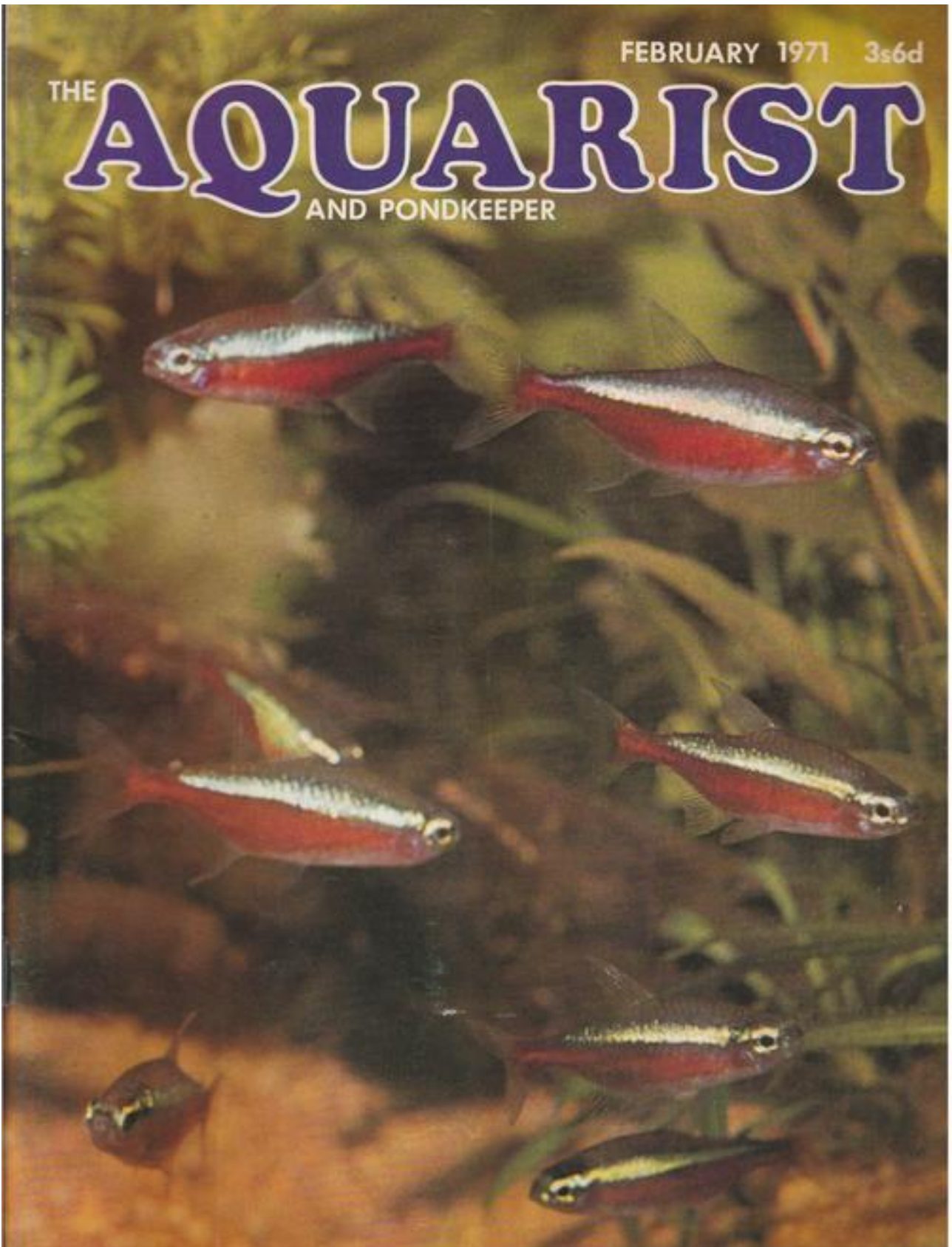


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THE **AQUARIST**
AND PONDKEEPER





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Our Cover

Cardinal Tetras—a photograph
of the first award for the best
individual furnished tropical
aquarium at the British
Aquarists' Festival—Belle Vue
1970.

THE AQUARIST

AND PONDKEEPER

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The Editor accepts no responsibility for views expressed by contributors.

WAGTAIL LYRETAIL SWORDTAILS

by B. Whiteside

I FIRST SAW them in a friend's community aquarium about seven months ago. They were red wagtail lyretail swordtails and I liked them very much indeed. The colours were the same as in a normal red wagtail swordtail—red body and black fins. There the similarity ended. In the aquarium were about nine young fish; they were too young to be able to distinguish their sex. The beautifully extended fins, the bright red colour and the contrasting black held my attention so much that my friend offered to give me a few of the fish. I knew little about how to breed them as I had never seen this combination before, but my friend informed me that, when the males were sexually mature, the gonopodium (the male's sexual organ), like the fins, became very extended, rendering the males incapable of fertilizing the females. This would mean, of course, that the fish could not normally be bred 100 per cent true.

My friend had never bred the fish but told me that the usual procedure was to mate a non-lyretail male, from a lyretail brood, with the lyretail females. This sounded logical. As all of the fish were lyretails we did not have any non-lyretail males from a lyretail brood and, anyway, we did not know which of his fish were males and which females. He decided to give me a gift of three of his fish and we set about choosing what we hoped would be two females and one male.

This raised problems. As the aquarium which contained the swordtails was a well-planted community tank containing other species of fish as well, the task of sorting out my three fish, and catching them, was not an easy one. As many readers will know, swordtails are amongst the hardest of fish to catch—as a recent survey in "What Is Your Opinion?" found. By the time that the three chosen fish were caught and placed in a jar, the beautifully planted aquarium had suffered, as had our patience!

I got the three fish home, placed them in an 18 in. × 10 in. × 10 in. aquarium without gravel, and added a few Indian ferns, weighting some of them down with small strips of lead and leaving others to float. The fish settled down quite quickly but were always nervous and could move with amazing speed around the tank. It was necessary to make sure that the tank had a closely fitting cover-glass. The fish soon started to feed, both on the Indian ferns and on a variety of flaked, freeze-dried and other foods. They were keen on the snails which were in the tank and obviously managed to "suck" these from their shells. They were also very keen on white worms. A couple of weeks later the fish developed their sexual characteristics and I was pleased to find that our original choice of two females and one male had been correct. Thus were my fish!



Female Red Wagtail Lyretail Swordtail. Notice double 'swords' and enlarged dorsal, pectoral and anal fins.

Photo by B. Whiteside

Male Red Wagtail Lyretail Swordtail. Notice the over-development of the gonopodium making the fish unable to mate.
Photo by B. Whiteside



The fish grew quickly and the Indian fern had to be replaced about once every ten days, as the fish nibbled it. The next problem became evident as the male developed. It was quite obvious that the male, whose gonopodium was over 1 in. in length, would be unable to fertilize the two females; however, I decided to leave the fish as they were in the hope that the male might just manage to become a father. After a couple of months it was obvious that this was not to be as both females were still virgins. My next task was to obtain an ordinary red wagtail male swordtail. Having bought one I removed the male lyretail and one of the two females and placed these two fish in another tank, still hoping that the male might yet manage to fertilize one female. (This it was never able to do.) The normal male was placed in the aquarium with the second female lyretail. At first he was a little confused as, I imagine, he wondered if the other fish, which sported two sword extensions to his one, was a "super" male. After a few attempts at fighting the other "male" his instinct soon told him that the fish was indeed a female of the same species—if not the form to which he was accustomed. He was soon attempting to mate with the female and, about a month later, the first brood of youngsters proved that he had been successful. They appeared to be normal baby swords, of various colours, some with wagtail markings, and some plain. At that stage I removed the parents in case they would eat the young. Little did I know just what a variety of youngsters the brood contained.

The young fish were fed on brine shrimps and a couple of brands of dried and freeze-dried foods for baby fishes. They grew quickly and were soon taking larger dried foods and mashed white worms. When the youngsters were about 1 in. in length it became apparent which of them were to be the lyretails. The

first sign was the elongation of the pointed tip of the dorsal fin. The variety of colour combinations did, I must admit, really amaze me. Considering that the male had been a red wagtail sword, and the female a red wagtail lyretail sword, I had thought that all of the youngsters would have been plain red or red wagtail. How wrong I was!

What did I get? Well, here goes: 20 red wagtail lyretail swordtails, 9 plain red lyretail swords, 1 golden lyretail sword, 2 green lyretail swords, and 5 green wagtail lyretail swords; plus 6 plain (i.e., non-lyretail) red swords, 2 plain golden swords, 3 plain golden wagtail swords, 10 plain red wagtail swords and 2 plain green wagtail swords—quite a mixture! (As the young fish grew, they appeared to be experts at jumping out of very small spaces in the cover glass. Four red youngsters died in this way—before I could see whether or not they were lyretails.) This left me with a total of 37 lyretail swords, and 23 non-lyretail swords. As I needed some extra aquarium space for other types of fishes, I sold off all of the young fish except the red wagtail lyretails and the red lyretails. As the fish had only reached lengths of from 1 in. to 1½ in., I was unable to tell the ratio of males to females, as only a few had, at this time, shown that they were males. I am looking forward to seeing how my remaining 29 fish develop.

I have used the term "lyretail" rather loosely. The photographs show the correct, double, tail extensions on my adult male and female fish but a proportion of the youngsters, with "lyretails," had tail fins which deviated from this norm. Some of the youngsters' tails had three evenly spaced extensions; some had a middle extension which was off-centre; some had a number of ragged, random extensions, and others had either the upper or the lower extension longer than the

other. Perhaps, in the latter case, the fin extensions would have both reached the same length, when the fish became adults. I'll be able to report on this at some later date when my remaining young fish get bigger and older. It will be interesting to see if any of the lyretail males prove to be capable of fertilizing females. There is still some doubt as to whether all adult male lyretails are incapable of mating. It may also be possible that males which are sexually mature but not fully grown or developed, may be able to fertilize females. If this were the case, then it would seem as though there might be the possibility of producing 100 per cent lyretail offspring. Only time will tell. For this reason it would be useful if amateurs would observe their fish and publish their breeding records.

You will notice from the picture of the male fish, that there is a partial tear in the dorsal fin. This effect does not seem to appear in the tail but is not to be unexpected in the large fins of fishes which are produced "artificially." In the wild, by natural selection, one would imagine that a fish such as the lyretail swordtail would die out, as the males would appear to be useless as breeders, although normal finned male swords could fertilize the lyretail females. I suppose that, in theory, assuming that one had a fertile male lyretail swordtail, one could "strip" the male of its sperm, and inject it into the vent of a female, using a hypodermic.

Has any reader heard of it having been done?

The other element which can be introduced into the swordtail is the hi-fin. Such fish bear a large, extended dorsal fin. The hi-fin element can be introduced into plain swordtails and into lyretail swordtails. The latter can be done by crossing a male hi-fin swordtail (which is capable of mating) with a lyretail female. In the offspring of this cross one could expect fish with plain fins, fish with hi-fins, lyretails, and hi-fin lyretails. This would decrease the proportion of plain swordtails in the offspring. From the resulting young one could cross a hi-fin male with a hi-fin lyretail female. With the variety of colours which are possible, one could fill a fish house with a variety of fin forms and combinations of colour. It's an interesting prospect!

These are interesting variations on the common swordtail, and I would recommend the keen breeder to give these fish a try—if he has enough tank space. My adults are nearly 5 in. long, including the tail extensions, so the fish require a reasonable amount of space. London prices for adult fish are in the 15s. 0d. to 18s. 6d. range, according to Mr. D. Larkin, of the Goldhawk Road branch of Queensborough Fisheries.

Finally, you may be interested to know that the second of my two original females became pregnant when a normal red wagtail male was introduced into her tank.

WALKING FISH INVASION

Extract from
The Manchester Evening News

THE CATFISH that walks, a voracious foreigner from Afro-Asian climes, has invaded the waters of the southern U.S. and threatens the well-being of true-blue American fishes as far west as Texas.

That's only part of the story. According to the Smithsonian Institution "tropical fishes and other aquatic animals or plants introduced here from other areas of the world are posing a serious threat to the American environment."

Many of these "exotic newcomers," a Smithsonian study said, "were imported by aquarium dealers and then accidentally or deliberately released" into local waters.

Others were introduced on purpose by federal or state agencies "For food, sport fishing, or forage."

These newcomers have often proved so tough and competitive that native species have suffered.

In short, the study said, the invaders "Contaminate the natural environment as severely as a dangerous chemical released in water and air."

The "most serious potential pest" among aquarium escapees, according to the study, is the Afro-Asian catfish, which can breathe on land as well as in water.

The walking catfish "can move considerable distances over land, especially on damp or rainy nights, and easily occupy new water systems."

"It appears likely," the Smithsonian said, "that it will inevitably spread through the Everglades, northward in the Gulf coast states, and westward to Texas," to the detriment of American fishes unable to cope with it.

Do you know this plant?

WATER WISTERIA

By Bill Simms



THIS USEFUL plant, *Synedrella triflorum*, is really amphibious for it will grow in swamps as well as below water. In Thailand it grows as a weed in the rice fields. In aquariums it has been found most adaptable for it grows readily and is very ornamental.

The plant develops leaves of varied shapes, sometimes narrow, and often broad, but always well-lobed and divided. The main stem may reach a foot in height, and the leaves can be as much as six inches long. Being light green above and lighter green below, these leaves give the plant a most distinguished look in any aquarium.

When seen from above it will be noticed that a well-formed plant is roughly rosette in style because of the leaf pairs sprouting alternately along the stem. Fine short hairs cover the leaves and stem. Any parts of the plant that grow above water have leaves that are smoother and more regular in shape.

Propagation of this plant is easy, for shoots grow from the leaf axils near the plant base. These can be used as cuttings. In addition, parts of the stem, and the leaves also, will quickly grow roots. Even leaves floating on the water surface have been known to produce roots.

If you wished to grow a quantity of this plant then a special compost could be used. Use about ten parts of coarse sand to one each of peat-moss and clay. Mix this thoroughly before use and well cover it with some of the sand. In this way you will avoid clouding the water when it is slowly syphoned in. I have found that the plant grows almost as well when planted straight into old mulm-ridden compost.

The temperature range of Water Wisteria is from 75 to 85 degrees F., but it will not die if there is a temporary drop in temperature. The pH value should be slightly on the acid side of neutral—perhaps 6.5 to 7.0, and soft water is preferred. Should you wish to develop the above-water type of vegetation, then make sure that you use a cover-glass on the tank for it requires a humid atmosphere.

Other plants from the same area can be grouped with it, for it grows well with many cryptocorynes. It is closely related to *hygrophila*, and its likes are similar. *Limnophila*, *Nomaphila*, and *Ceratopteris* will also suit it. Altogether this is a very useful plant for the tropical aquarium and more of it should be used.

COCKLES and MUSSELS of FRESHWATER

By Roy J. Purrott

PYGMY PEA COCKLE, Nut Orb Mussel, Shining Pera, Beautiful Pera, River Cyclas; these are a few of the picturesque names given in the past two hundred years to the tiny bivalve molluscs of the genera, *Sphaerium* and *Pisidium*. These creatures have two saucer-shaped shells, hinged together along one margin, just like their close relatives, mussels, clams and the freshwater *Unio* and swan mussel (*Anodonta*). They are also more distantly related to Gastropod molluscs, the snails of land and water.

Countless millions of these animals inhabit fresh waters everywhere, rain-water butts, garden ponds, mountain streams, canals, rivers and lakes. Yet they are little known and almost always overlooked. This is doubtless because they are so very tiny. The name "pea shell cockle" (*Pisidium*) makes them sound larger than they really are, in fact many of the adults are nearer split-pea size; about 2 mm. long!

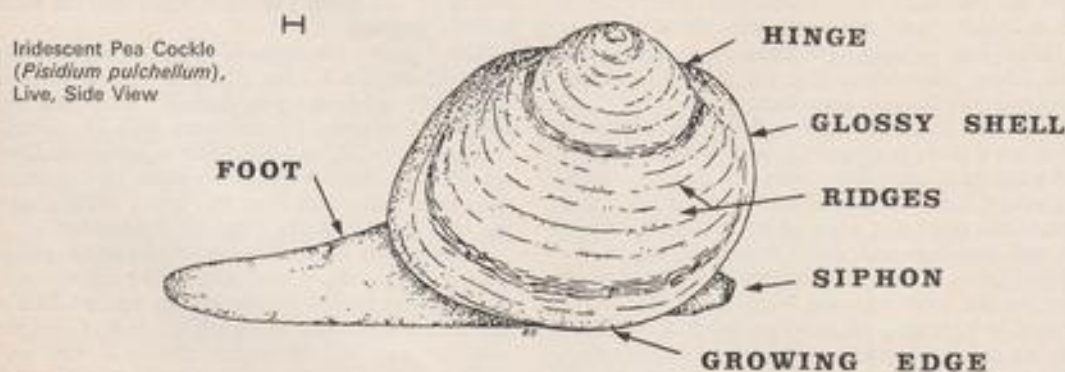
Generally speaking the three British species of orb shell cockles (*Sphaerium*) are larger than the 16 species of pea shells. The largest species are normally found along the banks of rivers where the river pea cockle (*Pisidium amnicum*) may grow to a length of 1 cm. and the nut orb mussel (*Sphaerium rivicola*) 2 cm. and more.

It is not difficult to see why they have become so abundant and widespread in Britain and throughout the world. Their requirement for calcium from which to

build the shells is really quite modest, and they are able to feed on tiny particles and organisms which are suspended in most bodies of fresh water. No doubt because they are so small they are easily transported from place to place particularly when a river or stream is in flood. But their ability to colonize our ponds, outdoor aquaria and rain water-butts is another matter and has a lot to do with rather novel methods of dispersal and reproduction.

When the two hinged shells are snapped shut, perhaps to avoid danger, it sometimes happens that things become trapped between them. Frequently the shells close onto the delicate leaves of plants growing in the water, like *Elodea* and *Sphagnum* mosses. Occasionally they even clamp onto the fins of fish. I have also seen these little aquatic "hitch-hikers" firmly fixed to the fingers of frogs and newts, the feathers and webbed feet of water birds and even the hairs of romping dogs. These animals may then move to some other pond where their molluscan passengers may detach themselves and found new colonies. It is a nice touch that dispersal can be one of the results of shutting out enemies! It is said that these tiny molluscs can bite off the fingers and toes of newts and frogs, but the missing digits soon regenerate.

The special feature of their reproduction is that they give birth to broods of about six live young which,



from the beginning, are like miniature versions of the adults. The young develop initially within the protection of the adult's shell, clustered near the hinge. Birth is simply achieved by "blowing" the young out through breathing tubes which we'll mention later. They are then left to fend for themselves. With a hand lens, it is possible to see that, like the adults, they too possess a single miniature foot which is protruded from between the shells to drag the animal along. Sometimes it is possible to see the impression left by the developing young in the "mother-of-pearl" lining inside the shells of dead specimens. The young are often ejected by pregnant adults when they are disturbed or captured; a good example of a survival mechanism! Many young appear at the bottom of specimen bottles although only adults were originally collected.

Because of this interesting parental behaviour a single brooding adult is capable, alone, of colonizing an isolated body of water such as a pond. These molluscs are also hermaphrodite and it may be that each adult can fertilize its own eggs, but nature often has mechanisms to prevent this kind of in-breeding.

The importance of these animals in the food chain of ponds and streams has not been very fully studied probably because they are so easily overlooked and sometimes difficult to identify accurately. But their enormous abundance suggests that their role in the turnover of plankton and organic debris is considerable. They are filter feeders, like the much larger fresh water mussels, and strain their food from the water in which they live. The water which carries the food also provides oxygen and transports waste products of metabolism such as carbon dioxide. This "life stream" of water is sucked into, and blown out of those same tubes (siphons) through which the young are born, passing over the gills in between.

In their turn these fresh water cockles appear to provide some of the food required by larger animals,

for instance incertain water birds. There are also reports of fish like Perch with stomachs filled almost entirely with them.

For those with ponds, and perhaps streams and lakes near at hand these little known animals would amply repay closer study. It is almost impossible not to find them once one has "got one's eye in" and learnt to distinguish them from tiny pebbles and sand grains. They flourish in the average aquarium and really require no special attention.

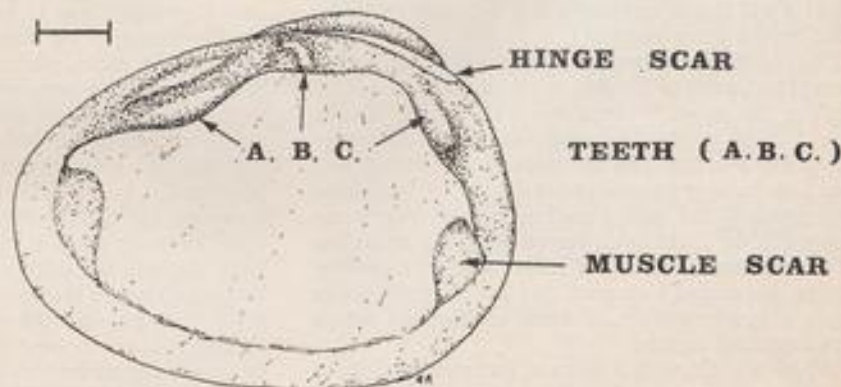
But the first task is to collect them, and for this a fine mesh sieve or white enamel plate is ideal. The edge of the plate can be used as a trowel to scoop around in the mud and silt at the base of water plants. Much of this material can be washed away with clean water by a kind of gold-panning operation. The cockles and sand grains rapidly sink to the bottom of the dish and are not washed away with the obscuring silt. Then it is simply a matter of looking for rounded orangey-white "sand-grains"; initially this is frustrating but once the first real cockle has been found the others stand out like never before. But be careful not to crush the delicate shells. If all the excess water is drained away, the animals can be picked up by touching them with a finger.

Because of their white colour, the ideal way to examine the live animals is to place them in a petri-dish of cold tap water, resting on a dark backcloth and illuminated from above. A hand lens ($\times 10$) or better still, a low power binocular microscope reveals many otherwise hidden details.

Firstly examine the shape and texture of the shells and find the edge along which the two shells are hinged together. If the animals are healthy they should soon become active and start to move. This is an unhurried snail-like process which begins with the opening of the shell along the edge opposite to the hinge. It will only open a little. Then, like a pointed tongue, the single foot will be protruded, appearing glistening white

Continued on page 379

River Pea Cockle
(*Pisidium amnicum*),
Inside Shell



Pseudotropheus auratus

by S. M. Grant

AS A RESIDENT of Malawi, I was extremely interested in C. W. Gorwill's article in the September issue of *The Aquarist and Pondkeeper*. The information contained therein substantially tallies with my own experiences with regard to *Pseudotropheus auratus*.

From current price trends in the United Kingdom with regard to various Malawi cichlids, their breeding overseas becomes particularly challenging. Here, in Malawi, one can always replenish the occasional loss by a weekend trip to the lake, the place that I use being about 120 miles to the north of the capital of Malawi, Zomba. Here the water is crystal clear and the various species can literally be seen in their hundreds, although the difficulties of catching must not be skipped over too easily! To amplify Mr. Gorwill's most informative notes, I would advance the following general comments with regard to *Pseudotropheus auratus*.

Compatibility of breeding pairs: This really is a problem and has to be watched carefully. My practice has been the standard one of separating the two fish by a glass partition, and awaiting until advances are made. Removal of the glass usually prompts a display of both fish circling one another at close proximity. This then develops into their retaining their relative position to one another of head to tail whilst the speed of circling becomes progressively greater. During this each fish is biting at the body of the other partner in the region of the anal fin area. After this has continued for several minutes, one fish will tire and attempt to flee from the attentions of the other. This flight is in earnest and unless the escaping fish can find a completely secure refuge it will almost certainly result in its rapidly being killed by the other partner.

The one female from which I have managed to raise a brood had, prior to the glass partition being removed, dug out the gravel between two rocks which in turn were buried in the aquarium sand. These rocks almost met overhead and the end result was a one way in and out hideout just tailored to the size of the female. This provided her with a convenient and snug home into which she could safely retreat when the attentions of the extremely dominant male became excessive. During this period I ensured that she received, in her home, a steady supply of small earthworms which were devoured eagerly.

Unlike Mr. Gorwill, I was not fortunate enough to see the actual mating taking place, but in retrospect I confirm that while she must have been carrying the

eggs in her mouth she was extremely retiring, spending most of the day in her hideout, with the watchful male almost always overhead. (Incidentally, I have found that the female does not swell greatly when she is ready to produce eggs, only a modest increase in the anal fin area can be observed.)

Returning to the experiences of this and other, as yet unsuccessful, females, I do regard the question of secure hiding places as being an essential one. In the absence of these the death rate will, I am afraid, steadily rise. The changing of partners is, of course, an unavoidable and time-consuming basis (costly, too, in the U.K.)!

When the eggs begin to develop in the female's mouth (other persons may similarly miss the actual spawning and think that nothing has happened) this can be identified by the gills beginning to protrude from their normal outline until they become noticeably distended. The mouth opens and closes more widely and vigorously than normal and the "chin" drops more than usual. All of this is clearly to increase the space for the ever-growing fry. When the light is right, a dark mass can be observed by looking down or in the mouth and also occasionally through the membrane just below the gill plate. When any of these symptoms begin to be observed, developments are well on the way and the male should be promptly removed.

Like Mr. Gorwill, I do feel that mention should be made of the manner in which the tiny youngsters resemble their mother. The yellow and black stripes are fully formed and quite vivid. I found that when once they had begun to swim outside her mouth they quickly began to be independent and found hiding places under rocks, plant roots, dead leaves of plants, etc. The mother attempted for a few days to catch some of her errant offspring which did not wish to return to their former home but many hid almost permanently in a substantial amount of mulm which I had permitted to build up. (It should be mentioned that in its natural habitat this species is a great lover of stony or rocky areas in the shallow water around the Lake Malawi coast and a number of stones and caves in the aquarium are greatly favoured by the young fish.) Right from the start the youngsters eagerly took brine shrimps but these were fed intermittently to prevent too much salt intake. A little emulsion of hard-boiled egg yolk was also appreciated and finely sifted proprietary food. At the half-inch stage tiny scraps of

raw fish were nibbled at with gusto. Throughout this period the fish were in an unheated 36 in. by 15 in. by 12 in. tank with the temperature in the region of 73°-79° fluctuating with the weather; I have no means of testing pH. There was a substantial amount of wild *Callinectes* dug from the lake, which provided cover and ultimately a lot of the mulm. My brood totalled 21 and there have been no losses to date.

To close, I hope that this material, together with the comprehensive article by Mr. Gorwill, will have

interested owners or would-be owners of *Pseudotropheus auratus*. Incidentally, I have never seen mentioned in print the substantial physical differences in size and coloration which exist between a mature male and a female of the species. I hope that would-be breeders do not exhaust their time and patience by placing a pair of the same sex in the breeding tank and imagining that the display (which also occurs with a couple of like sex, at times) is the prelude to welcome developments.

Cockles and Mussels of Freshwater

continued from page 377

and maybe slightly pink at the tip. Eventually the foot will emerge no further and will contract, heaving the shell and contents forward. The process will then be repeated and so the animal moves along in a series of tentative steps. Prodding will now send it back into its shell, the foot withdrawing quite rapidly followed by the shells which clam tightly shut.

Once you have discovered which end the foot protrudes from, look for the tiny breathing and feeding siphons which from time to time emerge just a little from the opposite end of the opened shell. The Rev. Mr. Jenyns in his monograph on fresh water cockles (1832) says that "whether or not (they) put out their siphons was very much a matter of pleasure" and for those eager to study these details, Jenyns advocated the use of cold spring (or tap) water which was fairly certain to arouse them into activity and to display their siphons. Not surprising!

The number of these siphons provides a clue which helps to distinguish between orb and pea shell cockles (*Sphaerium* and *Pisidium*). The former have two siphons, one apparently for ingoing currents and one for outgoing water. Pea shell cockles however have a single siphon which still manages to serve both functions. Like the foot, the animals are quick to withdraw the siphons to safety when provoked.

The living creatures are fascinating enough but it is equally delightful to examine the inside and outside of dried shells. It is difficult to open these bivalves when alive without breaking the shells. Instead wait until they die then the shells will gape wide open and the fleshy material can be easily removed. Boiling, especially in dilute caustic potash, is a quick method but tends to ruin the covering on the exquisitely sculptured surface of the shells. A longer but preferable plan is to leave them to rot in tubes filled with pond water for a week or two. This is equally effective and does no damage. After washing the decomposed material away, the shells can be dried and mounted so that the inner and outer surfaces can be examined.

Even within a particular species the general appearance can vary quite a bit depending especially on

whether the water was hard or soft. Shells from hard water seem to be very stout and rather different in shape compared with those from soft waters which are thin and almost transparent. This variability leads to considerable difficulty in distinguishing certain species from each other, though the commoner ones are less difficult. A binocular microscope will show a variety of surface ornamentations. Some will be dull and covered with myriads of tiny "pin pricks". Others will be smooth and radiant with hints of rainbow colours. Certain species are shiny and seem covered with concentric ribs rather like a very coarse gramophone record, and in one species a curious "guttering" like ornament protrudes from each shell near the hinge. As the cockles grow, extra shell material is laid down along the opening edge.

If these details are not clear then the surface may be covered with a crusty sediment and there is nothing for it but to gently chip this away with the point of a needle.

The other side of each shell—the side which is normally inside—is equally intriguing. It appears to be coated with spectral "mother-of-pearl" marked in several places where muscles for closing the shell were attached. The saucer-shaped shells are thicker on the hinge side and it should be possible to see an array of teeth and pits in this region. These remarkable structures, the muscles, hinge and teeth, are responsible for ensuring that the shells open and close properly. The muscles pull the two shells together, the hinge joins them to each other and tends to open them and the teeth prevent the shells from slipping sideways when they are closed.

All of these features, the shape and size, the surface ornamentation and the finer details of structures like teeth and hinge are used to identify the different species.

Looking at pea and orb shell cockles one marvels at the perfection of things so small. Given a little patience and perseverance many an aquarist and pondkeeper should find them completely absorbing.

FIVE'S ENOUGH FOR US

By R. C. Mills

WE HUMANS seem to stumble along quite well with the five senses that we are endowed with, and tend to consider ourselves as superior to anything else; from this lofty pedestal, on which we have placed ourselves, any other senses or faculties, that "lesser" animals possess are dismissed as unimportant, redundant to normal requirements or, as is usually the case when incomprehensible things are encountered, ignored completely! Mind you, most of us would grudgingly admit that perhaps animals in different environments *might* benefit from different sensing arrangements, even if we can't imagine what they can be. This is because we are bound to judge them in comparison with our "Famous Five."

We can, as an exercise, take our senses as yardsticks and see how fish measure up to our ideals.

Sight

This is probably at the top of the list as the most valuable sense. An obvious difference between us and fish is that we possess eyelids; these are not just devices to allow us to sleep, but serve as cleansing mechanisms constantly washing dust and grit from the eye. Fish, being immersed in a lubricating medium anyway, have no need of such devices whilst mammals on emerging from the sea in pre-historic times developed eyelids to enable their eyes to function out of water. One fish which does come out of water, the mudskipper, can rotate its eyes in their sockets and this approximates to our eyelid action, keeping the eye wet and clean.

Fish are not as keen sighted as terrestrial animals, nor have they need to be, for underwater the light soon becomes diffused and powerful eyesight would be superfluous.

Another difference—fish are not equipped with necks, hence they cannot move their heads to watch things; to overcome this they are able to move their eyes; any *Corydoras* owner will vouch for this fact! However, fish can use their eyes to a remarkable degree. The archer fish, *Toxotes jaculator*, is quite expert at shooting down insects flying above the water surface, unconsciously allowing for the refraction of light passing from one medium to another.

Naturally, fish are sensitive to light and changes in it. A shadow crossing a pond's surface will cause the fish to move (ask any angler); collectors of fish in the wild,

particularly of killis, have found that fish not only keep to the shady side of the pool or stream but also follow this shady part around the pool as the sun moves across the sky.

A startling extension of this is that some fish are sensitive to light when their normal eyes are covered! Fish with artificially sealed eyes have been trained to come for food when a light is flashed; further experiments proved that even when the brilliance of the lamp was dimmed to hardly a gleam (to our eyes) the fish still responded.

Diverting a little from eyes, but still involving light, it has been found that certain fish have light sensitive areas in other parts of the body. Eels and lungfish have such areas in the tail region; during the day these fish hide in caves but unless they were to "back in" they wouldn't be able to see if they had left anything hanging out of the cave for predators to grab. So the light sensitive areas serve to tell the fish when all is safely inside!

We often pride ourselves upon the colours of our fishes so we should not be surprised to learn that they can see colours very well and also differentiate between shades of similar colours.

Smell

The next most important sense, to fish that is, is the sense of smell enabling them to find food and also to detect alarm signals. This sense is acutely developed and differs from human nasal functions in that a fish's "nose" has no connection with respiration.

Humans would probably put the sense of hearing on a par with vision but in aquatic life a nose is far more use than an ear and is an excellent substitute for eyes. An example of this is our friend the blind cave fish, which manages very well in the dark and does not starve. Nature seems to spread the sense organs over the body of the fish as well as accommodating them in the main sensory organ; just as some species have light sensitive areas other than the eyes, so some have "smelling" areas other than the nostrils. It is thought that certain nerve cells in the gill covers, ventral and tail areas of the minnow are smelling devices.

Two examples of the fish's keen sense of smell: in 1957, Dr. Harald Teichmann proved that if a *thimbleful* of synthetic rose scent was diluted by 58 times the

amount of water in Lake Constance, eels could still detect the scent!

The salmon's arduous pilgrimage upstream to spawn is heroic enough, but each fish heads *exactly* for its birthplace. To eliminate any hereditary recognition factor "remembered" by the fish, fresh salmon spawn was transported from its bed chosen by the adults to another river hundreds of miles away to hatch; years later the now adult fish returned—to where the spawn had been transported. It has been shown that the fish recognise the scent of their birthplace and follow the scent upstream. Returning adult fish were caught, half had their nostrils artificially blocked and all were returned to the river at a point well downstream; all the unblocked fish unanimously re-chose their original route upstream whilst the others were completely lost. It has been suggested that by using this ability of the fish to smell, if a synthetic scent could be developed so that fish could be attracted back to abandoned waters, although one can detect commercial undertones in this academic exercise!

Reverting to the minnow once more, an interesting defence mechanism has been discovered; should one member of a shoal become injured a shock substance is released into the water that immediately disperses the rest of the shoal. This avoids the danger of a lurking predator picking off the shoal one by one.

This method of safeguarding the species is not only peculiar to the minnow; carp and tench will dive to the bottom on receipt of their alarm, gudgeon and loaches remain stationary for minutes on end, whilst

barbel leap out of the water. South American water snails also possess this alarm system and dig into the mud or crawl out of the water to escape danger. An interesting fact is that this alarm system cannot be voluntarily activated, it only comes into operation should injury take place and it is a case of one martyr saving the rest.

Finally, man has used the fish's smelling ability to safeguard himself against fish; during the war in the Pacific, shark repellants were developed to protect frogmen and divers and this was a dye containing a substance that the fish could smell.

Taste and Touch

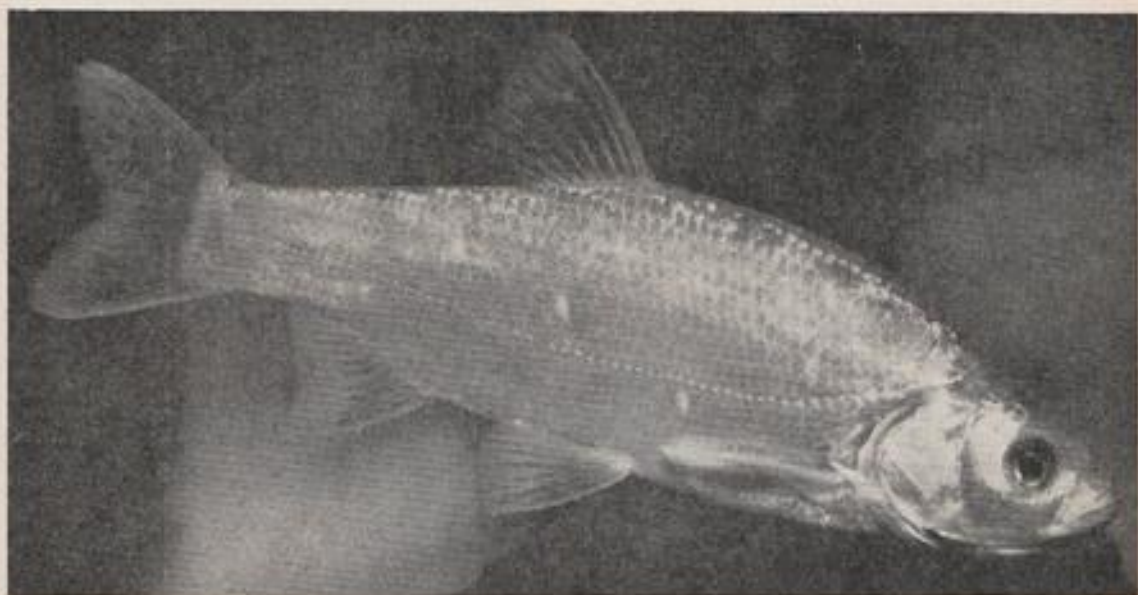
Closely allied to smell is taste. The fish may use its sense of smell to locate food, but its sense of taste will tell it if the food is edible—using the principle "If it tastes good, it must be food!" Some fish, particularly those of nocturnal habits, have taste cells in their barbels or even in the skin although this may be closely bound up with the sense of touch.

Throughout the fish's body there are touch sensitive cells and nerves, and the fish is able to feel touch in the same way as we can.

Hearing

Fish have ears! These are located within the skull, not outside as in animals. It has been shown that removal of this inner ear lessened the ability to hear. Fish can be trained to answer to sounds but these sounds may alter when heard in water so that assessing

Golden Orfe showing Lateral Line



the fish's hearing ability is further complicated; it is thought that sounds transmitted in water may be interpreted by means of the fish's lateral line, but there are differences of opinion upon this subject.

Whatever the mechanics of the fishes' hearing actually consist of, the fish can certainly hear sounds and this has been proved by discovering that fish make noises! It is hard to imagine that they would do this if the noises could not be understood by their fellows. Fish making noises upset America's Atlantic and Pacific defence systems during the war; listening buoys, set up to detect enemy ship's propeller noises, were triggered off, causing alarm sirens to sound and acoustic mines were even exploded!

The sounds emitted by fish are not beyond the human audio spectrum as is the case with bats' squeakings, but we cannot hear them because our ears are designed to operate in air and sounds in water have to be above a certain loudness (probably beyond a fish's capability) before we could hear it even faintly.

Unlike animals, fish seldom use their mouths as sound generators. Angel fish often give the impression that they are grunting, but it is the action of the gills expelling water forcibly which creates the knocking sound. Most fish produce sounds by drumming on their swim-bladders, using them as resonators.

The language of fish has many meanings: herrings shoaling together give directions and warnings with chirpings; courting sea-horses click to each other affectionately; clown fish (*Amphiprion sp.*) scare away rivals from their favourite anemones with noises, but if a fight should ensue, the vanquished can beg forgiveness with a humble quacking sound.

It may be accepted that very low frequency vibrations are, in fact, a preliminary stage of hearing and such vibrations are detected by the fish through its lateral line system. This is arranged from head to tail along each side of the fish and often shows as a dotted line (it is not an indication of where to fillet a fish!) The dots are tiny openings to a tube containing special fluid which runs the length of the body. These tiny openings are sealed from the outside water by a thin membrane; any vibration in the water is picked up by these tiny "portholes" and by the difference in time of the vibrations arriving at different parts of the lateral line the fish can tell from which direction the vibrations are coming.

Sharks and piranhas, although attracted over short distances by smell, are also attracted by the thrashing about of any injured fish (or man!) and can obviously detect a difference between normal swimming vibrations and those of a potential meal.

An interesting use of vibrations is found with the male Siamese fighter (*Betta splendens*). As soon as the fry become free swimming the male's job of protecting them is made more difficult and he obviously couldn't

catch each individual truant and transport it back to the nest. Instead, he vibrates his pectoral fins violently just below the surface of the water; fry, up to sixteen inches away, detect these vibrations, take their bearings from them and swim towards the centre of the vibrations. When all the fry have arrived it is a simple matter for the male to gather them all up and place them in the nest. This system only works while the fry are swimming at the surface, after a few days the fry take to swimming lower down in the water and this "collection service" ceases.

Vibrations are also used during spawning, the two fish need not actually touch each other, the female being excited enough by the male's vibrations to expel her eggs. In fact female fish can be induced to lay eggs by vibrations *not* made by a male of the species! (One wonders what you could do with an electric food mixer and a ripe egg laden fish.)

Blind cave fish navigate through their dark world by detecting reflected vibrations from obstacles in their path, and it is a thought that you could probably net them easier by holding the net *still!*



Male Siamese Fighting Fish vibrates pectoral fins to recall straying fry

Having disposed of the five senses that we are familiar with, the fish's sensory system doesn't stop there, Nature having provided a few refinements to suit various requirements.

Colour Control

When our fish are upset, frightened or excited, they

change their colour-patterns. We are all familiar with buying a highly coloured fish in the dealer's only to find it a shadow of its former self on arriving home; it soon regains its colours when it has settled into its new home. Some fish change their colours to suit their environment, others do so to catch their prey, pretending to be a leaf, etc.; cichlids use this ability to change colour during the breeding season, the various patterns threatening trespassers, attracting females, inducing spawning and so on.

Coupled with these chameleon-like gifts, the use of spread fins, extended gill plates and various twitching movements has given the fish a wide repertoire to suit any occasion, although how some of the "albino" forms manage poses a problem—one can hardly intensify non-existent hues!

Heat Sensitivity

Fish are particularly sensitive to changes in temperature; we all (?) take the precaution of equalising temperatures when changing fish from tank to tank, and probably assume that a degree's difference either way might not do much harm even if detected. However, extremely small changes in temperature *can* be detected, and a 0.03°C (0.054°F) change is not beyond detection.

The life cycle of the sole depends on its ability to sense temperature changes; in April it moves to shallow, warmer coastal waters and then out to sea again in June. It is thought that soles navigate to the coast by taking bearings on the warmer water areas.

Stability Control

Equilibrium, or sense of balance, is kept under control by the inner ear but should this fail then the

fish's sense of "up" and "down" is maintained by its eyes. It tries to keep in such a position so that light always falls on its dorsal surface. This is why side lighting is not suitable for aquaria, the fish swim around at a funny angle! I have an angel that had only one eye from birth, but I'm sure that it can detect light on its blind side for it swims around with its blind side up to the light in an attempt to equalise the light falling on both its sides, obviously thinking that it's swimming the right way up. Goodness knows what it thinks about the other fishes' swimming attitudes!

Another form of balance, the density of the fish, is maintained by the swim-bladder. This is an automatic process—the fish does not alter its position or depth by using the swim-bladder as a ballast tank (as with a submarine), but merely swims to its desired position, the swim bladder compensating for changes in the outside pressure on the fish.

Electric and Magnetic Sense

Knife fishes and elephant-nosed fish all possess electric organs, and this facility is used by the fish as navigational aids and as a signalling device.

In the knife fish, the electricity generated surrounds the fish with a weak electric force-field, very similar to a magnetic field; any obstacle that comes within this field either concentrates the lines of force of the field or weakens them. These changes are detected by the fish which then takes evasive action. There is one snag with this system—if the fish were to swim with the normal undulating movement of the body this would make the task of detecting and deciphering these electrical changes much more difficult. Therefore the knife fish is forced to swim along with its body held

Swim-bladder of
Veiltail Goldfish

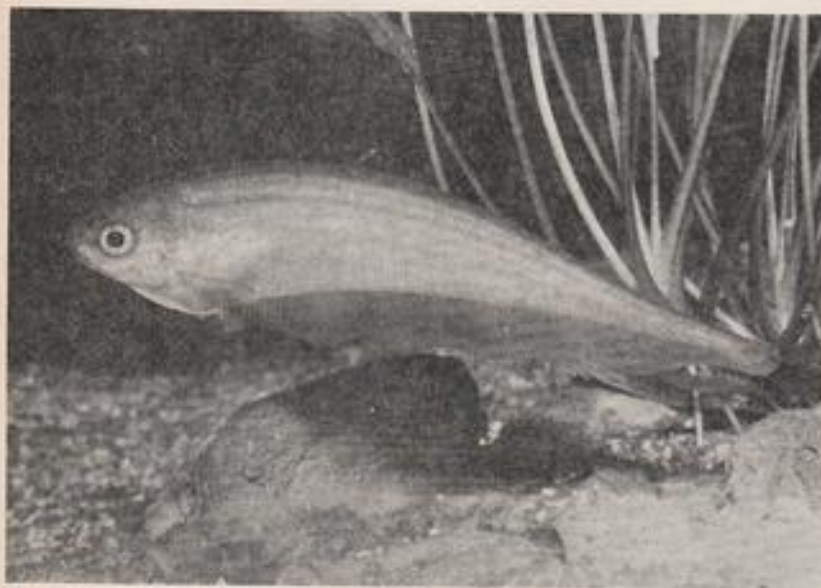


rigid, being propelled by a wave movement of the long anal fin. These fish have developed this unique guidance system since they live in turbulent, murky water where vision would hardly be an asset and also, because of the water's turbulence, lateral line perception is out of the question.

The elephant-nosed fish use electric impulses, in some species, to keep the shoal together; other species, being more solitary specimens, use impulses to define

more normally thought of methods involving actual living space, food availability and protection from predators, is not only confined to tadpoles; flour beetles suddenly turn cannibalistic when their numbers swell to too great a total. When too many female mice are present in a community pseudo-pregnancies occur and to such an extent that the females stop ovulating.

Trying to apply this to the aquarium, could this be the reason why, when a group of young fish are kept



Knife Fish has an electrical navigating device

their territorial limits, a physical struggle between adversaries only taking place should a preliminary electrical exchange fail to deter the trespasser!

The electric eel possesses *three* electrical transmitters. It navigates by a low voltage organ; the second battery may be used to attract fish to the eel's vicinity where the third, high voltage generator (300-800 volts) finishes them off!

Contraceptive Scents (or Sense!)

It has been found that if a large tadpole is put into an aquarium containing a group of small tadpoles, they are overcome by a fatal loss of appetite! The same thing occurs should some water, in which large tadpoles have been living, is added to the youngsters' tank. This is another of Nature's ways of limiting the population, balancing the dilution factor of the water with the sensitivity of the tadpoles, so that there are never more frogs than can be accommodated.

This type of population control, other than the

together and the odd one or two fish outgrow the others, the remainder stop growing? Normally the excuse for this is thought to be that the bigger fish grab all the food to the exclusion of the others.

Obviously, fish have many more senses than we give them credit for and there are even more sophisticated "senses" than those outlined above—the "phosphorescent" or light-making fish of the very deep sea and the migratory instincts of eels, salmon and herring. How on earth do we manage with only five?

Acknowledgement

Material for this article was drawn from "The Magic of the Senses—New Discoveries in Animal Perception" by Vitus B. Droscher (Paul List Verlag 1966, and W. H. Allen & Co.) and the author would like to thank the publishers for their kind permission to use the material. The book is to be recommended to readers interested in animal perception, be it fish, bird, insect or animal.



Colour in Goldfish

I have, for many years now, read with much interest, the articles in *The Aquarist* written by Arthur Boarder on goldfish and coldwater fish in general

Being a keen goldfish fan myself, there is one point which I feel may be of interest to all those who are thinking of exhibiting the Common Goldfish in shows in the near future.

It is all too common at these fish shows, as Mr. Boarder well knows, to see fine shaped fish of good size let down only by their colour, and all too often the remark is passed "If only the colour was deeper".

Well, for some time now I have found that if goldfish intended for exhibiting are placed in green water (through which you can hardly see) for some two months before a show, then taken out and placed in clear water, the somewhat sombre, pale orange colour will have turned into a deep blood red, a fact which I have proved time and time again with much success.

Perhaps Mr. Boarder would care to comment on this, as I would be pleased to have his expert comment on a subject which has given me many months of pleasurable experimenting.

R. S. BARNES,
Southend-on-Sea,
Essex.

Bubbling Gouramis

I re-read with interest the letter from B. Tate of Bingley, Yorkshire, in the November issue—re. "Mysterious Spawning Behaviour" of Honey Gouramis, after noticing similar behaviour just this weekend with *Colba labiosa* (Thick Lips).

The pattern of behaviour was similar but occurred during the spawning period. I watched the male make regular trips to the surface and then return to a position under the nest; there was no noticeable body movement but by what I can only put down to a "muscular contraction", fine bubbles were exuded from the full length of his body to join the nest which was rather poor in definition. The spawning act continued most of that evening and this bubble-forming act was carried out several times while the female was at the other end of the tank.

Unfortunately, being on night work at that period, I had paid little attention to my fish. I had noticed the colouring of the male deepening but had put off doing anything about it and all this took place with a pair of Dwarf and a pair of Sparkling Gourami also present in the tank, so I doubt if anything will come of it all. They are, however, a young pair and I shall know better next time (given the time to take the necessary action).

I might add that I did not see any such happening during spawning of "Dwarfs", as B. Tate says. This behaviour is not mentioned in any books!

F. J. MOREMAN,
Bristol.

All Varieties Covered

After reading the article written by Messrs. Phillimore and Goodall about Guppies in the November issue, I was a little concerned about the last paragraph which said that the F.G.B.S. specialise in the shorttail, but also have standards for broadtails. This statement, I think, is a little misleading. The F.G.B.S. does, in fact, specialise in *all* varieties. Incidentally, the Veiltail, which is one of the broadtail variety, was first introduced into this country by the F.G.B.S. way back in 1952 and is still the most popular variety on the show bench today.

A. BAKER,
Publicity Officer,
Federation of Guppy Breeder's Societies.

In Defence of U.S. Magazines

Mr. G. F. Riley's letter, part of which was quoted in Mr. B. Whiteside's December feature, calls for an answer from one who has derived, and undoubtedly will continue to derive, knowledge and sound guidance on many aspects of fishkeeping from American magazines. To write, as Mr. Riley did, that "... some leading American fishkeeping magazines ... are objectionable even when readable" is absurd.

That erroneous information creeps into some of them is not to be denied. But can Mr. Riley say that our own magazines are perfect? Of course there's too much high-pressure salesmanship and silly gadgetry in the U.S. But educated and intelligent American aquarists are no more taken in by it than we are ourselves.

My own collection of American aquarium magazines extends back to about 1914. In the main the standard of writing is of the best. The editorials of the late William T. Innes were written in faultless prose.

JACK HEMS,
Leicester.

WHAT IS YOUR OPINION?

by B. Whiteside



IN THE NOVEMBER edition I made some comments about the use of activated charcoal, hoping to stimulate both hobbyists and manufacturers into offering some information. I was pleased to receive a letter from Dr. J. N. Carrington of Inter-Pet, as his company seems to be one of the most progressive British firms manufacturing items for the aquarist. Dr. Carrington's tests indicate that wood charcoal is of very little value, both from the point of view of adsorbing toxic substances and also since it floats in water, which makes it difficult to use in filters. In his opinion, the only charcoals worth using are either those made from bone or coconut. Both these charcoals sink besides being inactive. One can get some idea of the activity of charcoals by shaking various ones up with a few drops of Methylene Blue and seeing whether or not they will adsorb the dye. Dr. Carrington says: "You will find, unfortunately, that the carbon usually sold for aquarium use is of little value when compared with ours." Interested readers may care to try Dr. Carrington's test.

The second letter comes from the secretary of the Wrexham Tropical Fish Society. I hope that he will accept my apologies if I get his name wrong. I found his signature a little difficult to read—hence my reason for asking writers to print their name and address on letters. His name seems to be Mr. F. Miner, of "Revilo", Eldon Grove, RhosAllen, Nr. Wrexham, Denbighshire, and he begins his letter by asking: "Why these continual problems with charcoal—such as passing through the filter slots, holding it down with gravel, getting it mixed up with the filter medium, etc?" He says that the answer is a small bag, made from an old piece of nylon stocking, and cut roughly to the size and shape of the filter. The open end is fastened with an elastic band twisted around it. The size and shape of such a bag, filled with charcoal, is very flexible, and the problems encountered when changing the filter medium are eliminated. The only problem is keeping it in position and this is easily overcome by using suckers, with fairly long extensions, obtainable from do-it-yourself shops. He ends his letter by saying: "Isn't it true that used charcoal can be reactivated by heating it up to drive off the adsorbed gases." (One could try heating used charcoal to partially reactivate it, but it would need to be heated

quite strongly. I doubt if it would be of very much use after one such re-heating and re-use. Fresh, activated charcoal would then probably be necessary to be of much use.)

Another Ulsterman, and contributor (you may have read his interesting account of aquarium photography in the November, 1970 issue), Mr. Jim Dunbar, of 58 Greenore Street, Belfast, BT6 8NF, writes on the subject of undergravel filters and the growth of aquarium plants. In his 3 ft. community tank he has two undergravel filters, along with an Inter-Pet Power Filter, and they keep his tank sparklingly clear. The latter filter is operated for approximately four hours per day. He has found that Indian fern and *Ambulia*, plus two different species of *Cryptocoryne*, grow without too much bother. The fern and *Ambulia* grow really well and he has plantlets from the former and cuttings from the latter growing in all of his tanks. The Indian ferns are all offsprings of one large plant which he bought when he started fish-keeping eighteen months ago. Some of the fern plants have stems which are 18 in. long. He has never had success with either large or dwarf Amazon sword plants and thinks that his water conditions may not be suitable. (Amazon swords, being quite heavy feeders, do not usually grow very well with undergravel filters; however this would not account for their failure in other tanks without undergravel filtration unless such tanks did not contain enough fish to supply the plants with food. Incongruous though it may seem, it is quite possible to keep aquaria too clean. Under such conditions, few plants will grow well.)

Mr. Dunbar would like to see more articles on growing plants—discussing water conditions and the use of peat under the gravel. He would like to have such articles written in such a manner that the complete beginner could understand them. He thinks that most plant articles, in books or magazines, would require the reader to have a degree in water chemistry to be able to understand them. He finds that many people waste a lot of money buying plants, through no fault of their own, which don't suit their local water conditions. He would like a large, flourishing Amazon sword plant, and must have spent £3 or more trying to grow such a one with nothing to show for it. (I live about twenty-five miles from Mr. Dunbar and can grow both large

and small Amazon swords like weeds. The former flower regularly and both produce many youngsters. Some time ago I sent Mr. Dunbar some dwarf sword plants but they did not thrive with him. I'll send him some more and include some hints on growing them this time.) Mr. Dunbar has tried two types of Japanese rush, wheat plants, parrots' feathers, and a few others. He thinks that these are bog plants which look well for a few weeks before dying. Regarding charcoal, Mr. Dunbar's dealer, from whom he bought his outside filters, told him that silk wool and charcoal were the best things to use. He has used them both ever since without giving much thought to their merits or otherwise, so he thinks that they must be of some use.

Mr. C. M. Collett, of 183 Minard Road, Catford, S.E.6, writes about his experiences with undergravel filters. He has been keeping fish for two years and has always used undergravel filters except in his breeding tank where he uses a small corner filter. When he first started using undergravel filters, he did not have enough gravel in his tank. He did not realise that a $\frac{1}{2}$ in. of gravel would not grow very good plants. With his second and third tanks he decided to use much more gravel. He used 2 in. at the front, sloping to 3 in. at the back. His plants grew much better but he still cannot grow *Vallisneria*. He thinks that this may be due to unsuitable water, or greedy fish. The plants which he can grow best are Amazon swords, water wistaria, *Sagittaria*, giant *Hygrophila* (very well), *Bacopa* (very well), duckweed (rather too well), *Ambulia* and hairgrass. He adds that, with the coming of autumn there is the "evidently normal drop in the plants' condition". (I must admit that I have never found this as all my tanks receive artificial light and the same temperature all the year round.) Seventeen-year-old Mr. Collett ends by saying that, provided an aquarium has a sufficient depth of gravel—3 in.—4 in.—the plants should grow well with an undergravel filter; and he thinks that they are neater and more convenient.

From 8 Coldharbour Road, Pyrford, Woking, Surrey, comes a letter from Mr. P. M. Backshall, who finds the opinions in this column to be most interesting. As the easiest cichlid to breed he nominates the blue acara, with, perhaps, a little help from "lady luck." On 27th March he bought a pair of 3 in. fish from his dealer and placed them in an unfiltered 24 in. \times 12 in. \times 12 in. tank with only three pieces of flat slate and an airstone. The fish soon settled and fed well. From 28th March to 1st April the fish were left alone and no artificial light was supplied. On 2nd April approximately 100 eggs were laid on a slate, the male fanning them. On the 4th the fry were wriggling and on the 8th free swimming. They were removed to a similar tank and 40 young were raised. On May 18th further eggs were laid by the parents and raised under similar conditions. The temperature was a constant 78°F.

Mr. Backshall started keeping fish about one year

ago with a 24 in. \times 12 in. community tank; later he added a 24 in. breeding tank for guppies. His next addition was a 4 ft. tank in which he keeps a mixed collection of cichlids: Oscars, keyholes, blue acaras, Dempseys, jewels, *Pelmatochromis*, etc., which seem to be reasonably content with each other. His two smaller tanks are now used for breeding. He did use undergravel filters, not very successfully, but now uses an Inter-Pet Slimline Power Filter in his 4 ft. tank, and finds it to be very good. He has quite a library of aquarium books.

"It is now quite some time since I caught the 'cichlid bug'," begins the letter from Mr. M. Furniss, of Fayrer House, Epsom College, Surrey. At the beginning Mr. Furniss only concentrated on collecting such fish as Oscars which caught his fancy. However, this summer he obtained, rather by accident, a male and female convict cichlid from different sources. With little hope he placed them in a 24 in. \times 12 in. \times 15 in. tank furnished with gravel, undergravel filters, a flower pot and a "Hykro" Vacation Food Block. He then left for a three weeks' holiday abroad. When he returned he found the tank covered with green algae and full of convict fry. He submits, therefore, that these must be the easiest cichlids to breed as they needed no help from him, and he still has a tank of rapidly growing fish. He lives in a very hard water area, did not meddle with pH, and the temperature was about 80°F. Mr. Furniss is another undergravel filter *Plecostomus* fan, finding these to be the only essentials for a clean tank, except in the case of his electric catfish. Normally he uses charcoal in his outside filters and never has many complaints. He likes to use the larger types but, as these are not always available, he has often to make do with the smaller particles. Before use he always washes the charcoal well in a fish net under a running tap to remove fine dust. He has never had trouble from fine dust but suspects that it would quickly settle.

Regarding Mr. Birchall's idea, in the November issue, of lists of points about one species of fish, Mr. Furniss thinks that much of the information required is included in Sterba's "Freshwater Fishes of the World," and the rest can normally be gleaned from other volumes such as "Exotic Tropical Fishes." The only time that Mr. Furniss has been really successful with tropical fish photography was with a photograph he took at Frankfurt Zoo's "Exotarium." He got a beautiful colour slide of a two foot *Ospromemus goramy*, which makes him sigh whenever he compares it with his own much smaller specimen. Mr. Furniss tends to agree with what Mr. Collett said about freeze-dried tablets. He finds them a terribly expensive food as a lot of his fish regard one tablet as one mouthful. Mr. Furniss concludes by saying that Mr. Wellby is a very lucky man in being able to buy *Plecostomus* at 8s. 0d. each. He has never seen one costing less than 17s. 6d.



Close-up of group of young plantlets produced by large Amazon sword plant (A) PHOTO: B. WHITESIDE

Mr. B. Germaney, of 22 Brookfield Road, Grimsby, Lincs., has also written to ask for the address of Mr. S. Jackson, of Arlesey. I know of at least one reader who has had a reply from Mr. Jackson, at the address given in my column. Mr. Germaney would like to know of any breeders of veiltail goldfish who have fishes for sale. (There would appear to be a shortage of good quality coldwater fish at the moment, judging by the number of people who want to contact Mr. Jackson. Perhaps any readers who have such quality fish for sale would send me their name and address for inclusion in a future column. Perhaps readers could tell me if there is such a shortage or if it is the case that breeders do not advertise, or do not want to part with their better fish. As I'm not a coldwater fan, I don't know what the market is like at present. Is the popularity of coldwater fishkeeping on the wax or wane? Drop me a line if you have any views or opinions on this subject.)

Talking of coldwater fish brings to mind a rather funny story—one of many, all of which are true, told to me by a friend whose work entails the visiting of junior schools. Knowing something of fishkeeping, she arrived in one school just as the goldfish, in their bowl, were having their weekly clean. The bowl was placed on the draining board beside the sink and she watched for the anticipated net to remove the goldfish. Eyes agog, she watched as the teacher delved her hand into the bowl, picked out each fish in turn, and placed it on the draining board. The bowl was then washed out, fresh water added, and the goldfish picked up and returned—apparently unharmed. My friend, on asking

if the teacher never used a net or another container, was met with a blank look, the teacher never having heard of such a net being used. My friend was then told that the goldfish had been receiving the "draining board" treatment for several years and had always been healthy and well. The story is amusing even though the practice is not one of those which I would recommend; it does, however, suggest that we might under-rate the stamina of some of our fishy friends! Other stories, from the same friend, concerning the escapades of mentally sub-normal children after having seen a magician on television apparently "eat" goldfish straight from the bowl, lack humour and hardly bear repeating in print—even though true.

Northern Ireland is being well represented in this month's feature as the next letter comes from sixteen years old Trevor Mitchell, of 38 Ballymacconnell Road North, Bangor, County Down. Trevor has a 36 in. x 18 in. x 15 in. tank which contains two under-gravel filters which run for twenty-four hours per day, operated by a "Star" pump. The only plants which he can grow are *Vallisneria*, *Cabomba* and *Bacopa*. He has tried growing spatterdocks and Amazon swords without any success. He finds that plant cuttings do quite well, and that *Bacopa* does very well, but plants with larger roots do not grow; they gradually wither away. He also has a 2 ft. tank with a corner filter and he has had no trouble in growing plants in this tank. The gravel in his larger tank is the "Gussie" brand, which cost him 5s. 6d. per packet. Trevor also has a garden pond and in early summer required some coldwater plants. He could only find one dealer in Belfast who sold these and he had not got a very good stock from which to choose. The plants were late in arriving at the dealers and were quickly sold.

Trevor has been feeding his fish on white worms for the past nine months and does not think that they are harmful. They are easily accepted by both his large and small fish.

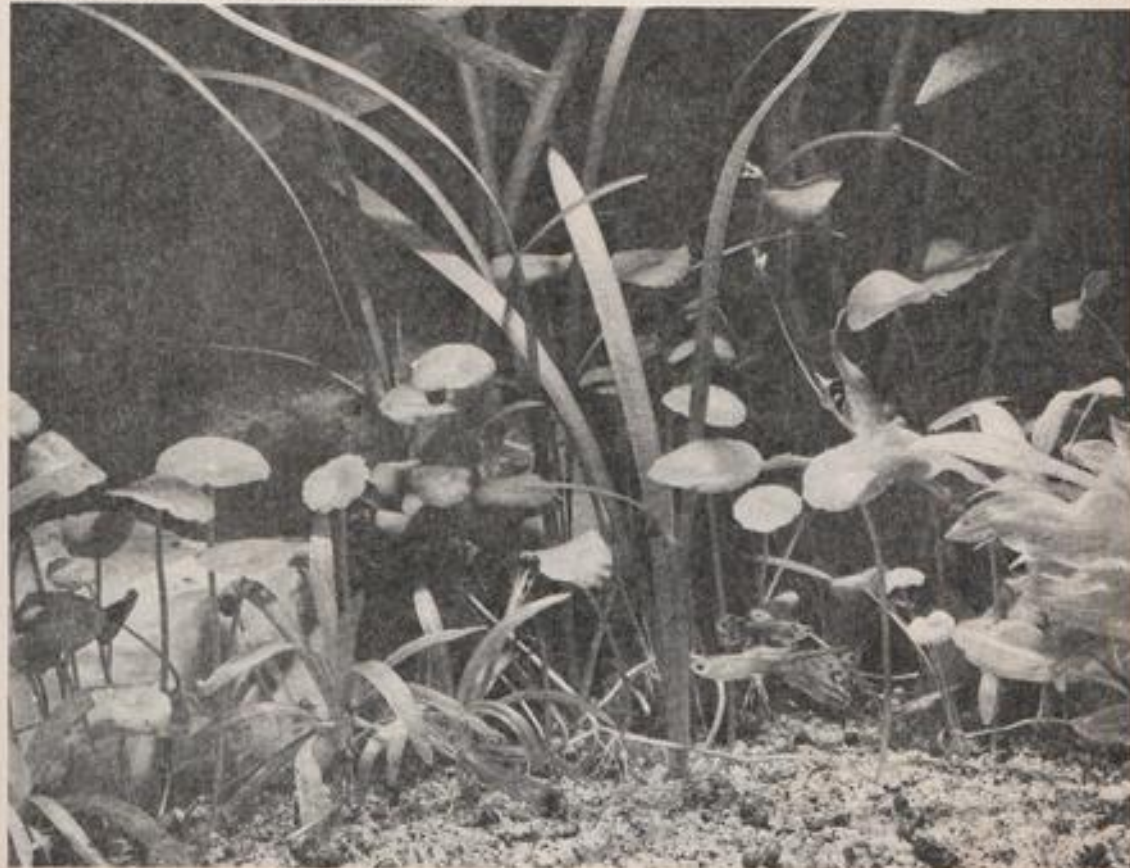
Well, that seems to be all the letters for this month. A number of readers seem to have difficulty in growing Amazon sword plants. Possibly the simplest answer is to stop trying to grow them and to stick the plants which you find to grow well in your aquaria. For the larger species of sword plants it is essential that they have enough space in which to grow. These plants will usually adapt their size to the size of the space in which they are growing. I kept one plant in an 18 in. x 10 in. x 10 in. tank for about one and a half years. The plant grew very little, reaching a height of about only 12 in. The number of leaves which it bore was fairly constant; as an older outside leaf started to die, a new leaf would appear from the centre. When the plant was moved to a 30 in. x 15 in. x 15 in. tank it grew rapidly and produced flowers and new plantlets. The plant is now very large—too large, unfortunately, to photograph without removing it from the aquarium

which I don't want to do. This brings me to a second point about the larger Amazon swords: they grow best if left undisturbed. My plants don't seem to be too particular about water conditions. Water which is around the neutral mark, and which is from slightly hard to hard, seems to be suitable. Plants will grow in the temperature range of 75°F-82°F. Around the 80°F mark seems most suitable. Growth is slow at the lower end of the range. Having large root systems, the plants are heavy feeders. Peat under the gravel does not benefit the plant, according to my findings. Clay probably would, but I have never tried it, finding that the plants grow well in a tank which is quite well populated with fish. Mulm, or fish droppings, left around the base of the plant, supply sufficient food. For the above reasons plants do not seem to do well with undergravel filtration. If you want to try to grow large sword plants in a tank fitted with such filters, plant them, say, in the space between two such filters, in the base of the tank, or leave one corner of the base

free from undergravel filtration and try your sword plant there. An alternative would be to grow the plant in a pot hidden in the gravel above the undergravel filter. The snag here is that the pot will eventually cramp the plant's roots. A depth of gravel of from 3 in. to 5 in. is not too deep for larger plants but one must be careful when setting the plant not to bury its crown under the gravel. Photograph A shows the crowns and roots of young plants. They are growing down towards the gravel, where they will eventually root. The young plants shown are now large enough to be carefully separated from the flower-plantlet stem, and grown on as individual plants. In photograph B one can see the edges of the leaves of the young plants in A. Above, and to the left of the leaves, can be seen the continuing growth from the flower-plantlet stem. The flowers are minute. At the left-hand side of B can be seen some dwarf chain sword plants which reproduce prolifically by sending out runners. Before the photograph was taken I had to clear out many of

Section of aquarium planted with *Sagittaria hydrocotyle* and Amazon sword plants. Left of centre small chain swords; extreme right, part of leaves of young plantlets produced by large Amazon sword. Note the continuing growth of the flower-plantlet stem vertically above guppy (B)

PHOTO: B. WHITESIDE





Male Guppy (C)
PHOTO BY B. WHITESIDE

these plants as they were obscuring the front view of the tank. When these runners have covered the base of the tank with young plants, they meander round the upper reaches of the water in long chains, their roots reaching down towards the gravel. It is unnecessary to sever the runners of dwarf chain swords which have rooted into the gravel unless one wants to move such plants to another tank. None of my chain swords has ever flowered. It is difficult to lay down set rules about growing specific aquarium plants as they can adapt to a wide range of conditions. The above conditions are those under which my plants flourish. Other readers may be able to grow the plants well under conditions which differ from mine. My plants receive

fairly strong lighting. Perhaps other readers would send their opinions on how they grow their sword plants!

I recently mentioned my current guppy breeding exploits. Photograph C shows one of my young males. The predominant colour is red. The finnage is reasonable but I would like to produce fish with slightly larger bodies, and fins to match. Perhaps other guppy-breeders would care to send me their opinions on the guppy in the photograph. Most of this month's letter-writers seem to be very keen on the larger tropical fish. I must admit that I am not so keen on larger fish. At the moment my largest fish are sword-tails.

Continued on page 397



Harlequin (D)
PHOTO BY B. WHITESIDE



SETTING UP A TANK

BREEDING GOLDFISH

by A. Boarder

MANY BREEDERS of goldfish like to have a set-up tank in the house as an added interest. This is especially the case when any of the fancy varieties are bred. It is then that the specialist breeder can keep a few of the best youngsters near at hand so that they can be examined for faults more easily than if they remained in a rearing tank or garden pond. It is surprising how many faults can be noticed when the fish are frequently under observation. Whilst a fish might look very good in a large container with many others it may show certain deficiencies when under close examination.

The size of the tank will be an individual choice; sometimes determined by the space available and the position in relation to a window or door. The usual 24 x 12 x 12 in. tank is very good but so is one of 18 x 10 x 10 in. The latter can be had in a plastic frame which never needs painting, will not rust and is not likely to leak. Do not buy a tank which is not either plastic or of a stainless metal, as you will be asking for trouble later on. The tank should have a hood with a lamp. For the normal indoor tank a 40 watt bulb will be sufficient. If one uses a much larger tank than those stated then two such lamps will be required.

A cover glass is also essential but some of the plastic tanks have a closely fitting lid or cover which prevents the use of a cover glass unless some alterations are made. With such tank covers it will be found that there is a fold of metal inside and with a little care two small strips each side can be cut and bent down at right angles to take the glass. The tank should then have a wash and then be ready for setting up. I like to use a coarse grit for the base and find that this can be obtained readily by sifting some aggregate. This is the type of material used for concreting. A quarter inch sieve is a good size and one gets many small stones of varied colours which blend well with usual rockwork.

For a small tank there is no need to use any loam, but to encourage the rapid growth of water plants it will be found that a little loam at the back will help. This should not be more than an inch deep at the back and should not reach more than half way towards the front. This must be well covered with grit and this should reach to the top of the lower frame in front. Do not pile up base compost above the front frame as you will only be cutting out much of the complete picture if you do.

Having added the grit some rock-work can be prepared. This serves no useful purpose apart from decoration and so could be excluded. However, one or two rocks carefully placed can add to the finished picture. Rocks should not be of a limey nature nor have any sharp edges which could damage the fish. The choice of plants can be very important and for a coldwater tank there are several good species to choose from. Do not be tempted to use as many different kinds as you can get. There is nothing clever in this. Remember that you are not setting up a furnished tank for exhibition purposes. You could use a different technique for that but all you are concerned with is to create an attractive tank which can last for many years without having to be disturbed.

I find that one of the very best plants is the Hornwort, (*Ceratophyllum demersum*). This plant never makes any roots, grows well in cold water and is easy to control. Before any water is placed in the tank it is possible to introduce the plants. I know that some aquarists prefer to half fill the tank first but I find that if the plants are placed on the compost, a small rock or stone laid on the stems will keep the plants in position and obviate the necessity of using lead strips. I do not like to see too much lead used in a tank as too much could be dangerous. One or two plants of *Vallisneria* can be used at the back corners as these tend to hide the back frame. Do not use plants too near the front of the tank or swimming space will be lost. The *Elodea* types are also very useful, and although rather quick growing can be controlled if they become too rampant. *Egeria densa* and *Lagarosiphon major* are two good species but *Elodea canadensis* is inclined to get out of hand rather quickly.

Some water can now be introduced. This can be added from a fine-rosed watering-can or some stout paper can be laid on the compost first. Any rocks should not have been placed too near the front of the tank nor too near the back so that they could form traps for a fish. As the water is introduced, the position of the plants can be noted and before the tank is filled some rearrangement can be done if necessary. The type of water to be used is important. Some aquarists use pond water but I do not like this as unless the water is very clear it is possible for it to contain harmful minerals and also minute pests. If the fish have been in rather warm water

then that in the tank can be brought up to the desired temperature by adding some boiled water. A short time ago I set up a tank and after two or three days I noticed that most of the tiny thin leaves had fallen off the Hornwort. The fish did not look too happy as they did not come up immediately for food and the water had a colour which did not appear to be right. I could not understand why the plants should have lost their leaves until I remembered that I had made one great mistake. When filling the tank I warmed up some of the water from my hot water system. I had forgotten that not long ago I had had a copper storage tank installed. I have so often warned readers of the danger of copper and should have realised that what I had done was dangerous. However, I did not think that so little water from the system could do the damage it had done.

I immediately emptied the tank and used only fresh tap water. The plants (fresh ones) soon looked well and the fish responded to the change. It has been stated that a fifth part of copper to a million parts of water could be fatal to fishes but I had never seen such an effect on plants by such a small quantity of contaminated water. Once the tank is filled with water up to the top frame, that is, high enough so that the top of the water cannot be seen from the front, the tank is ready for the first clean-up. This is done by drawing a clean sheet of paper from one end to the other fairly quickly. This will remove any dust from the surface.

The fish should never be placed straight into a freshly filled tank. You will notice that when fresh water has been run into a tank there will be a number of air bubbles on the glass and perhaps on the plants. If fishes were placed in such a tank it could upset them as they could show these same bubbles on them, or could be affected by embolism. Once the water has settled down and no air bubbles can be seen then the fish can be added. Do not over-stock, keep well within the limit of an inch of body length to each 24 square inches of surface area. Do not use large fishes. A tank will never look attractive

with fishes which are too large. I have a tank of 18 x 10 x 10 in. with seven young fantails, each with a body length of an inch to an inch and a half. They shoal well and look very attractive. I am sure that a few small fish will always look more attractive than two very large fishes.

The position of the coldwater tank should not be too near a window, and never directly in front of one. A good position is by a side wall not less than five feet from a window.

With such a tank as described there is no need whatever to use an aerator nor a filter. I have had coldwater tanks in a living room for thirty years or more and have never used either of these apparatus. If one is forced to use an aerator then it is a sure sign that the tank is over-crowded. As for a filter I consider that it is quite unnecessary in a set-up tank which is correctly functioning. All that will be needed is the weekly servicing when the front glass only is cleaned and the mulm from the front half of the tank is removed with a siphon. Some fresh water is then run in and the tank brought up to prime condition. If such a weekly task is performed then the tank can go on for years and years without having to be completely emptied and set-up afresh.

The time when the lamp can be left on depends on the amount of light in the room. Usually a few hours a day is all that is necessary. When one is in the room or visitors arrive, it is a good plan to switch on the lamp. If it is kept on too long it will encourage the formation of green algae, especially on the front glass. It will also make the water plants grow at a faster rate than is required owing to the fact that extra warmth will be given off by the lamp.

There is no need to feed the fish as soon as they are in the tank. At least a day can elapse before this is needed. All that is then necessary is a little food each day, but do not overdo it. Prune plants as required, introduce nothing from natural waters and everything should go well with the tank.

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at Alexandra Palace, Wood Green
London, N.22

9th, 10th, 11th JULY 1971

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A CURE FOR *Algae?*

Gyrinocheilus aymonieri

By B. Whiteside

PERHAPS MY TITLE is misleading, suggesting as it does that *algae* are a disease. They are no more of a disease than they are grasses but, like grasses, if they grow in places where one does not want them, they can be considered as a nuisance. We cannot "cure" *algae*, but we can control them. There are a variety of techniques which one can try, eg. chemical, physical and biological.

Many fish are very fond of *algae* in their diet and thus help to keep them under control in the aquarium. Probably the best *algae* eater which we can safely introduce into an aquarium—especially a community aquarium—is the *algae*-eating *Gyrinocheilus aymonieri*. This useful and attractive fish has several common names—such as the Siamese or India *algae* eater—but it is probably best known by its species name: *aymonieri*.

The fish belongs to the Family Gyrinocheilidae. The genus *Gyrinocheilus* contains several species, but only one, *G. aymonieri*, is suited to the community tank. Thailand is the country from which the fish originates. Specimens are said to reach about 9 in.



in length but, in the confines of the aquarium, 4 in. to 5 in. seems to be nearer the usual adult length.

G. aymonieri is a light, silvery colour on the ventral surface, with a light brown back. There are about six small brown bands along its dorsal surface. On each of its sides is a dark brown stripe, with about nine, vertical brown bars, arranged irregularly. The fins are almost transparent but the tail bears a series of small, dark brown dots. The upper half of the circular eye has a reddish coloration, the bottom half being silver; the eye's centre is black. The fish's mouth points downwards—rather like those of some catfish—and is modified for rasping *algae* off the solid objects in its aquatic environment, and sucking these into the mouth cavity. The "breathing" apparatus of the fish is modified to enable it to obtain oxygen while continuing to suck in its required food.

From the description and photograph it will be seen that the fish is not the most colourful or exciting inhabitant of the aquarium, but its *algae*-eating habits make it a "must" for all my decorative aquaria. The *aymonieri* I have found to be a peaceful fish, whether large or small. It is quite shy in its habits and spends a lot of its time amongst the plants. Living, as it mostly does, on the base of the aquarium, it is well camouflaged when at rest on the gravel, but it often makes trips out into the more open areas of the tank, in search of its favourite types of *algae*. It spends most of its time hunting for these lower forms of plant life and will sometimes swim up the glass sides and front of the tank, rasping off any algal growths. Its searches often lead it on to the leaves of the higher plants, but I have never seen it damage any of these plants. Although primarily a vegetarian, I have sometimes seen the fish nibbling at flaked food, or freeze dried foods, which have found their way down to the surface of the gravel. The fish usually makes a speedy retreat into the plants if one makes sudden

Continued on page 397

THE CHAMELEON

Junior Aquarist

(If you have tears, prepare to shed them now)

By Jennifer Aistrop
(age 14 yrs.)

He's SITTING on a small piece of geranium stalk at the moment, with his tail wound lovingly around a lower piece of it. Occasionally he heaves a deep sigh, showing very frail ribs. A friend of Daddy's brought the tiny creature to me, and said he had a ten-to-one chance of survival. I try to make myself believe that I'll be lucky.

He really is the most adorable thing, though. His little face is permanently crumpled up into a heart-rending sad expression. The bulbous eyes that viewed the world for the first time yesterday are closed most of the time. When they open, glittering black balls dart in every direction. He (or is it "she"?) really does look comical with one eye gazing at the scenery ahead, while the other looks at objects behind.

Although only an inch and a quarter from nose to tail, he is a miniature replica of a fully-grown chameleon. If I put my finger near him, he climbs trustingly aboard, and, after a few piercing glances round, settles down and goes to sleep. I am supposed to be doing my homework and washing my hair—but I can only sit and stare at the enchanting reptile before me. He won't eat, and sometimes his stomach stops moving up and down: I have to reassure myself that he is still with us. It's funny how a diminutive day-old animal can change the day's events so drastically. I try not to think of what surely must happen. Reluctantly I bring out my geography book.

A goldfish bowl with a woolly vest wrapped round it for warmth served as his night quarters. I put a small begonia in the bowl, and he climbed gratefully up its hairy leaves.

* * *



I can't fool myself any longer—he's getting steadily worse, and there's nothing I can do about it.

* * *

Now that he's dead I don't seem to care anymore. He opened his mouth and didn't close it again. On Sunday, December 14th, 1969, a tiny creature died as lots of living things do—of age: the only difference being that he was too young.

BRITISH MARINE *Algae*

By Huw Collingbourne

SEAWEEDS are highly developed marine algae. These plants do not have roots but holdfasts, with which they are secured to rocks or other firm objects. No nourishment is taken through these clasping structures, their sole function being to hold the plant on to a solid base.

In rock pools which are constantly submersed in seawater and are exposed to strong sunlight we find green algae. In ideal conditions good growths of *Ulva*, the Sea Lettuce and *Enteromorpha*, one of two common weeds called Sea Grass, will be abundant.

Emerald groves of Sea Lettuce move and curve with the flow of the cool salt water. Among their translucent leaves hide darting prawns, well hidden by the bright green fronds.

The Sea Grass drapes the rocks with colour. Longer and less broad than Sea Lettuce and yet holding a quality of movement and of life not found in other plants.

Red algae are delicate like the green species, but because they need less light than the green plants,

which must manufacture much chlorophyll, they live mainly in shaded places. Like the green plants the red varieties grow in always full pools in which they are never exposed to the drying air.

The two most common red shore weeds are *Ceramium rubrum* and *Corallina officinalis*, neither having universally accepted names other than the scientific classification. *Corallina* is a handsome light red plant. It grows mainly on chalky rocks because it needs to extract from the water calcium which it then stores in the form of a lovely coral-like secretion which hardens in the plant making it brittle but sturdy. *Ceramium*, on the other hand, is a fine and extremely delicate ruby-coloured algae. The formation is wonderfully intricate and fine, making *Ceramium* one of the most attractive and beautiful of all aquatic plants.

The brown weeds are extremely hardy and, unlike the other colour varieties, do not bruise easily. Some species, like the immense thong weeds, grow in deep water but the smaller varieties found on the shore can tolerate temporary exposure to the air. A few species, in fact, will not grow well if constantly immersed. Most brown seaweeds have a wide range of tolerance to varying light intensities and will thrive in conditions from semi-darkness to bright sunlight.

The Bladder Wrack, *Fucus vesiculosus* and Spiral

Wrack, *Fucus spiralis*, are representative of the brown algal varieties common to tidal pools. These brown plants take hold on pieces of driftwood and pebbles as well as on large rock formations.

The two brown seaweeds referred to have irregular, bumpy packets at the ends of some of the fronds. These are the reproductive organs or conceptacles. In Bladder Wrack the conceptacles are of separate sexes, that is, each is either male or female. In Spiral Wrack the conceptacles are not separate but are male and female.

* * * *

Most green and red seaweeds grow well in coldwater aquaria and Sea Grass and Sea Lettuce can be acclimatised to tropical sea water, though in warm water they do not grow well.

Corallina should be kept in alkaline water with a high lime content. The best way to achieve this is to add lime water if the acidity of the aquarium water increases.

Ulva and *Enteromorpha* are both very easy to cultivate in small sea aquariums and if natural sea water is used spontaneous growths sometimes occur. It is not a good idea, however, to try to maintain brown plants in aquaria as most of these, although hardy, need special conditions supplied by tidal movement.

From left to right

Enteromorpha compressa, *Ulva lactuca*,
Ceramium rubrum, *Corallina officinalis*,
Fucus spiralis, *Fucus vesiculosus*



British Freshwater Fishes

THE STICKLEBACK

By A. Boarder



Confrontation between male Smooth Newt and Three-spined Stickleback

THERE ARE two different species of Stickleback found in this country but some variations may be found in these according to their locality. The two species are the Three-spined Stickleback (*Gasterosteus aculeatus*), and the Ten-spined Stickleback (*Gasterosteus pungitius*). There is a species found in salt water, the Fifteen-spined Stickleback (*Gasterosteus spinachia*).

The Three-spined Stickleback is so common in most waters in this country that there is no need to go into fine descriptions of it. No normal person could mistake this little fish and few youngsters will not have had the opportunity of catching a few of them. They are known by various local names and no doubt thousands have died through having been caught and placed in a jam jar. I would go so far as to say that not one in five hundred of these little fish ever lives six months after capture. Yet they are one of the most interesting fishes we have. The fact that they are nest builders

makes them so very fascinating and anyone who takes the trouble to set up a fair-sized tank with at least one male and a couple of females in early spring, can get a great amount of satisfaction and interest from watching the nest building, laying of eggs and rearing of the fry.

The three-spined fish rarely exceeds 3½ in., and the ten-spined 2½ in. The fifteen-spined can reach 7 in., but this fish does not seem to be very common round our coasts. The food of the freshwater species consists of tiny live foods and some soft vegetation. In captivity these fish will take most types of food as fed to goldfish, but of course this must be reduced to a reasonable size. In the wild *Daphnia*, *Tubifex*, blood worms, mosquito larvae and small water shrimps are taken.

In the spring the fish take on a brighter colour with a bright red belly. The male makes a nest of pieces of water weed which he sticks together with a secretion

reputed to be from the kidneys. After the nest is made the male entices a female into the nest to lay her eggs. These are then fertilised by the male who continues to guard them. He fans them to encourage a good flow of fresh water over them. They hatch in from ten days to a fortnight but no definite time can be given as the hatching depends mainly on the temperature of the water. Warmer water brings a quicker hatch as it does with most fish eggs. The male continues to guard the fry when they hatch and also for a time when they leave the nest. Once the females have laid their eggs the male has no further use for them. They are chased away and if one is breeding them in a tank it is as well to remove them and leave the male in sole charge.

These little fish can be very pugnacious and so they

are not really suitable for a tank containing other small species. Small shoals of young fish may be seen in late spring and early summer and the Sticklebacks will continue in a shoal for some time before going their own ways. One would imagine that their fierce spines would be a protection from carnivorous fishes but this is not so. Perch will take them readily and I have opened the stomach of Perch and on occasions found at least a dozen Sticklebacks inside.

As the Sticklebacks can be found in both still and running waters it is recommended to use fish from still water for keeping in a tank as otherwise an aerator may be necessary to keep the fish in good condition. Also more than one male should not be chosen to prevent not only sparring but also to ensure that the male is undisturbed when brooding the eggs and fry.

WHAT IS YOUR OPINION?

continued from page 390

My favourites are the smaller species such as guppies, harlequins, neons, cardinals, glowlights and the smaller pencil fishes. Photograph *D* shows the harlequin, one of the most peaceful and undemanding of the smaller fishes. A group of harlequins kept on their own in a smallish tank which is planted with Indian fern, is a sight which is hard to beat; but I suppose that the larger fish do have the attraction of having some sort of individual "personality". What do other readers think?

Now for some further topics on which I would be pleased to have your opinions for the next edition (including the questions posed in the body of the

text). (a) Which is your favourite characin, and why? (b) Have you ever bred any of the characins? (Details please.) (c) Which aquarium plants do you find most difficult (or impossible) to grow, in a given aquarium? (d) Have you found that a good circulation of water in an aquarium encourages plant growth? (e) Which live food do your fishes appear to like best? (f) What have been your experiences with the use of ozone in connection with aquarium care? (g) Have you noticed any advantages in using rain water to top up aquaria? (h) Do you prefer to feed your fish on granular or flake fish foods, and why? I look forward to receiving your opinion.

A CURE FOR *Algae*

continued from page 393

movements at or around the aquarium but, as the species seems to be inquisitive, it soon returns to investigate what is happening. None of my fish has ever made any attacks on other fish species with which it shares its tank.

This interesting fish does an excellent job of keeping down algal growths in aquaria. Most of its life seems to be spent in searching for its favourite foods. Young specimens cost only a few shillings and are a very good investment for those who do not like *algae* to get out of hand.

In a former issue, in my W.I.Y.O.? column, I asked for nominations for the hardest fish to net. *Gyrinocheilus aymonieri* came top of the poll. There are few other fish which can move from a static condition with such speed, and one can easily spend hours, with a net, hunting a single fish around a well-planted aquarium. The energy—and cunning—of this fish often out-lasts the patience of the aquarist. At least it does, in my case! I have not yet read any reports of anyone having bred the species in the aquarium.

OUR EXPERTS' ANSWERS TO YOUR QUERIES



READERS' SERVICE

All queries **MUST** be accompanied by a stamped addressed envelope.

Letters should be addressed to Readers' Service, The Aquarist & Pondkeeper, The Butts, Brentford, Middlesex.

TROPICAL QUERIES

By Jack Hems

I should like to know where I could obtain some pieces of coloured quartz or prettily veined non-toxic stone to use as a decorative feature in my tropical tank?

As you live in London, I suggest you pay a visit to Gemrocks Limited, 7/8 Holborn, E.C.1. This firm has a huge array of fine minerals on display in its showroom, and the more ordinary kinds are quite reasonably priced.

Please give me some advice on the care and breeding of *Poecilia velifera*.

A two- or three-foot tank makes a suitable home for a pair or trio of this species. It should be filled with ordinary tapwater (preferably on the hard and alkaline side) to which about a teaspoonful of sea-salt per gallon has been added. A well-balanced dried food plus some greenfood such as duckweed or minced lettuce should be given in small amounts several times daily. A temperature range of from about 72°F (22°C) to 78°F (26°C) is advised. When a female becomes pregnant, a condition which results in a bloated abdomen, disturb her as little as possible. Providing the parent fish are properly fed and there are lots of cover plants at the surface, the fry need not be moved from the aquarium.

What are the effects of undergravel filtration on plant life?

In the long-term bad: unless, of course, the roots of the plants are anchored in pans or pots of good aquarium compost isolated from the normal bottom covering. For one of the results of a really efficient

undergravel system of filtration is the draining away of nourishment from the roots of plants.

Would young *Cichlasoma severum* and *Geophagus jurupari* get on well together in a 3 ft. aquarium already stocked with tin-foil barbbs?

Both these cichlids are quite mild-mannered, except when past medium-size and intent on raising a family. I feel confident that your young cichlids will not do any harm to one another or to the barbbs.

I am thinking of purchasing a pair of Siamese fighting fish. How can I tell the sexes apart, and can I be certain they will breed?

The sexes of the Siamese fighting fish are easily told apart; for whereas the male has brilliant colours and large fins, the female is quite short-finned, podgy, and drab. I think it is safe to say that, given the right conditions, mating is never very long delayed. But after eggs have been laid and the fry have hatched out the rest is entirely up to you. Our booklet entitled *The Fighting Fish of Siam* should interest you. It can be obtained from this office for 4s. post paid.

Can you suggest a way to prevent rapid loss of heat from a tropical aquarium?

Polystyrene ceiling tiles, three layers thick, stuck to the outside back, ends and bottom of an electrically heated aquarium, will prevent rapid loss of heat. In point of fact, a 36 in. by 15 in. by 15 in. tank, lagged as above, will not lose more than a couple of degrees (°F) if heat during a power cut lasting some three or four hours.

Can you give me some information regarding maximum size, disposition, and country of origin of *Aequidens potaroensis*?

This species attains a length of about 4 in. and is not aggressive in its smaller sizes. It is native to British Guiana.

What can you tell me about a piranha called *Serrasalmus brandtii*?

Not very much, though I was interested in some large specimens I saw in a dealer's shop in Leicester a few weeks ago. According to that invaluable reference work called *Exotic Tropical Fishes* (loose-leaf edition), *S. brandtii* has less muscular jaws and smaller teeth than its congeners and is therefore less of an underwater terror. Dr. George Sprague Myers, distinguished American ichthyologist, has written that it is one of the so-called innocuous species. The ones I saw looked exactly like the illustration in the TFH publication, that is to say greenish olive to greenish grey overlaid with a silvery sheen and suffused with some yellowish red in the pectoral, ventral, anal and tail fins. The dorsal fin is dark grey to black.

Is *Barbus oligolepis* a suitable fish to introduce into a community tank?

The checker barb, to give this species its popular name, is a well-behaved fish quite suited to living with other small species in a community tank.

What is the temperature range of *Rivulus hartii* and is this fish a ready breeder?

R. hartii will stand a temperature from the middle sixties to the eighties (°F) without ill effect. But the best all-round temperature is about 75°F (24°C). The species is a ready and prolific breeder.

Tubifex worms have established themselves in a corner of my tropical aquarium. How can I get rid of them?

A couple of corydoras catfish such as *C. paleatus* or *C. aeneus* would soon wrinkle them out. Another course of action would be to remove all the compost in the worm-infested corner and replace it with fresh.



Corydoras paleatus

The rubber bung of my aquarium heater has become slightly porous and I should be grateful for any advice you can give me as to a method of rendering it absolutely watertight.

Remove the heater from the aquarium (switch off the current first) and dry the top. Then spread a thin layer of silicone rubber sealant over the bung. This will make it perfectly watertight.

GOLDWATER QUERIES

By A. Boarder

Last winter I kept a hole open in my pond when it froze by removing the sprinkler from my fountain and lowering the nozzle four inches under the ice. This kept up a flow of water which prevented a patch from freezing over and supplied oxygen. What do you think of this idea?

The idea is quite a good one for anyone who has a fountain to operate. Some years ago a pond-keeper wrote about using a fairly strong aerator under the water. This brought up water from lower down

in the pond. The water at the bottom of a pond which has ice on top is of a slightly higher temperature than that at the surface. This warmer water keeps a hole open above the aerator.

We have a pond 3 ft. 6 in. by 2 ft. 6 in. and 12 in. deep. Although we have water plants in it the water is always green. Why is this?

The pond is very small and it is always far more difficult to keep the water clear in such a pond. The green is caused by algae which thrives in water

exposed to the light. The formation of the Algae can also be hastened by the presence of any decaying uneaten fish food in the water. Once the water plants grow more strongly they will choke out much of the Algae which also usually disappears once the water gets very cold in the winter. A covering of the surface with Duck weed will often help to clear the water, when most of it can be cleared off.

I am setting up an indoor fish pool and would be grateful for some advice about water lilies. Can you help please?

I do not know if the pool will be in a room of the house or in a conservatory. To be able to grow water lilies well it is essential that plenty of light is available. You will no doubt have to keep to the small growing types of lily which can be had under the name of *Nymphaea pygmaea*. Several colours are available. A good white one is *N. pygmaea alba*, and a yellow one is *N. pygmaea helvola*. The lilies can be set in plastic containers but unless they can get plenty of sunlight it is not likely that they will flower well. They can grow in less than 12 in. of water.

I would like to start a coldwater aquarium but am unable to find much literature on the subject, especially on types of plants and fishes. Can you suggest any titles of useful books please?

Get the book "Coldwater Fishkeeping", from this office at 6s. post paid. This was specially written on the very subjects you require information on. If, after reading this book, any further information which may be needed will be given on application.

I have one or two goldfish in my pond which show a kind of whiteness all over their bodies. This does not come away like fungus. What is this and can I treat the whole pond to cure the fish as I shall have a job to catch them?

The trouble with the fish is a form fungus known as Oodinium. This can be cured with the usual sea salt bath, but you are not likely to have much success by treating the whole pond. Some pond-keepers add sea salt to their ponds but it is always a tricky job as salt will remain in the pond and if too much is introduced it can do more harm than good. It is not easy to recommend any amounts to add as the amount of water is difficult to estimate in most garden ponds and the presence of water plants can affect the amount necessary. I do not like recommending adding salt for this reason and advise that the fish are caught for treatment separately; after all, if one of your family was ill and needed medicine you would not dose the whole family.

I have just lost three goldfish from my tank, 36 x 12 x 15 in., fitted with a filter. The fish

seem to blow up then gasp at the surface before dying. I feed with a good flake food and Tubifex every day. Why did the fish die?

The fish appear to have been suffering from Dropsy. Fish so affected blow up as you suggest and their scales stand out from their bodies. Once a fish is badly affected I do not hold out much hope of a cure. I suspect that the disease from which the fish died was brought into your tank with the Tubifex. These creatures live in filth and can bring trouble. It will be far safer if you stick to the flake food and for live food use garden worms or white worms as these do not live in water and so cannot bring in water-living pests and diseases.

We had three goldfish for about nine months and then bought a larger tank. Since then we have lost all of them. Can you give any reason why the fish died?

It is difficult to pin-point the cause of the death of the fish. There are several reasons for this but without further information it will only be conjecture on my part to suggest the cause of death. First of all let me emphasise that goldfish do not die for no reason but there must have been something wrong with the conditions. A tank when first set up should be allowed to mature for a week or so so that the water plants can get established and the water mellow. Once the fish are introduced the feeding is the next problem. More fish die in tanks through over-feeding than from any other cause. However, let me get this straight, it is not that the goldfish will over-feed but that if too much food is given any which is left uneaten will soon upset the balance of the water and the fish will be in trouble. Once a little food remains uneaten it starts to decay and pollutes the water. Unless the water is in good condition the fish cannot eat at their maximum. Therefore when more food is given this also decays and matters go from bad to worse. Goldfish do not need to be continuously eating and if left without artificial feeding for at least one day a week they will be all the better for it. When no dried food is offered the fish will suck over the water plants removing all the soft Algae which usually grows there. This is good for them and also for the plants and tank can look much fresher after artificial feeding has been stopped for a few days. Food should never be given unless the fish go for a little immediately it is offered. Healthy fish are hungry ones and it is better to keep them that way. I never knew a goldfish in a well planted tank die from not being artificially fed. I have found goldfish in tanks which I thought were free of fish after months of neglect when they have had no food from me at all, and yet they are in perfect health.

A variety of Koi showing large scales along the lateral line, a characteristic of the Mirror Carp



I am in some doubt as to what the fish known and sold under the name of Koi really are. There seems to be some confusion as to their origin?

The Japanese appear to be reluctant to tell the world the origin of the Koi carp. Many people are of the opinion that they are a result of selection from Higo. It seems that the word Koi or Goi means good and Higo means very good. Perhaps if we consider the Koi to be just a variety of the carp we shall at least be somewhere near the mark. When one considers the remarkable types of fish which have been developed from the common goldfish there is little reason for surprise at the colours of the Koi fish. Compare the shapes of the common goldfish with the moor, the oranda and the bubble-eye and it is not hard to imagine that the Koi carp can have been chosen from among some of the extraordinary shapes which will often appear even in well established strains. It is then possible to breed from these for further selections to get something very odd. I often find freaks in my own strain. I have often had young fantails with a single top to the tail and a double bottom but this year I have noticed one or two with a double top and a single lower lobe. No doubt if bred from I might get some remarkable variations, but space does not allow me to make such experiments.

I would be grateful if you can tell me when feedings of pond fish should stop for the winter? I have been told that they do not feed during the winter but not when to stop?

One cannot give any date when feeding of fish in the pond should stop. A lot depends on the weather and the temperature of the water. I find that my fantail goldfish in the open pond will eat

garden worms even when there is a layer of ice on the pond. Not that I recommend feeding when the water is so cold, as although goldfish will take the food at such times they take a long time to digest their food then and so need less. The safest method to adopt is to lessen the amounts and frequency of feeding as the water cools down. During the winter there is usually a mild spell or two when a little food can be given. The amount to be offered will depend on the size of the pond, the number and sizes of the fish and the temperature of the water. The colder it is the less food is to be given.

My goldfish in a set-up tank were all right for a long time but when I cleaned the tank right out and put the fish back they appeared to be in trouble. Why could this be?

There should not be any reason for changing the water in a furnished tank, not in a number of years. If everything is done according to the rules then all that is needed is a weekly servicing of the tank when a portion of the water is removed by siphoning up some of the mulm and fresh water is added. It is quite possible that the water you used was fresh from the tap. This could have been heavily chlorinated and such water can be fatal to fishes of the Carp family. It was noticeable that during the strike of sewage workers the tap water was heavily impregnated and it was possible to smell this quite strongly when the tap was turned on. If a part of the water for a tank is added straight from the tap, the concentration of chlorine is weakened by the older water in the tank. If a whole tank of fresh tap water is to be used then it is imperative that it is allowed to stand for sometime so that some of the chlorine can escape. Swishing the water about helps to disperse the chemical and the water is then safer.



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.

THE Bristol Tropical Fish Club marked the end of a highly successful season at the annual general meeting during which the following officers were elected. Life President, L. Littleton; Hon. Chairman, W. Holland; Hon. Secretary, F. Shorland; Assistant Hon. Secretary, C. McGrath; Hon. Treasurer, R. Toogre; Reporting Secretary, R. Chapman; Programme Officer, K. Gale; Librarian, P. Chapman; Auditors, E. Newan and F. Taylor. Award winners for the 1970 Table Shows were: Open Section (Ridder Cup), G. Furber; Novice Section Medal, R. K. Day.

This year's Open Show proved once again to be extremely popular and a committee has been formed to plan and arrange details for 1971. The Show Secretary is E. Newman, 71 Somerdale Avenue, Knowle, Bristol 4, and further details will be announced as soon as possible.

At the December meeting the Club were very fortunate in obtaining Mr. Amery of the Bristol Avon River Board as the month's speaker. His topic was pollution and its effects on fish life which was extremely well received by the members present. The addition of a short slide show on the reading of fish scales added greatly to the interest of the lecture. An invitation is extended to visitors or new members who are assured of a warm welcome at the monthly meetings held on the third Thursday of each month at the National Dock Labour Board Social Club, Welsh Back, Bristol, commencing at 7.45 p.m. Alternatively please contact F. Shorland, Hon. Secretary, 4 Fernbank Road, Redland, Bristol, for details.

At the December meeting of the **Tonbridge and District A.S.** a "bring and buy" sale was arranged for the members who attended. The results of the table show were as follows: Swordtails: 1 and 2, I. Matheson. Siamese Fighters: 1 and 3, I. Matheson; 2, R. Baker. A.O.S. Labyrinth: 1, Mrs. I. Bellingham; 2, R. Taylor; 3, Mrs. A. Calvert.

OFFICIALS elected at the December annual general meeting of the **Bedworth Aquarist and Pool Society** were as follows: Chairman, K. Upton; Vice-Chairman, M. H. Carter; Secretary, R. Tedds, 56 Joseph Lockna Road, Collycroft, Bedworth; Show Secretary, K. Edkins; Assistant Show Secretary, T. Pagett; Treasurer, L. Henton; Librarian, L. Pratt; Press Officer/News Letter Editor, M. H. Carter.

ALTHOUGH weather conditions were not good there were 42 members present at **Wednesbury and District A.S.** December club night for the Cichlid Table Show. The results were as follows: Class A: 1, A. Mawby (P.Kribensis); 2, A. Mawby (P. Annectors); 3, T. Wood (P. Goentheri). Class B: 1, Master A. Healey (Brown Acara); 2, K. Walker (Blue Acara); 3, R. Groves (Jewel Cichlid). A.O.V. Novice: 1, Hickman-Ward (D. Noboli); 2, R. Groves (Albino Sword); 3, Hickman-Ward (Red Fin Shark). Best Fish in Show went to A. Mawby's Kribensis which was awarded a gold star by A. P. Bolton, the judge for the evening.

While the fish were being judged a quiz was held on the recognition of fish, the winner being Master A. Dawes and second Mrs. Feyer.

At the annual Christmas dinner the chairman presented the award winners of the year with their trophies. The Chairman's Cup was

presented to R. Dawes for his consistent hard work for the Club. The E. Hyde Cup went to H. Heaven and the W. Devison Cup to Linney-Groves. A. Class: 1, T. January; 2, A. Mawby; 3, W. Tyson. B. Class Novice: 1, Linney-Groves; 2, A. Dawes; 3, G. Wardle. A.O.V. Novice: 1, A. Dawes; 2, L. Duckers; 3, Linney-Groves. The Egglayers Trophy was won by G. Wardle and Livebearers, Linney-Groves.

THE December meeting of the Yate and District A.S. was a purely social occasion well in keeping with the seasonal activities. The table show prizes for 1970 were also awarded. The results were: Open Class: 1, S. Green; 2, J. Powell; 3, A. Snell. Novice Class: 1, R. Waters; 2, R. Bennett; 3, C. Webber. Junior Class: 1, B. Waters; 2, S. Green; 3, H. Adams. Champion - Junior: B. Waters. Champion Exhibitor: D. Noble.

THE Boreham Wood A.S. recently held an inter-club table show against Hemel Hempstead A.S. in the Children's League. Boreham Wood won the event, including Best Fish in Show, a Kribensis entered by R. Biggerstaff. Other classes were Anabantids, Molles and Loaches. During the evening the members enjoyed a lecture and slide show, presented by C. Withers of Mid-Herts A.S. Anyone interested in becoming a member of the Boreham Wood Club, see welcome to come along to the meetings held at the Community Centre, Alham Lane, Boreham Wood, on the second and fourth Monday of each month at 8 p.m., or telephone 01-953 8302 for further details.

THE first meeting of the Morecambe Bay A.S. was held in December, and was well attended. A committee was elected, and an interesting and enjoyable meeting followed. It was decided that the Club should meet fortnightly and should become active in competitions. The Secretary is Mrs. A. Drye, 19 Park Street, Bare, Morecambe.

AN interesting talk and film show was given at the December meeting of the **Aberdeen A.S.** by Mr. Cooper, a former Federation member. He showed some good cine films and also slides and both films and slides had a taped commentary which made the commentary all the more interesting.

While the films were being shown the monthly table show was judged in another room. The number of entries was very poor and not encouraging.

At the February meeting it is hoped that there will be a much larger number of entries for the table show. There will be three classes for pair Gouramis, single angel and single fish, any variety, including cold water.

At the annual general meeting of **Swillington A.S.** the following officers were elected. President, G. Binks; Treasurer, R. Stringer; Secretary, P. D. Hines, 19 Gary Manor Drive, Leeds 17; Show Secretary, P. Reynolds; Committee members, R. Hinkon, C. Gascoigne, D. Stoad, A. Crowther and H. Crowther. Results of the fourth quarterly members' show were as follows: Furnished Jars: 1, 2 and 3, P. Reynolds. Pairs (Egglayers): 1, C. Gascoigne; 2 and 3, M. M. and A. Crowther. Pairs (Livebearers): 1, M. M. and A. Crowther; 2, H.

Wimble; 3, Mrs. E. Reynolds. Carps and Minnows: 1 and 2, L. Longfellow. A.O.V.: 1 and 3, P. Reynolds; 2, R. Hinkon.

Hemel Hempstead A.S. now have the first edition of their magazine finished. A lecture on Angel Fish was given by Mr. Jeffs recently.

Two table shows have also been held. The Secretary is D. Tremwith, 51 Woolmer Drive, Hemel Hempstead, Herts.

At the annual general meeting of the **G.K.N. Pond and Aquarium Society** the following were elected to serve on the committee: President, T. Lowe; Vice-Presidents, E. Hyde, H. Fellows, R. Cook, Mrs. L. Whittington, N. Sears; Chairman, P. Bolton; Vice-Chairman, D. Horton; Hon. Secretary, A. Hoare; Treasurer, J. Taylor; Show Secretary, K. Rowley; Newsletter Editor, A. Hall; Junior Member and Librarian, A. Rowley; Committee Members, Mrs. A. Taylor, V. Yarnall, S. Aston; Publicity Officer, A. J. Wright. The Club was congratulated on a particularly successful season by the President, highlights of which included the Paul Stokes-Harry Williams Memorial Show, and the Open Convention for M.A.A.S.

A LECTURE was given on general fish breeding by David Soper at the last meeting of the year of the **Mid-Sussex A.S.** He said whichever type of fish was being bred they should be kept in good condition and fed on nutritional foods before even contemplating setting up a breeding tank for them. Also cleanliness is very important, not only before breeding but when the fry had hatched. The best food for most fry after a couple of days of being fed on infusoria is normally brine shrimp hatched in salt water. Mr. Soper suggested different ways that some of the many species could be bred. As some fish lay eggs and some have live fry, the conditions required varied quite considerably from genus to genus. Indeed, egg-laying fish varied widely in their requirements and in their methods of courtship and spawning. Mr. Soper said he felt that one of the most interesting aspects of fishkeeping was being able to breed and grow on one's own fish, and that by starting with the "easier" varieties, results would soon be forthcoming. Both Mr. Soper and C. West, the Society's Treasurer, have now been accepted as Class "B" judges by the Federation of British Aquarist Societies.

THE second open show results of the Horsforth A.S. were as follows: A.O.V. Livebearers: 1, P. Reynolds (Swillington); 2, S. Hall (Aireborough); 3, D. Sharp (Castleford). Guppies: 1, M. Sullivan (Four Star); 2, D. Sharp (Castleford); 3, E. Cobb (Belle Vue). Guppies: 1, Mrs. Heap (Belle Vue); 2, Mrs. D. Pail (Horsforth); 3, J. Hartley (Aireborough). Swordtails: 1, R. Gibson (Buddersfield); 2, M. Dwyer (Aireborough); 3, G. Thickbroom (Castleford). Platys: 1, L. Hepinstal (Castleford); 2, R. Clark (Sherwood); 3, Mrs. M. Cobb (Belle Vue). Anabantids (small): 1, H. Lees (Oldham); 2, R. Wood (Four Star); 3, A. S. Allison (York). Anabantids (large): 1 and 2, A. E. Heap (Keighley); 3, C. Corra (Horsforth). Fighters (self): 1 and 2, J. Rhodes (Scunthorpe); 3, Mr. and Mrs. Cohen (Castleford). Fighters (multi): 1, S. Pogson (Scunthorpe); 2, Mr. and Mrs. Cohen (Castleford); 3, J. Rhodes (Scunthorpe). Cory-cats: 1, A. Baldwin (Nelson); 2, R. Davies (Belle Vue); 3, Mrs. Cohen (Castleford). A.O.V. Cats: Miss J. Helm (Horsforth); 2, Mr. Shillam (Keighley); 3, A. S. Allison (York). A.V. Loach: 1, L. Hepinstal (Castle-

holamid A FRACTION A DAY, KEEPS ALGAE AWAY
Hillside Aquatics London N12

ford); 2, Mr. and Mrs. Zametias (Bradford); 3, D. Cleary (Aireborough); Barbs (up to Ross): 1, Mr. and Mrs. Zametias (Bradford); 2, G. Thickbroom; 3, Mrs. Cohen (Castleford); Barbs (large): 1, Mrs. Cohen (Castleford); 2, Mr. Wade (Aireborough); 3, K. Freer (Castleford). Characins (up to Bleeding Heart): 1, Mr. Bowles (Aireborough); 2, Master Johnson (Aireborough); 3, Mr. Tongue (Gidham). Characins (large): 1, G. Thickbroom (Castleford); 2, D. Kennedy (Bradford); 3, T. Walton (Wakefield). Breeders (Baglayers): 1, Mrs. Geer (Keighley); 2, Mrs. Wells (Doncaster); 3, S. Poyson (Scunthorpe). Breeders (Livebearers): 1, Mr. and Mrs. Cohen (Castleford); 2, J. Brearly (Belle Vue); 3, C. Ward (Doncaster). Cichlids (dwarf): 1, I. Hepinstall (Castleford); 2, A. Hudson (Huddersfield); 3, McKenna (Nelson). Cichlids (large): 1, Mrs. M. Davis (Belle Vue); 2, T. Walton (Wakefield); 3, S. Harrison (Huddersfield). Angelfish: 1, A. Hudson (Huddersfield); 2, R. Gibson (Huddersfield); 3, H. and R. McKenna (Nelson). Pairs (Baglayers): 1, Mrs. Hoop (Belle Vue); 2, Mrs. Cobb (Belle Vue); 3, Miss J. Helm (Horsforth). Pairs (Livebearers): 1, R. Gibson (Huddersfield); 2, B. Meppon (Aireborough); 3, H. Khan (Lincoln). A.O.V.: 1, D. Kennedy (Bradford); 2, I. Hepinstall (Castleford); 3, H. Whitelock (Tadcaster). Sharks and Flying Foxes: 1, Mr. and Mrs. Ashon (Middleton); 2, A. Hudson (Huddersfield); 3, D. Kennedy (Bradford). Rasbora and Danios: 1, D. Kennedy (Bradford); 2, I. Hepinstall (Castleford); 3, R. Clark (Sheffwood). Toothcarps: 1, Mr. Malpas (Independent); 2, Mrs. Geer (Keighley); 3, M. and A. Crowther (Swillington). Carps and Minnows: 1, M. Tongue (Oldham); 2, M. Stevenson (York); 3, R. Senior (Sheffield). A.V. Fancy Goldfish: 1, G. Thickbroom (Castleford); 2, S. Hall (Aireborough); 3, Master A. Kaye (Top Ten). A.O.V. Cold Water: 1, Mrs. Miller (Belle Vue); 2, Mrs. Cobb (Belle Vue); 3, Mr. Miller (Belle Vue). Goldfish: 1, Mrs. M. Cobb (Belle Vue); 2, J. L. Sullivan (Four Star); 3, S. Hall (Aireborough). A.V. Tropical: 1, Master F. Cobb (Belle Vue); 2, Master G. Thickbroom (Castleford); 3, Master A. Kaye (Top Ten). Junior's Cold Water: 1 and 3, Master A. Kaye (Top Ten); 2, Master P. Ashon (Middleton). Best Exhibit in Show: Shown by Mr. Malpas (Independent). Lady with the highest number of points: Mrs. Geer (Keighley), 79 points. Highest pointed Society winning plaques for the year: Castleford, 39 points; 2, Belle Vue, 29 points; 3, Aireborough 18 points; 4, Huddersfield 16 points; 5, Bradford 14 points; 6, Keighley 12 points; 7, Scunthorpe 10 points.

The following officers were elected at the **Hendon and District A.S.** annual general meeting which was held recently. Chairman, H. White; Vice-Chairman, K. Purbrick; Secretary, R. J. Deacon, 88 Cotswold Gardens, Hendon Way, London, N.W.2; Treasurer, H. Watts; Assistant Secretary, D. Cuel; Show Secretary, T. Glass; Assistant Show Secretary, D. Allison; Committee Members, D. Finch, B. Mould, K. Brown. Meetings are held every Thursday evening at 8 p.m. at The Brotherhood Hall, West Hendon, London, N.W.9. New members are always welcome.

A **CHARACIN** table show was the main item at the December meeting of the **Yeovil and District A.S.** This was followed by a lecture with the aid of an episcopos on the Characin family given by S. Langdon, the Society's judge. Many varieties of this large family of fish were shown and discussed. Results of table show: 1, K. Forward (Pencil Fish); 2 and 3, Mrs. Wright (Copper Tetra and Pencil Fish); 4, M. Fischer (Black Widow). The Society's annual Xmas Special Skittle evening was supported by thirty members and wives, with Mrs. Collins and Mrs. Bushell winning the evening's competition.

RECENTLY Houghton and District A.S. invited Tynemouth "Priory" Fish Club along to an inter-club fish show and supper. One member from each Club was chosen as a judge, G. Fraser (Priory) and T. Wrighton (Houghton) and there were 85 entries in 22 classes.

At the end of judging the classes, the total to each Club was eleven classes each and to decide which Club received the honours a Best Fish in Show was chosen. "Priory" won with G. Lothian's Upside-down Cat.

THE ROCHAMPTON A.S. held their "Champion of Champions" competition in December. The result was as follows: 1, J. Hughes; 2, Mr. and Mrs. Hudson; 3, Mr. and Mrs. Lambourne; 4, J. Waller. At the final meeting in 1970 the "Champion of Champions" shield was presented to Mr. Hughes along with his gold medalion. Silver and bronze medalions were presented to Mr. and Mrs. Hudson and Mr. and Mrs. Lambourne. Mr. Hughes was also presented with the award for Labyrinth class and R.H.K.R. plaque for the member obtaining the most points in the league. Junior member Steve Mason was presented with the "John Hughes Trophy" being the member with highest total points after all table shows for last year.

THE OFFICERS of the Federation of British Aquatic Societies for this year are as follows: Chairman, R. D. Hison; Vice-Chairman, F. C. Tomkins; General Secretary, K. J. A. Pye; Treasurer, R. Dove; Assistant General Secretary, R. G. Sherwin; Council Members, B. Baker, A. Blake, C. A. T. Brown, M. Carter, T. Glass, L. Jordan, R. C. Mills, H. Towell.

FOR THE December meeting of the **Grimby and Cleethorpes A.S.** the guest speaker was G. Dixon of Grimby. He discussed many suggestions and ways of coping with the effects of the electrical power cuts or similar failures in the future. The speaker was of the opinion that air supply was more of a problem than heat, especially in more crowded aquariums, and suggested that the portable battery-operated pump, although costly, was the best solution. Mr. Dixon then went on to discuss the topical subject of Christmas gifts for hobbyists. Apart from the various aquarium equipment, the speaker reviewed a large selection of books, which members had an opportunity of glancing through during the interval. There was an entry of 50 for the table show, which resulted as follows: Anabantids (including Fighters) 1 and 2, C. Easton; 3, D. Riek. Danios and Rasboras: 1, R. Lloyd; 2, L. Deardon; 3, C. Easton. Pairs (Baglayers): 1, C. Easton; 2, M. Jerman; 3, L. Deardon.

OVER 350 fish were benched at the **Fur and Feather Aquarium Show** in November. The Essex, North and East London Aquarists' Association organised the aquaria section of the show. The results were as follows: Inter-Club Furnished Aquaria (tropical): 1, 2 and 3, Walthamstow; 4, Tottenham. Inter-Club Furnished (Coldwater): 1 and 3, Tottenham; 2, Walthamstow; 4, Thurrock. Individual Furnished: 1, K. Appleyard (Thurrock); 2, A. Pansel (Chingford). Barbs: 1, S. Cowell (Bethnal Green); 2, R. Bowes (Independent); 3, P. Arnold (Bethnal Green); 4, A. Blake (Basingstoke). Characins: 1, G. Marm (Bethnal Green); 2, B. Perry (Bethnal Green); 3, A. J. Smith (Croydon); 4, T. and J. Twine (Walthamstow). Hypheus Hemis Chlorodon: 1, S. Cowell (Bethnal Green); 2, R. Bowes (Independent); 3, P. Brindley (Bethnal Green); 4, E. Nicol (Thurrock). Cichlid: 1, J. Wilson (Catford); 2, V. Bayford (Bethnal Green); 3, P. Arnold (Bethnal Green); 4, A. Davis (Bethnal Green). Apist Pelmat Namaccara: 1, A. Blake (Basing); 2, T. Hands (Bethnal Green); 3, R. Bowes (Independent); 4, D. Reilly (Anson). Labyrinth: 1, S. Cowell (Bethnal Green); 2, E. Dilp (Independent); 3, R. Bowes (Independent); 4, P. Harrison (Chingford). Fighters: 1, Mrs. Applin (Independent); 2, J. Gower (Bethnal Green); 3, K. Appleyard (Thurrock); 4, A. White (Anson). Tooth Carps: 1, F. Kendrick (E. Dulwich); 2, T. Cusak (Hampstead); 3, A. Blake (Basing); 4, K. Owen (Catford). Tropical Catfish: 1, J. Howe (Anson); 2, F. Kendrick (E. Dulwich); 3, R. Wright (E. Dulwich); 4, S. Cowell (Bethnal Green). Corydoras Brochis: 1, D. Armour (Greenside); 2, A. J. Smith (Croydon); 3, R. Wright (E. Dulwich); 4, J. Howe (Anson). Rasbora: 1, P. Arnold (Bethnal Green); 2, A. Chandler (Walthamstow);

3, A. J. Smith (Croydon); 4, G. Martin (Bethnal Green). Danio and W.C.M.M.: 1, R. Bowes (Independent); 2, P. Brindley (Bethnal Green); 3, K. Appleyard (Thurrock); 4, Mr. and Mrs. Baulson (Walthamstow). Loach: 1, P. Arnold (Bethnal Green); 2, P. Shrimpton (Anson); 3, A. Blake (Basing); 4, D. Adams (Bethnal Green). A.O.V. Tropical Egglayer: 1, and 2, P. Arnold (Bethnal Green); 3, W. Williams (Bethnal Green); 4, A. White (Harrow). Tropical (Pairs): 1, J. Wilson (Catford); 2, S. Gosling (Enfield); 3, D. Durrant (Thurrock); 4, D. Reilly (Anson). Guppy (Male): 1, Mrs. Netherall (Riverside); 2, P. Coyle (Waltham); 3, A. J. Smith (Croydon); 4, J. Howe (Anson). Guppy (Female): 1, A. J. Smith (Croydon); 2 and 4, R. Bowes (Independent); 3, R. Green (Hampstead). Swords: 1, S. Cowell (Bethnal Green); 2 and 4, J. Twine (Walthamstow); 3, B. Mather (Walthamstow). Platies: 1, R. Bowes (Independent); 2, C. Stott (Waltham); 3, H. Johnson (Chingford); 4, D. Watts (Enfield). Mollies: 1, J. Howe (Anson); 2, J. Wilson (Catford); 3, Mrs. Applin (Independent); 4, D. Durrant (Thurrock). A.O.V. Tropical Livebearer: 1, 2 and 3, A. Blake (Basing); 4, C. Stott (Walthamstow). Breeders Tropical (Baglayers): 1, A. Chandler (Walthamstow); 2, M. Strange (Basing); 3, Mrs. Harrison (Chingford); 4, C. Stott (Walthamstow). Breeders Tropical (Livebearers): 1, D. Durrant (Thurrock); 2, C. Stott (Walthamstow); 3, F. Pimm (Chingford); 4, D. Watts (Enfield). Common Goldfish: 1, 3 and 4, Mrs. Hedger; 2, J. Hunt (Thurrock). Shubunkins: 1 and 2, D. Goodbody (Walthamstow); 3 and 4, J. Wilson (Catford). Comets: 1, K. Appleyard (Thurrock); 2, Mr. and Mrs. Woodward; 3, M. Carter (Bethnal Green). Twintails: 1, H. Johnston (Chingford); 2, H. Johnston (Chingford); 3, F. Barry (Tottenham); 4, J. Wilson (Catford). A.O.V. Coldwater: 1, Mrs. Hedger; 2, Mr. and Mrs. E. Lough; 3 and 4, M. Carter (Bethnal Green). A.V. Planes: 1, B. Mather (Walthamstow); 2 and 4, C. Stott (Walthamstow); 3, H. Johnston (Chingford). Best Tropical and Best Fish in Show: S. G. Cowell (Labyrinth Class Ctenopoma Kingsleya). Best Coldwater Fish in Show: D. Goodbody (Shubunkin Class). Inter-Club Trophy: Bethnal Green, 67 points; Walthamstow, 65 points.

A **FURTHER** increase in membership is reported by the **British Killifish Association**. At the annual general meeting members were promised four more transparencies of killifish along with their newsletters over the coming year. A new tape and slide show, covering David Blair's West African Expedition will be available to societies, thus supplementing the five tape and slide shows already in service which have been reviewed and brought up to date. Members also learned that a few fish, as yet unidentified, have been received from D. Blair's expedition. Similar to Aphyosemon cinnamomum they are at present known as K1's, T's and F's after the Kumba region of Ghana in which they were found.

It was also announced at the meeting that a general meeting is to be held in Wellington, Somerset, at the Squirrel Hotel, on the 4th April. Previous ventures of this kind have been a great success and members who can attend in addition to any newcomers will receive a warm welcome.

The Secretary of the B.K.A. for this second year of office is still W. Devison, 2 Shaw Road, Tipton, Staffs. The results of the table show held in conjunction with the annual general meeting were as follows: Top and Switch spawners (single fish): 1 and 2, R. Huey; 3, V. Probert. Soil and Peat Divers (single fish): 1, G. Waddle; 2 and 3, A. Crivil. Top and Switch spawners (pairs): 1, D. Highfield and B. Devison; 2, R. Huey.

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WITH the New Year, **Ialing and District A.S.** are looking forward to the coming season of shows and activities. The remaining fixture in the old fish year will be the Presentation Dance on the 13th February. At this function the prizes will be handed out to the winners of the Society's internal competitions held during 1970. In keeping with the Society's policy of trying new classes at shows, a class for Lake Malawi Cichlids was included at the Society's third Closed Show; this proved to be a really colourful class for the public to see.

New members are always welcome, and the Society meets every first and third Tuesday of each month at 8 p.m. at The Northfields Community Centre, Northcroft Road, W.13.

MEMBERS of the Coventry Pool and A.S. were entertained with slides of the year's events but before the slides were complete there was a power cut and so the rest of the meeting being a Christmas raffle was conducted by candle light.

THE Brighton and Southern A.S. met twice in December. At the first meeting a slide/tape lecture was the main event of the evening. The second occasion was exceptionally well attended for the Club "Fish of the Year" Show. Entries were high and the standard of the fish was well above average. The show was judged by B. Baker and the winner was F. Aylward with a beautifully turned out *Corviceps* which gained 83 points. The evening was supplemented by a lecture given by C. West (Mid-Sussex A.S.) on Rabbits. The evening was completed by the raffle and everyone who attended was given a consolation prize in surprise wrappings!

One really important factor to emerge is that from February the Club will meet at Clarges Hotel, Marine Parade, Brighton. The Club have the use of three fully carpeted rooms giving far more space and comfort and the capacity for enlarging the membership still further.

The first meeting at Clarges will be on 1st February and then fortnightly from then onwards. Plans for the coming year especially include the fuller participation by junior members in the Club activities. The Society will be pleased to hear from any junior who is interested in joining. All new members will be welcomed, and the Secretary, R. Shelton, is always available by phoning Brighton 506842, for any information required.

AT the December meeting of the **Plymouth A.S.** and for the second successive month, the general meeting and table show were combined. The main speaker of the evening was Mr. Hore of Messrs. Singleton Bros. (Electronics) Ltd., the Penryn manufacturers of aquarium equipment. Mr. Hore gave a comprehensive talk covering the development of the firm and the range of equipment manufactured. Members showed a lively interest in the samples displayed and their questions were absorbed into the main flow of the talk. Most of the samples were then kindly donated to the Club, by Singletons, for accession to the members. This not only gave members the opportunity to purchase good-quality equipment at reasonable prices but also considerably benefited the Club funds.

The table show was for "A.V. Livebearers," except guppies. Results were as follows: 1 and 2, Mrs. M. Pudner; 3, R. Bull. Because of the few entries the competition was made an open event. Mrs. Pudner, therefore, also received the certificate for the Best Fish in the Show.

THE Hounslow and District A.S. is now in its 21st year and some of the older members have seen great progress in the hobby during this time. Founder member F. Taylor and one of the earliest chairmen is still an active member. Also the Vice-Presidents, R. Luff and H. Pratt, and the Secretary, D. J. Woodward, have been with the Society since its early days. Plans for this year are well ahead and speakers have been booked to give talks and slide shows on many subjects within the hobby and table shows have been rearranged to give Danon, Rabbits and W.C.M.M. a class of their own. In the past they were included in the A.O.S. class.

At the last meeting the members were entertained by the Society's P.R.O., H. Pratt, a very experienced aquarist with a considerable knowledge of shows in the capacity of Show Secretary, his subject was "Fish and their Classes," this being aimed mainly at the beginners but it was enjoyed by all present.

Meetings are held at 8 p.m. on alternate Wednesdays at the Public Hall, Isleworth. Visitors are always welcome. Enquiries should be made to the Secretary, D. J. Woodward, 34 Uxbridge Road, Hanworth, Middlesex.

Awards presented at the annual dinner and dance were made to the following winners. Livebearers: 1, D. Love; 2, K. Brookes; 3, D. Brookes. Pairs: 1, D. Love; 2, H. Pratt; 3, Mrs. C. Walker. Cats and Loaches: 1 and 2, Mrs. R. Brewer; 3, M. Alexander. A.O.S.: 1 and 3, D. Brookes; 2, K. Brookes. Cichlids: 1, H. Pratt; 2 and 3, J. Bannion. Labyrinth: 1 and 3, H. Pratt; 2, Mrs. C. Woodward. Coldwater: 1, H. Pratt; 2, Mrs. R. Beer; 3, G. Johnston. Corydoras: 1, H. Pratt; 2 and 3, Mrs. R. Brewer. Characins: 1, K. Brookes; 2, H. Pratt; 3, W. Johnson. Barbs: 1 and 2, Mrs. C. Woodward; 3, D. Brookes. Breeders (Egg-layers): 1, D. Brookes; 2 and 3, Mrs. R. Brewer. Breeders (livebearers): C. Walker. Home Furnished Aquarium: D. Love. Breeder of the Year: L. Mathews. Best Fish of the Year: Mrs. C. Woodward. Points Shield: H. Pratt. Junior Points Shield: Master K. Brookes. Furnished Jars: Mrs. R. Brewer.

AT the end of November **Rotherham and District A.S.** held their All Winners Show, also an A.O.V. The show was judged by K. Coulson from Sheffield. Cups were awarded to W. Downing from Thryberg for most points throughout the year; also for winning the All Winners Show a plaque was given. D. Jones from Mexborough won the cup for the most entries throughout the year. He was also awarded a plaque for second place in the All Winners. The Club also had a very interesting lecture on decimals given by a Post Office official. The club meetings seem to be getting a number of new members and all are welcome to the meetings in the future. The secretary is Mrs. A. V. Harrison, 35 Osbert Road, Broom, Rotherham.

THE result of the Home Aquaria Exhibition of the **Nottingham and District A.S.** was as follows: 1, Mr. Ross, 84 points; 2, Mrs. Bulleyment, 73 points; 3, Mr. Hank, 70 points. Ladies' Cup: Mrs. Bulleyment, 73 points.

CHANGE OF VENUE

Yate and District A.S. February meeting will be held at the "Half Moon Inn," Coalpit Heath, Wednesday, 10th February. All further meetings will be held the first Monday in the month at the same address.

Lincoln and District A.S. have moved to new club rooms at The Swiss Cottage, Newlands, Lincoln. Meetings are held the third Monday each month at 7.30 p.m.

SECRETARY CHANGES

Federation of Guppy Breeders' Societies: Hon. general secretary is now J. E. Myers, 40 Charford Road, Ganning Town, London, E16 1QQ. Tel: 01-476 2919.

Grimby and Cleethorpes A.S.: L. A. Deardon, 165 Welholme Road, Grimby, Lincs.

Lincoln and District A.S.: Mr. P. Dobbs, 28 Wetherby Crescent, Lincoln.

Bristol Tropical Fish Club: Mr. P. Shoeland, 4 Fernbank Road, Redland, Bristol.

NEW SOCIETY

A new Society has been formed in Scotland and is known as the **East Kilbride Aquarium Club.** At the first meeting there was an attendance of 32. Any aquarist visiting East Kilbride will be made welcome. The Society meet on the last Monday of each month at the Kirktonholme Community Centre at 7 p.m. The Secretary is Iain Brown, 17 Bunbury Terrace, Westwood 6, East Kilbride.

AQUARIST CALENDAR 1971

28th February: Rotherham and District A.S. Second Open Show. Details from Mrs. A. V. Harrison, 35 Osbert Road, Broom, Rotherham.

14th March: Belle Vue A.S. Open Show to be held at Openshaw Boys Club, Crossley House, Ashton Old Road, Openshaw, Manchester 11.

2nd April: Thurrock Open Show at Thameside School, Arthur Street, Grays, Essex. Schedules from Show Secretary, D. C. M. Durran, 22 Kingsman Road, Stanford-le-Hope.

4th April: Houghton District A.S. Open Show. Schedules available in February from H. Leighton, 102 Abbey Drive, Sunnyside Est., Houghton-le-Spring, Durham.

4th April: Nelson A.S. Open Show, Civic Centre, Stanley Street, Nelson.

11th April: Newton Aycliffe A.S. Second Annual Show. Further details later.

17th April: Hemel Hempstead A.S. and Kodak Ltd. presentation of films on freshwater and marine aquarium fishes. The venue—Kodak Ltd., Marylands Ave., Hemel Hempstead, Herts. Tickets available from the show secretary, Alan Tuffs, 22 Fir Tree Close, Hemel Hempstead, Herts. Tel: (S.T.D.) 0442 2807. Tickets are 25p. for adults and 15p. for children under 16 years of age. Tickets are also available from the House of Fishes.

18th April: M.A.L. League Show, the Sports Centre, Granby Street, Loughborough.

18th April: Sheffield and District A.S. Open Show, The Moorsbrook Vestry Hall, Moorsbrook Park Road, Sheffield 8.

24th April: Reading and District A.S. Open Show at Brock Barracks, Oxford Road, Reading. Show Secretary, B. Grant, 20 Dover Street, Reading.

24th April: Independent A.S. First Open Show, Ilington Town Hall. Show secretary, T. Irlip, 85a Colney Hatch Lane, N.10.

25th April: Stockton on Tees A.S. Sixth Annual Show at St. Peter's & Paul's School, off Durham Road (A177), Stockton on Tees. Schedules available from Show Secretary, W. Bowman, 2 Seaton Close, Fairfield, Stockton, Teesside.

25th April: York and District A.S. Open Show. Show Secretary: P. Carey, 29 Yearsley Grove, Huntington Road, York, YO3 9XX.

25th April: Prelective Aquarist Society Open Show at All Saints' Church Hall, Surrey Square, Walsworth, London, S.E.17. Details from: Mr. J. Stamp, 72 Redman House, Boreough, London, S.E.11. Tel: 407 4066.

1st May: Trowbridge and District A. and P.S. Sixth Annual Show at Nelson Haden Girls' School, Trowbridge.

2nd May: Croxson A.S. Open Show, Stanley Hall, South Norwood Hill, S.E.25. Schedules from A. J. H. Smith, 3 Hindhead Way, Wellington, Surrey.

2nd May: Scunthorpe Museum Society Aquarist Group first Open Show. Details from V. Hardie, Hon. Secretary, 126 Baysdale Road, Abbey, Scunthorpe, Lincs.

2nd May: Dukeries A.S. third open show to be held in the Winifred Portland Technical Grammar School, Sparken Hill, Worksop, Notts. Show Secretary, Mr. M. Woodley, 56 Silverdale, Dinnington, nr. Sheffield.

9th May: Derby Regent A.S. Open Show, Sherwood Foresters Recreation Centre (Normanton Barracks), Ormsdon Park Road, Derby. (Follow R.A.C. signs.) Schedules from R. T. Bull, 36 Queens Drive, Littleover, Derby.

9th May: Worksop A. and Z.S. Open Show at the North Notts College of Further Education, Carlton Road, Worksop, Notts., the same venue as last year. Schedules available shortly on application to Show Secretary, F. G. Gibson, 17 Clinton Street, Worksop, Notts.

15th May: Uxbridge A.S. Open Show, Meadow School, Royal Lane, Hillingdon, Uxbridge. Details from N. V. Lee, 46 Airedale Road, Ialing, W5 4SD.

16th May: Merseyside A.S. Open Show.

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22nd May: Southend, Leigh and District A.S. Open Show will be held at the Liberal Hall, Clarence Road, Southend. Details from the Open Show Secretary, R. D. Orford, 8 Blenheim Chase, Leigh-on-Sea.

23rd May: Corby and District A.S. Open Show. Schedules from D. A. Page, 78 Crispin Street, Rothwell, Northants.

23rd May: Lymington A.S. First Open Show, Gregson Institute, Moor Lane, Lancaster. Schedules from Mrs. M. Norris, 70 Wyresdale Road, Lancaster.

23rd May: Coventry Pool and A.S. Open Show, Foleshill Community Centre. Details of schedules later.

29th May: Catford A.S. Open Show.
29th-30th May: The F.G.A. International Guppy Show, Glebe Farm Community Centre, Stochford, Birmingham.

30th May: Coventry Open Show, Poleshill Community Centre, Coventry.

6th June: Bishops Cleeve A.S. Second Open Show at the Tythe Barn, Bishops Cleeve on the Cheltenham to Ivesham Road (A435). Schedules from the Show Secretary, Mrs. C. F. Scriver, 27 Warden Hill Road, Cheltenham, Glos.

6th June: Bournemouth Aquarists Society. Annual Open Show will be held at Kinson Community Centre, Pelhams Park, Kinson. Show schedules and entry forms available from Show Secretary, Jack V. Jeffery, 30 Beasmar Avenue, Southbourne, Bournemouth, BH6 4JP, after 1st April.

6th June: Accrington A.S. Open Show.

6th June: Lincoln and District Open Show, Drill Hall, Beodagste, Lincoln.

12th June: Llanrwit Major A.S. Open Show at the Town Hall, Llanrwit Major. Show secretary, A. Ibberton, 84 St. Marys Ave., Barry, Glam.

13th June: Loughborough and District A.S. Open Show, The Sports Centre, Granby Street, Loughborough.

20th June: W.K.P.B.A.S. (Coleshill) Inter-society Open Show, Town Hall, Coleshill. Schedules and information from Show Secretary, R. Tromans, 27 Moschull Road, Birmingham, 34.

20th June: Swillington A.S. Open Show.

20th June: Glossop A.S. Open Show, Venue Glossop Centre, Talbot Street, Glossop, Derbyshire. Schedules from Secretary, Miss M. D. Smith, 3 Chapel Lane, Hadfield, via Hyde, Cheshire. This is an A.M.D.A.S. Show.

24th/25th/26th June: Bristol Tropical Fish Club Open Show, Congregational Church Hall, Newton Street (off Stapleton Road), Bristol 5. Details and schedules from E. Newman (Show Secretary), 71 Somerdale Avenue, Knowle, Bristol 4.

26th June: Chingford and District A.S. Open Show, Methodist Church Hall, New Road, Chingford. Show Secretary, A. Pannet, 9 Pembur Ave., Walthamstow, London, E.17.

27th June: Wednesbury and District A.S. first Open Show at Boys' High School, St. Paul's Road, Wednesbury. Schedules from T. Shipton, 9 Gloucester Road, Wednesbury.

4th July: Lytham A.S. Open Show at the Lowther Gardens Pavilion, Lytham. Show Secretary, I. Thompson, 83 Alexandra Road, St. Annes, Lancs.

9th-11th July: Aquarist and Pondkeeper Fish-keeping Exhibition, Alexandra Palace, Wood Green, London, N.22.

10th July: Port Talbot and District A.S. First Open Show. Full details to be given later.

11th July: Grantham and District A.S. second Open Show at the Guildhall, St. Peter's Hill, Grantham. Schedules available mid-March from Show Secretary M. Pattison, 8 Witham Terrace, East Street, Grantham.

15th August: North Staffs. A.S., Stoke-on-Trent third Open Show.

21st August: Weymouth and District A.S. (proposed date).

4th September: Yate and District A.S. Annual Open Show. Details to be announced.

25th September: Hounslow and District A.S. Open Show at Youth Centre, Cecil Road, Hounslow (awaiting confirmation).

26th September: Selby and District A.S. first open show, at The Museum Hall, Park Street, Selby. Further information may be obtained from Show Secretary, W. A. Bunnage, 22 Heath Croft, Fulford, York.

9th-10th October: British Aquarists' Festival, Zoological Gardens, Belle Vue, Manchester.

17th October: Sherwood A.S. Second Open Show. Show Secretary, D. Birkbeck, 173 Peter Smith Drive, New Olorton, Notts.

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