of the eggs. I hatched eggs artificially in about one-quarter inch of water with no nest or parental care. Surface tension held most of the eggs on the surface and later the fry, too. Those fry that fell to bottom had little struggle to return to surface. I should judge about 200 eggs were spawned though I knew many would be bad. To prevent any fungus on bad eggs from hurting the good ones, I used a little methylene blue in water with eggs. The fry are now free-swimming and eating rotifers. I can only make a rough guess at the number being about 50 to 60."

Gene asked me for any suggestions that might help him in developing a strain of albino fighting fish from the original mating between the albino and the Cambodia.

## Questions to Answer

When presented with a problem of this sort, the geneticist refers back to similar discoveries of albinos in other species of fishes. Fortunately, albinism has previously appeared in the swordtail, guppy, mollie and paradise fish among the common aquarium fishes and in large numbers of other fishes including the American brook trout and several species of catfish. We know something about the origin and subsequent hereditary history of the albino swordtail and guppy. The stories of these two albinos have been told in *The Aquarist*.

The first question that needed settling was, what strain of the Siamese fighting fish did the albino come from, the wild, dark variety or the light-coloured Cambodia? I knew from studying the histories of the albino swordtail and guppy that these did not arise as a *mutation* (or sport)



The female Cambodia fighting fish (left, top) mated with the albino male (right, top) produced all dark-coloured offspring (female—left, below; male—right, below). What progeny will result from brother to sister matings in this generation?

from the golden swordtail or from the golden guppy, but from the dark, wild type of these fishes. The albino mutant of the paradise fish, the mollie and of other species arose directly out of the wild type, for in all of these there are no golden mutants known.

I suspected, therefore, that Gene's albino *Betta* came, by means of a lucky mutation, from his dark-coloured strain rather than from his Cambodia. This suspicion became a conviction when Gene wrote me on 15th July, 1953, saying: "You might be interested in knowing that there is not one Cambodia (light-bodied) fry among the first generation stock that was produced from the crossing of the albino with a Cambodia female. The colour that is forming in the young fish seems to be a bluish-purple. The baby fish are doing fine and are about five-eighths of an inch."

#### Wild-colour First Generation

It would have been reasonable to guess that the albino *Betta* originated from the Cambodia because both varieties had light body colouring; the only outstanding and obvious difference between them is that the albino has pink eyes whereas the Cambodia has black pupils in its eyes. I have the impression from Gene's letter that he thought his male albino was derived from the lighter variety and that was why he mated it to a Cambodia. If the albino had come from the Cambodia, Gene should have obtained all Cambodia-like young from the mating of the albino father and the Cambodia female. Gene was probably disappointed when, instead of getting Cambodia-like fish, he obtained instead only "bluish-purple" young. In essence, the bluish-purple *Betta* Gene obtained in the first generation were throw-backs to the natural wild colouring of the species.

Illogical as it may appear on first thought, the chances of getting some albino fighting fish in the very first generation would have been a little better if Gene had mated his

albino male to one of his darker *Betta*. This is so because it is probable that some of his dark fishes are carrying the hidden albino hereditary factor. I say it would have been only a little better owing to the circumstances that it would have been impossible for the breeder to tell which dark fighting fish was actually carrying the important albino gene. Dark coloured *Betta* with and those without the albino factor would look alike since albinism is generally a recessive trait.

Be that as it may, where does the breeder go from there?

#### Theoretical Mating Results

If the albino father continued to be in good breeding condition, I would have suggested that it be mated to as many of his daughters as would have had him. Suppose the albino had been back-crossed to one of his daughters what might the breeder have expected in the next generation in terms of various kinds of coloured offspring and their frequency? Here the probable results are as worked out along the line of the theory based upon the Mendelian principles of inheritance:

If the albino father had mated with his daughter about half of their offspring should have been albinos; about half should have been of the dark type. We shall never know the results of such a mating because the albino male died during the summer of 1953 before his daughters matured.

Gene mated a number of first generation dark-coloured *Betta*, brother to sister. Under no circumstances, I wrote Gene, should he use the Cambodia female again, that is, if he was bent on getting albino offspring from her.

Gene, then, had no other choice but to mate the young of the first generation from the albino male and Cambodia female brother to sister. What may the fish fancier expect to get in the next or second generation from the brother

(Continued at foot of opposite page)

# Aquarium and Pond Goldfish Varieties

## 12. The Celestial

THE celestial goldfish is a highly specialised form of fancy goldfish which is not seen at many shows in this country. There are no standards for this fish under Federation rules, probably because when the standards were prepared very few celestials were to be found here. It is possible that if the fishes increase in numbers and popularity, standards will be introduced for this fish at some later date. A few very good specimens have reached this country since the war, and I well remember some good ones on show at *The Aquarist* stand at the Olympia during *The Evening News Flower Show* four years ago. Since that time I have only seen one or two and have no information that anyone is breeding them at present. Occasionally a few are imported from China where they have been bred for many years.

The main feature of the celestial is that the eyes are enlarged and directed upwards, that gives the name, "looking to heaven." Instead of being placed at the sides of the head as in the ordinary goldfish, the eyes have moved almost on top of the head and may be seen wholly from above. The placing of the eyes means that the fish has its main vision in an upward direction and so any foods on the bottom of a tank may not be seen. Foods which float for a period are more suitable for this type than those which fall quickly to the bottom. The fishes, however, have a good sense of smell and will find their food all right when hungry.

The rest of the fish is shaped more like that of the lionhead, but the hood is missing in the celestial. There is no dorsal fin and the tail is divided. The general shape is like the fantail as far as the body is concerned, with a fairly well forked tail or caudal fin. Most of the fishes I have seen have been variegated (gold and silver). For a show specimen a fish must have the eyes well developed and well on top of the head; some fish do not get the correct shape until they are over a year old, but the tendency for the abnormal eye can be seen from an early age.

The celestial is not a delicate fish but I do not recommend

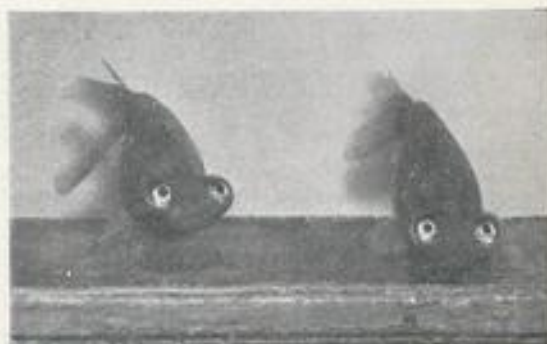


Photo:

Laurence E. Perkins

it for the open pond. The fact that the normal vision is reduced would place the fish at a disadvantage when among other fish, which would probably take most of the food before the celestial could find it. The breeding of them should take place in tanks where they can be kept away from other varieties. Being just another variety of the common goldfish they could interbreed with any other type.

Their breeding requirements follow along the ordinary lines for fancy goldfish breeding and no special arrangements need be made. One very good point to be borne in mind when feeding fully developed fishes is that if a small amount of cod liver oil is added to the dried food when it is given, this will ensure that the food remains on the surface of the water long enough for the fish to be able to see it.

These fishes could be shown in "any other variety fancy goldfish" class, and would gain points for the perfection of eye development. The fishes would also have to be without a dorsal fin, have a divided tail and be in good condition.

A. Boarder

## Albino Fighting Fish

(Continued from opposite page)

to sister matings? This is what the geneticist would predict on theoretical grounds. Out of every sixteen second-generation young born there should be:

9 Dark coloured <i>Betta</i> ..	56 per cent.
3 Cambodias ..	19 "
4 Albino <i>Betta</i> ..	25 "

Allowance in these predicted ratios must be made because of the greater weakness of the albinos, so that albinos would be represented in somewhat less than 25 per cent. of the total brood.

To keep me up-to-date of his progress, Gene wrote me 27th October, saying, "Thought you would like to know I spawned three pairs of the albino's first generation offspring. The second generation young are coming along fine but much too small to distinguish their colours as yet."

It should not be long now before we ought to have the critical results. It will be interesting to see what kind of *Betta* Gene actually obtained from mating the mature offspring of the albino-Cambodia cross. Will the predictions made here be borne out?

## The Aquarium on the Rock of Monaco

(Continued from page 200)

recalcitrant slaves. The voracious *Serranus* species was represented by the Mediterranean *S. scriba*, remarkable for being hermaphrodite, *S. cabrilla* (the ringer), and *S. hepatus* (the drum fish) the smallest of the genus, but just as voracious as its bigger congeners. The gobies (*Gobius*), of which some twenty species are native to French waters, were represented by *G. capito*, the largest of the genus, native to the Mediterranean, and *G. cruentatus*, a fairly common species. The adhesive eggs are deposited in a nest and protected by the male.

I had neither time nor opportunity (as it was a busy Saturday afternoon) to pay a visit "behind the scenes." According to the *Official Guide*, however, electric pumps draw the water direct from the sea to a huge reservoir 64 metres (200 feet) above the sea level. From there the water is passed to the tanks through a fall of several metres to permit aeration. Supplementary aeration, if necessary, is served to the tanks by an electric compressor. The heated tanks are held at a temperature of 27° Centigrade (80.6° F.).

# Seeing Fish in their True Colours

by W. HARCOURT ELLIS

I HAVE often wondered how many aquarists have seen their fish in their true colours. I imagine not many have had that pleasure. There are, of course, a variety of reasons for this. Probably the main one would be, however, an unfortunate lack of the necessary technique and knowledge in the science of lighting to enable them to equip their fish houses with correct illumination.

An enthusiastic aquarist for many years with the normal interest in fish and plants, I have, nevertheless, made my main interest one of endeavouring to obtain the correct type of light in my fish house, which would enable me to see my fish as they really are in their true lovely colours. One may well enquire why such a critical interest in the colours of fish. My answer would be that the real beauty of fish lies in their beautiful distinctive colours. Further, unless an aquarist was prepared and able to make the necessary arrangements to that end, he loses much of the enjoyment of his hobby.

To reveal the inherent character of fish colour, one must be capable of supplying the appropriate quality of lighting. It might be observed at this point, that the alchemy of colour is only the chemistry of light. For just as there can be no light without colour, so there can be no colour without light. Further, there can be no true colour seen except to the degree that it is contained in the wave form of light. For example, a red object reflects red rays only, and a green object green rays, and so on. Consequently if light has an excess of green wavelengths and is deficient in red, the chrome of saturation of the green object will appear accentuated or intensified. Conversely, the colour value of the red object will be attenuated or distorted proportionately.

During the course of experiments I found it necessary to pay increasing attention to colour rendering properties of many light sources, including natural daylight, for viewing colours of fish. First of all it must be emphasised here that, contrary to general belief, daylight is not the best type of light for critical colour discrimination. The reason for this is, that the colour quality of natural daylight varies from day to day, in fact from minute to minute. Lighting engineers have decided after careful study and collaboration with specialists in colorimetry that an overcast north sky in mid-summer is the ideal light for the critical appraisal of colours. Obviously this ideal state of affairs does not happen very often. Fortunately it can be made artificially.

To understand how this is achieved, we must first investigate the light sources at our disposal. The greater majority of us is readily familiar with ordinary tungsten filament lamps. This source of light is not at all suitable, because the incandescent tungsten lamp radiates energy at all visible wavelengths. This produces a continuous spectrum differing from daylight in colour value, being weak in violet and blue and progressively stronger towards the red end. This state of affairs could only succeed in completely distorting one's colour appraisal, and therefore would be absolutely useless for critical colour discrimination.

We are perhaps less familiar with fluorescent lighting which has reached us comparatively recently. Many books

have been written on this particular form of illumination. It would be impossible to go into this subject at this point, but for the purpose of this article I would state that various phosphors are used in the manufacture of fluorescent tubes. The only phosphor which is at all suitable for true colour discrimination is embodied in the colour matching tube. This tube approximates closely to a midsummer north light, and is ideal for lighting fish houses. This valuable property of the colour matching tube decided me in making the roof of my fish house the light source.

After careful checking of various positions, noting particularly the consequent effect on both the life and health of the fish, I finally decided to so orientate light sources as to provide general light rather than local light. I hasten to remark here, that this particular arrangement of light source in no way interfered with photosynthesis or photoperiodism of the plants which I keep in the fish house. I would deprecate the use of local lighting with aquaria, in particular the placing of a light at each end of the aquarium, in such a way as to shine horizontally directly at the fish. Whatever gain there may be in decoration is offset by injury to the health and general life of the fish themselves.

Should aquarists view the use of fluorescent light with a certain amount of distrust because of ultra violet factors, I would advise them not to be unduly alarmed. The small component of ultra violet present in the radiation of a fluorescent tube has no deleterious effect upon vision. In the case of an aquarist with defective colour vision, I can only suggest to him that he should increase the level of illumination in his fish house to double his normal requirements. This would assist him in whatever colour discrimination he possesses. For general reference I would state here that in my fish house, according to photometer readings, I have 50 lumens per square foot.

## Azolla

THIS dainty little floating plant, which somewhat resembles a small selaginella—the fern often seen hugging the moist pebbles of a warm greenhouse staging—is native to the Atlantic States of America and south through tropical America to the Argentine.

It likes soft water, a close, humid atmosphere, and a good top light and, given these requirements, it will spread rapidly over the surface of the water and provide plenty of shady lurking places for top-haunting fishes such as *Epiplatys*, *Rivulus* and the like. Normally, the lacy fronds are about half an inch long and coloured pale pea-green, but when grown in full sun or under bright electric light, the edges of the fronds will develop carmine-red to red-brown tints.

The plant multiplies by self-division, and when it is permitted to grow unchecked it will pile up on itself, frond on frond, so that in the proverbial no time it will literally carpet the surface with an inch-thick mat of greenery. It is not always possible to keep *Azolla* growing right through the winter, but if a handful of it is thrown into a spare tank kept away from frost, new plants will appear on top of the water the following spring.

*A. filiculoides* is another species well known to aquarium varieties. The fronds are larger than those of *A. caroliniana*, and paler green in colour. When conditions are to its liking, the fronds stand right clear of the surface in a vertical position. This species is native to the west side of South America, and is often found at extremely high altitudes.

J. H.

# Breeding Tropical Fish in Goldfish Bowls

by Dr. F. N. GHADIALLY

ALMOST all aquarists have at one time or another floated a jam jar or a goldfish bowl in their aquarium to isolate a female live bearer about to deliver young, a male fighter, or a fish that was diseased or "off colour." Such a small receptacle, maintained at the correct temperature, can be put to numerous uses. Indeed it provides a good method of breeding a fairly large variety of live-bearers and egg-layers. However, a large number of floating jars in a tank soon become a nuisance and an eyesore, so I decided to build the two set-ups described in this article, which hold literally dozens of jars, bowls and little all-glass tanks at 78° F. The one described first is very cheap and easy to construct, the other is a bit more elaborate.

The first set-up which I built consists of two old-fashioned sinks (36 ins. by 19 ins. by 5 ins. and 30 ins. by 15 ins. by 4 ins.) placed on a two-tier, angle-iron stand. The holes in the sinks can be blocked in numerous ways but probably the easiest and quickest way is to lay a ring of aquarium cement around the margin of the hole and press down a piece of glass (either round or square) on it. This gives a very nice seal which is quite permanent. The sinks are heated by long tubular pyrex heaters (made by myself) to distribute the heat evenly along the length of the sink. However, good results can be obtained by using two ordinary commercially made heaters of, say, 50 watts placed at the opposite ends of the sink. These may be held in place either with rubber suction discs threaded on to the wire, or bits of lead or stone placed at strategic points to hold them down. These heaters may be controlled either by a submersible thermostat or by an ordinary thermostat resting at an angle in one corner of the sink.

The sinks are filled with water which can then be maintained at the required temperature. Numerous jars and bowls containing fish, etc., may now be stood in these sinks, freeing the tanks of unsightly floating jars which reduce the surface area of an aquarium and often cause annoyance by sinking. Soon it was found that such a set-up had numerous uses and new applications were forthcoming at such a rapid rate that I designed the second heater set-up where single rows of jars are kept at a fixed temperature in a series of cement concrete troughs. These are mounted on a rigid iron stand with a shelf underneath to hold boxes of white worm cultures.

## Plan in Operation

This type of set-up can be put to numerous uses. It is ideal for breeding livebearers and a large variety of egg-layers too. For this purpose a 7½ ins. diameter goldfish bowl or a glass dish measuring 7 ins. by 10 ins. by 5 ins. is found to be large enough for the purpose. For live-bearers a few bunches of sea moss, fine-leaved plants weighted down with lead, or well-washed and boiled willow root is placed in the tank to protect the newly born young from the mother. The ripe female is then introduced. Feed almost entirely on live food, preferably *Daphnia*. As these are filter feeders they help to keep the water clear

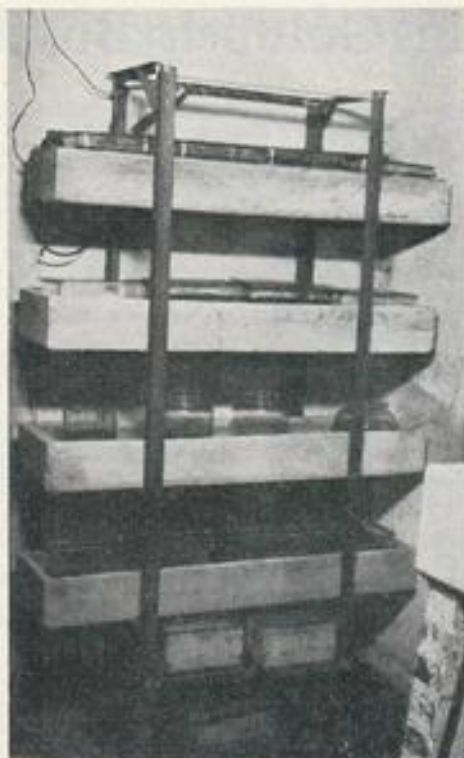
and a fish can be kept in such a jar for over a month without change of water if a few *Daphnia* are always present in the water. Natural plants tend to deteriorate in such a set-up because of the deficiency of illumination and the lack of compost in the bottom of the tank, hence it is convenient to use some other material to shelter the newly born fry.

This technique of delivering livebearers is superior to any involving the use of traps. Few, if any, young are lost if the female is kept well fed, and the danger of losing the mother (a quite common occurrence when traps are used) is eliminated. About the only livebearers which are too sensitive to deliver by this method are the black mollies. They seem to resent any kind of netting or change of environment when they are about to deliver.

When the young are born the mother is, of course, removed, and so also any plant or material that was introduced for their protection. It is best to keep the young in the delivery jar for about two to three days and feed them on brine shrimp and micro worms. After this they should be removed to a large rearing tank together with young obtained from various other jars. No netting is necessary to accomplish this. The entire jar and its contents is picked up gradually and immersed in the larger tank, letting the youngsters swim away, and then the jar is gently removed vertically with one end emerging from



Two old-fashioned sinks in use as thermostatic baths for the fish containers.



A later set-up utilising special concrete troughs in place of the sinks pictured on the previous page

the water before the other so that the water is not unduly agitated.

Both adhesive and non-adhesive egg layers can be bred by this technique. For breeding fish such as zebra fish and pearl danios all that is needed is a layer of pebbles placed in the bottom of the all-glass tank or goldfish globe. The conditioned and previously separated parents are then introduced and spawn readily in the small container. Spawning in such a small, confined space probably results in a bigger percentage of fertile eggs than that obtained in a larger container. The parents are then removed and when the eggs hatch out the fry are seen sticking to the sides of the glass tank. Nothing is done until they become free-swimming. Approximately 24 hours after this (during which time a little Infusoria should be fed) the fry may be gently transferred to a larger tank for rearing in the usual manner.

For adhesive egg layers a similar method is employed except that the pebbles are omitted and some fine-leaved plants or willow root is used to catch the spawn. Bubble nest builders such as the Siamese fighting fish have also been successfully spawned by me in these small jars and goldfish bowls. The set-up used is the same as for adhesive egg layers; here the plants or willow root are placed to provide some hiding places for the female.

The following fish have been successfully bred by this technique: numerous colour varieties of swordtails and platyfish, zebras, pearl danios, white clouds, rosy barbs, cherry barbs, half-banded barbs, *N. anomalus*, fighters, etc.

This technique has a few advantages over the usual method of spawning in larger tanks, the main one being

that larger tanks occupy more room and cost a lot more to acquire and maintain without offering any real advantage during the spawning stage. Thus one can have twelve small spawning jars, set up as described, for the price of one or two 24 ins. by 12 ins. by 12 ins. tanks. This set-up allows an amateur, with limited means and facilities, to carry out a more intensive breeding programme, for at any given time he can isolate, say, half-a-dozen livebearers and try out half-a-dozen pairs of various sorts of egg layers if necessary.

The only objection that can be raised against this method is that the young have to be moved at a very early date, for, of course, they would not grow well in such a small container. It is, I believe, a more or less accepted fact that it is not a good thing to move very young fish about. This is fairly sound advice for there is a small, though definite, risk involved in such a transfer. However, by eliminating the net and by using the method of transfer described above it has been found possible to transfer fry without causing injury or death. Of course the utmost care should be taken to see that there is no change in temperature (change to a slightly higher temperature seems to be tolerated better than a drop) and that the quality of the water (pH, hardness, etc.) is the same.

Besides the fact that this set-up provides a fairly good way of breeding various tropicals it comes in very handy for numerous other jobs. It is well known that the best male fighters are usually reared individually in jars. This method affords the perfect solution to this problem.

One of the major factors involved in hatching brine shrimp eggs is temperature. Brine shrimp eggs hatched in jars stood in the unit described begin to hatch out with clockwork precision at about 24 hours and are ready to feed by about 36 hours. In really cold weather trays of micro worms and Grindal worms also benefit by standing in these heated sinks. The same applies to Infusoria cultures. It is indeed surprising how rapidly really thick cultures of Infusoria can be made when they are maintained at 78°F.

Treating diseased fish and quarantining new arrivals is yet another use that some of the jars in this unit can be put to. The uses for these heated jars are indeed numerous and no doubt you will find more once you have made one of the units described.

## Cacti in the Fish House

IT is surprising how many aquarists are also interested in growing cacti, either in their fish house or on and near the fish tanks. The conditions suitable for the fish will often give a very good temperature which suits the cacti. These plants appear to appeal to aquarists because they are of such quaint shapes and their flowers are so strange that they have a special attraction for most naturalists. Considering the number of years that these plants have been grown in this country it is surprising how little is generally known about the correct treatment of them. Many people think that cacti flower only once in seven years. This is quite incorrect, as there is no cactus plant which will not flower each year once it has reached flowering size.

Cacti are a type of succulent plant which have what are called areoles, a small cluster of wool or hair from which a bunch of spines emanate. Practically all have single flowers without a stem. In the fish house they can serve a very useful purpose by giving some shade from strong sun. Nearly all cacti are sun lovers and so they revel in all the sun they can get in this country. If shelves are provided near the windows not only will they do well but their shade will be better for the tanks, although they will not prevent the warmth from entering the house.





A page for  
the beginner  
contributed  
by

A. BOARDER

**W**ITH the turn of the year most aquarists look forward with increased interest to the fascinating project of breeding their fishes. However great may be the pleasure obtained from the keeping of fish in a healthy condition, I am sure that few aquarists are satisfied until they have bred a number of fish of one type or another.

In the two main divisions of fish keeping, tropical and coldwater, one would imagine that it is easier to breed and rear the coldwater species than it is to succeed with the tropicals. I do not agree with this idea as I have found from experience that it is far more difficult to breed a number of good fancy goldfish than it is to breed many types of tropicals. I know that a few of the tropicals offer difficulties in breeding, but once this initial obstacle is overcome the fish are bred far more easily. All the tropicals with the exception of the guppy, the mollie, the platy, the swordtail and the fighting fish, generally turn out like peas in a pod. Except for a rare mis-shapen fish the whole brood is likely to contain anything from a hundred to a thousand fish to all intents and purposes alike. With such fish it is only necessary to provide a few of the youngsters with plenty of room, say a three-foot tank for half-a-dozen fish, and at least one winner will turn up and possibly all the batch can win.

When the question of breeding fancy goldfish arises a very different happening occurs. Even from the finest and best established strain of fancy fish many will turn up which bear no resemblance to their immediate parents. It is possible in a hundred young veils or fantails to fail to find two fishes exactly alike. Of course, when an extra good one is bred this fish gives far more pleasure than one is likely to get from breeding a hundred fish which are all alike.

#### Experience with Egglayers

My advice to anyone who would like to breed some good fancy goldfish is to gain some experience in breeding some of the easy tropicals. I do not mean the live-bearers, as all our types of coldwater fish which we keep are egg-layers. It is necessary then to gain some knowledge with the egg-layers among the tropicals. A start can be made with such fish as *Brachydanio rerio*, mountain minnows and rosy barbs. Not that it is always difficult to get these fishes to breed but the fact is that all the egg-laying species require a certain amount of skill on the part of the aquarist to be able to rear the tiny fry in the early days.

The young of the livebearers are usually born in such an advanced state of development that they are able easily to find their own food and swim about fairly actively. The fry of the egg-layers are so small and weak when they first hatch that they present far more difficulties than do the livebearers. First master the art of rearing to adult size, fry of the egg-laying tropicals I have mentioned.

The fry which hatch from eggs are generally born with a small yolk sac which serves to feed them whilst they grow slightly and gain strength. Normally, the fry will

cling to the sides of the tank or on water plants until the yolk sac has been absorbed. Some types drop to the bottom of the tank and are hardly to be seen for a week or so. When these tiny fry start to swim about is the time when food must be provided. The youngsters are so tiny that they can only take the smallest foods and it is safe to say that most of the fry of egg-layers can only eat food too small to be seen with the unaided eye.

Often it is in the very early stages that breeders go wrong. They fail to provide a sufficient amount of food which is small enough for the fry, and a bad start means a lot of hard work to make up the lost leeway. If fry can be kept eating nearly all the day long they will not only make good growth but they will make much more healthy fish in later life. Most aquarists are acquainted with the tiny water animals known collectively as Infusoria. These breed and increase in water which contains decaying vegetation. Most are too small to see but some such as *Paramecium* can be seen as a white moving cloud in water which contains a good culture. I do not think that there is any better food for young goldfish than Infusoria and as long as plenty is provided for the first week or ten days, the fry are almost sure to thrive.

#### Check Infusoria Cultures

What often happens is that a culture is prepared and then later on fed to the fry before the water has been properly examined with the aid of a microscope. Dirty water can contain many impurities but no actual Infusoria. If a magnifying glass of about 70 magnification is used the Infusoria large enough for the fry food will clearly be seen and then this will obviate the wasting of time in trying to feed on a cultureless liquid.

When rearing the tiny fry it is essential to see that a continuous supply of Infusoria is available. The drip method is the best as this allows a few drops of Infusoria infested water to drip into the tank all day long. The best method is to have a spare tank supported above the tank containing the fry. Some water is removed from the fry tank so that when the fresh water runs in the tank does not overflow. A small siphon tube is fitted to the Infusoria tank which will allow a drop about every second to reach the fry. This tube must be inspected at regular intervals as the outlet hole can easily become clogged and so stop the flow.

Once you have successfully reared some fry of the tropicals mentioned above you can start with the fancy goldfish. The conditions for rearing are very similar as it is important to see that the water which holds the coldwater fry is kept at about 70°F. for about a month. All aquarists may not agree with this advice to provide warmth for coldwater youngsters, but I can state definitely from experience that it is a great advantage to be able to do so. The rate of feeding, and consequently the rate of growth, depends upon the warmth of the water. The colder it is

(Continued at foot of next page)

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

**M**ANY people are turning to flowering shrubs because in the long run they are the cheapest form of gardening. It's true that the initial cost is higher than most other forms of gardening, but then a well-planted shrub may last for 25 years and, though it may cost 7s. 6d. it is indeed a good investment. The way to manage the shrubs is of course to mulch them properly with sedge peat to the depth of an inch, and if this is done there's no need to do any forking in the winter or any hoeing in the summer. It is true that annual weed seeds do occasionally drop on to the peat and grow, and so some hand weeding may be necessary.

Just think of a beautiful border which flowers for most months of the year and which gives some protection, which is the ideal background for pool or little lake, and which needs the minimum of looking after. So often our gardens suffer from winds. Mine certainly does in Thaxted, and I long for the day when the shrubs and trees have grown up and can give all the other plants the protection they need. Some people say that you can only have a shrub border in a very big garden, but this isn't at all true. There is no reason why one shouldn't have a little border say 10 feet long and five feet wide, and plant it with shrubs that take less room and don't grow too tall. Such a border needn't be in straight lines at all. It could have quite a wavy outline just to break up the straightness of the garden which might otherwise look like everybody else's. The joy of flowering shrubs is their informality.

In the small garden there's naturally a desire to get the same kind of effect as one can with lots of room at one's disposal. By all means only have one shrub of each kind planted, but do bear in mind the harmony, colour of the flowers, the contrasting shades and so on. Never be tempted to overplant a new border. Read the catalogue carefully and if a shrub grows nine feet high, then remember that it really needs four-and-a-half feet on either side if it is to grow naturally and properly. Few people do give quite as much room, but they say that if a plant grows three feet high it will need two square feet of room. If it grows six feet high—four square feet of room, and so on. There are always exceptions to every rule, because there is a *Cassandra calyculata* which only grows three feet tall and needs about 11 ft. square in which to grow!

As a shrub border plant at the right distance always looks a little bare, it may be advisable to have some of what are called inter-plants. These can either be other shrubs which are put in purely on a temporary basis and *must* be taken out in five or six years time, or they can be annuals which are grown in drifts so as to give splashes of colour in the summer. That's what we do at the Horticultural Training Centre; we stick to the main plan and plant up accordingly. The shrubs are properly labelled and then the sedge peat is put into position. In the spring it's a simple matter to sprinkle the annual seed in drifts in among the peat and it's surprising how well the flowers do.

Of course, you can have what I call the one-type of border, that is to say if your soil is free of lime and you love azaleas, you could have a whole border devoted to these delightful shrubs. There's a lot to be said for a shrubby heather garden, or a border devoted almost entirely to camelias. It would be possible to have a berberis border or one devoted to the many different species of brooms. It's surprising when you come to read a book like *The A.B.C. of Flowering Shrubs*, how many one-type borders you can find.

Undoubtedly, the way to get flowering shrubs is to go to a reliable nurseryman and see the plants growing in the nursery for yourself. Don't go to a firm which doesn't

grow any shrubs at all, but just publishes a catalogue and then gets its needs from some wholesaler. If you do this there may be two transplantings and that doesn't do the specimens any good. The nurseryman who actually grows the shrubs is keen to have a satisfied customer and so will be glad to replace losses which are really due to his fault. Go into a nursery and thus you will see exactly what you are getting.

Womenfolk will tell you that half the joy of buying a new dress is the shopping and choosing entailed. This is just as true in the case of shrub buying, for the result may be a beautiful garden for 20 or 30 years to come. The dwarfier shrubs will do far better and establish themselves quicker. Furthermore, of course, they are cheaper. You need a shrub with a good root system. It's far better to have a smaller plant with plenty of good roots than a specimen which is all top and has damaged roots. Ask for the shrubs to be delivered at the right time for planting. Be prepared to buy, using the Latin name. Common names unfortunately differ from district to district, and particularly from north to south. It isn't swank to mention Latin names, it's sheer common sense.

The shrub which keeps its leaves in the winter months is best moved in the spring, say in May, when the ground is warm and the weather is showery. The alternative period is from the middle of September to the middle of October. These autumn dates are suitable in the south, though it's safer to wait in the north. The deciduous shrubs, that is, those that drop their leaves in the winter, can always be moved say, in November. With the evergreens it helps if there can be a good ball of soil to their roots, but with the deciduous shrubs the roots can be planted quite bare.

Plant the shrub at the same depth in the garden as it was in the nursery—the tendency being to put it in slightly shallower than deeper. Firm planting is essential and one of the reasons why it's so important to get the digging done in the autumn is to give the ground a chance of settling before transplanting takes place in the spring. It isn't easy to plant in puffy, newly dug land. After planting tread the soil firmly around each plant, wearing your heaviest boots.

### Stepping Stones

(Continued from the preceding page)

the less do the fish move around and feed and the longer does it take them to digest their food.

The three tropicals named can be bred in any fair-sized tank which has a good planting and, in the case of the danios and mountain minnows, has some pebbles at the base. The danios will eat many eggs if they are allowed to lie on the sandy bottom, as these eggs are non-adhesive. Once a good number of eggs is seen in the spawning tank it is advisable to remove the parent fish, or the eggs, and later on the young, may be eaten.

Providing the breeders are in good condition and have been well fed there is little trouble in getting them to spawn. On the other hand it is positively useless trying to breed from weakly or under-nourished fish. I shall be returning to this later in the season and meanwhile to all coldwater fish keepers I suggest that as often as the fish in the pond show an inclination to feed a little food is offered, but only the smallest amount should be given, which must be cleared up before any more is given. As long as the fish are willing to take a little food I can see no reason why it should not be provided.

# The British Marine Aquarists' Association

by L. R. BRIGHTWELL

THE British Marine Aquarists' Association is yet in its infancy—but so was once the now world-wide "trop" movement. Don't forget how the London Zoo shook the world with a handful of guppies (not one show point between them!) in 1906. And it was only a century ago that a Mr. Holdsworth, English chemist, mildly suggested that there was a better way of keeping goldfish than putting them—and as many as possible—in a nice glass bowl, and giving them nice clean water every day, with a total disregard to changes of temperature.

So no one need laugh at "those marines," because they are only just on the map after much tribulation. The upkeep of a public aquarium with abundant funds behind it, possibly a few permanent supply ships, and a well-trained staff is one thing; but a tank or two in the home, with scanty literature and no nearby fellow fan to guide one—how very different. The B.M.A.A. is out to correct this.

There is no subscription—every member is his or her own unofficial secretary. The presiding secretary is Mr. Pugh Thomas of 35, Meols Drive, Hoylake, Cheshire, and he circulates a sort of scrap-book wherein each member of the movement writes his findings to date, and passes the book on to the next member—at his own expense, a matter of a few pence. Before some official of a wealthy cup-encrusted "trop" society dismisses this as too Utopian, let me say that it is growing fast. Already there is a worth-while little library and a "pool" of specimens on which members can draw, paying all their own expenses, of course—again, a matter of relatively small cost.

The circulated volume is a mine of information. All those who contribute have something worth saying and since some are coast-dwellers, and others far inland educationalists who must carry, or pay through the nose for every drop of *aqua marina* in their tanks, there are some fine brain-pickings for all to profit by.

Two valuable contributors (all are valuable, of course) are Mr. John Clegg, director of the famous Haslemere Educational Museum and author of the most comprehensive work on freshwater life ever assembled between covers, and Mr. H. Sinclair, curator of the small but excellently kept Southsea Aquarium. There are others offering hints on temperature, transport, filtration, pH, and the safe association of tankmates. This last is particularly vital when one remembers that the largest tank must be a mere spoonful compared with the ocean. At the same time a large tank offers more space for some minor trouble to diffuse itself than does a small one.

This little band of pioneers, as yet without even a meeting-place, is assured of vigorous growth for its sole aim is to ascertain the truth and broadcast it. No cup-hunting has yet crept in, with commercialisation and corruption in its train. As H. G. Wells reminded us, not all the great contributors to Natural Science have been professionals, a case in point being the discoverer of the acorn barnacle's origin, as quoted in Dr. D. P. Wilson's excellent *Life of the Seashore and Shallow Seas*:

"In 1816 there was appointed as the District Medical Officer of Cork, a surgeon, Vaughan Thompson, who is



"Dog-show on fins!"

remembered not so much for his medical work as for the far-reaching discoveries he made in marine biology."

Even the great Cuvier at this time regarded the barnacle as a mollusc, but Vaughan Thompson, in the face of much ridicule, born of jealousy, patiently worked out its life cycle and established it as a crustacean, a phenomenon now as generally accepted as the sunset or the tides.

Amongst its other aims the B.M.A.A. seeks to encourage the private research worker and, if he is on the wrong lines, save him much labour lost by pointing him to the most likely authority who will set him right.

Finally, a well-typed monthly bulletin is now sent out to all members.

## Your Choice Plants By Post

A GREAT amount of business done by aquatic dealers is done by post, especially in the plant line, as a large proportion of aquarists like myself, who live some considerable distance from a reputable dealer, must resort to such a method—though not an ideal one—of obtaining either a stock of the general run of plants or a choice specimen of some value.

I have received quite a considerable number of plants through the post, but in spite of the apparent excellent packing by the dealers, have suffered a set-back owing to lack of moisture (the plants drying out). In one case I found that the post office had left the package undelivered over the week-end, resulting in complete devastation to the enclosed plants. I then resolved to find some method of ensuring the safe arrival of plants. It was obvious that sending the plants by rail in a can of water would be almost ideal, but this method was expensive and unsuitable when only ordering a small selection or special plant. A substance which would retain water, thus keeping moist and at the same time being light in weight to save storage, would be ideal. It then struck me that vermiculite—a substance whose qualities were described in a previous issue of *The Aquarist*—would be excellent.

The method I now use is to forward to the dealer a cardboard box lined with a waterproof material (which I understand is used for lining coffins), with sufficient material to fold over the enclosed vermiculite, which is sent dry. On top of the box I print instructions to the dealer, informing him to wet the vermiculite and place the plant or plants in the substance before returning. In this manner I now receive my plants in as good condition as they leave the dealer.

I. McCallum



"AQUARIST AT HOME" *spotlights a contributor—*

## Mr. A. Boarder

*Interviewed and photographed by* LAURENCE E. PERKINS



I SUPPOSE that the name of no aquarist is more synonymous with a variety of fish than is that of Mr. A. Boarder. The mere mention of fantail goldfish immediately calls to mind the name of Boarder. For this there is ample reason since Mr. Boarder's famous strain of red-gold fantails is established as the finest prize-winning strain in the country. This statement is well founded on the widespread success these fish achieve in countless shows throughout the land.

At a very early age Mr. Boarder accompanied his father, an enthusiastic angler, on fishing excursions. His primary function on these expeditions was that of bait-carrier and his pockets were usually crammed with worms! He started to keep fish when he was about eight years old and at thirteen was writing articles on methods of catching fish, and varieties of bait to use, for his school magazine.

Although he continued to keep fish it was not until seventeen years ago that Mr. Boarder decided to undertake seriously the perfection of a strain of fantail goldfish which would be hardy, enjoy a change of colour at an early stage of their development and be suitable for exhibition purposes. He kept up his breeding activities throughout the war years and in 1946 entered one of his fantails in the first post-war National Aquarist Society Show. In a mixed class this fish took second prize. The following year he entered three of his fantails for the N.A.S. show, which was a much larger affair than its predecessor. These three fish secured first, second and third prizes for Mr. Boarder, which encouraged him to

continue breeding what was obviously a type of fish that appealed to the judges. Since then, fish from this strain, shown by himself and other aquarists, have secured firsts and specials at many of the leading shows including the National, Olympia, Manchester, Nottingham, Southampton, Harrow, Watford, Cardiff, Southend, Bath, Friern Barnet and Wembley.

Mr. Boarder's breeding system is most unspectacular. His small pond contains about six pairs of spawning fish all of which have some good points worth keeping in the strain. These fish are allowed to spawn together without any careful pairing of individual fishes. The number of combinations involved in selecting special pairs would, Mr. Boarder contends, take too many years to exhaust. Perhaps, at a later stage, when more of the wanted characteristics are shared among a smaller number of fish, careful selection will be more practical but at present the eggs from the general spawning are collected from the pond as soon as they are laid and removed to tanks in an old greenhouse to hatch. The fry are reared on various packet foods, earthworms, and dried shrimps until they are of a size to show character. Specimens thought to show promise are carefully selected for culture and subsequently returned to the pond where they remain permanently, feeding on a diet of earthworms and brown breadcrusts.

Mr. Boarder doesn't favour crystal clear tanks and has but two which are in any way ornamental. These he has set up in his living room where they stand, fully planted and looking for all the world like tropical show tanks, year in year out without undergoing any wholesale cleaning out.

Mr. Boarder, who is on the panel of judges and lecturers for the F.B.A.S., has less time now to devote to the perpetuation of his strain and, as a judge, cannot show his fish, but as a lover of the fantail he is very keen to encourage the spread of the strain and is always pleased to learn of other aquarists' achievements with fish from it.



A show specimen fantail now used for breeding. On the right is a view of Mr. Boarder's garden pond



# AQUARIST'S Notebook



by  
RAYMOND YATES

GENERALLY speaking cichlids seem to be out of fashion nowadays, although it is hard to understand why. It is true that many dealers fail to stock them because of the low demand and this undoubtedly helps to push them into an unwarranted obscurity. Apart from the dwarf varieties there are several members of this class which are quite suitable for a community tank and which are simplicity itself to keep.

That quiet and sedate fish, *Cichlasoma severum*, is one in point. This fish probably suffers from the handicap of a stupid name as it is anything but severe in disposition and small specimens of two inches or so are splendid community fish. They are not fastidious fish and will eat most foods offered, although they naturally prefer live food where possible. Their rapid colour changes are quite remarkable and young fish can change in seconds from pale green to a very good imitation of the zebra cichlid and to almost jet black. Just as fast as they change colour one way their original colours can return.

When trying to net this fish it usually hides in the darkest part of the tank and turns black, with the result that it just cannot be found. *Severum* are bottom feeders in the main but are always ready for anything that may be available. They are not nervous fish but they are sedate and their movements are rarely hurried.

Another good cichlid, when small, for the community tank is *Cichlasoma festivum*. The colour here rarely changes although young specimens have several dusky bars almost always showing as a background to the wonderful upward stripe that runs from the eye, right across this fish. *Festivum* also are hard to net, mainly because they can move like lightning and avoid the net with ease. These fish prefer the upper portion of the tank water and cruise at or near the surface although they will search the bottom for food when hungry.

This fish likes to make a home behind some rock and keeps intruders away, although fish that are not cichlids are rarely bothered. *Festivum* do better at a high temperature (around 80°F.) and do not worry plants or other fish, remembering that it is never wise to put very tiny fish with larger fish. Fish the size of glowlights are quite safe with all the cichlids mentioned which, for the sake of balance alone, should not exceed two and a half inches in length themselves. Festive cichlids have rather small mouths and are able to do little damage, even if they wished. It is interesting to record that large angels in a tank are very wary, and even scared of new cichlids introduced to a tank, but within an hour or so they become quite accustomed to the newcomers and treat them with the contempt that follows familiarity. Cichlids always recognise other varieties of cichlids put into their tank however much they ignore other species of fish, and this applies even to the dwarf types.

Young firemouths are very docile in spite of their pugnacious look and are splendid community fish at a size of two inches or thereabouts. Orange chromides are also very easy-going fish and are suitably sized but, unfortunately, they are somewhat choosy and not quite so hardy. The commonest cichlid on sale at present is the zebra cichlid (*Cichlasoma nigrofasciatum*). Small specimens of an inch or so are colourful and interesting, and always on the move in a community tank. As this fish becomes larger it is wiser to move it to quieter quarters as it can be very savage. Other tank occupants tend to panic at its near approach owing to its habit of dashing about at high speed for no particular purpose. *Nigrofasciatum* seems to have strong powers of survival out of water; I have seen

specimens which have jumped out of their tanks for ten minutes or more swim unconcernedly away on being returned to their native element.

We are constantly being reminded in the press that women have a longer expectation of life than men. Unfortunately no fish statistics exist but it would be interesting to know how things compare in the aquarium world. Our most colourful fish are mostly males and it is always these which seem to depart first, leaving the disgruntled hobbyist with very plain and unattractive females. On reflection, it would appear that tank mortality falls heaviest on males (where sexing is possible) except in the case of livebearers where, on average, males seem to outlive their opposite numbers. In the egglayers most fishkeepers will agree that males usually die first in the following species: dwarf gourami, three-spot gourami and blue gourami, leeri, paradise, most of the barbs and danios and, to a great extent, the characins. By and large more males are kept than females and this will tend to make the loss ratio seem greater than it really is. However, there is little we can do about it except make the best of a bad job where this applies.

Aquarists with young children will be interested to know that an excellent painting book of tropicals is now on sale under the title *A Painting Book of Tropical Fish*, price two shillings. The coloured illustrations are large and the coloration and line drawings are true to life. The fish included are the clown barb, green swordtail, spotted scat, *Barbus ticto*, harlequin, Buenos Aires tetra, firemouth, *H. rosaceus*, Jack Dempsey, Argentine pearl fish, neons, nigger barb, angel and dwarf gourami. The pictures in this book are well worth having for use at shows, or passing round at lectures or discussions.

A short film now being shown at cinemas throughout the country is entitled "Strange Cargoes." This film is not entirely about fish but there are good shots of fish arriving by plane at Northolt, cold water plants under cultivation at Rickmansworth and close-ups of about twenty different species of pet fish, including sea horses, goldfish, golden orfe, catfish, harlequins, swordtails, angels and many others. A film well worth seeing and a "short" that is not too short.

After being relatively rare for years there are now considerable numbers of black-banded sunfish available, and generally at a very reasonable price indeed, small specimens about an inch or a little longer selling for three or four shillings. This aristocrat of the aquarium is no newcomer but it has never been in great supply although there has always been the demand. It is just one hundred years ago since this fish was first discovered in New Jersey, and it is not strictly a tropical. Nevertheless it gets along very well in a community tank and even a temperature of 80°F. does not appear to put it to any inconvenience. Large specimens of three or four inches in length are seen at shows but my personal opinion is that the small specimens are best.

They are rather sedate fish who do not rush at food in

the usual perch-like manner but casually select tit bits to their own choosing. This fish will not accept any food except live food, preferably something which is wriggling or struggling. In time, from watching other fish, they will take strips of raw fish or meat, but it is safer to offer them *Tubifex*, white worms or *Daphnia*. Some of the small-sized fish fail to grow in aquaria, but this is of little consequence as they are so attractive when one inch in length. They are peaceful and get on well with all other fish including cichlids.

They prefer acid water and sometimes do not take kindly to their new home. When this happens they mope at the surface, fold their tail and develop fungus. If nothing is done they die in about three or four days. Removed to another tank they often recover overnight, failing which a salt bath works wonders. Even so they will again fail if returned to the original aquarium. If they take to your tank, leave well alone, you are dealing with a touchy fish.

It is the exception rather than the rule nowadays to find dealers members of their local clubs. In the early days most dealers joined their local society and for a time all worked well. It was not long however before dealers began to find that their interests and those of the club did not coincide. Many were pestered to give lectures (free, of course) for the sake of the advertisement they got, and club members began to expect and openly hint at preferential terms and treatment for themselves.

The sale of fish bred by members or auctioned off, as also second hand equipment, was all a loss to the local dealer, and if he happened to be on the club committee he was often liable to be the target of grievances, real or imaginary, of disgruntled members. Realising these points most dealers to-day refrain from identifying themselves with any particular club and in this way maintain a neutrality which enables them to be on friendly terms with all and beholden to none.

## Breeding Enamel Fins (*Pristella riddlei*)

IN my opinion the enamel fin (*Pristella riddlei*) is an inoffensive characin worthy of a place in any collection of small exotic fishes. In dealers' tanks it often appears merely as a silvery fish with white occurring in dorsal, ventral and anal fins. Nothing, however, could be further from the truth. In suitable water the body takes quite a greenish-yellow tinge. The dorsal and anal fins assume three definite horizontal stripes of yellow, black and enamel white, while the caudal is quite flushed with red.

Sexing is fairly simple in adult fish, the female being usually the larger and certainly much deeper in the body than the male. There appears to be no colour difference, but the time-honoured method of body shape is very reliable, and even the veriest tyro would have little difficulty in sexing adults once seen.

Here is a fish which, although possessing enough individuality to warrant attention for its own sake, nevertheless can provide a useful stepping stone to the more difficult types to breed. *Pristella riddlei* are not difficult to breed but do not fall into the "easy" class; besides, if one is successful in the spawning and rearing of these fishes there is little doubt that the experience leaves the amateur much better equipped and prepared to tackle the "hard to breed and rear" class. It is no mean feat to rear *Pristella* fry. They are fairly small, they could not be classified as fast growing, and tax the breeder's ability to supply a sufficient quantity of

specially graded food for a number of weeks. If this can be successfully achieved then the aquarist can look forward with more confidence to the fulfilment of his secret hopes and ambitions with other fish.

As with the spawning of most fish, water is the first consideration, and although *P. riddlei* are not terribly fussy over water, I found the best results were obtained by using fairly soft, slightly acid water, so I will detail, briefly as possible, exactly the method I used.

The brood fish were separated, liberally fed on *Cyclops*, *Daphnia*, white worm, bloodworms and earthworms for three weeks. The female was soon bulging with roe. A tank, 36 ins. by 10 ins. by 10 ins. base-heated, was filled six inches deep with a mixture of rain and tap water in a ratio of two parts rain, one part tap, acidified to a pH of 6.7 by boiled peat, which was allowed to settle on the bottom, no sand being used. The water had 5° of hardness. A good clump of Indian fern was floated (most fish seem to prefer to spawn near the surface) and the fish introduced, late at night, with the temperature standing at 78° F. The fish had been conditioned in tap water pH 7.4 at 72°-74° F. and their reaction to the acid conditions was immediate. The colours became pronounced and the body assumed a suffusion of amber I hardly thought possible.

Next morning at 7 a.m. they were spawning. With erect, quivering fins, they made repeated rushes into the plants, the male pressing his body against the female momentarily while about six to 10 eggs were released and fertilised. This continued at intervals until 9.30 a.m. when the fish were removed. The temperature was raised to 80° F. and in about 24 hours the fry hatched out. Quite a few eggs had dropped on the peat and these also hatched successfully. No shade was given to the eggs and they were unaffected by direct sunlight. In 48 hours the fry were free-swimming and it was amazing how they disappeared once "on the fin." When the tank was inspected it was amusing how they would "freeze" in the oddest positions. This is common in many fry and can deceive the aquarist greatly when trying to determine the number of young. Often the original number counted is doubled or even trebled when the final count is taken.

As soon as the fry were free-swimming a small quantity of cultured Infusoria was warmed to temperature and added to the tank. I am a great believer in pond Infusoria and proceeded to keep a steady supply going. After about seven days micro worms were introduced in addition to the sifted natural food and on this mixed diet good growth was obtained. At the age of four weeks the fry were  $\frac{1}{2}$  in. long and were unmistakably *Pristella riddlei*. At seven weeks the average length was  $\frac{3}{4}$  in., and the final count revealed 120 young fish of a very even size with no runts.

To conclude, there are a few points that may be helpful. Uneven growth is a sign of unsuitable food or insufficient quantity. Do not use too small a tank. When feeding pond Infusoria (which I found contains a high proportion of *Cyclops* nauplii) I always warm it up to tank temperature. It will quickly die if this is not done, especially in cold weather. Always maintain a steady supply of food but do not cram the tank. Little and often is the best plan. Although it has been reported to the contrary, never, in years of experience, have I found *Cyclops* nauplii attacked the fry.

Nauplii, in my opinion, are the ideal food. They stand rough treatment; live for a long time in storage; when newly hatched are smaller than *Paramecium*; a rise of 40° in an hour will not kill them; fishes grow very quickly on this diet. It can be obtained most months of the year. It is worth the trouble of seeking. Try it and see!

Johnson H. Hood

## OUR EXPERTS' ANSWERS TO READERS' QUERIES

Can you please give me some information about the breeding habits of the chocolate gourami (*Sphaerichthys atherinoides*)?

Up till the time of writing, very little is known about the breeding habits of this fish. Some authorities say that it is a mouthbreeder; others state that it builds a bubble nest similar to that constructed by other gouramis. It is known, however, that there are two species, or perhaps races, of *Sphaerichthys* native to the East Indies: one from the Malay peninsula and Sumatra; the other from Borneo. Several years ago, John Paul Arnold, the great German authority on aquarium fishes, drew the conclusion from reports he had received from correspondents in the East Indies that the species from the Malay peninsula and Sumatra incubated the eggs in the mouth, while the species from Borneo built the typical bubble nest.

Do you consider it wise to purchase fish which have just recovered from "white spot" disease?

Unless the fish are being sold at a very reduced price, and you are perfectly aware of the risk you will run if you purchase them, we strongly advise you to leave them alone. It is easy enough to introduce white spot disease into a healthy aquarium, but not so easy to get rid of it.

Can I use one thermostat to control the temperature of two tanks placed side-by-side?

Certainly you can use one thermostat to control the temperature of two aquariums. If the tanks differ slightly in size, place the thermostat in the smaller of the two, and use a more powerful heater in the larger one.

I should be very grateful if you would give me the name of an inexpensive but really reliable handbook on fishkeeping for beginners.

You cannot do better than obtain a copy of *Aquariums* by Anthony Evans, Editor of this magazine. This small book covers a great deal of ground, and contains much information not to be found in many expensively got up publications. It may be obtained for 2s. 6d. from most bookshops and better-class aquarium dealers.

Please can you tell me whether angel fish will spawn on any other objects besides the stems and leaves of strong-growing underwater plants?

Angel fish have been known to spawn on such things as heater and thermostat tubes, on rockwork, on the side of the aquarium, on bamboo canes stood upright in the water, or even on glass tubes painted green to imitate reeds.

Although my aquarium is set close to a window, the sides have become clouded with brown algae. Please can you tell me the cause of it, and what steps I should take to get rid of it?

Brown algae is often caused by hard water, though sometimes it makes its unsightly appearance in a tank insufficiently planted with higher plant life such as species of *Vallisneria* and *Sagittaria*. It will sometimes occur in badly lit aquariums. We advise you to remove as much of the fuzzy brown growth as you can by rubbing the sides of the aquarium with a piece of clean cloth wrapped round the end of a piece of stick, and, when the water has cleared, siphon all sedimented matter from the bottom. After a good clean, plant plenty of underwater grasses along the back and sides of the aquarium.

I should like to breed perma-black mollies. What size of aquarium should I give them, and please tell me the best plants to grow in it, and the sort of water mollies like.

Mollies need plenty of living space, so a large aquarium is desirable. A pair in a twelve gallons capacity tank should do very well. Plants with feathery foliage are the best to use, for such plants provide plenty of hiding places for newly born fry. Mollies need a well-lit situation, and green food in their diet. The ideal and most natural green food is algae, the soft mossy algae which grows on rockwork, and more often on the sides of the aquarium. But after the fish have nibbled this off every fixed object,

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.

you can feed them with chopped lettuce, cooked spinach, and cereal foods sold at chemists' shops for human consumption. Mollies in their wild state often inhabit slightly brackish water; so the addition of one level teaspoonful of common household salt to every gallon of water contained in their aquarium is beneficial. But after adding the initial supply of salt do not add any more, otherwise you will kill the plant life.

A short time ago I moved the fish from my established aquariums to some newly set up in a fish-house. In a few days most of the fishes were dead or dying. Can you explain this tragedy?

The sudden change from old, matured and probably acid water to new water may have had a lot to do with the fatalities. When such changes have to be made, it is a wise policy to empty some of the water out of the established aquariums into the new ones. This lessens the shock which the fish feel when they are changed from an environment they have grown used to, to one quite new to them.

Is it possible to earn a living breeding tropical fishes? Semi-invalidism precludes me from following normal employment.

It is possible to earn a living breeding tropical fishes just as it is possible to earn a living by buying and re-selling secondhand gramophone records, furniture, books and the like. But all these things demand a certain amount of capital, much hard work, and infinite patience, besides a sound knowledge of the business it is intended to follow. Breeding fish for the commercial market is not one of the easiest careers to take up. It means plenty of hard work for many hours every day, getting used to heart-breaking disappointment after disappointment, and understanding and anticipating the requirements of dealers. If you are really keen on trying to earn a living from breeding fish, we suggest that you concentrate on some of the easier-to-breed popular species rather than waste time and money on rare or notoriously difficult species. And we should like to say that it may be many months or even years before you see any appreciable return on capital invested.

For a long time I maintained a tropical aquarium close to a window with a good light. Both plants and fish kept in perfect condition, then circumstances arose which necessitated my moving the aquarium into another room with a window facing north. I have had to place the aquarium some distance from the window, but illuminate it for a few hours every night with two 25-watt bulbs. Now the plants look most unsightly with browning leaves and, in many cases, naked stems, the leaves just decaying and falling off the plants. Can you give me any reasons why my plant life is failing?

Yes. Lack of bright light. We presume you have such plants as *Vallisneria*, *Hygrophila*, Indian fern and others. All these species need a bright light. You will have to increase the amount of electric light you are burning from 50 watts to about 75 to a 100 watts, and keep it burning for at least seven hours every day. On the other hand, if you plant such species as *Cryptocoryne* and *Sagittaria* you will find that they will prosper in shady surroundings, and some lovely effects can be obtained by planting the different species of *Cryptocoryne* in clumps along the back and ends of the aquarium.

My two angel fish have lost their ventral fins. Will these fins grow again?

You did not tell us whether the fish lost their fins through

disease, or whether they were bitten off by some other fish. But, in either case, the fins should grow again, though probably not quite so sweeping as the original pair. Meanwhile, keep the fish fed on nourishing meaty or live food, and maintain an even, high temperature in the aquarium. If the fish lost their fins through disease, it would be a good idea to give them a salt bath; that is to say, place the fish in a solution of common household salt and water: one teaspoonful to every gallon. And take care that the fish do not get chilled during the process of netting them and placing them in the bath. An hour or so in the saline solution should be long enough for treatment.

I am setting up a tropical aquarium for display purposes, and should like to portray the sort of underwater scenery found in the Amazon. Can you supply me with the names of plants found in the Amazon, the sort of rockwork found there, and some idea of the bottom?

The river Amazon is such a wonderful river that it

would be impossible to tell you much about it in the space of a few lines. In fact, it would need a very thick book to deal with only a few of the plants found in it. The river is more than four thousand miles long; some of its tributaries cover greater distances than a line drawn between London and Moscow. Great ocean liners steam a thousand miles up its course. In parts the Amazon is clay coloured. Its banks are clothed with all kinds of vegetation. In the shallows may be found species of *Vallisneria*, *Heteranthera*, *Egeria*, *Echinodorus*, *Cabomba* and *Sagittaria*. Your best plan would be to use rockwork and compost of approximately the same texture and colour and plant up with plenty of *Vallisneria* and *Sagittaria* interspersed with clumps of *Echinodorus intermedius* and *Heteranthera zosterifolia*. If you are really interested in the flora and fauna of the Amazon we suggest you borrow from your library some of the very fine books which have been written about it.

## COLDWATER FISHKEEPING QUERIES answered by A. BOARDER

I have a three-year-old, cross-bred shubunkin which has developed warty looking growths on top of both gill fins where they join the body; it seems in very good health and took a vigorous part in spawnings in my pond last year. Is this a sign of disease?

The growth on the pectoral fins is only the sign of a healthy male fish. Some show the small white tubercles on the gill plate and others have them extended down the front of the pectoral fins. In some cases I have seen fishes with a very thickened front to these fins and your fish appears to be one of this type. There is nothing to worry over—it is a sign of good health in a male fish.

Why do goldfish in a pond turn white?

Some goldfish in a pond turn white because they have been bred from a strain in which several fishes have had the white or silver markings. I have seen a brood of young fish numbering 400 and among them were a very few white fish. The parents were gold but there may have been some silver in the strain which produced them. Some goldfish develop white markings after they are a couple of years old and then get whiter each year. It is, of course, quite possible that there is something in the make-up of the pond which may cause the fish to turn white but I cannot think that anything in the water could really change the pigment which determines the colour in a fish.

Will you please tell me when I can safely return to the pond shubunkin fry hatched in July last year. It is a fair sized pond with four large shubunkins in it.

By early October, your fry should have been quite large enough to be placed in the open pond. A great deal will, of course, depend on how well the fry have grown. If they have had plenty of room and have been well fed they should be at least three inches in length over all. In any case as long as they are over an inch long the large fish are not likely to eat them. If you have been keeping the fry warmer than the water in the pond it is advisable to see that the temperature of their water is reduced gradually before you put them in the pond.

We have a pond which is 8 feet by 4 feet and 2½ feet deep. In the centre there is a portion which holds the water lilies. This contains about four inches of manure, six inches of earth and a covering of small pebbles. Early last year the pond turned green and although emptied and re-filled it soon went green again. We have tried all sorts of cures but cannot keep the water clear; the fish appear healthy but the pond is so green that it looks very bad. What can be done?

The greening up of a pond is quite a natural event. The green is actually caused by tiny plants called algae which will thrive only in good light. If light is excluded from a tank of water it will never turn green. In a well-established pond there should be sufficient growing water plants to choke out the algae either by reducing the amount

of light considerably or by using up the nourishment which the algae requires. It can be likened to a weed in the garden. If you leave a vacant plot in the garden, weeds soon take control, but if the plot had been planted with potatoes the weeds would mostly have been starved or crowded out. It is the same with the pond.

Water lily leaves can keep much of the sunlight from the water but some under-water plants should also be provided to help use up some of the carbon dioxide. If you empty the pond late in the autumn, say the end of October or early November, you will find that the water may remain clear for the rest of the year. In the first instance, when you placed the manure and earth in the pond, you provided the very conditions under which the algae thrives. I do not believe in placing manure and earth in a fish pond unless you require a water lily pond only. Lilies should be planted in a separate receptacle with the minimum amount of earth so that they are encouraged to send out some of their roots into the water and so use up some of the waste matter from the fish and decaying vegetation. The more food you provide for the lilies then the less will they do their job of acting as scavengers.

I have a tank 36 ins. by 18 ins. by 18 ins. with glass sides and a metal base. It is on a table in the garden against a wall. I have in it nine small goldfish, a gudgeon and some sticklebacks. I am unable to have the tank indoors and I am concerned as to what would happen to the glass if the water froze. Can you give any advice?

If we get a severe winter the water in the tank will certainly freeze up and in doing so the expansion can cause the glass to crack. Even if you cover the whole with sacking on a cold night this would not be sufficient protection if 15 degrees of frost or more were experienced. As far as I can see there are only two things you can do; one is to run an electric lead to the tank from the house and install a small wattage heater in the tank. Even one of 15 watts would be enough. If the electric idea is impossible you could build a small box under the tank or under the table and have a small paraffin lamp on during severe weather. A hole could be cut in the base of the table to warm the tank a bit. Some ventilation would have to be provided in the box, but not enough so that the wind could blow into it and make the lamp draw up too much.

I am having difficulty with my outdoor pond. It has developed a blue tinge and is dead looking. The fish are surfacing and seem to be gasping.

The condition you describe is one which sometimes appears during hot spells. If the pond had been very green for a time and the water becomes foul, the algae can



die and then the water generally turns blue. You say you have been circulating water from another pond through the affected one by means of a pump. This will not help matters but will cause both ponds to become foul. You had better empty both ponds and give them a good clean out before re-filling with fresh water.

I have just built a concrete pond of cement, "Pudlo" and coarse sand. The walls and base are six inches thick and it has hardened like rock. It looks a first class job but leaks terribly. I cannot detect any flaws. What can I treat it with to make it waterproof?

When a pond constructed such as this will not hold water there must have been some fault in the making. The concrete tank illustrated is made from one part of ordinary cement to three parts sharp sand. Although only about half an inch thick the tank holds water so well that the outside remains quite dry even if completely full for a year. You can try letting the concrete dry and then painting it all over with several coats of silicate of soda. It might also seal the concrete if the surface was floated over with a sloppy mixture of one part cement to one part of fine sharp sand. If the base of your pond was made and allowed partly to set before the walls were added this may cause a leak at the join. Leaks can also be caused by stale cement, dirty sand or lumps of sand not properly covered with cement. Once the water has been added to the mixture the concrete will soon start to set or "go off" as it is termed. Then when the next is added it will not wed and that allows a leak later on.



Photo:

Laurence E. Perkins

Concrete aquarium measuring 24 ins. by 12 ins. by 9 ins. with half-inch thick sides, made and used by Mr. Boarder

In my coldwater tank I have some plants of *Sagittaria natans* which have become covered with a growth of brownish algae. Is there a way of cleaning this from the plants?

This plant often becomes covered with this growth and I find in one of my tanks that although *Vallisneria spiralis torta* keeps clean the *Sagittaria natans* gets a lot of the brown covering the same as yours. Sometimes this can be cleaned off with the siphon tube when servicing but if not it can be moved by holding the plant in position with one hand and then drawing the fingers of the other hand up the leaves, when the algae can be slid off. I am coming to the conclusion that the two plants do not appear to grow well together and I advise anyone setting up a tank to use the twisted vallis. only and not the *Sagittaria natans*.

When should I stop feeding my goldfish in the pond?

There is not a stated time to cease feeding the fish in the pond. The longer you can feed into the cold weather the better. As long as fish will take food there is no earthly reason why they should not be fed. Naturally they cannot be expected to eat as much as when it was warmer but I have found that my fantails in the pond took worms

even when the water was frozen over. It is well known that goldfish take a long time to digest their food when the water is very cold, but they are the best judges as to whether they want food or not. They will not over-eat, but it is the uneaten food which turns the water foul and does harm. If the weather is at all mild at any time of the winter you can offer a small piece of garden worm and if this is soon taken a little more can be given. As long as the fish will take a little food at any time of the year I cannot see that it can do them any harm.

Should water lily leaves be allowed to die down for manure or should they be removed?

I think that in a fairly small pond it is well to remove as many leaves as possible as soon as they turn brown as nothing appears to foul the water more than a large number of decaying water lily leaves.

Will you please tell me what is wrong with my fish? I have four two-inch goldfish in an 18 ins. by 12 ins. tank and have had them for about a month. They have suddenly gone to the bottom where they lie almost motionless and only eat half-heartedly. What is the matter with them?

There may not be much the matter with the fish. Once the weather turns cold most fish in ponds or tanks will become much quieter. These types of fish, although they do not exactly hibernate for the winter, do become almost torpid when it gets very cold. All their actions are slowed down and they do not need to feed. If they do take food occasionally it will take them a long time to digest it. Do not think that fishes must be continually fed every day; once the water in the tank cools down it is imperative that you reduce the amount of food you have been giving. If a fish could eat an ounce of food a day when the temperature of the water was 70°F., then it could only eat one-tenth of this in the time if the water was nearer 40°F. The colder the water the less can the fish eat; it's as simple as that.

How do I treat trout and what do I feed on?

You do not say whether you want to keep the trout in a pond or in tanks. Whichever method you intend to adopt you must realise that trout are fish which prefer a fairly swift running river with a gravelly bottom. They must have plenty of oxygen. They can live in a large pond as long as it is kept in good order and does not get too hot during the summer months. A fountain will help to re-oxygenate the water considerably or a pump which provides running water is a help. In a tank you will only succeed with trout if they have plenty of space and you must provide constant aeration. A good strong jet forcing fresh water and air into the water is one of the best ways of keeping these fishes in a tank. They are not easy to keep and unless you have had some experience with keeping other types of fishes you may have losses before you find the best way to keep them.

Can I construct a satisfactory sea water tank with concrete painted over with a non-bituminous paint or will a well-weathered, concrete tank be all right?

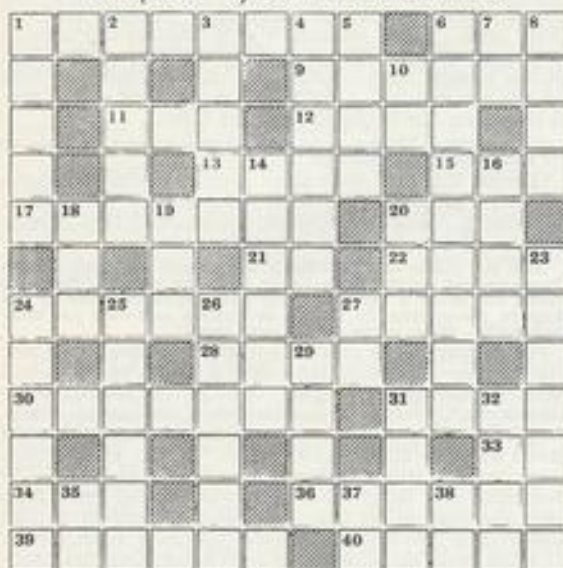
An all-concrete tank will be quite all right for a marine tank as long as it is well weathered. A tank similar to the one illustrated can be made with three parts sharp sand to one of cement. I make them and use no re-inforcing at all. I find that metal inside concrete tends to rust; it then causes the concrete to split.

I have been feeding a mixture of flour paste with a pinch of salt to my goldfishes and they seem to like it. They have a grown to a large size. Is it wise to continue to use it?

The proof of the pudding is in the eating, or so they say. You may have a similar saying in Singapore. As long as the fish are thriving there is no need to worry. If the fish are in an outdoor pond they are almost sure to be able to find some different kinds of live foods. If you mixed some Bemax and dried shrimp to your mixture I consider the fish would probably like it better and also grow well.

# The AQUARIST Crossword

Compiled by J. LAUGHLAND



### CLUES ACROSS

- |   |  |
|---|--|
| 1 This fishing is seven-eighths uncooked fish (8) | 27 Nothing here (5)  |
| 6 Girl of Uncle Tom's Cabin (3)                   | 28 Mire changes with frost (4)   |
| 9 Salmon fry (6)                                  | 30 Sambo says "Sir, eat" for this popular small fish (7)                           |
| 11 Simian (3)                                     | 31 Went astray in many ponds (4)   |
| 12 Roman mantle (4)                               | 33 Pith of reed for exclamation (2)  |
| 13 — fish; small spiny lobster (4)                | 34 Often in the creel (3)  |
| 15 Crony (5)                                      | 36 Some of these spinners are amphibious. This answer is singular (6)              |
| 17 Warm the female fish, no angel (7)             | 39 Fish may this their food; you may this your fish; or you may put it on them (6) |
| 20 Homer did (3)                                  | 40 Lumps of earth or turf (5)  |
| 21 Short manuscript (2)                           |  |
| 22 Rees change to earths (4)                      |  |
| 24 Formerly <i>Elodea</i> (6)                     |  |

### CLUES DOWN

- |  |  |
|--|--|
| 1 The doctor fish (5)                    | 19 Rocky height of tortoise (3)                                  |
| 2 A.A. car (anagram) (5)                 | 20 Little Oliver (3)   |
| 3 Blood-sucking aquatic creature (5)     | 23 Skate starts the ice fans (7)                                 |
| 4 <i>Salvinia</i> — (6)                  | 24 See tar (anagram) (6)   |
| 5 — light tetra (4)                      | 25 Make a member (6)   |
| 6 Disappear as vapour (9)                | 26 Family of pondside plants (6)                                 |
| 7 Girl starts with viviparous fishes (2) | 27 Begin the Beguine (2)   |
| 8 Pin often indicative of sex (4)        | 28 Widely term for a few spots of water on the floor (4)         |
| 10 For example as in <i>Egeria</i> (1,1) | 31 Headless snail (4)  |
| 14 Stay (6)                              | 32 Hardly the term for <i>Cryptocoryne</i> or <i>Lobelia</i> (4) |
| 16 Barren Rock of the pipers (4)         | 35 See 33 (2)  |
| 18 Roe, perhaps, in singular (3)         | 37 Forty-nine, perhaps (1,1)                                     |
|  | 38 Front half of the dory (2)                                    |

### PICK YOUR ANSWER

- "Master, I marvel how the fishes live in the sea." is from Shakespeare's: (a) *Cymbeline*, (b) *Hamlet*, (c) *Othello*, (d) *Pericles*.
- Barbus stoliczkanus* is native to: (a) Borneo, (b) Burma, (c) Ceylon, (d) Kashmir.
- Metynnis maculatus* reaches a length of about: (a) 6 ins., (b) 8 inches, (c) 10 ins., (d) 12 ins.
- The popular name of *Gambusia panchax* is: (a) The Black Gambusia, (b) The Blue Gambusia, (c) The Silver Gambusia, (d) The Texas Gambusia.
- The general colour of *Corydoras arcuatus* is ivory-white with a: (a) Green sheen, (b) Mauve sheen, (c) Red sheen, (d) Yellow sheen.
- Acorus* is represented by: (a) 2 species, (b) 4 species, (c) 6 species, (d) 8 species.

(Solutions on page 218)

G. P. H.

## OUR READERS

*Write*

### Acid Water

I FOLLOWED the instructions concerning the use of peat water given in Herr Walter Bertholdt's article (*The Aquarist*, September), using it with rain water of 0.5 DH (hardness) to replace the old water in my community tank which was 4.4 DH and pH 7.5. The pH is now 6.7 and I hope further to reduce it by degrees. It has been in my tank for a little over a month and these are the results I have noticed.

Fish, especially *Hyphessobrycon serpae*, white cloud minnows and zebras seem to have become much more lively and a little more intense in colour. *Cabomba*, *Cryptocoryne cordata* and *Myriophyllum* among the plants have put on a luxuriant growth, but the acid water seems to have stunted *Vallisneria spiralis* and the leaves have a tendency to become translucent and come away from the plant at the slightest provocation. I have been plagued with algae for years but the change to acid water has dealt it the final blow.

P. A. TYLER,  
Redditch, Worcs.

### Parthenogenetic Guppies

I SET up my tropical community aquarium about ten months ago and in it introduced three very small guppies—all females—together with a few other varieties. Two days ago I was surprised to see two female guppies, slightly smaller than the ones introduced ten months previously. As the other occupants of the tank were worrying them I put them in a jar and floated it in the main aquarium. The next day two more fry were swimming about and were placed with the others. Another female guppy has arrived since.

There has never been a male guppy in the aquarium and I have tried to think of an explanation. I remember having read something about this in an Editorial of *The Aquarist* (April, 1953) and I wonder if any other readers have reported similar instances?

R. HARRISON,  
Kenton, Middlesex

### Late Spawning

AS a matter of interest the shubunkins in my pond spawned last season on the 4th and 5th of October; water temperature was 62°F. and this week-end was followed by a period of really lovely weather for so late in the year.

Some of the eggs placed in the indoor tanks hatched on the 14th and 15th and two days later were free swimming. One of the females aged four years first spawned 12th May and to my knowledge had spawned eight times last season; she again threw many eggs on the 4th October. I mention this to stress the fact that it was a determined effort by most fish in the pond and not an effort by fish that had not spawned well and were attempting to make a show to evade disposal before this year's breeding season commences!

W. WICKS,  
Fratton, Portsmouth.

### Zebras and Minnows

I READ with great interest the letter by Mr. J. J. Brady in your November, 1953 issue, and should like to enquire at what temperature the zebras and minnows were kept, as I think this is the reason why the two species cannot be kept together. Some of my aquarist friends have tanks

(Continued on opposite page)

## Dwarf Sucking Catfish (*Otocinclus affinis*)



*Otocinclus affinis*

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

FAMILY:—Loricariidae, from Latin *loricatus*—clad in mail.

SPECIES:—*Otocinclus affinis*, from Greek *otio*—ear, and Greek *kinchis*—lattice or opening, plus Latin *affinis*—adjacent or related.

**O**TOCINCLUS AFFINIS is one of the species of catfish rarely seen in this country, but whenever it is obtainable it is, in my opinion, a good buy, if only because of its amusing and interesting habits.

Not a showy fish by any means, and no great size, it seldom reaches a length of one-and-three-quarter inches. Male and female are identical in appearance except when the female is swollen with roe. There is a dark band running longitudinally along the body, starting at the end of the pointed snout, proceeding backward through the eye, and stopping short at the commencement of the tail rays. Above the line the fishes are a dull, greenish brown, but below they become much lighter. The abdomen is creamy white, and almost flat.

An interesting feature is the mouth, situated on the underside of the head. The lips of the mouth are soft and mobile, and project to form an almost circular sucking organ.

Their food consists of algae, and they are forever busy cleaning the plants of the aquarium. This they do by literally crawling over the leaves, clasping the edges between their fins, using them as arms. It is fascinating and amusing to see them doing this, particularly when they disappear over the edge of, say a leaf of *Vallisneria*, and appear upside down on the other side. They never lose their grip, and can remain stationary in any position. They have been credited with the ability to cling in an upside down position to the meniscus of the water, and to move about cleaning the surface while in this extraordinary

position, although I cannot vouch for the truth of this from personal experience.

Readers of my article on *Corydoras paleatus* (*The Aquarist*, May, 1953) will recall that the female of that species, after a peculiar embrace from the male, climbs a leaf and lays a few eggs on the under surface. The male pays no attention to the eggs at any time. With the fish now under discussion the procedure differs in one or two respects. The female lays single eggs, pressing them on to the under surface of broad-leaved plants. Far from evincing no interest the male follows her and fertilises each egg by placing himself in the same position as his spouse. Only one egg is laid on any given leaf. These hatch in about four days at 72° F.—less at higher temperatures.

Young *Otocinclus* must have plenty of algae-filled water if they are to be reared. Bright light will encourage the growth of this, or a separate culture can be made and added to the aquarium. Starvation is the chief cause of the death of both fry and adults. So far as is known they are completely herbivorous—their mouths are made to suck soft algae, and not chew live food. *Daphnia* will deprive them of their natural food to a large extent, and should be excluded from the tank in which they are kept.

Only once have I seen *Otocinclus* at an exhibition, and that was in a brilliantly lit, beautifully furnished tropical aquarium. Their busy ways and attractive demonstrations of their climbing abilities drew and kept a crowd around the tank for the duration of the exhibition.

We are still dependent upon importations of this little fish. Maybe, as travel facilities improve, and restrictions are lifted, greater numbers will arrive. Speedy transportation is essential, as in crowded cans, without food, most of the fishes die before they reach their destination.

## Our Readers Write

(Continued from opposite page)

at anything from 80°—82° F. The zebras will stand this temperature but the white cloud mountain minnows will not. I have kept both zebras and minnows together at a temperature of 72°—74° F. I look forward to having other readers' comments on this much-discussed problem.

VICTOR HILLMAN,  
Chaddersley Corbett, Worcs.

**MR. BRADY'S** letter (*The Aquarist*, November, 1953) came as a surprise, as I have been experimenting with these fish due to present circumstances and past letters which aroused my curiosity. Eighteen months ago I set up a community tank 38 ins. by 15 ins. by 15 ins. and amongst other species, all of which were young fish, I introduced one male zebra and three white cloud mountain minnows. They grew up together and flourished.

Recently I introduced two young female zebras into the tank when they were only half an inch long. Whilst the zebras flourished the minnows became sluggish and took to the tank bottom. I first noticed this during the third week after introducing the zebras. Eventually, one of the

minnows died and I removed the other two to another tank. Although they were in a wasted condition they picked up and on live foods they soon filled out again. Still curious, I put the same two zebras with them again, and again they wasted away.

One of the minnows died and three days later the other followed—the same day that I received *The Aquarist* containing Mr. Brady's letter. I think Mr. Brady is quite correct in saying that the two species will grow up side by side but that new additions from a younger generation produce detrimental effects.

W. H. BALL, Exmouth.

### 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 tin box. Despatch as soon as possible after death, with brief history of aquarium or pond conditions.

FIRST annual general meeting of the newly formed society *Pisces* was held recently and Mr. F. King, 14, Lonsdale Avenue, East Ham, London, E.6 was elected secretary. The society holds meetings on the first and third Thursdays of each month at 8 p.m. in the Plaistow area of London.

READING district now has a section of the *Federation of Guppy Breeders' Societies* and there will be meetings on the third Tuesday of every month at the White Hart Hotel. This month, Mr. E. S. Roach of the Federation will address members (19th January) and all aquarists are welcome to attend. Secretary is Mr. R. Lawn, 27, Chester Street, Caversham, Reading, Berks.

AT last month's meeting of the *West Middlesex Aquarists' Society* two members, Mr. A. Salter and Mr. R. A. Brown, gave talks. This month there will be staged a show of any variety tropical and coldwater fishes in competition with Feltham Aquarist Society, one of a series of such events organised by the South-West Middlesex Aquarists' Association.

FOLLOWING the annual general meeting of the *Worcester and District Aquarist Society* last month a general discussion was held and the society's future programme announced. The society is to form a junior section.

LAST month the president of the *Bournemouth Aquarists' Club* gave a lecture on his experience of keeping and breeding tropical fish. A table show of platys followed, won by Mr. T. Walker.

HEADQUARTERS of the Stonehouse and District Aquarist Society have been moved and the name of the society will now be *Stroud and District Aquarist Society*. Meetings now take place on the first Tuesday of each month at the Bell Hotel, Stroud, Glos.

SPEAKER at last month's meeting of the *Ilford and District Aquarists' and Pond-keepers' Society* was Mr. C. Creed (F.R.A.S. judge) who outlined the various technical and artistic points which he assesses when judging furnished aquaria. This month's meeting of the society will take the form of a "quiz."

A PAIR of black swordtails owned by Mr. S. Pritchard were placed first in a table show staged by the *Shirley and South Birmingham Aquarists' Society* last month and two male thick lipped gouramis of the same owner were placed second. The society now meets



## 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.

on the first Thursday of each month at the Masons Arms, Shirley.

FORTNIGHTLY meetings are now held by the *Netherfield Aquarists' Club*, details of which will be supplied by the secretary, Mr. F. H. Woolant, 69, Langdale Road, Bakersfield Est, Nottingham.

CROYDON Aquarist Society enters its twenty-third year with new and more central accommodation for meetings. Commencing this month members will meet on the first Thursday of each month at the Pembroke Hall (Supper Room), Wellesley Road, West Croydon at 7.30 p.m.

BREEDING and rearing fishes of the *Aphyozion* genus was the subject of Mr. H. Shaw's talk to members of the *Stockport and District Aquarist Society* last month. After the talk Mr. Shaw judged a table show, one of the events held quarterly by the society at which members can gain points towards an annual aggregate, the highest number gaining a cup award.

DECEMBER meeting of the *Belle Vue (Manchester) Aquarium Society* featured a demonstration and talk by Mr. F. Bentley on setting up an aquarium, specially arranged for beginners in the hobby. This month Mr. Harry Loder will talk to the society on sexing fish and members of the *Prestwich Aquarists' Society* will be present as guests.

VICE-PRESIDENT of the *Hampstead Aquatic Society* is Mr. George S. Cansdale. Last month Mr. R. W. Tucker was judged winner of the society's annual breeder's show

when he gained two first awards with teams of six *Lisias* and six mouthbrooders.

### Secretary Changes

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

*Balham and District Aquarist Club* (Mr. J. E. Searle, 68, Southcott Road, Tooting, London, S.W.17); *Bethnal Green Aquarists' Society* (Mr. W. A. Richardson, 98, Warner Place, Hackney Road, London, E.25); *Bridgenorth and District Aquatic Society* (Mr. A. Edwards, Claremont, Victoria Road, Bridgnorth, Salop.); *Bromley Aquarists' Association* (Mr. E. W. Neale, 2, Archer Road, Ovington, Kent); *Dudley and District Aquarist Society* (Mr. D. Fleetwood, 32, Ash Road, Priory, Dudley); *Guppy Breeders' Society Eastern Counties Section* (Mr. A. F. Holmes, 330, Grange Road, Plaistow, London, E.13); *Halifax and District Aquarist Society* (Mr. J. Wheelwright, 7, Avondale Place, Halifax, Yorks.); *Marble Arch Aquarist Society* (Mr. A. Collins, 30, Noelard Gardens, North Kensington, London, W.11); *Newcastle upon Tyne and District Aquarists' Society* (Mr. W. Tait, 52, Martelle Gardens, Newcastle upon Tyne, 7); *Northampton and District Aquarist Society* (Mrs. L. Johnson, Flat 6, Fire Station, Upper Mounts, Northampton); *North Staffs. Aquarists' Society* (Mr. H. Crook, 332, Ford Green Road, Norton, Stoke-on-Trent, Staffs.); *Oldham and District Aquarist Society* (Mrs. V. Tripp, 187, King Street, Oldham, Lancs.); *Stonehouse and District Aquarist Society* (Mr. K. A. Brown, 15, Sunnyhill, Cashes Green, Stroud, Glos.); *Weston super Mare Aquarist Society* (Mr. E. J. Mason, 2, Albert Avenue, Weston super Mare, Somerset); *West Wilts Aquarist Society* (Mr. M. A. Fennell, 11, Roseland Avenue, Devizes, Wilts.).



Trophies and section of the furnished aquaria class at the three days show of Gloucester and Cheltenham A.S., the second annual event staged by the society

### Crossword Solution

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

PICK YOUR ANSWER (Solutions)  
1 (d). 2 (b). 3 (b). 4 (b). 5 (b). 6 (a).

