

The AQUARIST AND PONDKEEPER

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Interior of a tropical fish breeding house on a fish farm in Florida, U.S.A., now claimed to be the world's chief centre of domesticated fish culture

VOL XVIII No. 2

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Editorial

IT is sometimes said of modern times, and usually regretfully, that the spirit of adventure which prompted our forbears to undertake hazardous explorations and journeys into uncharted regions has been lost. Some say the joys of discovery can to-day only be sought in the laboratory. Others who speak in defence of modern outlook will point to the way in which speedy transport has brought what were once most inaccessible parts of the world within the unromantic confines of aeroplane timetables, and ask where is it possible for the would-be explorer of the kind who was our hero of childhood book-reading to find new fields to conquer.

They are easily answered. The Kon-Tiki adventurers at once spring to mind, and when thoughts have turned seaward the fact that the greatest part of the world's surface is under water brings realisation of a huge submarine world of which we know nothing. That it is an illusion to think of the spirit of adventure as dead is shown in recent books by men already bringing us some imagination-catching glimpses of what awaits the explorer of the deep. Hans Haas in his *Under the Red Sea*, and Captain J. Y. Cousteau's *The Silent World* both have admirable photographic evidence for their enthusiastic descriptions of their invasion of this unknown world. For the first time man is enabled by special techniques and devices such as the "aqualung" to penetrate the deep sea unhampered by diving suit and unrestricted by diving bell or underwater ship.

Apart from the wonderful animal and plant populations to be seen, with new appreciation of these that is brought by examination at home and at close quarters, valuable relics of history lie on the sea-bed awaiting discovery, and what relics of pre-history (living as well as dead, if the advent of the coelacanth is an example) remain to be uncovered there no one can tell. This, then, is the modern sphere of exploration. Can it be that in an admittedly minor way, the aquarium-keeper—unconscious of the significance of his awakening interest—has sensed the trend of events in becoming a student of the aquatic world?

Aquarium and Pond Goldfish Varieties

5. The Fantail Goldfish

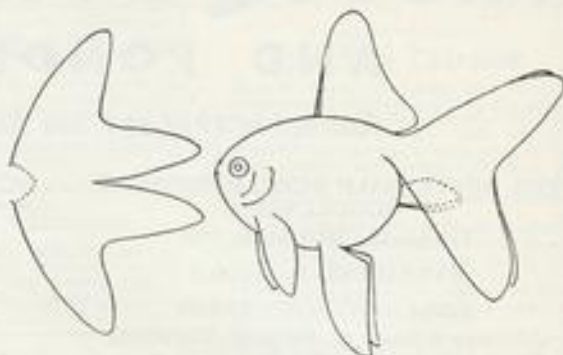
THE fantail goldfish is one of the handsomest of the fancy goldfish suitable either for the tank or open pond. There is a scaled and a calico type, and the former will be dealt with here. The calico I shall describe next month. For the garden pond the scaled fantail is ideal as it is quite hardy and the full finnage and plump body provide a distinct change from the common goldfish.

The colour should be as for the common goldfish, that is, a rich warm red. Any white, whilst not disqualifying a fish at a show, will probably mean the loss of a few points as the self red is preferred; as it is more difficult to obtain it necessarily gets more points than a variegated fish. Like the common goldfish the young fish are bronze at first and only change to the desired red at a later age. I have found that to get the best deep red it is essential that the fish should spend a summer in an open pond. Many pale-coloured fish seen have generally been kept in a tank indoors. It is possible to get these fish to change colour completely from three months after hatching, but a lot depends on the particular strain as well as the amount of warmth and sunshine available for rearing.

The shape of the body is ovoid or egg-shaped. It should not be round as is required for the veiltail, but a fairly deep oval shape without any humps on the back is ideal. The head should be wide and short and the eye should have a coloured iris. The dorsal is fairly high, three-quarters the depth of the body, and held well erect. The caudal fin or tail is divided except for the first quarter of its length. It should be held well out from the body and must not droop. It should be deeply forked so that it shows four distinct lobes. The pectoral fins are two-thirds the depth of the body and the pelvic as deep as the body. The anal fins are paired and half as long as the pelvic fins. The lack of one of the anal fins can cause disqualification at a show.

For exhibition under Federation rules the fantail must have a body length of two inches. A point looked for by judges is the full, plump body—as near oval as possible. The illustration of the fantail shows a fish so oval that it has no nose or mouth, but this is an outline sketch showing the main lines; it is not exactly life-like, but is meant to be a guide for breeders.

The tail is one of the most important features of this fish and this is where many fish fail at shows. Too many have drooping tails or tails which have elongated flowing points. These usually grow in excess to the normal growth of the rest of the fish and so if a young fish develops an unusually long and pointed tail in its youth it is, not likely ever to be of much use as a show specimen. Some fantails are seen with the base of the tail almost straight, but this will usually signify that the fish is from a veiltail strain and so it will



Outlines of a specimen fantail goldfish. The tail is seen from above on the left. From "Show Standards for Cultivated Fishes" (F.B.A.S. 2s. 6d.)

be down-pointed for this fault.

To breed this grand fish I consider that it is essential to have a pond in which to winter the parent fish. On no account should they be coddled. Show fish could be kept in an unheated fish-house for the winter but artificial heat should not be used once the fish are over three months of age. Although I consider that the scaled fantail is best kept and bred in the pond it is much better to remove the eggs from the pond when laid for hatching under cover and in warmer conditions. You will not be coddling these fry as it is quite natural for tiny fry to have warmth, which they would get naturally in early summer. I think that a temperature of 70° F. is very good both for hatching and for rearing up to three months. These fish can undergo very cold conditions and I have had one-inch fry withstand a winter out of doors, often being completely frozen over.

The best food for the fantail is a mixture of live and dried foods, and earthworms and a cereal make an ideal basic food. They are fond of most live foods but should not be fed on these exclusively or they may not develop the chubby body required. Some starchy foods such as oatmeal and barley flakes with the addition of Bemax will ensure that the fish are provided with the types of food which will tend to build up the perfect shape.

To build up a strain of these fish it is necessary to start with good-strain fish, and then even if those youngsters are not perfect in themselves it is possible that they will throw some youngsters at least as good as their parents and perhaps better.

A. Boarder

London Zoo Aquarium

Special Coronation Attractions

CORONATION year sees the centenary of the first exhibition of a marine aquarium in the old "Fish House" of the London Zoo in Regent's Park, and this year is also the 125th anniversary of the opening of the Zoological Society's gardens. Special displays are now being prepared to celebrate the anniversaries, and from mid-June until September the gardens will remain open on Wednesday and Thursday evenings until 11 p.m. Exhibits will be flood-lighted from dusk.

A replica of the first marine aquarium installed in 1853

is to be shown in the aquarium. This tank was originally stocked with native specimens by the celebrated marine naturalist P. H. Gosse. Another aquarium, to be known as the "Coronation tank," is being stocked with brilliant sea anemones from the Mediterranean to form a special display.

Silver Medal Presentation

At the Zoological Society's meeting last month a silver medal was presented by Lord Alanbrooke to Mr. H. F. Vinall, who is now curator of the aquarium, to mark his 52 years' service to the Zoo. Appointed overseer of the aquarium in 1923, Mr. Vinall became curator in 1947, and he has made many tours abroad to bring back new stocks for the aquarium.

The Lateral Line Organ of Fishes

by C. E. C. COLE

IT is still quite widely held by fishkeepers and breeders that the main, if not only, function of a fish's lateral line is to manufacture the mucus which coats and protects its skin. Nothing could be farther from the truth. As explained in my article "The Body Covering of Fishes," published in the February, 1953 issue of *The Aquarist*, the production of this slippery covering is the special concern of numerous "slime glands" situated in the outermost layer of the fish's skin.

Actually the lateral line is an important part of a fish's nervous system, and in most of our aquarium fish its position is clearly indicated by what appears to be a series of dots along both sides, starting just behind the gill-covers (opercula) and continuing to the end of the caudal peduncle, where the caudal, or tail fin, begins.

There are some exceptions to this general rule. In cichlids, the line is not continuous. Starting behind the opercula, the line curves upwards, following the profile of the back for about three-quarters of the length of the fish, and then disappears, a short, straight line appearing several rows of scales beneath the ending of the upper line, and continuing to the base of the caudal peduncle. In cyprinodonts, which include all our livebearers, no surface features are apparent at all.

The "dots" are actually the spots at which short branches from the lateral line canal proper communicate direct with the water, either passing through or between the scales to do so. Figure A gives an idea of the appearance of a magnified section of the perforated scales along the lateral line of an uncoloured goldfish. Goldfishes have every scale in this row pierced. In the canal proper, there are many sensory nerve endings, and from each of these a nerve branch joins the deeper seated lateral nerve, which is a branch of the tenth cranial (the vagus) nerve.

Where the lateral line canal reaches the head of the fish, it divides into several branches and becomes connected with the seventh (facial) nerve. One branch passes over the eye to the snout, and is called the supra-orbital; a second

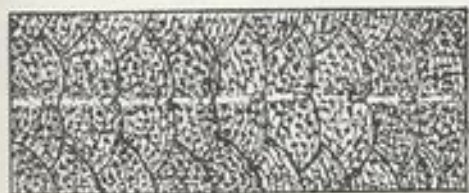
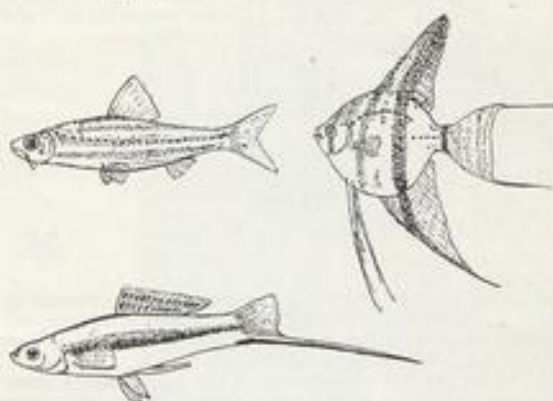


Figure A: Magnified part of lateral line of goldfish. A single scale is also shown enlarged with its perforation to the right of it.



Lateral lines of fishes: typical barb (upper left); typical cichlid (right); surface features of lateral line entirely absent in cyprinodonts such as the swordtail

proceeds under the eye to the snout and upper jaw, and is known as the infra-orbital. The maxillary and mandibular branches serve the jaws, and the transverse occipital crosses the skull from one side to the other. The course of most of these branches is revealed by the small pores which still connect the canal with the water. Careful observation with a magnifying glass in a good light will show them as indicated in Figure C. (Overpage).

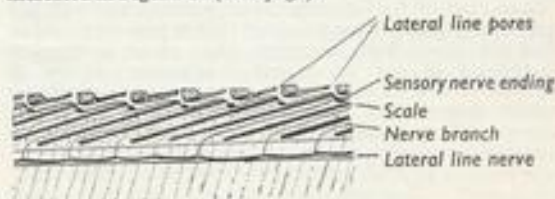


Figure B: Diagrammatic vertical section through fish skin along the lateral line

Much speculation occurred as to the true function of lateral lines until an American investigator put the whole thing to a test by severing the nerves at their source, and comparing the reactions of the fishes he operated upon with others of the same species which had not been interfered with. He persevered until he found the stimuli to which normal fishes responded but which failed to move the others.

The results showed that the lateral line picked up vibrations of a lower frequency than could be registered by the ears. Later, in England, an oscillograph was used to measure the extent of the electric discharges in the nerve of the lateral line. The result pointed to the same conclusion—the function of the lateral line is to receive low-frequency vibrations.

A fish uses this ability to gauge distance and avoid obstacles in its path. As it moves through the water, vibrations move away from its body in all directions, and keep on moving until they meet an obstacle. This may be a rock, a plant, another fish, the edge of the pool or stream, or the glass sides of our aquaria. Immediately reverse vibrations start back to the fish—they stimulate the nerves



Figure C: Pores of the branches of the lateral line seen on the head of a goldfish

of the lateral line, and the fish is aware of the presence of something it may not even see. When vibrations are coming in from all directions the fish is wary—it is surrounded by objects it may need to avoid.

Thus is the fish made aware of the presence of a slow-moving net in the hand of its owner. It feels it getting nearer through increased pressure on the lateral line. It backs away, or moves forward, until fresh pressure from the opposite direction tells it that it is being trapped. A sudden lightning dash, and it is safe, often to the chagrin of he who would catch it. It can be said, then, that the lateral line acts as a subsidiary ear, a long-distance organ of touch, and a second pair of eyes, without actually being any of these.

Comparatively recently it has been claimed that the lateral line system also appraises the fish of the temperature of the water. It acts as a warning system, and may often be a life-saver. Normally a fish's blood is only a couple of degrees or so higher than the water in which it is swimming. The mechanism for adjusting the temperature acts well, but not terribly fast. Thus a sudden change into very cold or very hot water, from temperate, often causes a complete breakdown of the adjustment mechanism. Fishes in aquaria, of course, cannot take advantage of this warning system they possess, because they are completely at the mercy of their owners, but in the wider waters of their

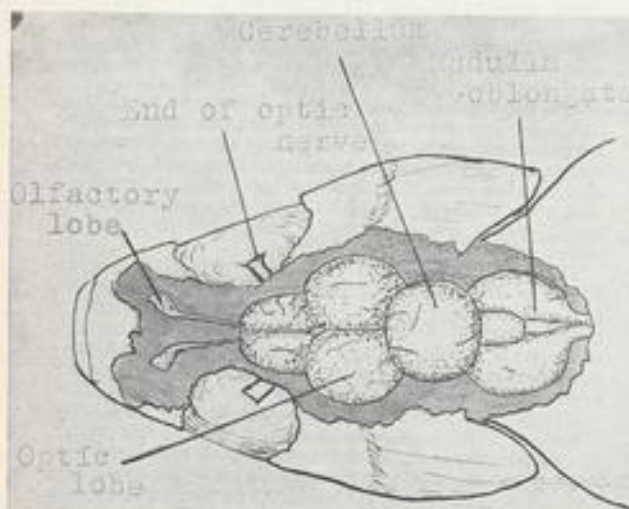


Figure D: Typical features of the fish brain

natural habitats they can seek those conditions which best suit them.

Earlier in this article I explained that the lateral line canal system is intimately associated with the tenth and seventh cranial nerves. There are ten pairs of cranial nerves altogether, which, as their name implies, originate in the brain of the fish. Careful removal of the thin bones on the top of a fish's head will reveal the dorsal aspect of its brain. It looks rather like a collection of small pieces of soft herring roe, arranged in pairs or singly, one behind the other. The development of the different parts differs considerably according to the species being examined. Figure D illustrates the brain of a shubunkin, and E that of a swordtail, both drawn *in situ*. The differences between these two specimens are obvious.

All fishes' brains are divided into three sections, known as the fore, mid, and hind-brains respectively. In the fore-brain is a pair of lobes from which the first cranial nerve reaches out to the nostrils. The lobes are the olfactory lobes, and the nerve the olfactory nerve. Damage to these lobes would destroy the fish's sense of smell. A shark or a dogfish would be particularly hard hit, because they hunt their prey by scent alone. Dissection shows that in these two species the olfactory lobes dwarf the rest of the brain.



Figure E: Brain of a swordtail from above

Just behind the olfactory lobes is another pair, seldom developed to any marked degree in bony fishes. These are the cerebral hemispheres, or cerebrum, used by higher vertebrates when thinking or reasoning. Where developed in fishes, however, they seem to be more intimately associated with the olfactory sense.

Behind the cerebrum comes a third pair of lobes, concerned solely with the fish's eyes. Here again development shows marked differences in different species. The dogfish and shark, with large olfactory lobes, possess tiny optic lobes, but the goldfish and carp, which both use their eyes more than their nostrils, have comparatively large optic lobes, and in the trout they are relatively enormous.

Cranial nerve number 2—the optic nerve—originates under these lobes, and is surprisingly robust. The right optic nerve crosses the skull to enter the left eye, and the left optic nerve does likewise to serve the right eye. Of the 10 cranial nerves this is the only pair (in bony fishes) which crosses in such a fashion.

Both 1 and 2 nerves are sensory—that is to say they enable a sense to operate, but nerve 3 is different. It is a motor nerve—one which is concerned with muscular movement, and not a sense. Nerve 3 stimulates some of the muscles of the eyeball.

Having considered the paired lobes we now come to a well developed single lobe—the cerebellum—which is part of the hind-brain and the seat of balance and muscular coordination. There is a groove beneath the optic lobes and the cerebellum, and from here starts the fourth nerve, which

(Please turn to page 30)

Building Your Own Fish House—6

by CUTHBERT L. NICHOLSON

ALL you need do to your fish house is to make the concrete tanks and to put the fish in, and this is perhaps the most interesting and important operation. An illustration in the March article showed how the shuttering for the concrete tanks is fastened to the uprights on the path sides of the tanks. You will notice that the boards are not nailed straight on to the uprights but that a $\frac{1}{2}$ -inch strip is first fastened to each side of the posts. This strip serves a twofold purpose. It brings the concrete to the desired thickness and also ensures that after the shuttering and the strip have been removed, the post can be totally enclosed in concrete by trowelling some cement mix into the space left when the strip is taken away.

Now look at the shuttering for the tank side farthest away from the path. A picture appears with this article. Do not underestimate the number of supports the shuttering will require. What you see illustrated is the minimum. Each is securely wedged by the horizontal timbers at the bottom and the vertical supports are long-nailed (temporarily) to the roof timbers.

When the shuttering is in position make sure the concrete floor inside of each shutter is clean so that the wall will joint well. Throw in a bucket or two of water to make sure. Now make a 4 : 2 : 1 mixture of stone chippings, sand and waterproof cement as earlier described and after it is thoroughly mixed dry bring it to the right consistency for concrete by adding and mixing water. Bucket the mix into the boxes and after every six buckets tamp with the end of a piece of timber (about as thick as a roof timber) until all corners are filled and the surface begins to find its level. Carry on in this way until the concrete stands two feet high.

You will not need a spirit level to see if the last measure lies level. Just finish off by clopping the surface well with a five-foot piece of straight timber held horizontally and you will get a fine, even, level top to the tank. In the illustration the concrete wall has just received the top tamping and is securely united to the experimental brick wall at the corner near the expansion box. I report that both types of wall are successful, but remember to face any brick wall you may choose to build as a tank wall, with a waterproof cement mix of four parts sand and one part waterproof cement.

Section by Section

If you are very careful nails may be withdrawn by their protruding heads with a claw hammer after 24 hours and the shuttering gently removed, but do not start hammering fresh shuttering up near at hand until the concrete has set hard, in, say, two days. I removed the shuttering from each piece of work fairly early so as to sluice the drying concrete with water to aid a very hard set.

After you have made the inner skin of the fish house and the tank sides along the centre path the next job is to divide up the parallel walls to make tanks. Again the uprights and the roof timbers come in useful, for timbers can be fastened to them temporarily to aid the shuttering for the tank divisions. These dividing walls seem to take a longer time, for the making of short runs of shuttering between the erected walls is more fiddling than constructing the long



Shuttering in position for the construction of the outermost sides of the concrete tanks. Earth will fill the space between these and the fish-house wall



runs. Night by night the place will get nearer completion but patience is tried as the delight of soon housing fish gets nearer.

I tried vertical boards for shuttering the tank divisions on the side where the pipes run and with a little ingenuity and several small pieces of wood made good the spaces round the water pipes.

Treating the Pipes

You may wisely choose to paint your pipes with Ruberoid bituminous paint before concreting them in at the points where they pass through the dividing walls. Even if you assume that a pipe embedded in waterproof cement does not need protection you must paint all parts of the pipe and the pipe supports, also the concrete near the pipes, with at least two heavy coats of such a paint.

When finishing off the place last April, after two months of work in the evenings, I treated the pipes in most of the tanks with the paint mentioned, after I had received the written assurance of the manufacturers that it was entirely suitable for tropical tanks and in no way injurious to fish. Another tank was left untreated. The fish and plants in all tanks thrived but the untreated pipe took on an unattractive shade of rust before I emptied the offending tank and gave the pipe bitumastic treatment recently. The paint is very low priced and most effective.

The Final Jobs

The last back-testing job is to fill in the space between the inner and outer walls with good soil for the cucumbers, and now is the time to do it. Of course, you will have a wall to climb over but the job is in its right place—coming after the concreting is finished. You may even have left the glass out until now and prefer to tip in the soil over the three feet outer wall. A lot will depend upon your height and you will probably find it cleaner to carry inside and fill in over the two feet wall.

For those under the sign of Aquarius, by birth or by



The fish house complete

choice, the rest is sheer pleasure. You will have six tanks of concrete daily growing whiter as they dry harder, with a man-size heating system running through four of them. You will have sufficient space to contain between six and seven tons of water, and no doubt too many tanks in the house which could well be mounted on strong angle irons laid across the backs of the concrete tanks. Enjoy the rest. Hose in water. Do the glazing. Scrub the tanks with a stiff broom. Shake in permanganate of potash crystals. Ignore the people who tell you they are no good. You will like the picture of oceans of purple water. Set siphons going and empty the place. Fill it up again. Let your children sail their boats. Let them swim. Empty again. Fill again.

Use pH as a Check

Take pleasure in seeing everything come clean and if you are that way inclined get some Johnson's comparator test papers and see how the pH is getting on. Try the book with pH1 to pH10, which gives the very wide range you need at this time. The flakes on the top of the water, even after a few changes, will change the paper indicator from the book to the rich blue of pH10 every time, but after a fortnight of

changing, swilling, scrubbing and testing the pH will start coming down and staying down. Mine was a safe pH7 in about three weeks. There is no point in rushing in the fish too soon. For the fastidious the test book pH6.8 to pH8.3 will give the final accurate tests.

When the water in your tanks is clear and when you consider or have proved that the dangerous lime has passed out of the concrete, fill up the tanks, see that the heating system is topped up by looking in at the lid of the expansion box, then set your heater going.

The rest is rather like starting with the glories of your first glass tank and the procedure of letting the water mature a little and plants take root before introducing the first "test" guppies is so similar that I shall not describe it. Rather would I describe sometime to you the pleasure of having a large, warm place into which one can go during spare time at nights, in winter or summer, to observe, to experiment and humbly to learn from the wondrous ways of fishes.

(Conclusion of the series).

As Every Aquarist Knows



"But this means I can do without that noisy aerator!"

The Lateral Line Organ of Fishes

(Continued from page 28)

is another motor nerve concerned with the movement of the eyes.

The remaining cranial nerves all have their origin in the last part of the brain—the medulla oblongata, part of which may sometimes be obscured by the growth of the cerebellum over it. Briefly the nerves are as follows:—

Nerve 5—both sensory and motor—many branched and widely distributed over snout and jaws.

Nerve 6—another motor nerve, controlling, with 3 and 4, the movements of the eyes.

Nerve 7—connected, as already mentioned, with the head section of the lateral line system, but also partly motor.

Nerve 8—purely sensory, serving the organs of hearing.

Nerve 9—both sensory and motor—branches to the first gill cleft and the palate.

Nerve 10—probably the most important nerve of all. Supplies all gill openings except the first, serves the whole of the lateral line canal, passes along the alimentary canal, and regulates the heart's action.

Also arising from the medulla oblongata is the spinal cord, which is protected by being passed through the vertebrae of the fish. Spinal nerves from the cord emerge from between each vertebra and these divide and sub-divide so that eventually a network is spread over every part of the fish's body.

When dissecting a fish, the nerves will appear like threads of white or greyish cotton, often with frequent nodes along their length. Actually, under powerful magnification it can be seen that the white thread is composed of countless thousands of individual fibres contained in a sheath. It is interesting to note that muscles are also composed of an immense number of fibres bound together, and that every single muscle fibre must have a nerve fibre to stimulate it to activity.

One sometimes reads that the brain can be compared with a telephone exchange, receiving and sending countless messages, and the nerves are the wires along which those messages travel backwards and forwards. Actually this is a very loose analogy, because the same wires of a telephone are used for both receiving and sending messages, but nerve fibres will receive only or transmit only—the same fibres cannot perform both operations.

Armoured Catfish (*Corydoras paleatus*)

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

FAMILY:—Callichthyidae, from Latin *callus*—hard skin, and Greek *ichthys*—a fish.

SPECIES:—*Corydoras paleatus*—from Greek *korys*—a helmet, Greek *dorion*—a small spear, and Latin *paleatus*—dappled.

CORYDORAS PALEATUS is one of a group of catfishes popularly called South American armoured catfishes. The description "armoured" is not inaccurate, because nature has endowed these fishes with a double row of extremely tough, hard, overlapping, protective "plates" instead of the more usual scales. In aquaria, at any rate, no other fish attempts to molest them, although whether this is because they are so protected it is difficult to say.

Their beauty, though very real, is not by any means striking. In fact, so well do they harmonise with their environment that they often escape notice for days on end. Body colouring is a mixture of brown, green, and black, and fins are spotted with brown. The eyes are golden. Ventral surfaces are pale.

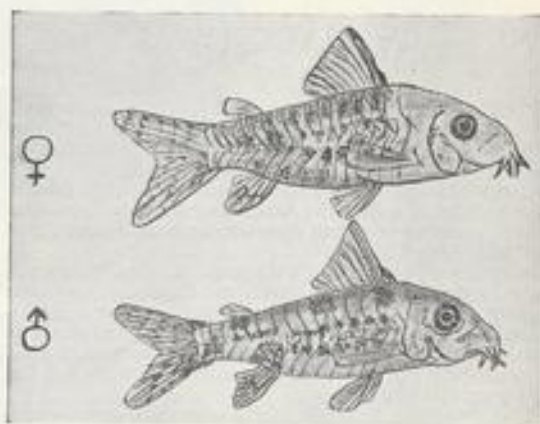
Why then, if they are so inconspicuous, are they so popular, I can hear the tyro asking. The answer is simple. They are usually kept because of their great usefulness as scavengers. They will busy themselves year in, year out, searching for and consuming food, dying leaves, etc., which if undiscovered would eventually start off highly undesirable conditions in our aquaria.

It is interesting to watch the little creatures digging in the sand and sucking quantities into their mouths. Having extracted what nutriment they can from the sediment they do not spit it out again in the manner of most other fishes. Instead they pass the unwanted sand gently backwards out of the gill openings—one can see it trickling from them as the meal continues. If *Tubifex* worms, or other aquatic worms have colonised in an aquarium, the fishes can be relied upon to root every one of them out, for they greatly appreciate live food when they can get it.

If breeding them is to be attempted, a certain amount of live food is essential to bring them into tip-top condition. Although normally seldom seen off the bottom of the tank, the introduction of *Daphnia* will bring them up, eagerly snatching at every one within reach, and manifesting every sign of excitement.

Sexing is not always easy, but the following hints may help. The female is usually larger than the male, and as breeding time approaches, her ventral surface takes on a pinkish or reddish hue. The first ray of her pectoral fins reddens and thickens. Her body becomes much rounder. The male dorsal and ventral fins are generally supposed to be more pointed than those of the female, but this does not appear to be invariably the case.

The actual spawning is quite unique. The male swims frequently over the back of the female, touching the top of her head with his barbels. Then down he goes beside her on the bottom and an embrace appears to take place. During this embrace, a number of eggs are collected by the



Female *Corydoras* above, male below

female between her pelvic fins. Leaving the male where he lies she swims away carrying the eggs to a spot previously vigorously cleaned, and spreading her fins, squeezes the eggs on to it. The chosen spot may be on plants or on the glass sides or front of the aquarium; more than one spot may be chosen.

Much discussion has taken place as to how these eggs are fertilised, as the male leaves them strictly alone except occasionally to pay them the doubtful compliment of attempting to eat them. Some aquarists believe that the female carries the sperm of the male in her mouth, and fertilises the eggs with it herself. This might be the case, but I believe it far more likely that in the embrace that has just taken place, the sperm from the male is emitted at the precise moment that the eggs emerge from the female, and that as the eggs expand they draw in the spermatic fluid with the usual water.

Spawning has taken place in temperatures ranging from 65° to 74° F. Higher temperatures act as a deterrent to spawning activities. The eggs will hatch in from four to six days, according to the temperature of the water. The newly hatched fishes drop into the mulm and sediment on the bottom of the tank, where they are completely invisible.

Here they will feed upon whatever food they can find for about 10 days. It is wise to ensure that some is present for them by allowing a little finely powdered food to sink into the sediment. After the first 10 days, the fry will suddenly become more active, and swim above the mulm, resting on plants and stones. Although the little creatures are scavengers too much decaying matter will destroy them. It is better to introduce finely sifted *Daphnia*, and provide moderate aeration until the fry develop their labyrinths—at about five weeks of age. After this they will make sudden dashes from the bottom of the tank, or wherever they may be resting, to the surface to gulp in a little air to augment the oxygen they extract in the ordinary way.

After the development of the labyrinth chamber, little difficulty should be experienced in raising the youngsters to maturity. The maximum size that can be normally expected, under first-class conditions, is male two and a half inches, female three inches. There are exceptions, but they are few and far between.

(Continued overpage)

The Argentine Pearl Fish (*Cynolebias bellottii*)

by JACK HEMS

THE phrase "Butterflies under water" has often been used by writers in the popular press to describe the vivacious little fishes which give life and colour to the tropical aquarium. And of all the many and varied species which the phrase so aptly describes, perhaps none is more entitled to it than the Argentine pearl fish (*Cynolebias bellottii*), a small oviparous cyprinodont from Buenos Aires Province, Argentina.

In common with most of our aquarium fishes, the male is more handsomely coloured than the female. In general appearance he is blue: cobalt or ultramarine or indigo—according to his mood—and overlaid on the head and side with a glassy sheen of emerald—or brassy-green. A myriad of pearly-white or pale blue spots adorn the body and the dark pigmented fins.

The female is loamy coloured—or khaki-green—with several brownish spots and vertical bars on the side, and some brown to greyish markings in the fins. Apart from her more subdued coloration, the female can be distinguished from the male by the fewer rays in her dorsal and anal fins. Both sexes are very active, and when not chasing each other all over the aquarium, they will hover, for seconds on end, close to submerged vegetation, or, for that matter, over any object which fixes their attention.

The species is one which seems equally at home in full sun or partial shade. But this, I fancy, is to be expected from a fish which, in the wild, is used to living in ditches overhung by trees and plant life, or open mud-holes in the *pampas*. For the same reason, temperature is of no great moment: 72° F. is warm enough for all practical purposes but, as a rule, a higher temperature will result in a better show of colours.

C. bellottii is a flesh-eater, and should be fed with tiny living things such as baby wood-lice, white worms, water fleas, gnat larvae and the like. When live food is off the menu, minced shellfish, minced butcher's offal, or scraped red meat, cooked or raw, will suffice. For its size—a full three inches—the fish eats a lot, and should be given at least two good meals every day.

Not a Community Fish

The Argentine pearl fish is not suited to life in the community aquarium. For one thing, it is a bully, and, if given the opportunity, will molest and drive smaller and timid fishes away from food; for another, it is more likely to settle down in shallow water covering a muddy floor than in the conventionally set-up aquarium containing 12 to 15 inches of water over a thick carpet of plain sand.

In the *pampas* the water in the pools and ditches it inhabits often evaporates completely—that is, during the dry season—and leaves the fish to perish miserably on the hot mud. But nature, with her gift for compromise, has ordained that the slimy bed on which the fish die, also preserves the species from extinction. For, as the waters go down, so the fish mate and bury their eggs in the mud: and there they remain until such time as the coming of the rains re-fills the holes and dried-up watercourses, and life springs afresh in the waters; and the newly hatched baby fish which have lain for so long in the egg, dart and coruscate in the sunlight, and crowd the whole span of their existence into the space of a few warm months.

Although *C. bellottii* has been known to tropical aquarium keepers for almost half a century (in Germany since 1906),

it has spawned only a few times in captivity. But then, not every aquarium keeper is prepared to imitate in his aquarium the sort of conditions which prevail in the *pampas*, especially when no one can say with any certainty that the fish will spawn, and, even if eggs are laid, whether any of them will hatch out.

However, if an attempt is made to spawn the fish in a specially set up aquarium, a temperature of about 80° F. should be maintained, and after the eggs have been buried by the male in the mud, the water should be siphoned away until only about an inch remains on the bottom. Then this small amount should be allowed to evaporate slowly.

After two weeks or a month or even longer have passed, the tank should be re-filled with tepid water, not all at one time, or by the gallon, but in small quantities, say a pint at a time over a period of a week to a fortnight. During this time, the temperature should be kept at an even 75° to 78° F. A few weeks after water has been introduced into the aquarium baby fish may, or may not, appear. But if any are seen, the important thing is to supply them with plenty of small live food such as rotifers, micro worms or tiny water fleas.

Although *C. bellottii* is the species most often seen in this country, another one, *C. adloffii*, is occasionally imported from the Continent, where it sometimes arrives in direct shipments from Brazil. *C. adloffii* is found only in the State of Rio Grande do Sul. It is a smaller fish than *C. bellottii*, seldom reaching a length of more than two inches.

Corydoras paleatus

(Continued from preceding page)

Temperature tolerance of *Corydoras paleatus* is quite good. If a heater fails they will be the last fishes in a community tank to show distress. Some years ago I kept one specimen in an unheated tank through the whole of one winter. It survived, but perished at the beginning of the following one. It was not my intention to deliberately experiment with the fish, but when all other tropicals were removed to another tank, I could not find the catfish, which had buried itself in the thick sediment of the bottom. I put no food in the tank, which contained just a few snails and some *Riccia* and duckweed, yet in the spring the fish was still alive.

Expectation of life is greater than that of many less hardy fishes. From five to seven years and longer *paleatus* can live, doing valuable work for their owners the whole time. In spite of their liking for live food, I have yet to hear of a case where they have attacked fish fry—even the smallest. Unprotected spawn will suffer from their attentions, so it is advisable to remove them from egg-layers' aquaria during breeding periods.

Classes for "A.V. Catfish" are often included in the show schedules of aquarists' societies. When arranging entries in these classes, it is well to remember the habits of catfishes. They will lie on the bottom of their show tanks for the duration of the exhibition, and as the tendency at modern shows is to arrange the aquaria at or a little above eye-level, *paleatus* will be invisible. If, however, sufficient sand is placed on the bottom of the tank to bring the fish above the bottom frame, they will be plainly visible to both judges and visitors, and much better appreciated by both.

What colour *paleatus* possesses will not fade under show conditions, and, indeed, it was not until I saw mine on spotlessly clean sand that I really appreciated its beauty.



*A page for
the beginner
contributed
by
A. BOARDER*

THIS month I shall deal with the breeding of goldfish both in the pond and tank. All varieties of goldfish have been evolved from a common ancestor and it is as well to remember this when considering the breeding of all types. Because of this common inheritance all varieties will breed with any of the types and the resultant young will be fertile and not hybrids. If any particular strain of goldfish is favoured and it is desired to breed this exclusively it is essential that no other types of goldfish are left in the same tank or container for they will surely cross.

As the goldfish has been so much domesticated for many centuries the normal breeding habits have changed and instead of a single spawning as would be natural for types of carp, the goldfish is likely to spawn four times in one season. Fish can breed at one year of age and if they have a body length of about two inches. The larger the fish the more eggs are likely to be laid. A healthy female can lay four or more thousand eggs at a spawning, and can repeat this in a month's time. In an open pond it is usual for them to spawn from late April to September, rarely before or after. The earlier spawnings must be considered the best as the long days mean that the fry can feed well and so grow to good-sized fish by the autumn.

There is no particular secret for breeding goldfish; it is fairly easy to get the eggs—the difficulty often comes when attempting to rear the fry. I am often asked by beginners if they can breed fish in a fairly small tank. I am sorry to say that it is not very likely that many fry can be reared in one small tank. I know that it is possible to get the fish to spawn all right, but as soon as the excitement of spawning is over most fishes start to eat the eggs as fast as they can.

Even if the eggs are not eaten it is probable that the fry will be once they move about. It might be asked, "Why is it that fry are not all eaten in natural ponds?" The reason is of course that in a pond there is usually plenty of water plants in which the fry can hide. I think that anyone would be lucky to rear half-a-dozen fry in a tank 24 ins. by 12 ins. by 12 ins. containing one pair of breeders.

Unless you have at least two tanks or containers there is bound to be trouble in breeding.

A tank as large as the one above would be ideal for the spawning of a pair of fish always providing that you are prepared either to remove some of the eggs to another tank or place a dividing glass in the tank so that the parent fish are unable to get at the eggs or young when hatched.

Before expecting your fish to breed make sure that you have fed well with plenty of earthworms. I know of no finer food for the conditioning of breeders. There are all sorts of ideas about how to make the fish spawn, but I do not place much importance on any of these as I have found that healthy fish will breed in their own good time and any interference from you may have the wrong effect. The temperature of the water alone is not enough to cause the fish to spawn, as I have had fish spawn at most temperatures from 50.5° to 75° F. What often does have the desired effect is a quickly rising barometer, as happens at the

commencement of a warm, settled spell. My advice to all who wish to succeed is to exercise as much patience as possible and do nothing to try to force the fish.

See that you have plenty of fine-leaved water plants in the tank. The water may be lowered to half the usual depth; the fish prefer to spawn on water plants on the surface of the water, but they will spawn anywhere if ready, irrespective of the depth.

There is no need to have several males to one female as is so often advised. One male could fertilise all the eggs laid by a thousand females, as the male sperms are so tiny that it can be said that one drop of male fluid as large as a goldfish egg would contain enough spermatozoa to fertilise all the eggs laid by a single female. In a pond it is noticeable that when several males are present there is a more vigorous chasing and more eggs are likely to be fertilised. The sexing of some of the fancy goldfish is not at all easy as those with short tubby bodies cannot be sexed as easily as the slimmer types. Generally the female would be fatter in the belly especially when viewed from above. Some males show distinct white dots on the gill covers but this is not always apparent.

Most fish spawn in the early mornings, especially if the morning sun shines on the tank. Once a fair number of eggs is laid you must remove some or place the partition in. The eggs when first laid are adhesive and stick to anything with which they come in contact. They appear to you as tiny transparent beads of jelly about as large as a pin's head. Any fairly shallow containers are suitable for hatching. Place them in the warmth if possible and they may be in the sunshine as long as the container is not clear-glass sided. The eggs will hatch in four days if the temperature of the water has been about 70° F. In cooler water the eggs take longer and may be a fortnight in hatching with a temperature in the region of 50° F.

Any eggs which were not fertilised will turn white and become covered with a form of mildew in a couple of days, and the good eggs will be almost clear. The fry when hatched will not want feeding until they are free swimming, usually after about two days according to the temperature of the water. The earliest foods must be very tiny and the best are Infusoria and algae. Water from an established pond will probably contain enough fine live food for the fry, and this can be fed to them frequently by a drip feed from an overhead tank.

It is possible to raise Infusoria by placing in a jar of pond or tank water some crushed lettuce leaves, potato peelings, banana skin or boiled spinach. Leave this in warmth for a few days and then you should see a form of white cloud gradually moving in the water. This can be fed by a drip feed, and a succession of jars of Infusoria should be kept so that a continuous supply is obtained. When a jar is nearly empty add some fresh water and a little more medium and more Infusoria will form.

Next month I shall deal with further feeding of the fry.

Miami—New Centre of Fish Culture



Part of the collection of large outdoor tanks used by Sunlan Aquatic Nurseries in Miami, U.S.A., for fish breeding and aquatic plant culture. This installation is new and still being added to. When completed there will be 57 tanks of the type illustrated

THE world centre of tropical fish culture has shifted from Germany, before World War II, to the Miami area of Florida, U.S.A., it is claimed by American aquarists. Since 1948, producers report, their business has been increasing at a rate of 50 per cent. each year. It is estimated 14 major producers are grossing about a million dollars annually, and that this amount is limited only by present facilities to fill orders, most of which are running from two to four weeks late.

Climate and geographical location plus technological developments have brought several producers to Miami to build tropical fish farms. Climate permits producers to operate breeding and growing tanks out of doors 12 months in the year, reserving indoor operations for special species requiring close observation. Climate also aids cultivation of water lilies and other tropical plants for aquaria.

While producers are said to be breeding most varieties, they require some imports from Latin America. Deliveries of these fish and others which have defined breeding efforts so far, coupled with orders to customers in the southern hemisphere, have developed a brisk international trade. Miami is ideal for this interchange, since it is the closest point in the United States to Latin American centres.

Ninety-nine per cent. of all tropical fish are flown to markets. New York is but four hours away; Chicago less than five. Shipments to Los Angeles are only 12 hours distant. "Air transportation has allowed us to move our plants to Miami to mass produce tropical fish for the world trade," says Mr. William Oldfield, operator of Sunlan Aquatic Nurseries. "We are able to ship with such speed and safety," says Mr. M. Matsuno, proprietor of Eastern Garden Aquarium, "that we can guarantee delivery of live fish in good health."

Sunlan is the largest producer in the area, reputedly

accounting for one-third of the business, while Eastern Garden is the world's largest direct mail order house. Both Mr. Oldfield, formerly of New Jersey, and Mr. Matsuno of New York, moved to Miami in 1951.

Shipments already are being speeded, with introduction early this year of a cardboard container to replace heavy metal cans. The waterproof carton permits shipment of more fish per volume of water, reduces shock, forms a better insulation, is more easily handled, takes less space in an aeroplane and eliminates cost of returning empty metal



Mr. William Oldfield of Sunlan Aquatic Nurseries prepares to lower a fish trap into this outdoor breeding pond, which is also used for growing water lilies



Mr. Matsuno at work on the indoor aquaria of the Eastern Garden Aquarium in Miami

containers. Ninety per cent. of the Miami producers are already using cardboard cartons.

Twelve producers have created the South Florida Fish Farmers' Association, first of its kind, to stabilize the industry and to protect members on extension of credit. Breeders report that research laboratories, medical schools and biology classes are displaying a growing interest in use of tropical fish. Studies are being made of fish genetics as well as diseases and their cures.

Even more important is the demand in Latin America. Heavy shipments are sent to Havana, Cuba; Port-au-Prince, Haiti; San Juan, Puerto Rico; Managua, Nicaragua; Colon, Panama, and Curacao, Netherlands West Indies. This activity is so vital to airlines that KLM has established a "fish hospital" in Curacao. If tropical fish in transit must lay over a day or two *en route*, oxygen is introduced into the cardboard container so that specimens can survive the long trip better.

Fresh supplies of "raw" tropical fish come from Trinidad, British and Dutch Guiana, Brazil and Venezuela. One producer operates his own flying boat between his source of supply in the headwaters of the Amazon and Miami. Fishes which so far have defined domestication are not forwarded from Miami nurseries to dealers and jobbers until they have undergone reconditioning and fortifying through diet and care under controlled conditions. Although some domesticated fish must be bred back to native stock after several generations, producers claim the varieties they develop are marked by better colour and health.

Each tropical fish farmer tries to induce reluctant species to breed in his tanks. Sunlan has found the answer to the breeding habits of *Thayeria obliqua* of Brazil, and expects enough specimens for shipment this summer. *Serpae* tetras are also being bred in Miami now, and so are thousands of dramatically-hued fighting fishes.

Out-of-doors breeding tanks, 12 feet by 26 feet, are built of concrete blocks, sealed from the inside. Fish are protected from birds and other natural enemies by screening. Almost as important to producers is the cultivation of water lilies and other aquatic plants. These are put in tanks under controlled conditions for healthy pest-free growth, and are also shipped in waterproof cardboard cartons.

In the Water Garden

by Dr. W. E. SHEWELL-COOPER

LAST month a reader of *The Aquarist* wrote to me about a water lily for a tiny tub. I think that the smallest and daintiest of the water lilies is *Tetragona pygmaea alba*. It has light green foliage, tiny star-shaped snow white flowers and I have known it grow quite happily in a receptacle no more than a foot across and with eight inches depth of water.

For those who want a water lily which can be used for cut flower purposes, I can well recommend *Odorata* pink opal. The flowers are medium sized, star-shaped, and of a pretty shade of deep coral pink. The plants will grow quite well in 12 inches of water and will only cover an area of about 24 inches. The reason it cuts well, I think, is because the flowers stand well out of the water naturally. You can either do the cutting with a fair length of stem, or use the flowers just for floating in a shallow bowl as a centre piece, say for the dining room table.

Some people write to me and say they would very much like to grow the reed mace because it is so stately and graceful, but are frightened of touching it because of its creeping root stock. The way to prevent *Typha* or reed-mace spreading all over the pool is to do the planting in a large box and to sink this into the ground where the tops of the roots will be covered with anything from one inch to six inches of water. I always wish there were some aluminium boxes that one might use for the purpose, for these would last far longer than wood. (Incidentally I use aluminium seed trays throughout the Horticultural Training Centre, and they last for ever!)

One of the nicest typhas is *T. angustifolia*. Of course you have to have a fairly large garden to cope with it because it can grow 10 feet tall, though I have seen it in some parts of the north no higher than five feet. It is one of the most graceful plants I know, with slender, linear leaves. You get the dark brown flower spikes which are so interesting because they have both male and female flowers on the same stem. They are carefully separated by being spaced several inches apart. *Typha latifolia* is often confused with the bullrush. It has been called the cat-o-nine-tails. It grows to a height of six or seven feet as a rule though in the shadier gardens it is no taller than four feet. It produces grassy leaves about 20 to 24 inches long and over an inch wide. The "pokkers," as some people call them, are very attractive, and they never shed their seeds until the spring. They attract goldfinches, who look very pretty clinging to the heads for the purpose of eating the seeds.

Some people will say that this is not a suitable plant for the small garden, and of course it is true. But again, it is not difficult to grow, and anyone who is fond of the bullrush type of aquatic should certainly include it. There is one species, however, *Typha minima*, which only grows 18 inches tall, and I often plant it for that reason at the shallow end of the small pool. It produces narrow rush-like leaves and rusty brown flower spikes. *Typha shuttleworthii* is a little taller: with me it grows to three feet. It produces brown flower heads and has linear leaves.

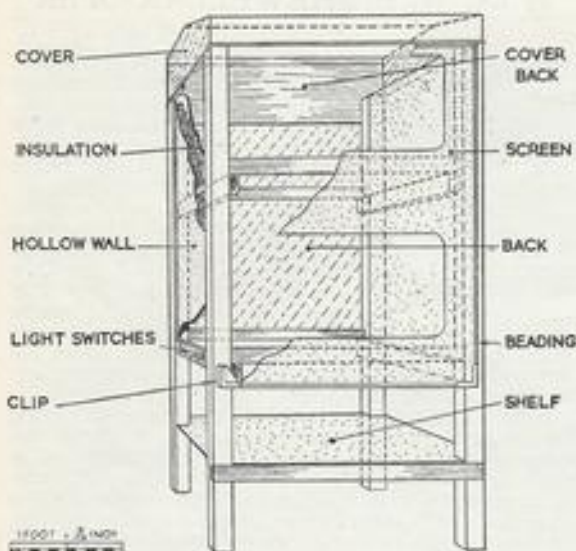
I am sometimes asked if there is any really hardy aquatic that could be grown in only two to four inches of water, and the answer, of course, is the lizard's tail or *Saururus*. There is *S. chinensis* which grows about 12 inches tall and produces cylindrical spikes of whitish yellow flowers, surrounded by oval leaves about five inches in length.

Some of the arrowheads will grow in shallow water too.

(Continued at foot of next page)

Saving on the Electricity Bill

by G. BISHOP



THE general increase in the cost of electricity set us thinking about tank insulation. The idea was to provide an insulated cabinet to house two tanks, which would obviously provide a substantial saving on the electricity bill and at the same time be decorative enough to fit in with the decorations of any room. The basic idea will appeal to aquarists who for various reasons cannot have a fish house, but wish to have an attractive community tank and also do some breeding in a small way. In my own case the top tank is the show piece and the lower for breeding; we call it the "maternity tank."

Not being very clever at woodwork and not having a workshop with lighting available, the idea had, of necessity, to be simple and was actually completed—with the co-operation of the "lady of the house"—in the drawing room. The cabinet takes two 24 ins. by 12 ins. by 12 ins. tanks but the measurements can be suitably adapted for any size of tank. Heating is by a 100-watt heater in each tank, controlled by a thermostat in the top tank; temperature in the lower tank is a few degrees lower than the other.

Various alternatives can be adapted to suit materials available, for example, plywood can be used in place of hardboard and in the example shown insulating board was used because we had a small piece over from another job. Cardboard can be obtained by carefully cutting up old cartons from your grocer.

The front panel is simply a sheet of hardboard, strengthened by pieces of quarter round beading screwed round the sides, and it stands in two brackets made of aluminium. The brackets are best made by first cutting a cardboard template; this saves considerable waste in cutting the metal. Two small bolts as used in china cabinets hold the panel at the top on the inside. To remove panel one simply pulls back the bolts through the viewing aperture of the top tank and the panel is lifted out.

All cross pieces are glued and screwed and a 25 watt bulb is fitted above each tank with reflectors of polished aluminium. The top cover has wood sides with a hardboard top, steamed and bent to shape, is hinged at the back by a

piano type hinge and supported when open by a gramophone cabinet fitment. The tank cover glasses have semi-circles cut in front which makes feeding quite a simple matter.

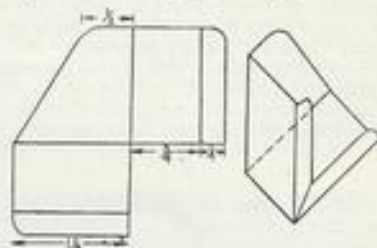
The completed cabinet painted or stained to match the decoration of the room looks very attractive and can be made by anyone with a few simple tools.

Materials Required

Wood:—four pieces 1½ ins. by 2 ins. by 54 ins. for legs; four pieces ½ in. by 1½ ins. by 25 ins. main supports; four pieces ½ in. by 1½ ins. by 13 ins. side supports; two pieces ½ in. by 1½ ins. by 28 ins. for shelf cross pieces. One board 6 ins. by ½ in. by 28 ins. for back; one board ½ in. by 3 ins. by 28 ins. for front; two boards ½ in. by 5 ins. by 13 ins. for sides and one board ½ in. by 1½ ins. by 28 ins. for cover.

Hardboard, cardboard or Insulating board:—Hardboard—front 36 ins. by 27 ins.; shelf 14 ins. by 25 ins.; top of cover 14 ins. by 28 ins.; two pieces 10 ins. by 28 ins. for sides. Cardboard—two pieces 34 ins. by 10 ins. for inside of sides.

Beading:—¼ round—28 ft. 2 ins. by ½ in.
Strengthening for cover: two pieces 31 ins. by 1½ ins. by ½ in.; two pieces 22 ins. by 1½ ins. by ½ in.



Details of assembly of the aluminium bracket or clip used to support the front panel of the cabinet

In the Water Garden

(Continued from preceding page)

They get their name because of their arrow-shaped leaves. Take, for instance, *Sagittaria japonica*. This, in addition to the arrow-shaped glossy leaves, produces a conspicuous spike of white flowers with yellow centres. I like it along the margin of a pool in five or six inches of water, but I have seen it growing in aquaria producing flower stems about two feet in height. There is a double form known as *flore pleno* which is slightly taller. The third of this group that I should include is *Sagittaria sagittifolia*. This flowers from June onwards and loves a sunny position. It seldom grows taller than 18 inches and bears white flowers with lovely purple centres. The leaves are long, and of course, once again arrow-shaped.

COLDWATER FISHKEEPING QUERIES *answered by* A. BOARDER

I have a pond 10 ft. by 5 ft. by 2 ft. in size and have been troubled with blanket weed. What can I do to shade the pond?

The best way to provide some shade for the pond will be to plant water lilies. The leaves will provide the shade required and also give some protection for the fish. Strong sunlight always encourages the growth of the blanket weed and so until the water lily leaves grow up well it will be helpful to drag out as much of the weed as possible. A stiff brush will do this and there is an implement on the market for the purpose. If you can get some duck weed (*Lemma*) this will help to form a covering for the pond, and will also provide some food for the fishes.

I have been told that I should have made pockets round the side of my pond for planting. Is it too late now the pond is completed or is there anything I can do?

Pockets are not essential. Where the depth of a pond is too great for the ordinary planting of water plants they can be brought up to the necessary depth by placing pieces of paving stones or bricks on the bottom of the pond on which to stand the plant pots. By this means it is possible even in a pond 2 ft. 6 ins. deep to grow the smaller types of water lily, by raising their pots to within 12 inches of the surface of the water. This method can also be adopted when introducing a new lily to the pool. Many grow best when not too deep at first. Then as the plant grows the pot can be lowered to the required depth by removing some of the bricks below.

Can you recommend a publication giving full details on coldwater fish, plants, snails and breeding?

Certainly, why not get my book, *Coldwater Fishkeeping*, as advertised in *The Aquarist*. Everything you need is there and having written the book I can thoroughly recommend it.

Why do fish "blow bubbles" even when the water is changed? A shubunkin is the culprit and it makes a noise like a whip crack.

If the shubunkin is among other fish in the tank and this is the only fish acting as you describe, then I imagine that there may be something the matter with it. If there is a general foul condition of the water or lack of oxygen, you would expect all fish of the same size or larger to act the same way. The larger the fish the more oxygen do they need. The fish may have had some injury to its gills. It may at some time have been attacked by gill flukes, and if the gills are damaged they are unable to extract sufficient oxygen from an ordinary breathing movement and so the fish gasps at the top. Again if there is a general deficiency of oxygen or a super-abundance of foul gases in the water this may be caused by something foul or decaying in the tank. In this case thoroughly clean out and disinfect the tank and start again.

About a year ago I bought two small goldfish and kept them in a tank. They grew well and were healthy. Last September I made a pond in the garden, 7 ft. by 8 ft. by 2 ft. deep. I placed the fish in and added eight more I purchased. The pond was frozen over for some time and after it thawed I found four of the later bought fish dead and I have not seen the others, except those I had originally, which are all right. Why did the fish die?

If a pond the size of yours is frozen over for some time and the ice is not broken many foul gases may have formed in the water and have been locked in by the ice. Also fresh oxygen cannot find its way into the water. The fish which you purchased may have been fairly recently imported from a warm country, and they could not stand the treatment as well as the fish which you had fed well and got used to the climate a bit before the winter. I recommend that in your case it would be better to clean out the pond well before re-stocking.

I have a pond 20 ft. by 6 ft and graduated in depth from 5 feet to 1 1/2 feet. There are 14 pockets at all stages of depth. What are the correct depths for planting water lilies and other plants?

Many queries from readers of "The Aquarist" are answered by post each month, all aspects of fish-keeping being covered. Not all queries and answers can be published, and a stamped self-addressed envelope should be sent so that a direct reply can be given.

There is no exact depth at which a water lily must be planted. Some need a depth of at least two feet whilst others must not be over 12 inches deep. It is possible to buy lilies for the different depths and if you tell the supplier what you require he will recommend those best suited for your purpose. As for the other water plants, these are many and varied but the great majority do not require very deep planting. All the more ordinary types such as the reeds, rushes and pickerel weeds, only need be just covered. So many of the so-called water plants are only bog, or marsh plants, and grow quite well when in a swampy area.

I should like to know the number and types of fish for stocking my pond; are 15 inch golden orfe suitable?

Golden orfe are certainly suitable for your pond and there is no reason why you should not get them to breed in it. These fish do like a fairly large pond and I know where they have bred in a pond not quite as large as yours. To be successful at breeding these, or in fact any other types, you must not over-crowd the pond with other fish. I suggest half-a-dozen orfe and a dozen goldfish. A few shubunkins could be added and some fantails. Some green or golden tench, say four, and half-a-dozen rudd. If you do not put too many fish in the pond in the first place they will soon breed and you will have all the fish you require at less expense. Do not put in any perch, sticklebacks, roach or pike.

I have a tank 24 ins. by 12 ins. by 12 ins. which contains three goldfish, each three to four inches long. I have spent pounds on plants only to see them torn up and eaten by the fish. I have tried chopped lettuce and spinach but to no avail. What else can I do?

It is rather strange that some goldfish once they are over two or three inches long destroy plants. Some never seem to do this whilst others are always at it. You could try setting up the tank with plenty of water cress and then if they do eat some it will not be such an expensive game re-stocking. If they eat the *Vallisneria*, try some *Sagittaria*; this is tougher and may last longer. *Potamogeton* is also a fairly strong plant which may not be eaten so avidly. Feed the fish well and see that some Bemax is added to the diet.

We have a large pond with eight goldfish as big as herrings. When the pond was cleaned out we found one which appeared to have lost its golden scales and had a large silver patch. It was evidently not fungus as it was smooth and silvery. In the pond are also a number of brown fish which someone has put there. At the moment we are in trouble with frog spawn, but we are removing it as fast as we can. Can you give advice?

As long as you are sure there is no sign of fungus there is nothing to worry about. Many goldfish have patches of silver on them and this can increase in size until the fish may become all that colour. If they develop black patches, these often go—they are sometimes the result of damage. The brown fish in the pond are in all probability young goldfish which have been bred in the pond. These are always bronze in colour when young and change to the gold later on, sometimes in a year or two but sometimes never at all. If a number of uncoloured fish are allowed to remain in the pond as breeders it may be that your strain of goldfish may be so spoilt that in time very many fish may not change colour at all. It is better to remove uncoloured fish which

are in the pond each spring. As for the frog spawn, why remove it? I cannot get enough of it. I consider that the frog tadpoles are one of the finest foods for goldfish. They are also very good scavengers for the pond but do not last very long where goldfish are about eating them. You would be well advised to keep the spawn till it hatches and rear some tadpoles to a larger size as they make much more food when say, half to full grown.

I was interested in your reply concerning the sticklebacks which had two white objects in them when they died. We had a similar occurrence but there were three objects which did appear to be able to contract some time after removal; also the fish was just a hollow shell.

This certainly seems to indicate that the objects may have been some form of flat worm. It is a pity that the objects could not have been examined under a microscope. I shall be interested to hear if any reader has had a similar experience or if the actual objects have been thoroughly examined.

Last November, I emptied my pond and the water lily has been kept dry since then. What should I use for potting compost and as it has been out of the water so long should I use some bone meal for nourishment?

The water lily should not have been kept dry all the winter. These plants in nature are under water all the year round. If the root-stock has got very dry indeed you may have killed it. Plant it in the pot with some old turf; a little crushed bone can be used, but this is not important. The water lily roots should search in the pond, they soon run outside the pot, and so use up the waste matter and muck in the water.

Advice is often given to add some sea water to a tank to keep the fish healthy. Is this condition to be permanent and would fish suffer if removed to fresh water?

I certainly believe in the addition of a little sea salt to a tank containing goldfish if they are out of sorts. I think that the addition of a heaped table-spoonful of sea salt to a 24 ins. by 12 ins. by 12 ins. tank is beneficial to the fish. During the weekly servicing some of the water is removed and fresh water added. This gradually lessens the strength of the salt solution. Fish moved to a freshwater solution

from such a concentration would come to no harm. It is only after salt treatment, when an amount as above is added to a gallon of water, that the strength should be weakened gradually so that the fish are not harmed in any way on removal to fresh water.

During the last two days I noticed that a comet and shubunkin are showing signs of mating. There are four other fancy goldfish with them in a 24 inch tank. I have another smaller tank—would it be possible to breed in this one?

In the first place you are likely to get some awful cross-breeds, but if you must breed from these fish it is possible to let the fish spawn in the tank and then remove the plants with eggs attached to the smaller tank for hatching. Your smaller tank would hardly be large enough to spawn the fish in. You must keep a good watch early in the mornings to look for the eggs so that you can get them before the fish eat them all.

Among a spawning of fry from a pair of shubunkin types I have found a perfect comet. This fish has a tail like a pair of scissors. How did I get a comet from these fish?

Just because the fish has a long forked tail it does not make it a comet. Many present-day so-called shubunkins have been so crossed with other types that their progeny can be almost anything. Even in a spawning of Bristol shubunkins from a good strain it will be found that the length of tail can vary considerably in different fish. The comet should be a scaled fish, and I am sure that a good one could not be produced from such a crossing as described by you.

I have a tank 5 feet by 3 feet by 3 feet in my dining room. How many fish will it hold and what lighting should I use overhead?

The tank could hold 90 inches of fish. If you place in it many large stones or rocks the volume is somewhat reduced, but the surface remains the same and this is the more important. For coldwater fish light is only necessary to improve the appearance of the tank and to encourage growth of the water plants. I think that if you have 100 watts spread out to say, four 25 watt lamps, and use them according to the amount of good daylight the tank will also receive, this will do for your purpose.

Discussing NETS

A FEW weeks ago a friend had his first experience of *Ichthyophthirius* (white spot) and to his dismay the fishes in all three of his tropical tanks were affected. Fortunately, with the use of a proprietary cure, the condition was soon remedied without the loss of a single fish. Few aquarists have never had this disease attack their fishes, but it is hardly feasible that it broke out simultaneously in each tank. New specimens had not been introduced to any of the tanks during the previous fortnight, but the same net had been used in each tank within the space of a few hours some two or three days before the outbreak of the disease.

It is probable that diseases other than white spot are passed on in this manner, and to avoid any risk it is a sound idea to keep one particular net for use in each tank. Frequent sterilisation of nets in boiling water lessens the chance of spreading disease and should always be carried out immediately after netting a dead or dying fish. Society table shows and exhibitions are a possible source of infection and organisers should make a firm rule that every competitor supplies and uses his own net.

Nets left lying on the aquarium cover glass in a pool of

water soon rot, and their lives are lengthened if hung up where they can dry quickly. After spending 15 or 20 patient minutes trying to catch a slippery customer it is most irritating to have your capture escape through a hole in the net, so as soon as holes appear in the fabric, renew it at once. Suitable material can be obtained from the sixpenny stores and is easily sewn into place on the original wire frame. To prevent damage to fry it has been recommended that the net used should be made of oiled silk. A dessert or tablespoon is a good substitute.

Make your own inexpensive *Daphnia* net by sewing the top half of a nylon stocking on to a heavy gauge galvanised wire frame. The handle is made by forcing the two ends of the wire into a suitable bamboo cane. Complete the net by closing the end of the stocking with tightly tied string. This net, being of a conical shape, is not ideal for catching *Daphnia* or other similar live food on a large scale as the *Daphnia* in the bottom of the net tend to be crushed. It is, however, quite suitable for the aquarist with one or two tanks.

Although nets are not normally a big item in the average aquarist's budget, pence saved by careful usage and home repairs can be spent on other items of equipment. Careless use can have far-reaching and devastating consequences and may result in the loss of many valuable fishes.

Roy Whitehead

THE AQUARIST

AQUARIST'S Notebook



by

RAYMOND YATES

WHENEVER I visit public aquaria (which is rather frequently) I am rarely satisfied until I have been the complete round of all the tanks four or five times. This is essential for many reasons. One has to see just what fish and plants are on view, the numbers, sizes and groupings used, lighting and effects, feeding and so on. Other visitors are, on occasion, rather distracting, and the best times to visit these establishments is early morning, as soon as they open, or late evening. (I remember having Southsea Aquarium to myself one evening by going in at 9 p.m.) The living vista in every tank is changing all the time and the aquarist often sees some interesting aspect which was not on view the first or second time he passed the tank.

Belle Vue (Manchester) Aquarium has a novel poster on view at the entrance which shows a man in an aquarium who has just been hit on the head by a brick thrown by one of the fish. The caption below intimates that this stunning blow is very much what the fish feel when you tap on the glass. Aquarists should bear in mind that aquarium covers which are banged down sharply produce much the same effect. The Bolton municipal aquarium situated in the town hall (admission free) is remarkable for the vast size of the tanks for tropicals. These are roughly six feet deep but this depth never worries the inmates, who swim happily around or browse on the bottom without any obvious discomfort.

Another feature of this large tank space is that large cichlids such as the Jack Dempsey can be kept in numbers with very small fish such as zebra danios without trouble. Perhaps horsehead (on which most cichlids are fed in public aquaria) is more tasty. In large tanks like these it is easier to see the natural positions of the various fish—the top, middle and bottom swimmers.

Some time ago, in one of my visits to a public aquarium, I came to a tank which contained three clown loaches, three bumble bee fish and one adult harlequin. The harlequin was in the last stages of white spot disease, being covered with hundreds of white spots, fins folded and quite at its last gasp. The other fish, however, were excellent specimens, completely free of the disease and it would seem that these two varieties are resistant. In another tank was a number of "scats" and I was interested in their efforts at uprooting plants.

The tank was planted with approximately 50 clumps of Indian fern and the scats were busy pulling away the gravel round the roots of each. They did not bother with un-planted parts of the tank gravel but concentrated on the fern roots. As far as I could see the plants themselves were not harmed but in the space of 10 minutes the scats had uprooted 17 plants, which floated to the surface. Cichlids could not have done a better job. I was interested to see that a shoal of *Rasbora dormocellata*, numbering about 20 fishes, all had tail-rot whilst their companions (*Rasbora ainoensis*) were in excellent condition.

One of the best aspects of public aquaria is that therein the fish should be seen as near as possible to a natural state—the fish and furnished aquaria seen at shows are so unnatural. But sometimes one comes across tanks at public aquaria which do a great disservice to the hobby—tanks overgrown with blue-green algae, crowded with *Hydra*, fish diseased or deformed. On such occasions aquarists should draw the attention of the person in charge to the offending exhibit.

A BOOK of zoological poetry issued recently is now in many of the public libraries. This is *Zoo for Zanies*, by Nicholas Husk, published by James Barrie. In its

150 pages there are many very humorous poems about fish and other denizens of the deep, including the archer fish, climbing perch, upside-down catfish, sea horse, tench, blind cave fish, eel, bitterling, octopus, walrus, whale, remoras, porpoise, sea cow, whelk, oyster and sponge. Strangely enough the only creature with four legs likely to be kept by those interested in vivaria which is included is the skink. Altogether a very amusing book, written by a man who was called "The Oyster Poet," or "The Bard of the Bivalve," who, unfortunately, is no longer with us.

FISHKEEPERS who have sons in the Boy Scout movement should take the opportunity to let them know that there is a fish called after a scout. This is the white cloud mountain minnow (*Tanichthys albonubes*) which, translated, means Tan's fish. The idea is popular that this fish was called after a Chinese boy scout named Tan, who discovered it. Alas for language difficulties, we shall probably never know the name of that boy scout who introduced us to such a delightful fish. The Chinese word for a scout is "jun tan" and the verb to scout is "dzoh jun tan," so it seems as if the white cloud is really scout fish.

SOME of the chemicals used for treating sick fish are harmful to plants. Methylene blue kills all plants, mercurochrome is very hard on *Apogon* and *Cabomba* whilst quinine and mepracrine are fatal for *Vallisneria*. There are many other examples and the aquarist's dilemma is very real. I was mourning the loss of some good plants recently when I suddenly realised that there was an easy solution to the problem, after all.

Before adding chemical treatments to a tank I first of all remove those plants which are likely to be affected by the drug. These are thoroughly washed in warm water and then placed in a glass jar, globe or floating dish. Fresh water of tank temperature is added and to this I add a strong dose of acriflavine, a chemical which does not appear to have any effect on plants. When the disease has been overcome in the tank, the water is gradually changed until little trace of the drug which has been used remains and the plants can now be returned, after a further thorough washing.

The combination of washing and acriflavine treatment removes any risk of reintroducing the disease into the tank when the plants are put back. I usually stand the jars containing plants under treatment in another aquarium so that the correct temperature is maintained.

Post-Mortem Examination of Fishes:

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

Specimens should be sent direct to Mr. Cotton with full particulars of circumstances, and a fee of 3s. It is important that the following method of packing fish be adopted:—Wrap fish, very wet, and loosely in grease proof paper and then in wet cloth. Re-wrap in greaseproof or wax paper and pack around with cotton wool in tin box. Despatch as soon as possible after death, with brief history of aquarium or pond conditions.

OUR READERS

Write—

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



Toxic Rubber Suckers

HAVING recently got some small suction "rubber feet" from a chain store I used them to fix partition glasses in two tanks, in both of which fish died within about 30 hours. On removing the partitions, the rubber stops had a slimy feel such as I had never noticed before when handling similar-looking rubbers on thermometers, etc., and suspecting that they might be the cause of the trouble, samples were sent to Mr. W. H. Cotton.

With his permission I enclose a copy of his report as I think this is a subject about which aquarists should be warned.

Report from Mr. W. H. Cotton:—"In 24 hours at 50° F. water in which these rubbers have been immersed becomes toxic to animal life. I am unable to determine the exact nature of the toxicity, but it may be associated with the colouring matter in the rubber. Under tropical aquarium conditions, with bio-activity between 75° and 80° F., I would expect the toxicity to be intensified and in consequence I would not advise the use of these rubbers. I think it is possible that different batches and different colours of these rubbers might vary in their reactions as obviously they are not intended to be chemically inert, but I do not think it would be worth while risking them in any circumstance."

(Miss) A. GURNEY,
Bath.

Zebras in Trouble

I WOULD like to relate my experience with zebra fishes and white cloud mountain minnows. When I first set up my 24 ins. by 12 ins. by 12 ins. tank in November, 1951, I purchased four locally-bred young zebras (all proved to be females). In May 1952, I obtained a pair of young mountain minnows from a local breeder and placed them in the tank containing the zebras.

The female minnow died after a month (cause of death unknown) and in July, 1952, I purchased a further pair of locally-bred mountain minnows. Ever since the zebras, minnows and other fishes have been housed happily together with no ill effects. The zebras never lost any of their dash or spirit—in fact they are still together, except for one zebra which I lent to a friend for breeding and which has produced a very good batch of fish. Many of my friends have admired the size, shape and condition of my zebras.

D. MANN,
Bognor Regis, Sussex.

I HAVE found the correspondence concerning zebra fishes and mountain minnows interesting as I have kept these two species in the same aquarium for some 18 months with,

as far as I can see, no ill effects. In fact, if readiness to spawn is any criterion, they are in good condition for both have spawned on the day following their removal to a breeding tank.

I cannot, therefore, accept the theories propounded by those of your correspondents who have been unable to keep these fish together.

E. W. GALLAGHER, Secretary,
Lyons Club Aquarist Section.

The only aspect of this matter which has not been cleared up by the correspondence is whether or not any possible inimical effects of one of the species on the other are seen only if one species is introduced into a tank in which the other species has been established for some considerable time. This would be the case, if the phenomenon be a real one, if the inhibition of one species is due to accumulation of a secretion in the water, for example; perhaps tolerance of its effect develops when the two species are kept together right from the start—Editor.

Poisonous Copper?

IN the April issue of *The Aquarist* Mr. A. Boarder states that the use of copper tubing for water fountains can be poisonous to fish. I would like to point out that having been a designer and constructor of fish ponds for Messrs. Bentalls of Kingston-on-Thames for a number of years and having introduced fountains in a number of ponds, I have never hesitated in using copper tubing in ponds we have constructed, and have never found it to harm the fish in any way. Should Mr. Boarder doubt this I would be pleased to show him some of these ponds so that he can see for himself how the fish look.

R. A. RICHENS,
Ham, Surrey.

The concentration of copper known to be fatal to goldfish has been recorded (copper sulphate) as 0.5 parts per million; blanket weed is killed by 0.12 p.p.m. and *Daphnia* die in water containing 2 p.p.m. Trout are much more sensitive to copper (lethal concentration 0.14 p.p.m.)—Editor.

Rust Prevention

ON page 16 of *The Aquarist* (April) mention is made of the product "Rustanode." Providing that the metallic surface concerned is rubbed down to the extent of giving the preparation a large number of bright spots for it to "key in" it will do its job excellently. I have used it on my motorcycle and speak from experience. However, it has danger for aquarists and this is why.

"Rustanode" consists of a heavy paste of zinc particles suspended in a poisonous fluid. It is a self-electrolysing

metamorphosis

medium that deposits a coating of zinc on ferrous metals, thus preventing further rusting. Unless the bright spots are too far apart rust will not eat its way up through the paint but remains immobilised. No aquarist needs to be told of the harmful effects of zinc on the well-being of fish, so this paint should be covered by a thick undercoat and finishing coat of a good waterproof paint—preferably cellulose, as fumes of this paint lose strength quickly and the tank can be brought into use more quickly than slower drying paints. "Rustanode" itself dries remarkably quickly, especially on warm days.

Incidentally, late last year a reader asked if it were usual to have half a dozen or so white flowers growing from *Vallisneria*. At that time I had at least 50 flowers growing from some 18 or 20 *Vallisneria spiralis*.

LAURENCE SANDFIELD,
London, W.13.

Kingfisher

A READER asked if anybody else had seen a kingfisher as near to London as he had (10 miles outside). I would like to tell you that I saw one a month ago in a London park. I think it is an unusual sight to see this bird right inside London like this.

B. MORRIS,
East Dulwich, S.E.22.

Vermiculite in Aquaria

MR. E. ELKAN, in commenting on my letter (*The Aquarist*, February) seems to have missed the point of my complaint concerning the lack of written information about vermiculite. My letter referred to the handling of vermiculite from the aquarium point of view whilst his reference to various publications and articles seem to relate to the scientific and horticultural uses of vermiculite.

Mr. McCallum's article is, however, sufficiently encouraging for one to persevere with vermiculite. In my own aquarium there has been a definite improvement in plant growth—old growths have almost entirely died away and have been replaced by brilliantly green new leaves and new shoots. I have now adjusted the pH of the water to slightly alkaline (not having soaked the vermiculite in water before use) and the fish seem to be quite happy.

There appear to be several types and grades of vermiculite on the market, with varying acid and alkaline reactions, and it would seem essential to neutralise their effect before use in an aquarium.

J. G. POWELL,
Gorseinon, Nr. Swansea.

Vermiculite

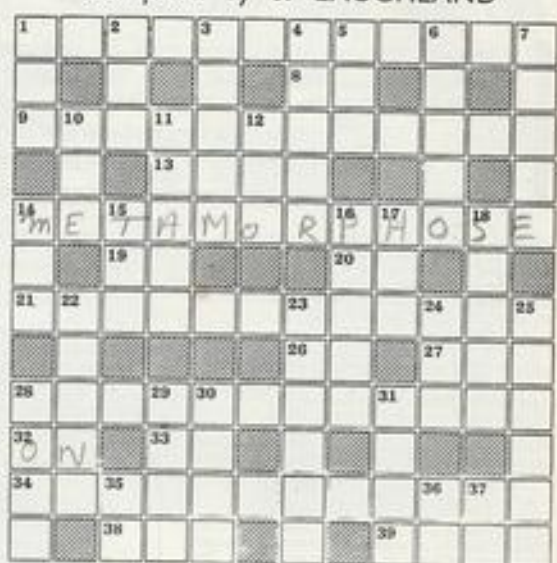
COMMENTS on the use of vermiculite in aquaria, as expressed in recent issues, will probably leave many readers guessing as to whether it has any value or not. The opinions of Mr. McCallum and Dr. Elkan are, in effect, diametrically opposed—the former says it is useful, the latter useless.

From my observations I lean towards Dr. Elkan's views. Vermiculite seems to have the property of encouraging root growth, but will not support plant life. Cactus growers use vermiculite to "strike" cuttings of plants which are normally difficult to root, but if left in the vermiculite, the cuttings will fail even after an adequate rooting system has been established.

Relating this to the aquarium, it does seem that vermiculite under the compost can have very little value. My recipe for good plant growth is adequate top-light, preferably from the sun, a compost of coarse sand and gravel which will not pack, and only occasional use of the dip-tube.

BARRY FUNNELL,
St. Leonards-on-Sea, Sussex.

The AQUARIST Crossword
Compiled by J. LAUGHLAND



CLUES ACROSS

- 1 Fiscal hip rot (anagram) (8, 4)
- 8 Head of the *Betta* (2)
- 9 Grey whale (12)
- 13 Soft mud or leak (4)
- 14 Change, as tadpole to frog (12)
- 19 Halting exclamation of herring (2)
- 20 For example from osier (1,1)
- 21 Would this aquarist raise a breeze in Arctic seas? (9, 3)
- 26 Head of *Acara* may heat tank (1, 1)
- 27 A perch holds the monkey (3)
- 28 The mud or beer (anagram) (12)
- 32 This is not off (2)
- 33 Long drawn sound of fish-book (2)
- 34 I am our leg rag upset (5, 7)
- 38 Salmon river polluted this season (3)
- 39 Hush before the Christian era (4)

CLUES DOWN

- 1 Half of 23 down (3)
- 2 Whale (3)
- 3 A variation of a language (5)
- 4 His name upsets a bren (5)
- 5 Leerie without ire (3)
- 6 Making known (slang abbrev.) (5)
- 7 He sat confined (3)
- 10 Weapon of hatcher-fish? (3)
- 11 A — of goldfish? (5)
- 12 Prefix denoting Aztec (3)
- 14 Mackerel head for Scot (3)
- 15 Abbrev. most common before numbers (3)
- 16 Portion (5)
- 17 Half herring (3)
- 18 Factor in fish judging (5)
- 22 O, (5)
- 23 Fish from trap on (6)
- 24 Transient craze (3)
- 25 Sea nymph (6)
- 29 Domestic implement of use to aquarists, we fear (4)
- 29 What the net did (4)
- 30 — and the result (4)
- 31 Fishes' aid to balance (4)
- 35 39 unrhused (1, 1)
- 36 Hal returns (2)
- 37 Mother of 14 down (2)

PICK YOUR ANSWER

- 1. A representation of *Malapterurus electricus* (the electric catfish) has been found in: (a) The Great Pyramid of Cheops at Giza. (b) The Step-Pyramid at Sakkara. (c) The Temple of Isis at Philae. (d) The Temple of Ramesses IV at Karnak.
- 2. *Microplanis parakybas* (the barlequin catfish) belongs to the family: (a) Callichthyidae. (b) Doradidae. (c) Loricariidae. (d) Pimelodidae.
- 3. *Gasterosteus spinachia* is the scientific name of the: (a) 3-spined stickleback. (b) 4-spined stickleback. (c) 10-spined stickleback. (d) 15-spined stickleback.
- 4. The generic name *Xiphophorus*, as in *Xiphophorus helleri*, means: (a) Sword-bearer. (b) Sword-fish. (c) Sword-shaped. (d) Sword-tailed.
- 5. *Marattia* (water clover) is represented by about: (a) 20 species. (b) 40 species. (c) 60 species. (d) 80 species.
- 6. The flowers of *Ranunculus delphinifolius* are: (a) Blue. (b) Red. (c) White. (d) Yellow.

(Solutions on page 44)

G. F. H.



from AQUARISTS' SOCIETIES

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

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

IN spite of adverse weather conditions Mr. C. Graham visited the **Oldham and District Aquarist Society** to talk on selective breeding and guppy breeding, and members specially thanked their lecturer for overcoming difficulties of snow and ice to reach them.

NINETEEN members present at the monthly meeting of the **Peterborough and District Aquarists' Society** heard a talk given by Mr. G. Stockdale on water plants. He dealt briefly with over 50 varieties of tropical and coldwater plants, and in the discussion which followed members raised questions on lighting, types of compost and plant identification.

MEETINGS of the **Piscus Aquarist Club (Dulwich)** are now held on alternate Wednesdays and Fridays at 8, Beaufort Road, East Dulwich, London, S.E.22. The club hopes to organise a show to be held in conjunction with Camberwell Coronation celebrations and is looking out for new members. (Secretary:—Mr. Harvey Buck, 6, Havelock House, Honor Oak Road, Forest Hill, London, S.E.23.)

DR. C. W. D. COLE gave a talk entitled "On the outside looking in," when he visited **Wolverhampton and District Aquarists' Society**. He spoke of what constituted good and bad members of a society and the best and worst features of shows, and then spoke on fish diseases and their cures. At a later meeting members were asked for their "bright ideas and crazy notions" and many useful hints and tips were forthcoming. The society has changed its headquarters to the Y.M.C.A., Stafford Street, Wolverhampton.

NEW headquarters of the **Wimbledon and District Aquarists' Society** is St. Marks Hut, Compton Road, Wimbledon Hill, London, S.W.19, where meetings are held on second and fourth Mondays of each month.

AT a table show for any variety fish held by **Wigan and District Aquarists' Society**, first awards went to Mr. E. Boddard (best in show and best characin); Mr. L. Buchanan (best guppy); Mr. E. Ainsworth (best A.O.V. livebearer); Mr. L. Buchanan (best A.O.V. tropical fish).

WHEN the annual general meeting of the **West Surrey Pondkeepers' and Aquarists' Club** was held the treasurer said that but for the club's 1952 show there would have been a financial loss on the year. Last month Mr. J. Abrahams gave a talk to the society on tortoises and terrapins and showed members some living specimens.

VISITORS are always welcomed at meetings of the **West Middlesex Aquarists' Society** and full details of the Society's activities can be obtained from secretary, Mr. C. L. Wood, 19,

The Crossways, Heston, Hounslow, Middlesex. In March the Society staged a show of goldfish, fancy goldfish and livebearers.

WHEN a three-class table show was held by the **Wembley and District Aquarium and Pool Association**, Mr. A. Wilmet took first in the A.V. guppy class, Mr. W. Peplar's black widow fish won the A.V. characin class and Mr. J. Harrap's tiger barb was first in the junior section's A.V. fish class. Auctions of fishes and plants are held regularly at meetings and at a



The Aquarist's Badge

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

To obtain your badge send a postal order for 1s. 9d. together with the **Aquarist's Badge Token cut from page XX**, to **Aquarist's Badge, The Aquarist, The Buss, Half Acre, Brentford, Middlesex**, and please specify which type of fitting you require.

recent meeting a discussion of various methods for painlessly destroying diseased or ageing fish was held.

SOCIETIES in the neighbourhood of **Warrington Aquarist Society** are challenged to a match table show on an evening which can be arranged by interested secretaries who write to Mr. D. Shepherd, 21, Green Street, Warrington, Lancs. Only lady competitor in the Society's furnished aquaria contest, Mrs. J. Moisdale, took first prize and was awarded the Dave Shepherd Challenge Cup.

REGULAR meetings of the **Walthamstow and District Aquarists' Society** are held on first Fridays and third Wednesdays of the months at St. Luke's Hall, Brookdale Road, and are well attended. Judges are to visit members' homes to award one of several new trophies for the best kept aquarium. The fourth annual

show of the Society is being planned for two days in September.

FIFTY members were present at the cinema show which formed the March meeting of the **Urmston and District Aquarium Society**. A visit by members to the Blackpool Tower Aquarium is being arranged and the Society is staging an exhibition of aquaria in Coronation week.

NOTES on white worm culture, dwarf cichlid spawning, tropical water plants, aquarium indicator lamps and glass tubing technique are included among other practical items in "Tabs," the monthly bulletin of the **Tyneside Aquatic and Biological Society**.

CHANGE in meeting place and times is announced by **Staines and District Aquarists Society**. Meetings now take place at 8 p.m. on the second and fourth Thursdays of each month at Phoenix Hotel, Church Road, Staines.

LAST month the **South-Western Aquarists' Societies Association** met at Bristol Zoo for an all-day programme. A talk on aquarium hygiene and healthy fish was given by Mr. W. Harold Cotton.

EACH attending member at the last meeting of **Southport and District Aquarium Society** was presented with a micro worm culture. There was an auction of plants and a brains trust, and at the table show for barbs Mr. R. Gregson's half-banded barb took first. The secretary of the Society, Mr. G. F. Briant, 124, Upper Aughton Road, Birkdale, Southport, Lancs., hopes to form a local section of the Federation of Guppy Breeders' Societies and would like to hear from interested enthusiasts.

MEETING date of **Southampton and District Aquarists' Society** is now the fourth Friday of each month and the rendezvous is 30, Carlton Crescent, Southampton. The Society will be staging a competitive show in September.

AT the first annual general meeting of the **South-Glasgow Aquarium Society**, Mr. R. D. Neilson was elected president and Messrs. W. L. S. Mackenzie and J. B. Brown were re-elected treasurer and secretary.

NEW headquarters of the **Smethwick and District Aquarist Society** in High Street, Smethwick, were opened by Mr. A. Bowyer, member of the panel of the Midland Association of Aquarist Societies last month, and Mr. Bowyer gave a lecture to members on characins.

RECENT meetings of the **Shirley and South Birmingham Aquarists' Society** have included a practical demonstration of points judging of fish by Mr. C. D. Roe, the president, a table show (winner, Mr. E. R. Penton—none) and last month a lecture on show standards of coldwater fish by Mr. T. L. Dodge—secretary of the Midland Aquarium and Pool Society.

A SPECIAL programme for beginners was arranged at the March meeting of the **Sheffield and District Aquarists' Society**, when aquarium setting up was demonstrated, aquarium apparatus shown and described and various species of tropical fishes were discussed and illustrated by the epidiacope. This proved a very popular evening at the new meeting place—The Postman's Recreational Club—and many questions were asked and answered by expert members.

An alligator was among the specimens exhibited when Mr. A. Boarder gave a talk on the hobby and aquarium keeping to members of the Streatham Women Residents' Association



Photo :

Streatham News

THE end of the Jubilee Year of the Scottish Aquarium Society was marked by the annual general meeting. Popular Mr. Strachan Kerr, secretary of the Society since 1935, retired from office and with Mrs. Kerr was made honorary life member. Mr. C. H. Thomson, treasurer for 14 years was also made life member on his retirement. New secretary of the Society is Mr. A. Heron, The Bellahouston Hotel, Paisley Road West, Glasgow, S.W.I.

SIAMISI fighters were shown at a table show for members of the Scalare Scarborough Aquarist Society in March, when a cambodia specimen owned by Mr. A. Wardill took first prize. Second prize was also awarded to a cambodia fighter, owner Mr. J. Lastenby, who also took the monthly prize.

AT a recent meeting of the Salisbury and District Aquarist Society members heard a talk by Mr. G. Knight on pond construction, maintenance and stocking.

Important Announcement LECTURE TOUR

THE AQUARIST is proud to announce that by special arrangement, Dr. Myron Gordon, geneticist to the New York Aquarium, our distinguished American contributor and the world's foremost authority on fish genetics, will be visiting Britain this September to give a series of illustrated talks on the selective breeding of tropical fishes. A schedule of places and dates for the talks is being prepared by *The Aquarist* and details will be given in a coming issue.

ANNUAL Show of the Rochdale and District Aquarist Society will take place this month (see Aquarists' Calendar). The Society is to instal an aquarium at the Rochdale Children's Orthopaedic Hospital. A visit by members to Chester Zoo is planned for 21st June.

GREAT satisfaction was expressed by members of the Redhill and District Aquarist Society with the growth and activities of the Society during its first complete year at the occasion of the annual general meeting in March.

RUSSELL Challenge Cup, for the greatest number of points gained during the year by a member of the Aquaria Group of the Preston

Scientific Society at the Society's table shows, was awarded to Mr. W. Critchley at the annual general meeting last month. At the March meeting a novel feature was introduced—members offered lococretes on various aspects of aquarium keeping, and many useful tips, suggestions and accounts of personal experiments in Infusoria feeding resulted from the short talks. Members are to visit a fish hatchery in the near future.

A SOUND financial position was reported by the treasurer of the Portsmouth Aquarists' Club at the annual general meeting. The chairman spoke of the success of the club's open show last year and predicted greater results from this year's show. Mr. J. Booth, 17, Landguard Road, Southsea, was re-elected secretary.

FRIENDS & FOES No. 14

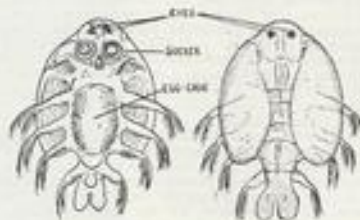
ARGULUS

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

CLASS:—Crustacea—from Latin *crustaceus*—having a shell.

THE *Argulus* is a fish parasite quite often introduced into ponds or aquaria with catches of *Daphnia* from wild fish ponds, or on native fishes procured from anglers. It is extremely flattened, and almost circular, and the tyro may easily mistake it for a loose fish scale when it is attached to its host. If more than a casual glance is given it will be seen that the "loose scale" has four pairs of legs constantly on the move.

It attaches itself to its victim by using a pair of strong discoid suckers situated on the ventral surface. Above these



Female fish louse magnified $\times 6$.
Left: under surface; right: dorsal view

suckers is a large, hollow proboscis, which is inserted between the fish's scales to reach its blood supply. Normally pale and semi-transparent, it may become any shade of greenish or

Fish Louse

yellowish red as it gorges itself. The largest I have seen have been a little over one quarter of an inch in size.

Each female is fertilised by a male and then lays between 100 and 300 eggs, attaching them to stones, or, if in an aquarium, to the glass sides. The eggs hatch in approximately 28 days, and the immature lice are free-swimming for a period before seeking a host. Females are said to outnumber males and to die after laying their eggs. They are sexually mature when one month old. Breeding occurs throughout the spring and summer months. Minnows are said to feed on argulids.

Respiration occurs through the gills, situated in the fish-like tail, and also to a lesser extent over the whole of the body.

C. E. C. Cole

New Societies

Invicta Fish-Breeders' Circle Secretary: (Mrs.) B. M. Rushton, 240, Canterbury Street, Gillingham, Kent.
Redwing Club Aquarists' and Angling Section Secretary: D. J. Silenus, c/o Redwing Ltd., 340, Beulah Lane, Thornton Heath, Surrey.

Secretary Changes

CHANGES of secretaries and addresses have been reported from the following societies:
Ayrshire Aquarist Society (Mr. A. Morrison, 29, Bonnyton Road, Kilmarnock); **Birkenhead and District Aquarium and Herpetological Society** (Miss J. M. Byrne, 5, Harrington Avenue, Birkenhead); **British Herpetological Society** (London Group) (Miss J. E. Callow, 2, St. Mary's Avenue, Teddington, Middlesex); **Brixton Aquarist Society** (Mr. N. Rogers, 12, Regent Road, Herne Hill, London, S.E.24); **Croxley and District Aquarist Club** (Mr. J. V. Wright, 48, Gonville Avenue, Croxley Green, Herts); **Eltham and District Aquarist Society** (Mr. R. J. Somerville, 4, Gloucester Road, Balvedre, Kent); **Hornchurch and District Aquarist Society** (Mr. B. G. Ashman, 19, Knighton Road, Romford, Essex); **Lambeth Aquarist Society** (Mr. W. J. Olford, 54, Kenbury Street, London, S.E.5); **Miltham and District Aquarists' Club** (Mr. K. H. Sykes, 57, Warwick Gardens, London Road, Thornton Heath, Surrey); **Reading and District Aquarist Society** (Mrs. M. C. Brown, 74, South View Avenue, Caversham, Reading); **Scottish Aquarium Society** (Mr. A. Heron, The Billshouston Hotel, Paisley Road, West, Glasgow S.W.1); **West Wilts Aquarists' Society** (Mr. D. Remington, 38f, Longfield Road, Trowbridge, Wilts); **Workington and District Aquarists' Society** (Mr. J. G. Park, 2, Wall Street, Workington).

Aquarist's Calendar

6th-10th May: **British Aquarists' Festival**. Open show of furnished aquaria, tropical and coldwater fishes, reptiles, water gardens, etc., at the Exhibition Hall, Belle Vue Zoological Gardens, Manchester.
 15th May: **British Herpetological Society** (London Group) meeting "Lizards and snakes," 7 p.m. at the Linnaean Society's rooms, Burlington House, Piccadilly, London, W.1.
 16th-17th May: **Rochdale and District Aquarist Society**. Second annual open show of furnished aquaria, tropical and coldwater fishes. Full particulars from show secretary Mr. J. Dodsworth, 251, Rooley Moor Road, Rochdale, Lancs.
 18th-23rd May: **Ulster Aquarium Society**. Coronation open show of aquaria and fishes. Schedules available from Mr. J. Lutton, Rannoch, Antrim Road, Glengormley, N. Ireland.
 28th-30th May: **Kettering and District Aquarist Society** annual show open to entries from members of societies in the area. At the Co-op and Labour Institute, Kettering. Show secretary: Mr. S. D. Simons, 52, Church Street, Burton Latimer, Kettering, Northants.
 30th May-13th June: **King's Lynn and District Aquarists Society** annual show with marine, coldwater, tropical and herpetology sections at 26, Broad Street, King's Lynn.
 3rd-6th June: **Workington and District Aquarist Society** annual non-competitive exhibition of tropical and coldwater fishes at the Central Hotel, Workington.
 5th-7th June: **North Derbyshire Aquarists' and Pondkeepers' Association**. Natural history exhibition at the Barrow Hill Hotel, nr. Chesterfield.
 6th-7th June: **Chelmsford and District Aquarist Society**. Open aquaria show in conjunction with Chelmsford Coronation

celebrations. Details from Mr. R. A. Green, 2, Norfolk Drive, Chelmsford, Essex. Entry closing date, 25th May.

11th-13th June: **National Aquarists' Society** National Aquarium Exhibition at Royal Horticultural Hall, Westminster, London, S.W.1. Closing date for entries 18th May. Competition secretary Mr. C. R. Macdonald, 73, Tudor Gardens, London, W.3 (phone: Acorn 1063).

19th-20th June: **Haslingden Aquarium Society**. Open show of tropical and coldwater fishes and furnished aquaria (details from secretary, Mr. W. Taylor, 11, Salisbury Street, Haslingden, Rossendale).

22nd June: **British Herpetological Society** (London Group) meeting "Reptiles and amphibians in art and literature," 7 p.m., at the Linnaean Society's rooms, Burlington House, Piccadilly, London, W.1.

27th-28th June: **Burnley Aquarists' Society** second annual Roses Show (Lancashire & Yorkshire) with furnished aquaria and individual fish classes. Show secretary: Mr. F. Taylor, 25, Hogarth Avenue, Roschill, Burnley, Lancs.

1st-4th July: **Wembley and District Aquarium and Pool Association** third annual open show at St. John's Hall, Crawford Avenue, Wembley. Show schedules from show secretary, Mr. A. Williams, 16, Weston Drive, Stanmore, Middlesex.

2nd-4th July: **Coventry Pool and Aquarium Society** show and exhibition of tropical and coldwater fishes at Swan Lane Garage, Ford Street, Coventry.

18th July: **Frimley, Camberley and District Aquarists' Society** show in conjunction with Camberley Agricultural Show. Details from secretary, Mr. J. A. Willis, 5, Sherwin Crescent, Farnborough, Hants.

21st-25th July: **Shelf and District Aquarist Society** open show of furnished aquaria, tropical and coldwater fishes at Shelf Church School, Shelf, nr. Halifax. Show schedules and entry forms from Mr. L. P. Nash, 28, Rochester Terrace, Great Horton Road, Bradford, Yorks. Closing date 25th June.

23rd-25th July: **Bath Aquarists' Society** open show at the Pump Room, Bath.

28th July-1st August: **Bournemouth Aquarists' Club** annual show and exhibition at Princess Hall, Grand Hotel, Bournemouth. Schedules and entry forms from Mrs. Pennon, c/o Haskins Bros. Nurseries, Coy Pond Road, Westbourne, Bournemouth.

3rd-8th August: **Hendon and District Aquatic Society** annual open show of fishes and aquaria. Schedules available from Mr. B. Calow, 6, Axholme Avenue, Edgware.

Early notification of dates of coming aquarists' events for free insertion under the above heading is requested to ensure inclusion in good time.

Aquatic Traders Association A.G.M.

ANNUAL general meeting of the Aquatic Traders Association was held in London on Tuesday, 31st March. Officers of the Association and members of its council were elected as follows:—Chairman, Capt. L. C. Betts; secretary, Mr. H. F. V. Wright, 88, Inderwick Road, Heston, London, N.8; treasurer, Mr. S. C. Jacobs; manufacturers: Mr. R. P. Shepherd (Little Wizard Products Ltd.), Mr. T. C. Horeman (Windmill Products); wholesalers: Mr. J. North (J. North (London) Ltd.), Mr. R. A. Fairbairn (Fairbairns Aquaria Ltd.); retailers: Mrs. Riley (The Aquarium, Croydon), Mr. C. Wright (Kington Exotic Fisheries).

It was announced that the Association is offering a trophy for the best trade stand at the National Aquarium Exhibition next month. The report of the secretary was made, the treasurer's balance sheet presented and a general discussion of a trade survey made by Mr. H. A. Boughton (Singleton Bros. Ltd.) took place. The question of white spot diseased fishes was raised and the difficulty for retailers of ensuring that the stocks they ordered were disease free. An importer, Mr. Jacobs (Hillside Aquatics), spoke of experiments taking place to perfect a container for tropical fish transportation which would minimise the falls in temperature which were undoubtedly a cause of so much so-called white spot.

The chairman (Capt. L. C. Betts) in presenting his report stated that the Association was now in its fourth year. That the A.T.A. should still be in being was in itself an achievement, bearing in mind the difficulties that are inherent in keeping alive such an association. Nevertheless, he could not understand the apparent lack of desire on the part of the trade to really get together. It seemed that the trade vacillated between indifference and a lukewarmness, dependent on the state of the trade itself. When trade was good interest vanished, when it was bad a sort of critical indifference manifested itself. Despite this a handful of enthusiasts,

largely centred in the council, kept going and met regularly. It might be that the work of the Council was not adequately publicised, in which case this could be remedied. During the past year the Council had met at six-weekly intervals and their deliberations had been lengthy and into the small hours. Very briefly their work had been—amongst other things—(a) To launch an Approved Product Scheme to the trade. (b) To tighten up the membership to ensure that only bona fide traders obtained membership. (c) To open up negotiations with the Customs and Excise with a view to exemption from purchase tax on aquarium goods, or at least a reduction in the scales of assessment. (d) Successful negotiations with the Railway Executive for the better handling and more expeditious delivery of fish and equipment for A.T.A. members. (e) The settlement of charges by one member against others, of unfair trading, or of disputes generally. (f) The arrangement of meetings for the three branches of the trade, to discuss the problems and difficulties associated with each. (g) The arrangement of an annual dinner.

It cannot, therefore, be said that the Council has been lacking in its efforts and it is difficult to see what more can be done without a more active membership. For the chairman to appeal to the members to take a greater interest in their own affairs is surely putting the boot on the wrong foot. The secretary, for his part, complains bitterly that the members are not making known their difficulties sufficiently for him to take them up and give a service which he is only too willing to take on. Thus it can only seem that the A.T.A. is fully capable of becoming a live active association, but it rests with the members alone to breathe into it that life force which makes the whole thing worth while. The chairman therefore appealed to the members to change their attitude from a negative indifference, to a positive, active participation in an association which means so much to them.

Crossword Solution

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

PICK YOUR ANSWER (Solution)

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