

The AQUARIST AND PONDKEEPER

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Photo:

Laurence E. Perkins

An unusual inmate of the aquarium but a most interesting one is the crayfish. Some observations on its breeding habits are given in an article on page 36

Editorial

THERE is something about the electrical methods now so widely used for catching fish that offends the sporting instinct in most of us, whether adherents of the rod and line or not. The case for electric stunning has been presented that it is a valuable technique enabling all the fish in a stream to be examined and sorted without injury and little fuss. Apart from the misuse of the technique by poachers, the questionable harmlessness of the method has also raised doubts about it. Lord Hollenden, as president of the Salmon and Trout Association, recently announced that there is a possibility that trout can be permanently damaged by electric currents. The main effect is apparently on the vertebrae of the fish, which are changed so that the backbone becomes inflexible, ultimately causing death. It is to be hoped that investigations will reveal the conditions which produce this happening so that it can be obviated without limiting advantages of electrical fishing.

Preventing Tragedy

IN the past few years there has occurred a disturbing number of deaths by drowning of small children in garden ponds of private houses. These tragedies can take place in a very short space of time when vigilance over a child's activities has been temporarily relaxed, and it is a regrettable fact that even the most shallow ponds can represent a serious danger to infants. This is a plea for aquarists who own ponds in situations where their own children or other children can have ready access to them to ensure that members of their household appreciate the danger. There is unfortunately no cure—prevention is the only remedy. It is probably best to fence ponds or cover them with netting for the period of a child's life when this danger exists. A reader has recently provided us with information concerning the source of a neatly made covering protection for ponds at reasonable cost, and we shall be pleased to give details to other readers requesting this.



Mr. E. W. Aubrook standing before tanks containing neon fish of his own breeding

EARLY in February I visited Mr. E. W. Aubrook of Dalton, Huddersfield. It was one of those days which started with the false promise of a thaw but by the time I had arrived in Huddersfield in the afternoon the snow was crunching crisp underfoot as I made my way along Albany Road to the home of this well-known West Riding aquarist. The warming effect from the "cup that cheers," quickly produced by Mrs. Aubrook, revived the flagging spirit and the usual topic when aquarists meet was soon well and truly under way.

Mr. Aubrook is a member of the Huddersfield Society and has been interested in fish life for a good number of years; in fact, the interest started when he was a boy. I should say that each year finds it growing stronger. His fish house is situated in the garden at the rear of his home and is constructed of double asbestos sheeting with a high-ridged, single-wired, quarter-plate glass roof. The building is some 12 feet long by nine feet wide with a height of eight feet to the ridges, and six feet three inches to the eaves; it houses 20 tanks ranging in sizes from 12 ins. by 6 ins. by 6 ins. up to 36 ins. by 15 ins. by 15 ins. They are all base heated by gas and the first interesting thing I noticed was the type of burners used in this heating system. Instead of producing the usual vertical flame which one is accustomed to seeing, each burner provided two small horizontal flames. Actually they are known by the trade name of Bray's Horizontal Burners. Mr. Aubrook told me that he finds them extremely efficient and far superior to the vertical type burner.

No thermostat is used—experience indicates the right adjustment to provide what may be described as subsidiary heat for the tanks from this base heating, because the house temperature is maintained at approximately 60° F. I was told that a certain amount of variation occurred in water temperature, of course, but Mr. Aubrook is a firm believer in a reasonable amount of variation and, as far as he is concerned, satisfactorily achieves the variation required by this method.

Plants and their propagation is one of this aquarist's

AQUARIST AT HOME:

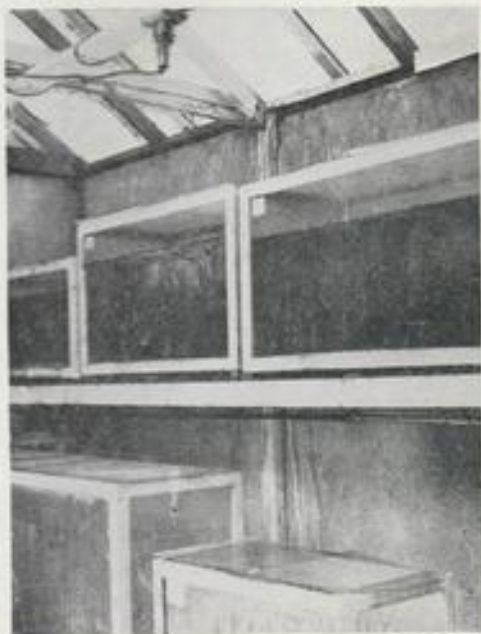
Mr. E. W. Aubrook

(HUDDERSFIELD)

Interviewed and photographed by JAS. STOTT

particular interests and I know from personal experience that he grows some grand specimens, especially Indian fern and varieties of *Cryptocoryne*. These two species are always grown in earthenware pots (seed pans) containing a base of peat which is covered with a deep layer of medium gravel, offering plenty of depth for root development. No gravel is used over the base of the tanks containing these potted plants; the water is rendered slightly acid by the peat and a number of fish are placed into the tanks with the plants.

At the time of my visit, *Barbus schuberti*, pearl gouramies, mountain minnows, *Aphyosaimon australe*, black-banded sunfish, penguins, yellow wagtails and neons were to be seen in the tanks of this fish house. I was impressed by the really good colouring of the neons, and Mr. Aubrook told me that he attributed this to the conditions in which he kept them. He keeps his neons in tanks so placed, in the fish house, that they are always in subdued light. He is firmly convinced that excessive light is detrimental to obtaining full coloration with the neon and is of the opinion that it is responsible for lowering the neon's resistance to disease. By using methods described in well-known articles by German authors he has been successful in breeding these fish. All the fish of this species to be seen on my visit were owner-bred.



In this aquarist's fish house stock aquaria are thickly planted with *Vallisneria*

Transporting Tropicals in Safety

by LAURENCE SANDFIELD

ALL of us are at some time or other faced with a long and cold journey while carrying "trops," delicate or hardy. The vacuum flask is a good stand-by, of course, but it is quite costly, and it always seems a waste to me to use a food-liquid appliance for the transport of livestock. Aside from that, the one used for the hobby often gets mixed up with the domestic one, and then the lady of the house quite justifiably says that she does not fancy using either!

The case that I made to avoid all this sort of thing consists briefly of a felt-lined box with a flap in front and a hot water vessel to heat the inside of the case by convection. I'm no joiner, and I was out for low cost, so carpentering friends have spoken scornfully of my effort. However, it works, and that is the main consideration.

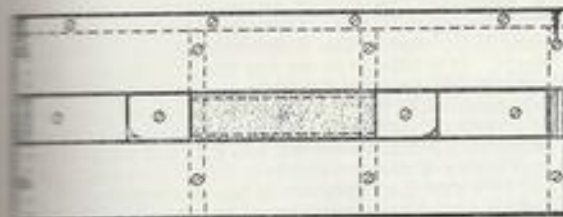
Deciding the Dimensions

The dimensions depend on two things: the size of the hot water vessel and the size of the fish bottles. You can use either an eight ounce medicine bottle for the hot water container, or build one out of 18 gauge brass, soldered or silver soldered at the joints.

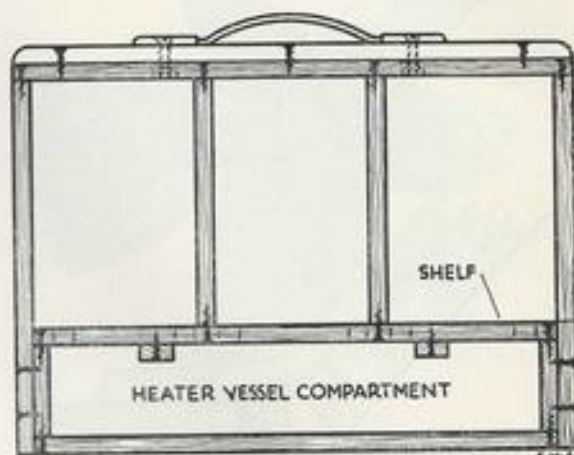
To obtain the length of this, take your three fish bottles and place them side by side with a quarter of an inch between them, upside down. Measure across the three, at the greatest diameter. Cut the sheet brass for the body to that length.

Bend it into a cylinder along its length and solder, using plenty of solder and flux. When set, press it into an oval cross section and solder the two ends on. It's best to hold the job in a vice, holding the ends against the body. One end will have a hole cut in it the size of a small cork. When you have the ends fixed, solder a ring of brass of the same internal diameter as the hole around it to afford purchase for the cork. Then fill it with hot water and cork it to use if it works.

You can build the case out of quarter-ply for a really high-class job, but my method was to buy an egg crate from our grocer and cut what I wanted from it. Other than this, everything can come from that famous multiple store whose name begins with W. They sell a squat, square, screw-topped bottle with a green plastic cap. Inside the cap is a paper washer which can be fixed by sticking it to the plastic with the jointing compound called Hermoseal, which is not soluble in water. If you have a motor-



STRENGTHENING PIECE, SCREWHEADS & HANDLE



FRONT VIEW SHEWING COMPARTMENTS ETC.

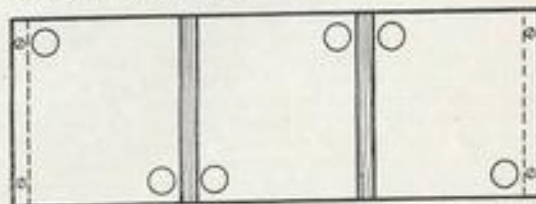
cyclist friend, he will probably have on hand the small amount you need for this. My own case is actually based on the dimensions of these bottles.

To obtain the length and width of the shelf on which the bottles stand cut a piece of ply a half inch wider than the bottles and stand three of them on it with a quarter inch between the centre and the two outer ones. The length will be the total dimension of the bottles plus a half inch. Cut two battens a half inch deeper than the heating vessel and as long as the shelf is wide. Screw them on each end. Screw two half inch battens to the shelf to hold the heating vessel firm. This is now the underside of the carrying case. So now you have a shelf with two small battens on the underside and two supporting legs its own width, one across each end, screwed to the underside.

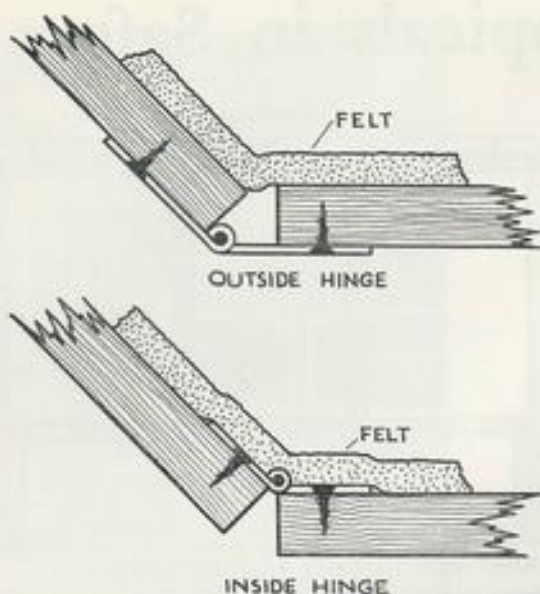
The Bottle Departments

Cut two ends, now, the same width as the shelf and high enough to project above it the height of the bottles plus one inch. This is finger room. Screw the ends to the shelf legs, making sure that all the edges are flush. To recapitulate, we now have a shelf with two end plates projecting above it. Now you can decide whether or not to have your bottles in separate compartments. If you do, cut a pair of walls the height of the part of the end pieces that project above the shelf. Put one bottle right in the centre and mark a line each side. Screw the walls on to the shelf so as to cover the line. This will make a close fit.

Now hop out to W's again and purchase three sheets of the coarse hairy felt they sell for reducing the wear of



THE SHELF SHOWING APPROXIMATE POSITION OF THE VENT HOLES



Showing allowances to be made for felting when inside or outside hinges are used

stair carpets; at the same time, buy two bottles of gum. When you get home, spread the gum on the wooden ends (inside) and press the felt firmly home. It will stick quite quickly. From the underside, drill at least two half inch holes into each compartment, arranging them to miss the bottles. A vee-shaped cut front and back will do, for these are the heat-vents.

Cut a piece of wood that will cover one side of the construction. Screw it on. This piece is the back. Make all edges flush. Fit another beneath the shelf big enough to cover all edges and flush up with the outer surface of the back. You are now three parts complete. Cut strips of felt to fit the back of the compartments, and the back and ends of the heat vessel compartment. By the way, you can either fit the hinges for the front outside after you have secured the bottom, or inside before you do. The inside fitting leaves an ugly gap when the case is closed.

Top and Handle

For the top, take a piece of wood as large as the bottom. Along the exact centre screw a piece about one inch wide and a quarter inch thick. This is the strengthening piece to which the handle is attached and will not be necessary if you make the top piece a half inch thick. This method, however, saves weight, for a half inch of strong wood is considerably heavier than two thinner pieces of weaker wood. You can also use shorter and lighter screws.

I used for my handle one of the type that consists of two pieces of leather sewn together with a flat piece of spring steel between them. Any good leather shop will sell this type at about 1s. 3d. There is a slot at each end, and these are covered by two metal caps. A metal thread bolt (preferably 2BA) is passed through the cap and the slot and also through the wood to which the handle is attached, so that when carrying the handle bends up in the middle and the spring steel gives slightly to each motion, thus rendering carrying more comfortable. When the box is put down, the handle lies flat, nice and neatly.

Recess the nuts into the underside of the lid if you have the tools to do so, otherwise turn the bolts very hard with

a screwdriver so that the nuts are drawn a little way into the wood. Gum felt on the inside after screwing the top down on to the rest of the case. Now you have a case that looks something like that shown in the sketch. You have a top, with or without a strengthening piece, three compartments side by side and a narrow compartment beneath them. All is lined with felt except the bottom of the heater vessel compartment.

Let us turn to the front flap. I've already spoken of the alternative inner and outer fitting of the hinges, so it remains but to say that if the outer fitting is used leave enough leeway so that when the flap is held vertically prior to lining, a gap half the thickness of the felt is left.

When the fitting is finished, spread gum over the bottom of the heater vessel compartment (up to now left unlined) and also over the inside of the flap. Now lay the felt upon the two surfaces so that both of them are completely covered. From above, with the flap open, the gap between the flap and the case bottom will be invisible. The felt must cover the inside flap to within one eighth of an inch of each edge, or flush with each edge.

Finishing the Case

So now you have an almost complete case, with all the inner walls lined with rough, heat-holding felt. The only walls not so covered are the two internal walls that split up the case into three compartments. It would be just as well to cut a vee in the front of these walls to permit the warm air from the lower compartment to circulate not only upwards but also horizontally between compartments.

You have two jobs left now. W's will supply a hasp for about 4jd. The loop and ring type was what I used. Screw the loop on first, attaching it to the flap. When you fix the ring on to the top, make sure that it is just far enough from the edge so that the loop has to be pushed over it and fits tightly, drawing the flap close against the front edges and compressing the felt between the edges and the flap, thus making an air-tight case.

A light padlock or a bicycle combination lock will give an added feeling of security, although it did not prevent my second case from being stolen behind my back, as it were, while travelling on the Underground. This one had been built carefully, all screw heads sunk and filled with plastic wood and the whole stained and filled, then sealed and cellulose polished in the same way as radio cabinets are. The best thing to do is to fill the screw heads as above and paint the job with a couple of coats of white cellulose paint. This gives a neat look, and one jar of white, or cream if you prefer it, from W's will do it nicely.

The water in the fish bottles will retain its vital warmth for some hours in this case, and I have carried tropical fish safely from Ealing to Wimbledon and from Ealing to Portsmouth in the first crude case that I still use.

Fishkeeping—3,500 Years Ago!

IF you own any Egyptian mouthbreeders (*Haplochromis multicolor*) they may be descendants of fishes that once belonged to Pharaoh Akhnaten, who ruled about 1,500 years B.C., during the Eighteenth Dynasty of Ancient Egypt. It is difficult to say just what species were kept at that time but it is a fact that tanks were used in which to keep fish, presumably for the same reasons that we have aquariums to-day. Although only the foundations of Pharaoh Akhnaten's North Palace are left, it is still possible to see the remains of numerous tanks in one of the immense halls, and by a stretch of imagination you can visualise the King and his attendants marvelling at the tenacity of the female mouthbreeder in caring for her babies.

R. W.

THE AQUARIST

Fighting Fish

(*Betta splendens*)

ORIGIN—Labyrinthici, from Greek *labyrinthos*—a tortuous passage, and Latin *icius*—suffix indicating possession of a character.

FAMILY—Anabantidae—from Greek *anabantos*, gone up, or *anabaino*—to go up, plus Latin *idae*—suffix added to stems of generic names to form family names.

GENUS—*Betta*, from a native name Ikan bettah, and Latin *splendens*—splendid, bright, glittering.

VERY few of our aquarium pets cause such gasps of amazement and admiration as the fighting fishes. In furnished or unfurnished aquaria they maintain their glowing reds and blues and greens, and with the slightest encouragement display their flowing fins to the greatest advantage. People who are normally completely disinterested in fishes stand staring in astonishment and incredulity wherever these living gems are exhibited. Frequently, after listening to an account of the fishes' attacking habits, these people are imbued with enthusiasm—there seems more in fishkeeping than they imagined possible—and another embryo aquarist is born.

The magnificent specimens of *Betta* seen at fish exhibitions to-day are the result of many years' selective breeding and bear only a faint resemblance to their ancestors, imported from Siam many years ago. The wild type fish, we are informed, were great home-breakers and caused many domestic upheavals in the country of their origin than any other single cause. Bred for their pugnacious qualities, male fishes carried the fortunes of their owners and owners' friends upon their backs. Defeat in the battles royal that were staged, frequently meant ruin and misery to their unfortunate backers. I doubt very much whether any other fish has ever been called upon to bear so much responsibility.

Experimental Breeding

Several years ago there was much discussion in this country regarding the formation of a specialist society devoted to line-breeding and culture of fighting fishes, but as far as I am aware nothing was actually started. Perhaps lack of people willing to take office and to do the necessary work was the reason. Maybe there will now be more talk after the magnificent articles on "Heredity in Siamese Fighting Fish," written by Dr. Myron Gordon, the famous American geneticist, and published in the October and November, 1953, issues of *The Aquarist*. These articles certainly give a wealth of information and ideas to anyone interested in experimental breeding or line-breeding. The Goldfish Society of Great Britain, and the Guppy Breeders' Society were formed with a great deal less reliable information to work upon.

Bettas like comparatively warm water—a temperature of 75° to 80° F. keeps them happy. Normally they are peaceable with other species of fishes, and it is quite usual to have either a male, or a pair, in a community tank. Occasionally, however, this does not work at all satisfactorily. I remember one sad occasion, during the period when fishes other than livebearers were extremely difficult to come by, witnessing the sudden and entirely unprovoked attack by a fighting fish upon a half grown zebra danio. The danio



Displaying male fighting fish (above); female (below)



was seized and shaken violently, just as a dog shakes a piece of rag. It was released, but before it had recovered suffered another severe shaking, from the result of which it expired.

Such savagery is usually reserved for members of their own species, particularly during breeding periods. When the male first feels the urge to reproduce his kind he does not seek a female fish until he has prepared a nest of bubbles at the surface of the water. He works for long hours at this self-imposed task, and it is commonly believed that the bubbles blown from his mouth are prevented from bursting by being coated with a secretion from the buccal cavity. Certainly no ordinary air bubble would remain whole for such a time. If floating leaves are available, the nest may be constructed beneath their protecting undersides. In such cases the leaves may be lifted clear of the water surface by the pressure of the air bubbles.

Woe betide any fish which approaches during the construction of the nest. Females of the same species wisely keep out of the way, knowing the penalty for incaution is torn and bleeding fins, if no worse. Likewise, when the job is completed, a female unwilling or unready to mate risks death. If willing she will allow herself to be shepherded to a position beneath the nest. It is then that the male demonstrates the amazing suppleness of his body. After a short preliminary displaying of his fins, during which he swims round the female, twisting first one way and then the other, he literally wraps his body in an almost complete circle round that of his spouse. For a moment or two the pair remain stationary, with the female usually turned upon her back. Then they drift apart, seemingly in a coma, and a number of white eggs, each no bigger than a pinhead, begin their downward journey to the bottom of the tank.

Sometimes it seems that the pair will never emerge from their trance, but they do. A sudden convulsive movement and they come to. The male swims downwards and gathers the eggs in his mouth, followed a split second after-

wards by the female. Both swim back to the surface and spit out the eggs into the midst of the bubbles, which prevent them from falling once more to the bottom. The embrace, the pause, and the egg-gathering is repeated until the female is spent. By this time up to one thousand eggs will be safely buoyed up at the surface.

Now the mood of the male changes. From being a gentle and solicitous lover he becomes a savage wife-beater. The female quits, and hides from his fury wherever she can find cover. It is only humane to remove her as gently as possible. This is a ticklish task. Any undue disturbance of the water will break up the nest, and may cause the male to lose interest and feed on the eggs. Normally, however, he maintains an unending vigil beneath the nest, replacing any bubbles which burst, and constantly moving the eggs around and piling them closer and closer together in a floating cone.

Incubation is rapid, and usually within 48 hours the fry begin to emerge from the eggs. The bubbles now support their tiny wriggling bodies. Violent movement may rupture the bubbles in places, causing the fry to tumble out of the nest. Father is waiting for just such emergencies, and is utterly reliable. A stroke with his fins and he is there to catch the little fish in his mouth. Will he eat it? No, indeed! Back he goes to the nest and hurls the baby back through the bubbles into safety.

Providing always that he has been fed on ample live food before starting his vigil, and he is not unduly disturbed by hosts of human faces peering into or through his home he is unlikely to consume the fry. If either of these provisions are not made, however, anything might happen, as many an owner has learned the hard way.

It has sometimes been stated that fighters do not mind living in cramped and dirty quarters, because they are independent of oxygen from the water. This is only partially correct. Adult fighters will exist in dirty water—that is to say, dirtier than that tolerated by other species, but not in really foul conditions. The fry must not be kept in anything but clean surroundings, for until they are three weeks old they are without the auxiliary breathing apparatus (the labyrinth) which gives their order its name.

Only the tiniest of Infusoria can be tackled by the fry. If

no culture is available, powdered hard-boiled yolk of egg can be substituted. Little and often is the maxim to be followed with this method of feeding. Too much will foul the water. Keep the food gently moving at or just under the surface. This is best achieved by very slight aeration. Follow up as the fry grow with brine shrimp, *Cyclops* nauplii, micro worm, tiny *Daphnia*, gnat larvae—any live food small enough for the youngsters to swallow without choking.

Given sufficient, and warm enough water—about 78° to 80° F.—growth should be steady and colours start developing within four to five weeks—sometimes earlier. Usually it will be found that a few fry jump right ahead, and that as they grow older the difference in size and development will be more and more manifest. Sometimes these are the best fishes—sometimes they are not, being short-lived, or coarse. Not enough information is to hand to say whether one should encourage or try to hold back such offspring.

At first it will be impossible to sex the fry, but when a female is about two months old, a tiny white spot, looking for all the world like a protruding egg, will appear at her vent. No male ever shows such a spot.

A curious fact about fry raised together is the absence among them of fighting. They live harmoniously in a group, however, only while none are removed from the aquarium. As sure as one is taken away it seems to upset the equilibrium somehow, and squabbles ensue. When sexing is possible, select the finest males and raise them in a number of separate containers—one to each container. They will benefit by being given the greatest possible amount of room each, but, if space is strictly limited, can live and mature in a 2 lb. jar, floated in heated water.

To make certain that the males do not get out of the jars, keep them covered. I have known fish jump two inches or more vertically into the air to get over the edge of a 2 lb. jam jar which had barely a quarter-of-an-inch between it and the aquarium cover glass.

The females are usually happy enough together in one large aquarium. The fins of males which have been engaged in scraps usually heal satisfactorily, but when spread show traces of scars, which detract from their value as exhibition specimens.

FRIENDS & FOES No. 24

Pond-Skaters (1)

GERRIS

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

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

FEW aquarists indeed have failed to see this interesting little visitor to their ponds at one time or another during the spring and summer months. Brownish in colour, and much fatter in body than the water-gnat, it literally "skates" across the meniscus of the water with surprising short, sharp spurts.

It could be termed the scavenger of the water surface, for it immediately falls upon any fly or other insect luckless enough to wet its wings and be unable to rise again. If large, like a blue bottle, and powerful, the *Gerris*

will wait in the vicinity until its intended victim is exhausted by its struggles, and rests quietly. The skater carries a shorter proboscis than the water-gnat, but it is none the less effective in withdrawing the juices of its prey.

I have seen it stated that fish fry are likely to be attacked, but have no evidence to support such a contention. Indeed I have seen fishes such as golden orfe rise and neatly take *Gerris* as a titbit. Eggs are laid beneath water lily pads if these are present, or upon other floating aquatic plants.

Apart from size, the young skaters are almost identical with their parents, some of which are winged, and some wingless.

C. E. C. Cole



THE AQUARIST

Marine Aquarium Keeping

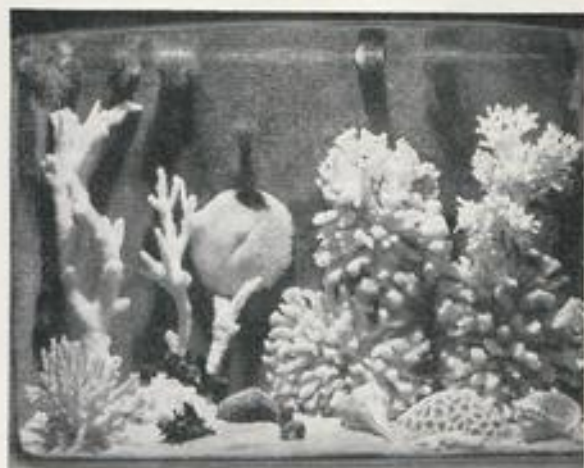
by JOHN B. BOURSOT

FEW places there are of greater enchantment than that narrow world where land and ocean meet, and none on whose inhabitants nature has lavished greater extravagance of shape and hue than on the teeming millions of lovely creatures that people the seashore. Whether you stand on a palm-fringed stretch of shimmering coral sand that rings a lonely volcanic peak in the South Seas; or lounge on the white sandy beaches washed by the warm, sun-drenched waters of the drowsy West Indies; or, warmly clad, defy the icy rain on some bleak northern shore where wintry seas froth before the gale, and leaden breakers explode on slippery rocks or cold grey sand in clouds of stinging spray; whichever it be, there are myriads of living forms of as many designs growing and feeding, fighting and dying, and filling their niche in the great scheme of the sea with the rhythmic pulse of an endlessly repeated life-cycle inherited by many from the dim aeons of time that followed the dawn of primeval slime.

For the last 25 years I have toyed with the idea of a marine aquarium; of coral-encrusted walls with recesses for flamboyant sea anemones; of rainbow-coloured reef fishes darting among branching heads of staghorn-coral, and a surface ruffled by two or more hidden air releases to reflect rippling shadows on the white sandy bottom. But fears and misgivings haunted me—sea water was tricky and apt to putrefy at the touch; coral fishes wasted and died, and invertebrates were unthinkable. Then one day, in an abandon of enthusiastic adventure, I decided to try, fortifying myself with the comforting thought that did it not work it would merely be a question of pouring the sea water down the drain; of washing the coral and sand under the tap and storing it with the empty tank in the attic.

My first consideration was a suitable tank, and one which would eliminate a view of the wallpaper behind. Two all-glass aquaria 20 ins. by 12 ins. by 17 ins. and 20 ins. by 14 ins. by 14 ins. were pressed into service. The former was new and had to be soaked under water for at least a month to remove all traces of alkali from the cement. But the latter had already done duty for a number of years as a home for some of the more beautiful fresh water tropicals which were finally put into a 60-gallon tank. If ordinary tanks are used for sea water (stainless steel is best) all metal parts should be painted with asphaltum varnish or liquid cement sold by dealers. For sealing the sides and floor of an ordinary tank it is advisable to use "Marine Cement." This dries to enamel hardness in a few minutes, and has the advantage of expanding with the pressure of the water. It will last the lifetime of the tank. Heaters and thermostats should be glass-covered if tropical marines are desired.

I bought and collected various species of coral and the lattice-like skeletons of sea-fans. All the former were duly bleached for 24 hours, then boiled in fresh water and subsequently dried in the sun. The sea-fans must, unfortunately, have all traces of their colourful calcareous spines removed by being soaked in water and rubbed with the fingers. This is very necessary else they will rot in the aquarium and pollute the water. Only their lattice skeletons may be used with impunity for decorative



Photo

J. B. Boursot

One of the author's marine aquaria showing anemones and coral skeletons

purposes. From Florida on the Gulf of Mexico I obtained a parcel of sugary white sand almost as fine as talcum powder. This, too, was scrupulously washed in fresh water, and lastly with sea water to displace the fresh. A few selected marine shells were inspected for cleanliness, and work on the arrangement of the tanks was begun. Setting up marine aquaria is far simpler and quicker than is the case with fresh water aquaria. There are no plants to be taken into consideration, and the different coral heads, unlike ordinary aquarium stones, may be leant against each other when they will, as often as not, "hook together" in almost any position desired—within reason.

First I covered the bottom with sand to a depth of an inch or so, and the coral and other marine growths I piled up on edge round the walls. In the case of a tropical sea-water aquarium this should be done to simulate the natural appearance of a reef as nearly as possible. The air releases must not be forgotten, as they are essential for sea water, and should be installed at the same time as the coral. A few small, clean, bath sponges or better still any tree-like forms such as *Clathria delicata*, or flask-shaped forms like *Reniera urceolus* add an alluring atmosphere to the scene when cleverly set among the coral. There are two snags to sponges however. First they are very hard to clean, and only constant thumping with the fist on a flat surface and repeated squeezing in as many as 70 or more waters will render them fit for use in the tank. Then, after about three months they slowly disintegrate.

Seaweeds are best avoided and, indeed, with an adequate panorama of brightly hued sea anemones, crimson organ pipe coral (*Tubipora*) surrounded by heads of ivory bush coral (*Oculina*), clubbed finger coral (*Porites*), rose coral (*Manicina*), and the brown dendritic skeletons of sea-fans and sponges with an odd shell or two deftly placed among them to look as though washed into position by waves, seaweeds are quite superfluous. For aquaria with a northern underwater scene sea moss is excellent and instantly decorative. Pieces should be chosen which have had all traces of animal matter cleaned off. While the lead weight remains inert in sea water, the "fern" slowly falls to pieces

after a few months.

It is a good plan to allow newly collected sea water to settle, and then, by means of a siphon, filter it through filter paper from one receptacle into another. The most convenient containers for the purpose are five-gallon glass jars. Filtering will insure clarity from the start, and avoid any possible fouling of the water by the inevitable death of any suspended plankton. Sea water thus filtered may also be kept in reserve for months in tightly corked carboys set in a cool, dark place. Unfiltered water can be very interesting for a time, however, especially at night when hundreds of tiny light-producing organisms silently flash and sparkle with a cold eerie light in the stream of air bubbles from the pumps.

The marine aquarium should be covered. It prevents the escape of inmates, and the strip light from corrosion. This was neatly arranged for by the builder of my tanks, who constructed a quarter-inch cement ledge round the inside just below the top. The ledge supports a pane of glass which fits the length and breadth of the tank perfectly. The glass cover should have a large circular hole cut in the centre, and notches cut out on the sides just large enough to admit of the necessary tubes and pipes (plastic or pure rubber) connected with the air releases and outflow tube.

Filtered water may be returned through a separate small hole in the glass cover just large enough to accommodate the inflow tube.

The water may be changed every six or seven months, and if no uneaten food be allowed to remain on the bottom it should stay pristine indefinitely. It is wise to siphon off the bottom into a large glass jar once a week or so depending upon the rate at which sediment accumulates. The water is then poured back into the tank through filter-paper in an enamel funnel. If tropical marine fishes are desired the aquarium must be kept at a temperature of between 75° F. and 80° F. Feeding, in so far as my experience goes, presents no problem. My fishes (*Pomacentrus* sp.) readily take raw meat, porridge, brine shrimp and some prepared food and have, in a few instances, grown considerably.

Float any densimeter (I use one for milk) in fresh, un-evaporated sea water, and carefully note the number to which it sinks. By floating the densimeter in the aquarium it will immediately be apparent whether sea water or distilled water should be added to make up for evaporation.

Why marine aquaria are so universally shunned by aquarists is an enigma. They offer new and beautiful horizons, and their scope is as boundless as the sea itself.

(To be continued next month)

The Aquarist's Net

FEW aquarists are deliberately careless when handling their fishes, but thoughtless handling is very prevalent, and often results in ultimate fatality. The eyes of a fish are accustomed to the diffused light which penetrates water; the gills have muscles which must be strong enough to overcome the pressure of water to enable the fish to breathe; the entire muscular system is accommodated to water resistance—but when a fish is held in a net, like a sausage in a frying pan, the eyes are subjected to the full glare of light against which they have no protection, the released gills fly open with risk to the tender gill lamellae and as the muscular system thrashes against less-resistant air, internal organs are in grave danger. So let us describe an efficient net, and a satisfactory way of using it.

The details to be given relate to a four-inch net, but reference to the diagrams will enable any size to be made, and if any accessory manufacturer will produce it commercially in a dark material, a valuable item of equipment will be available to us all.

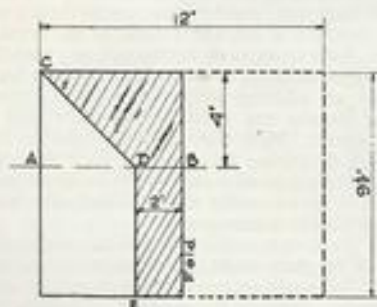


Diagram 1: Pattern

To make the paper pattern (illustrated in diagram 1), take a rectangle of brown paper 12 ins. by 9½ ins. and fold it down the centre. Measure 4 ins. down the fold from the top edge, and draw line A-B. Mark along this line two inches from the fold and draw the diagonal C-D, then mark along the bottom edge two inches from the fold and draw

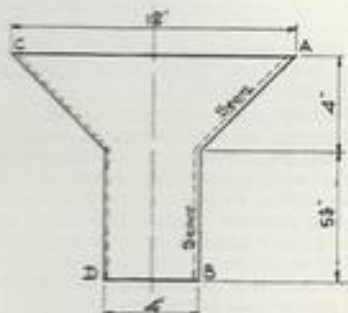


Diagram 2: Cutting

line D-E. By cutting along line C, D, E, and opening out the fold, you have a pattern as in diagram 2.

After cutting out the net material to the pattern, the points marked A and B are brought together and seamed along the dotted line (diagram 2). The points C and D are dealt with in the same way, and when the net is attached to the handle with the points A-B, and C-D, nearest the handle, you have the wedge-shaped net shown in diagram 3.

With a net of this shape, the fish is caught and trapped by raising the edge of the frame above the water line, and then lifted with a backward sweep of the net which secures the fish as in a bag, with its eyes shrouded from light, its gills held closed, its struggles restrained—and it cannot jump out.

W. L. Mandeville

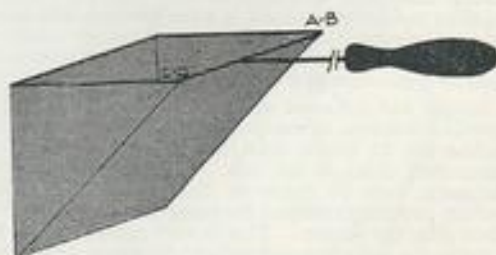


Diagram 3

AQUARIST'S Notebook



by
RAYMOND YATES

EVERY show nowadays has a class where breeders can display teams of six fish which they have bred themselves. The date of birth is shown against each entry in the show programme and also on the front of each tank. The printed word in the programme causes little comment. This only happens when the visitor comes face to face with the fish and reads the date of birth of the fish on view. After a quick mental calculation one hears expressions of naive disbelief . . . "Never in this world!" "Impossible," "Outright dishonesty," "This sort of thing should be stopped," and so on. It is true that almost all the fish on view in this section are amazingly well-grown specimens and the viewer, thinking of his own lack of success, feels that they must have all been reared on Ambrosia (the food of the Gods).

It is a natural human failing to fall into the error of thinking that what we cannot do ourselves is beyond others also. When the judge comes to this section he looks quickly at each tank and notes the dates given. Although usually a man for whom life holds no more surprises he, too, feels somewhat amazed. He cannot question the dates shown; all he can do is accept the figures as given and judge on these or, alternatively, judge each tank on its merits, discounting any dates which appear either impossible or improbable. A great deal of thought has been given to ways and means of eliminating all doubts in this class, but no perfect method has so far been evolved. As long as it is possible for young fish to be purchased and reared in small numbers it will remain an easy matter for substitution to take place. All systems of registration and the like are useless and as we cannot as yet brand fish in the wild west way it looks as if we shall have to accept the dates given without question.

A certain club obtained a few bulbs of the Madagascar lace leaf plant through the good offices of an official in Madagascar who was made an honorary member of the club. These were raffled free of charge in the club and the lucky winners tried their luck. From all accounts no results were forthcoming apart from several outbreaks of white spot!

One successful aquarist in the north has solved the problem of catching fish without effort and with a minimum of tank disturbance. With the tank cover removed he merely introduces the net plus a long piece of blue Perspex. The latter item seems to mesmerise the fish, who are much more interested in watching the Perspex than the net, so much so that they are more or less held in a trance until netted. This is the more remarkable as blue and green are less attractive colours to fish than are red and yellow.

The two-tier stands which are obtainable from any dealer are excellent but suffer from the fact that the lower tank is so well below eye-level that they can rarely be used for show tank purposes or community collections. Some aquarists however are bothered about fitting a tank on this lower level but have used this space for a wireless set. Boarded in the effect is excellent and is well worth considering by those who are cramped for room and find a low-level tank unattractive.

Following the long spell of very cold weather quite an epidemic of fish deaths occurred in the north. Of course, it comes that many fish die at this time of the year, particularly old fish and livebearers, of which the platy is the most

obvious. The losses were very widespread, however, and covered all types of fish, including some of the hardest specimens. The trouble seems to have followed topping up of tanks with raw tap water after the thaw. In the north drinking water contains little, if any, chlorine, but with the many burst pipes in the industrial areas the water seems to have been very well chlorinated as a precaution. Aquarists have taken things too much for granted and losses have resulted. Tests of pH in tanks which had been topped up have shown surprising results and immediate action was frequently necessary. Before removing any water from tanks the fresh source of supply should be checked. In other times of the year, after heavy rain or drought, water can be very doubtful, and is often discoloured.

The problem of cleaning tanks is one which is always with us and one which probably no two aquarists ever agree upon. My own method is rough and ready but I appear to be one of those lucky people who can get away with murder as far as fish are concerned. When a tank needs cleaning I remove all rockery and plants and go over the whole of the glass with a razor blade scraper until all sign of film has disappeared. The dirty water is then allowed about four hours to settle, no fish ever being removed. When a heavy sediment has collected on the bottom I siphon off with gas-pipe tubing into a large enamel bucket until about half the tank water has been removed. To refill I put a large Kilner jar into the centre of the tank or a tall lager glass and pour the fresh water into this. For pouring purposes a large white enamelled jug holding about two gallons is by far the best investment.

It is rarely necessary to remove the sand from a tank which is kept in a proper manner, and this should not turn black, particularly if aeration is used. Sometimes the sand at the front of the tank, below the surface as seen through the front glass, seems to be rather discoloured. Have no fears, this is usually only algae inside the glass below the sand surface and it is easy to remove with the scraper. While the sediment is settling the rockery is scrubbed and the plants cleaned and re-weighted where necessary. These are then returned and the tank left for 24 hours. By this time a trace of sediment previously missed will now be in evidence and this can be removed with the siphon. Where aeration is used and small fish are kept with heavy, jungle-like plant life, I consider it is not necessary to clean out more frequently than once a year, with a monthly sediment removal and topping up. Where large fish are kept with few plants (cichlids for example) then this may be necessary every month.

Live food usually offers less trouble in a tank than dried preparations. Invalid tanks, aerated, but containing no sand or plants, seem to foul very quickly. However, they are generally small and quickly cleaned. I do not think fish should ever be removed from a tank unless they are being disposed of or have to be changed to new quarters. Raw water additions never worry me and I find that long experience allows one to judge the temperature of the new water to be added without even using a thermometer. This is not for the less experienced, however. Where the gravel is discoloured but not too offensive a respite of a month or more can be obtained by merely adding another

inch layer of fresh gravel on top. My own view is that some types of fish benefit from frequent changes of water, in particular, cichlids and characins. Livebearers are not so keen and it would be a foolish policy with *Aphyoseiion*.

Aquarists as a whole fall into two main classes, the "high temperature brigade" and the medium heat followers. Personally I have tried out both of these over long periods and also have been very successful at the lower range—70° F. It is very remarkable what fish will stand and I think it is now generally agreed that a constant temperature with no rise or fall is the least agreeable to the fish. I have kept fish at very high temperatures for months on end (using continuous aeration) and they eat well and colour well besides being very active. Their life is probably shortened thereby. Fish at about 75° F. are perhaps the most happy and this figure is the one at which most aquarists aim. At the lower temperatures, however, all goes well and the only main difference is not colour, which seems to be just the same, but a slowing up of activity. Feeding seems much the same as at higher temperatures. I have for a long time tried out a change of 10 degrees up and down in every 24 hours and from what I can see the fish enjoy it and are certainly not worried.

Some time ago I had the unusual experience of discovering that a tank thermometer was not registering correctly—in fact, it recorded five degrees below the actual figure. This meant that the tank-top temperature was really 85° F. Nevertheless, the fish were quite unconcerned. Where aeration is in use little trouble is likely as this provides an evening-up and obviates wide differences in the tank. Almost all fish will live long happy lives at 70° F., but below this, even half a degree, it is very easy to get white spot. Where the temperature has fallen below this figure I think it wise to raise it to about 80° F. and keep it there for about a fortnight. When a thermostat sticks and the temperature rises, most tropicals die around 95° F., although the bubble nesters will survive over 100° F. Even so they are uncomfortable and will as like as not develop shimmies, followed by tail rot and eventual death.

Occasional specimens of the rather savage cichlid *Astronotus ocellatus* are offered for sale but find few buyers as they have a bad reputation. However, they are not quite the killers they are made out to be if they are kept with other large fish. Some time ago I saw an enormous pair in a dealer's shop. The fish were at least 12 inches long (this is no fishy story) and they were sharing their quarters in friendly fashion with large *severian* and *Barbus everetti*.

The great majority of show programmes exhibit little originality and mostly slavishly follow the set-up of those issued at the larger and more national shows. It should be remembered that if the show is to be a success the public has to attend in fair numbers and that only a very tiny percentage of these visitors will know anything worth knowing about fish. Nevertheless they will buy a programme and the idea of the show is to interest non-aquarists in the hobby and to introduce them to it. The programme is thus the medium whereby these people may be attracted and given much information which they would probably never bother to ask for from stewards in the hall itself. Self-evident as all this is, most programmes are merely a catalogue of classes and entries with an alphabetical list of exhibitors at the back, interspersed with numerous advertisements which pay for the production costs of the programme, but which are almost as annoying as those in theatre programmes (usually 90 per cent. advertisement and 10 per cent. theatrical information).

A good programme should give a great deal of information about the club, meeting nights, times, whereabouts, present

membership, subscriptions and perhaps details of the last 12 months' club programme. The reader will then know just what the club is like without having to ask anyone about it. A plan of the tank lay-out in the show is helpful. Some societies give useful details about some of the fish on view in the show and notes on plants too. For the sake of intending aquarists who may not want to bother with joining clubs as yet, details of the cost of a fully set-up tank could be itemised, this information being of great interest to many visitors with no experience of the hobby. If possible photographs should be used as this adds to the effect. Reference to young members being welcome is rarely made and yet young members or a juvenile section can be a very good thing for any club. Some clubs preclude these would-be members by having their club headquarters on licensed premises, which means young members cannot attend. I think this is a pity; some juvenile aquarists are very enthusiastic and much the hardest workers for a club. My own interest in the hobby began at the age of nine and by the time I was 12 I had written a book on the subject, complete with numerous illustrations, which, perhaps fortunately, never got into print. Brighten up those programmes so that they become more of a souvenir and less of catalogue.

The new forms of adhesive wrapping tape have come to stay and are very useful to the hobbyist. This tape saves messing about with gum or paste when mounting cuttings on fish matters and is very good for mounting pictures for display purposes. It can also be used for the purpose of putting "blinds" to the sides or back of a tank and is quickly removed. At shows it is of use in attaching to tanks labels which can be taken off without leaving the tank glass an unsightly mess. It is very economical if bought in the large rolls, which cost about four shillings or so—the small rolls which cost ninepence or thereabouts prove to be a much dearer method of purchasing this article.

Aquatic Agonies



"As you say, it's a revolting case, but he hasn't been able to talk anything but platy and guppy for a long time now"



A page for
the beginner
contributed
by

A. BOARDER

NOW that the warmer times are here it will be noticed that all coldwater fishes will become more active. This is because their actions are to a certain extent controlled by the temperature of the water. When very cold the fish move about hardly at all but with the increased warmth of the water their movements are quicker. At the same time they get much better appetites as they naturally need more food to make up for this increased energy. If this altering appetite is understood by the aquarist he will more easily realise how often and how much to feed to the fishes. As long as there is sufficient oxygen in the water the fish will feed well if the water temperature is above 50° F. Just over 60° appears to suit most kinds of goldfish the best, although youngsters will thrive at a higher temperature, up to 70° at least.

Unless fish get plenty of the right kinds of food at this time of the year they are not likely to remain healthy, grow and breed. Only the very healthy ones are to be expected to breed, and to try to get unhealthy fish to spawn is just a waste of time. Many beginners fail to recognise the healthy fish, but it is not difficult to pick one out when a few sure signs are looked for. Healthy fish will be almost always on the move during the hours of daylight, especially when the temperature of the water is between 60° and 70° F. The fins will be well spread and the dorsal fin will be held erect. The eyes will be bright and the scales should shine. The whole actions of the fish will show a certain liveliness and the fish will be searching for food most of the time. This is noticeable especially with all types of goldfish, as they have no large stomach in which to digest a large meal. They normally eat small portions at a time but a healthy fish will hardly stop feeding all day long. Watch one browsing over the leaves of the water plants and you will soon see what I mean. The bottom of the tank will also be searched and it is always a good sign to see fish well down in the tank and not slowly cruising around at the surface of the water.

Fish which continually remain at the surface are rarely healthy, especially if they are blowing bubbles. This usually indicates the presence of foul gases or the lack of oxygen in the water. A good test for a healthy fish is to drop a little food into the tank and watch its reactions. If the fish immediately dashes for the food and takes some it is a good sign. Do not expect the same fish to continue to gobble up a large amount of food. It will not do this no matter how hungry it may be, it just cannot swallow a large amount of food at a time. The fish will be seen to go to the rear or top of the tank and chew over the food for some considerable time, and then sometimes a portion will be rejected. After a time the fish can take some more food, but a very little given fairly often during warm weather will be found a safer plan than to attempt to give the fish their day's rations at one go.

The appetites of the fish can be often increased by a partial change of the water. At least once a week and twice in hot weather some of the water should be siphoned

off and fresh tap water added. I do not believe in straining the water taken from the tank so that it can be returned. One point must be borne in mind and that is, if your tap water appears to contain a large quantity of chlorine it must stand in the air for a few hours to sweeten. It is then fairly safe, but if used fresh from the cold tap, the water may be harmful, especially to young fry. If water has gone through a hot water system it is usually safer, but see that it is not too warm as it will not then contain sufficient oxygen.

If you have been fortunate with your fish spawnings you may have some fry by now. Many people are unable to rear the fry although they may have many hatch. One necessity for the successful rearing of fry is to see that they have plenty of space and enough food for them to be able to eat at any time of the day. During the long days the fry will be eating almost all day long and when the tank water is about 70° F. the fry will eat well and thrive. The very young fry do benefit from being fed on live foods where possible. I do not think that anything adequately takes the place of live foods. I know that it is possible to rear fish on dried foods alone, I have done it myself, but I am sure that if enough Infusoria can be given for the first fortnight the fry will do better. After that time they can be given micro worm, then Grindal worm for another week or so. The next step can be to small *Daphnia*, gradually increasing the sizes as the fry grow. You will find that they always go for the largest pieces of food and so you can tell from the way they take the food which sizes are necessary. From these foods you can move forward to chopped white worm and *Tubifex* and then on to chopped small earthworms. Providing the fry have sufficient live foods for the first five or six weeks there should be no trouble as long as the fry are not overcrowded. All kinds of fancy goldfish can be reared easily once they are over six weeks if they have not had a bad check through wrong management or lack of food.

Although the fry may be crowded somewhat during their very early days, it is imperative to see that they are given more space as soon as possible. If not they may develop "velvet disease," fungus or get attacked by flukes. Also plenty of room for them means that there are always likely to be more tiny animals in the water for the fry to feed on. If dried foods are used for rearing many of them are better moistened before being fed to the fry. Some useful early foods where live ones cannot be obtained are: dried egg, milk powder, fine cooked oatmeal, finely ground Bemax and pastes made with ground shrimp and brown flour. Of course it must not be forgotten that the earthworm is a very fine food for most fishes and if it is shredded fine can be used even for small fry. When using shredded worm it is a good plan to feed through a fine net so that only the fine particles go into the tank. Any skin left in the net can be given to the older fish.

Do not be fussy with your rearing tanks. The crystal
(Please turn to page 40)

Breeding Crayfish in an Aquarium



Moulting the cast shell seen on the left was accomplished within two hours by this specimen

by N. E. PERKINS

(Photographs by LAURENCE E. PERKINS)

THE small freshwater crayfish (*Astacus fluviatilis*) is common to many of our streams, especially those which flow through chalky districts, for the creatures require a high lime content to the water in order to successfully produce their characteristic shells. They are shy, retiring creatures of nocturnal habits so that unless one is acquainted with their ways, and on the lookout for them, a stream in which they abound may show no obvious signs of their presence.

I recently acquired a pair of these interesting animals and housed them in a small aquarium of 16 ins. by 10 ins. by 10 ins. I had frequently read that they were very difficult to maintain in captivity unless running water could be provided. However, I decided to offset the absence of this with aeration of the tank by means of an air-pump and by changing the water daily. The tank was kept half full so that the tops of the rocks (included for hideouts) just showed above the water, the volume of which was about half a gallon.

Female "in Berry"

The female was what is termed "in berry"—i.e., she was carrying eggs secured to the swimmerets below her abdomen by a kind of cement. I was keen to see whether these eggs would hatch and interested in a change that became apparent after twelve weeks. The colour of the eggs was altering from a deep purple to a light fawn, each with two prominent black spots. At times the female would tuck a pair of her walking legs amongst the eggs and vigorously scratch herself, pausing occasionally to gently pinch some of the eggs between the small nippers with which the first two pairs of walking legs are armed. At very frequent intervals the whole cluster of eggs was set swinging by the backward and forward motion of the swimmerets. This, of course, was to provide adequate aeration and is customary even when eggs are not present.

One evening, when I went to look at them, I found that the eggs had hatched out and the young, secured somehow by the tail end, were being swished up and down so that their heads scraped the gravel at every stroke. I thought that this treatment must inevitably kill them, but after a few hours they had gathered enough strength to curl upwards and secure themselves by their claws.

The weather was now very warm and the temperature of the water had risen to 78° F. which I knew to be far too high for creatures accustomed to life in an English stream. However, although I could not lower it much (the water from the main supply was 68° F.) I did give very frequent changes of water over that weekend and, despite their lethargic appearance, I was hopeful as the temperature fell that the worst was over.

Death of the Male

During this time I had noticed a change in the attitude of the female. She had become very aggressive and chased off the male whenever he came near—quite the reverse of what had previously occurred. Thinking that he was well able to look after himself I left matters as they were. On returning from my work on the Tuesday, however, I found the male dead and, although this may have been the direct result of the heat wave, it did occur to me that his spouse may have killed him in order to safeguard the young which would soon be crawling about the tank. This is purely surmise as I did not see what caused his death, but her newly acquired pugnacity certainly lent colour to the idea, whilst a fracture between the abdomen and the cephalothorax of the male appeared to support it. This fracture may have been caused by the rapid decay which occurs with these creatures after death but, considering the very short space of time (about eight hours) between seeing him alive and finding him dead, this is improbable.

After the youngsters' first moult, which took place about one week after hatching, they began to drop from the female and congregate on the gravel beneath her. She, in the meantime, had made a retreat underneath some rocks by shovelling out the gravel with her large claws. I noticed that she had also made a narrow channel about three-eighths inch wide beneath another of the rocks and that some of the youngsters had retreated to this spot. While trying to obtain a better view of these I must have alarmed the parent,

for she reared up at me while, at the same time, some of her walking legs, with a sweeping action to the side, bundled all the remaining youngsters into a narrow crevice. I was amazed to see such apparently intelligent action on the part of a creature whose central nervous system is not greatly in advance of that of a worm.

I had often read that the youngsters climb back under the mother's abdomen in times of danger but did not see this happen. I am inclined to think it unlikely because the rapid movement of the mother at such times sets up currents in the water which are too powerful for the youngsters to battle against. It was noticeable that they returned in a leisurely manner and climbed aboard if she seemed about to move off, but even then some preferred to remain in little niches of their own.

The young appeared to be in different stages of development and I had noticed that the actual hatching of the eggs was spread over several days, the first to hatch leaving the mother permanently as much as a week to ten days before the last.

The taking of photographs may have upset the mother, for on the last occasion, when the young, numbering some 40 odd, were three weeks old, she seized and ate one. This may be the creature's natural behaviour but it came as a surprise after the gallant way she had been protecting them.

Ammonia Production

The organ of nitrogenous excretion (the green glands) may provide the answer to the difficulty of maintaining crayfish in captivity in the absence of running water. I noticed that even with a complete change of water each day there was always a strong smell akin to ammonia by the time the next change was due and only wish that I had the equipment available to test the percentage of free ammonia present in the water as against some other aquatic creature of equal weight. However, the whole project was more successful than I had initially anticipated, and I had hopes of obtaining further pictorial records of the moult (ecdysis) in progress.

In this, fortune was not so kind, for although the event occurred whilst both my brother and I were present, we did not actually witness the female's withdrawal from the carapace, which must have taken place within the space of two hours. A photograph was taken, however, of the female beside her cast shell and does show the amazing extent to which this moult is carried with even the covering of the gills being shed together with the major portion of the lining of the alimentary canal. The moult is necessitated by the requirements of growth and, whilst occurring frequently with the young, is reduced to an infrequency of once a year with the adults.



Female crayfish with youngsters—miniatures of the adults—seen at the left of the picture



In this attitude the female crayfish "in berry" exhibits the eggs carried beneath her

Another male was purchased in order that the actual mating might be witnessed and possibly photographed but he appeared to be rather timid and afraid of the female who is by far the larger creature. As time passed, the care bestowed on these animals inevitably became less, principally because I was engaged in the breeding of fancy goldfish which required a considerable amount of attention whilst in the fry stage. The constant changing of the water in the crayfish tank was gradually relaxed and finally, after their removal to a larger aquarium (24 ins. by 12 ins. by 12 ins.) they were left for a week or more, and even then the water was just siphoned off and fresh added.

Purifying Water Fleas

During this time some water fleas (*Daphnia*) used for feeding the goldfish fry, became accidentally introduced to their tank, and these multiplied at an unusual rate, probably because the waste products of the crayfish provided an adequate diet. However, the presence of these water fleas so assisted in the purification of the water that changing the entire quantity became unnecessary, it being sufficient to merely remove small quantities (which were added to the fish tanks that the fry might have the benefit of the fleas for food) and the amount so removed replaced with fresh.

Another interesting point is that the crayfish have gradually become tame, coming to the front of the tank to ask for food whenever I enter the room and taking the food from my hand which, for timid nocturnal creatures, is quite remarkable. I have now had these animals nine months and feel that they have much to commend them as pets.

The Functioning of the Swim Bladder

by C. E. C. COLE

It must not be assumed that *all* species of fishes are equipped with air or swim-bladders. Many marine fishes are without them, and apparently suffer no inconvenience whatever from the lack. They live long, and thrive exceedingly, often enough alongside or among closely related species which possess the organ. This is one of the mysteries which have intrigued scientists ever since the facts were first discovered, and for which no completely satisfactory answer has yet been proffered.

It is generally accepted, however, that the development of the air-bladder was forced upon most species of fishes which were in existence three hundred million years ago. About this time there occurred the greatest, fiercest, and most prolonged drought the world has ever known. Vast stretches of water dried up completely, exposing whole new continents to the humid air. Oceans became inland seas, rivers disappeared, lakes became little more than puddles. Untold millions of aquatic creatures perished, and only those able to develop some means of breathing atmospheric air outlasted the drought. The air-bladder was the fishes' solution to this terrible problem. It budded itself off from the gullet and served as an auxiliary breathing organ, augmenting with air gulped in through the mouth the meagre supply of oxygen obtainable from the sulphurous waters.

Swim Bladder Filling

To-day, of course, things are different, and many species no longer use the air-bladder as a primitive sort of lung. Yet a great number still possess a duct from the bladder to the gullet. This can often be seen when dissecting fishes, if care is exercised. All the characins possess it, as do the goldfishes (see diagram). It is extremely doubtful in these cases whether the duct is used after the primary filling during the first few days of life. In fact, many of the ducts become so choked with mucus in later life that the passage of air through them is impossible.

Yet *some* method of maintaining the supply of gas must be used, for the bladder grows rapidly, and in a fish of any size at all takes up a surprisingly large amount of the body cavity. So thought a gentleman by the name of Bohr, who tried to find out how the gas supply was maintained by conducting experiments.

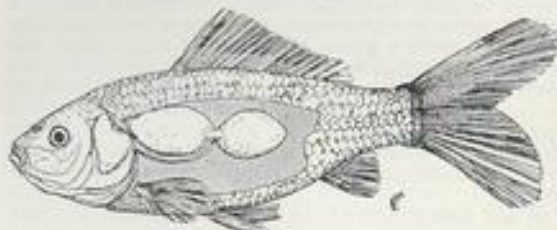
First he punctured the air-bladders of various fishes, and extracted all the gaseous contents. Without any artificial help, the bladders refilled. That's easy, I can hear you saying. Air got through the hole made by the needle. But not so fast, my friend. Ordinary air contains approximately 21 per cent. of oxygen. The air-bladder contained about 80 per cent. oxygen. Where did this extra 59 per cent. come from? Bohr cut the branch of the vagus nerve which served the bladder, and the secretion of gas ceased. The brain of the fish had become separated from the organ, and no longer exercised any interest in it.

Now the air-bladder of a pike was filled with atmospheric air, and placed in a bath of pure oxygen. If the walls of the bladder were porous, oxygen would replace the air which came through the walls until the composition of gases were

similar in both bath and bladder. Nothing happened until the cell tissue surrounding the bladder was destroyed, when rapid diffusion took place. The conclusion to be drawn was that the gaseous contents of the bladder must be controlled by "specific secretion" within the bladder itself. Bohr's deductions were backed up by the discovery that in many species the walls of the bladder are richly supplied with blood-vessels, which can discharge oxygen into the bladder.

The composition of the gas inside the bladder varies, being higher in oxygen in those fishes which dwell deep down in the ocean. This argues that these species probably draw upon the oxygen to enable them to remain at great depths—in much the same way that a pilot, or a modern mountain climber, will carry a supply of oxygen to help him stay in a rarefied atmosphere.

While talking about deep-dwelling fishes, it is interesting to note that the possession of a swim-bladder can be anything but an asset under certain circumstances. A fish is forced to adjust his bladder to conform with the surrounding pressure of water upon his body. Otherwise it would be crushed and useless. For every 30 feet this pressure increases by 14.7 lbs. per square inch. So a fish swimming, say, three hundred feet below the surface is so attuned that it can successfully resist 147 lbs. pressure on every square



Swim bladder of the goldfish

inch of its body surface. This is equivalent to a 10½ stone man standing upon each square inch.

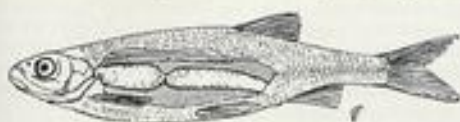
When suddenly and rapidly brought to the surface in a net or trawl, the poor creature is unable to adjust itself quickly enough to the rapidly reducing pressure, and may literally burst. Alternatively, its bladder is forced out of its mouth, or the fish remains in a completely helpless and distressingly swollen state. If the fish has not burst, relief is often given by inserting a needle into the bladder. The hiss of gas escaping is followed by the resumption of a normal shape, and the ability to swim in a normal manner is recovered. Left alone, the swollen fishes often subside after a period, demonstrating the fact that the bladder can not only generate gas, but absorb it, given sufficient time.

Over-inflation can sometimes be observed when fish fry are making the initial effort to become "free swimming." Too much air is gulped into the intestines, and the fry cannot swim down from the water surface except by prodigious effort. Immediately they relax, back they float to the meniscus. Conversely if the air-bladder does not become inflated, the fry become heavy and are unable to swim except in jerks, head up, and tail down. In fact, they manifest all the distressing symptoms of fishes with "air-bladder trouble," and seldom live more than a few days.

In goldfishes, development, or inflation, normally occurs within the first four days after hatching, depending to some extent upon the temperature of the water in which the fry are being kept, and the rate of absorption of the yolk-sac. It is plainly visible as a single "bubble" in the centre of

gravity of the fry. At from 10 days to a fortnight old, the "bubble" divides within a matter of hours into two compartments. Gas is freely passed from one to the other. This can be demonstrated by extracting a bladder from a fish, and exerting slight pressure upon each compartment in turn. The section not compressed will swell with the extra gas and become as tight as a drum.

This pressure on one compartment or the other is often brought about quite naturally by the fishes themselves by over-indulgence in dry food, which subsequently swells, or by over-eating generally. The pressure will pass from the forward section of the bladder on to the rear portion as the food passes down the intestines. During this process the fish will appear acutely uncomfortable, and very unstable,



Long, narrow swim bladder of the orfe

rolling in a drunken fashion round the aquarium, and sometimes even floating belly upwards. Expressing the contents of the intestines by gentle stroking of the sides may help it, if it is robust enough to stand such cavalier treatment.

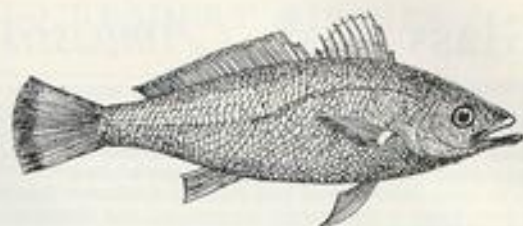
Excessive fat may also cause partial derangement of the bladder, compressing the whole of the contents of the body cavity into a space too small for them. Here the remedy is starvation until the fish is more normal. This remedy is not likely to meet with the approval of those aquarists attempting to produce fishes with globular bodies.

When dissecting fishes it is interesting to compare the shapes of the air-bladders with the body shapes of their owners. Generally speaking, the deeper the fish body, the shorter and rounder the air-bladder. This is partly shown in the sketches accompanying this article. In species which are much compressed laterally, like the angel, *Symphysodon discus*, and *Monodactylus*, the bladder is narrow and deep rather than globular, and so interferes less with rapidity of movement. The lightning dashes of the streamlined golden orfe are assisted by the long, narrow, streamlined air-bladder, but the slow, cumbersome gyrations of an overfat veiltail are in no way helped by the presence in its centre of gravity of an almost double sphere.

In most of our aquarium fishes the main purpose of the air-bladder is to act as an adjustable float to minimise the effort necessary in swimming. It also serves, however, for a less-well-known purpose—that of a sounding board for vibrations received through the water via the auditory capsules of the fish. If the lateral line can be described as a subsidiary ear, the swim-bladder can equally truthfully be considered as an amplifier, enabling the fish to hear underwater sounds which would be inaudible without its assistance. The sounds are passed back to the bladder by means of modified sections of the three first vertebrae of the spinal column. These were originally discovered by Weber, and



Swim bladder of the rudd



A noise-producing fish, the meagre or weak fish (after plate by Jenkins)

named after him—the Weberian ossicles. The characins, carps, and catfishes all possess them—in fact, most of the fresh water species of the world. K. von Frisch, in 1938, experimented with minnows, and found that removal of their air-bladders, while not completely destroying their hearing, considerably reduced its efficiency.

Yet another use to which the air-bladder has been put by many fishes is that of making noises. It is possible that a number of our aquarium pets have this ability, but, if so, they are on a range of vibrations which render them inaudible to human ears. This is just as well, for to go to a fish exhibition that was as noisy as the parrot house at the Zoological Gardens would surely decide most quiet-seeking aquarists to turn to other hobbies in pursuit of peace and relaxation.

It is not the air-bladder alone which makes the noise. Again it acts as an amplifier of sounds made against its walls, or transmitted via bones, or muscles. In some catfishes, for instance, the fourth spinal vertebra is modified to form a pair of oval, plate-like outgrowths, which press upon the air-bladder. From these plates, a pair of strong muscles pass to the back of the skull, and contraction of the muscles sets up rapid vibration of the bladder walls and produces a humming sound. The Mauritian fish, *Balistes aculeatus*, rubs together some of the bones of the pectoral arch, and the



Fourth vertebra of catfish *Auchenipterus nodus* (magnified) showing bony plates normally attached to its swim bladder

air-bladder exaggerates the noise. Sometimes special muscles inside the air-bladder itself cause the sounds. Artificial stimulation of these muscles in a bladder lying on a bench has resulted in the reproduction of the noises normally made.

Best known of all fishes which indulge this ability is the meagre, or weak-fish, *Sciaenops ocellatus*. Where this creature derived its popular name is a mystery, for it is neither weak nor meagre. Specimens five to six feet long, weighing up to 64 lbs., have occasionally been caught round the coasts of Britain. Liverpool Museum had, and maybe still has, a specimen caught in the Mersey Estuary in 1870. Some members of the *Sciaenidae* are dumb. In others, only the male fish makes a noise, as does *Sciaenops ocellatus*. The remaining members answer each other back, making a drumming noise by means of a special muscle which may or may not be attached to the wall of the air-bladder, against which the muscle contracts.

With the fishes 50 feet down under water, the noise produced is sufficient for a person six feet above the water

(Continued at foot of next page)

Glass Fish (*Ambassis lala*)

by JACK HEMS

THE Centropomidae is a family of fishes ranging over a large area of the tropical world, and inhabiting every sort of water, from fresh to salt, from the east coast of Africa, through the warm seas of India and the island-dotted Malay Archipelago, to Australia and beyond.

The most characteristic and perhaps distinctive feature of these fishes is the laterally compressed and diaphanous body through which the backbone and internal organs can be clearly seen. There are also two dorsal fins united at the base. The front, or anterior fin, is spiny, and held stiffly erect; the posterior dorsal is soft-rayed and extends back towards the tail. The anal fin has some frontal spines.

The family is represented to aquarists by one genus—*Ambassis*—and three species, namely, *A. lala*, *A. biroensis*, and *A. nama*. Of the three, *A. lala* is the smallest, and, generally speaking, the most easily obtainable of them all. It has been known to tropical aquarium keepers in this country for more than a quarter of a century.

A. lala, or, as it is commonly called, the glass fish, is native to the brackish and freshwaters of India and Burma, and, though it has been reiterated so many times in the past, I think it is worth repeating, for the interest of newcomers to the hobby, that the species is so abundant in the wild state that every so often large netfuls are pulled out of the rivers and spread as fertiliser over the land, which to me seems a terribly cruel way to treat any sort of fish.

But, be that as it may, there is no question that, as an occupant of the small home aquarium, the fish belongs to the aristocracy of the smaller species. As it swims about, usually in mid-water, its translucent body reflects various prismatic tints such as blue, yellow, green and lavender, like a finely cut bottle-top bathed in sunlight.

The basic colour of the fish, though it appears to be ever-changing, is a faint yellow, a lemon-greenish yellow, darker on the back, but lightening to silvery-white on the underparts. A greenish sheen covers the caudal region. The eye is black, encircled by a rim of shining gold. The spines and some of the membranes of the anterior dorsal fin are marked with black; the posterior dorsal and anal fins are edged with blue; the forked caudal fin is tinged with lemon-yellow. A few dark vertical lines or short bars often show on the side close to the head.

Telling the sexes apart is not very easy, but the male has more blue in his fins than the female, and he has a slimmer body. It is said that a reliable way of distinguishing a male from a female is by placing several adult specimens in a tank brightly lit from behind the back glass. Fish with a larger intestinal space than their companions are almost sure to be females.

A. lala is carnivorous by nature and, though harmless enough when placed with fishes of its own size, it will chase after young livebearers and devour all those small enough to

be swallowed. Although some specimens may be induced to take dried foods of a meaty nature, it never seems to eat them with any relish, and the best diet for it is live food, small live food such as brine shrimp, half-grown *Daphnia*, and the like.

As a community tank fish it adds grace and charm to its surroundings but, like the pygmy sunfish and one or two others, it seems to settle down better and live longer when it is given an aquarium to itself.

An aquarium for *A. lala* should be brightly illuminated at all times of the year. It is a sun-lover, and in the absence of sunlight a few hours of strong electric top light should be given every day, especially during the dark days of winter. It also likes very clear water over a finely sanded bottom. Alkaline conditions suit it best. If any salt is added to the aquarium, do not introduce more than one level teaspoonful to every gallon contained in the tank, for though *A. lala* will stand a greater degree of salinity, the plants will not, and disintegrating plants will quickly foul the water. A temperature of between 75° and 80° F. should be maintained, increasing this slightly for breeding purposes.

The glass fish is not, however, a ready breeder, or, for that matter, an easy fish to breed. It must have everything to its liking before it will decide to raise a family. As mentioned above, it likes clear water, and there must be plenty of it for the fish and fry to move around in. A 24 ins. by 12 ins. by 12 ins. tank is about right for a pair. The water should be on the shallow side, say between four and seven inches deep. Clumps of fine-foliaged plants should be arranged along the back and ends and dotted here and there in the middle.

The fish breed after the manner of barbs, scattering eggs among the plant life. The eggs are adhesive. The female lays a few eggs at a time, and spawning may continue over a day or two. The eggs are not always deposited close to the floor of the aquarium. Sometimes they are scattered in matted surface vegetation; on occasions eggs may be laid on patches of clean sand or even inside large shells and the like.

After spawning is over it is best to remove the parent fish to another aquarium. The eggs hatch out within a day or so and the fry hang like splinters of glass from the surface of the water or from the sides of the aquarium close to the top. In three days the fry become free-swimming. The baby fish have tremendous appetites, and one reason why most aquarists are not successful with this fish is because they cannot keep up the supply of fresh Infusoria. But given plenty of Infusoria, the fry should make rapid progress, and can be got on to tiny water-fleas, *Cyclops*, micro worms and mosquito larvae in a very short time.

Besides its common name of glass fish, *A. lala* is sometimes known as the glass bass, the gold bass, and, less commonly, the X-ray fish.

The Functioning of the Swim Bladder

(Continued from preceding page)

surface to hear it. So the noise is by no means "meagre" either. It is most frequently heard during the spawning season.

No article for aquarists upon the air-bladder can be complete without reference being made to the suggestion that in some species of fishes sex can be positively told by the shape of the air-sac, particularly with angels and *discus*. Now that angels are so cheap and easily obtainable, perhaps someone would like to investigate this matter further. Personally I very much doubt its veracity, but we all live and learn—or don't we?

Stepping Stones

(Continued from page 35)

clear exhibition tank is not the place in which to rear fry. It means starvation as a rule, for it contains no natural foods. A good healthy green-looking water is far better and would not only contain plenty of Infusoria but would also contain plenty of algae, the tiny plants which cause the greenness and which are good food.

You will now find that all your ordinary tanks will have to have the front glass scraped inside twice a week, as algae form very quickly at this time of the year. Any glass at the window end of the tank can be allowed to green up to prevent too much light from reaching the tank.

OUR EXPERTS' ANSWERS TO READERS' QUERIES

I intend to attempt glazing a tank, about 30 ins. by 12 ins. I have never tried to do this before. Do you think the risk of making a poor job of it too great to make it worth my while? What kind of glass should I use?

There is no reason why you should not make a good job of glazing the tank. I do not know whether you are the handyman type. Some people can do almost anything they put their mind to and others cannot even drive a nail home! Start by giving the frame a good coating of waterproofing paint, paying special attention to the inside of the top frame. This will be the only one exposed to dampness and will rust first. The size of glass depends on the extent of each piece. For a strong job plate-glass is best; you can get special drawn plate which is not quite as clear but is cheaper. This will do for all but the front glass which must be clear. Where the depth of the tank does not exceed 12 inches and the length not more than 30 inches, 32 ounce glass would do. Naturally the larger the surface of glass unsupported the more will the strain on it be. See that the compost or putty you use is quite free from any hard pieces as these can cause a crack. Glaze the bottom first, then the sides, finishing with the ends. When measuring for the glass see that the thickness of the other pieces is allowed for. Do not try to squeeze out all the glazing compound. Fill with water when done and the weight will tend to press the glass in position. A carefully glazed tank should not leak but if a tiny leak does develop this will often seal itself. I have known aquarists allow a small portion of sandy silt to settle near the leak and this soon stops the trouble.

I have succeeded in rearing a culture of white worm and now find difficulty in separating them from the compost. How can I do this?

Lift a piece of the bread or whatever food you use in the culture box and dig out a portion of the soil underneath. Place this in a container with a piece of glass on top. Then apply slight heat underneath and the worms will climb on to the glass. If you just leave the mixture with worms which you have removed in some water you will find that after an hour the worms will all have collected in a nice tight clean bundle on the bottom.

Can you tell me if maggots (gentles) cut up would be suitable food for aquarium fishes? I can find no mention of them anywhere.

Gentles, the larvae of flies, are an excellent food for most fishes. Ask an angler—he will soon tell you how many kinds of British freshwater fishes are fond of them. If you feed them in stale fish or meat it is advisable to let them clean themselves in sand before feeding them to the fish. It is also safer to break them when feeding to small fishes. You may not have been able to find mention of gentles as food because like so many other goldfish foods they are so common and well known that their actual description has been omitted. To list all the foods a goldfish could eat would fill a small volume.

I am very interested in fishkeeping and wonder if you can recommend a way of breeding *Daphnia*. I have tried unsuccessfully in a small aquarium with lettuce leaves for food, but the result was disappointing.

Daphnia are as difficult or as easy to breed as goldfish, whichever way you like to look at it. A good-sized container is necessary, such as a small pond or a large sink. They like plenty of oxygen and will not thrive without it. Their food consists mainly of small forms of Infusoria and without a plentiful supply they will not grow and breed. From my experience I am inclined to believe that they do not feed almost entirely on green algae as has been thought, but live on the actual Infusoria found with the algae. I have handled many *Daphnia* but cannot remember finding

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.

them all green, which one would expect if they fed on green algae alone. Breed your Infusoria with crushed lettuce leaves, potato peelings, boiled spinach or banana skins and when a good culture can be seen with the aid of your microscope, introduce a few *Daphnia*. When they are very thick you can feed from this tank or pond, but start another similar one so that if the old one fails you have another to keep going as a reserve.

I have a tank which has a white stone in it. The water appears to be very hard or limey. Can I do anything to improve matters?

You should remove the white stone immediately, as this can be part of the cause. Use well-weathered rockery stone—Westmorland is very good. Leave a linen bag of peat suspended in the tank for a few days and you may find that the condition of the water will soon improve.

I am considering setting up an aquarium in the lounge. It will be 36 ins. by 15 ins. by 12 ins. Which species of fish will provide a colourful show (not for breeding), and will paradise fish live at a temperature of from 49° to 66° F. in the winter? Will rudd and green tench live, and how many fish of each kind do you advise?

Paradise fish will certainly live at the temperatures stated. You can have two or three of these. You can also have goldfish, fantails, shubunkins, veiltails and moors. The rudd and tench will live all right and the golden types of these will be more attractive. Small specimens of dace and bleak can also be kept. The maximum number of inches of fish for the tank will be either 18 or 22, according to whether your tank is fifteen inches wide or only twelve. Do not stock to the maximum as the fish must have room to grow. It is far easier to keep a few fishes healthy than to try to overcrowd and be for ever in trouble.

I am considering giving a small coldwater tank for a present. The tank is 15 ins. by 12 ins. by 12 ins. What fish and how many will it hold and what plants shall I put in it?

Two three-inch fish or three two-inch ones will be plenty. Use twisted *Vallisneria* and *Egeria canadensis* for planting.

I recently shot a pair of spawning pike and artificially spawned them. The eggs hatched in a heated tank and I would now like to know how to rear the fry. I can get plenty of fresh water shrimps.

The pike fry would not be able to eat the shrimp for some time. You will have to feed them on Infusoria for a week or ten days and then gradually get them on to larger live foods. Pike are carnivorous and are not likely to eat foods which do not move. From the Infusoria stage you can add micro worms for another ten days and then they may be large enough to take very small *Daphnia*. They could take newly hatched brine shrimps after about ten days from free swimming. As they developed you could try them with chopped white worms and larger *Daphnia*. Once they can take medium sized *Daphnia* it will become easier to feed them, as they could go on to mosquito larvae and tiny earthworms. When large enough they prefer live fish but you may be able to rear some on earthworms. There does not appear any object in trying to rear many of these fish but a few would be interesting and in a large

tank one or two would look very well, apart from the novelty of having artificially spawned them. You may find that half a dozen will be quite enough to find the right food for.

A few friends and I are interested in forming an aquarist society in this district. Please can you tell us how to start one?

Have a preliminary meeting in one of your houses and then if necessary get a notice in the local press, or a bill in a local aquarist's shop. A notice would be published in *The Aquarist*, free, and then you could advertise another meeting and form your rules. Another society would probably lend you a club rule card for a specimen. However, having given some directions as to how to start a society I feel bound to ask, "Is a society really necessary?" In your district there are already two societies and when I visited one to give a lecture not long ago there were only about twenty members present!

I am all for the formation of aquarist clubs when necessary but if too many are formed in adjacent areas they cannot be large enough to function properly and the procuring of lecturers will become very difficult. Already with about four hundred clubs and societies in the country the lecturers have too much to do getting around to the clubs. What happens is that a knowledgeable aquarist lecturer is so much in demand that if he complies with most of his requests for visits his own hobby is sadly neglected as he is rarely at home. I have heard club members envy the successes of Nottingham Society, but in the area covered by this club twenty clubs could be found in a similar area in your district. In fact, I could name this number easily in an area not more than ten miles across. Surely, if aquarists have sufficient interest in the hobby they can travel a few miles to their club? Since 1931, I have attended regularly a society that meets 15 miles away, once a month. If ten or more clubs amalgamated in some London areas we would once again see the grand open shows held each year, when the whole hobby would benefit greatly.

About six months ago I set up a tank with sand, plants and fish and now the fish have started to die and the sand has gone a blue colour. What is the reason?

Providing the compost for the tank was all right when you set the tank up I can see only one main cause for the trouble and that is over-feeding, or feeding with the wrong foods. If a tank is set up correctly with growing plants, and if there are not too many fish, all should be well. It is when feeding commences, usually far too soon, that trouble starts. I will guarantee that 90 per cent. of the foul tanks are caused by over-feeding. Some foods contain too much dust which may be left by most fishes; this gets swept behind the rocks by the actions of the fishes and then starts pollution. Often a film of mildew-like texture can be seen over the bottom. Also if too much food is given, obviously the uneaten food soon starts to go bad and upsets the water. Another point lost sight of by many aquarists is that some foods are not properly digested by the fish and then this partially digested food is voided and soon goes foul. At least once a week the tank should be serviced and all the mulm to be seen near the front of the tank should be removed. Experience will tell you how much to leave for the benefit of the plants. You had better make a fresh start by washing all the compost under a running tap and then when you set up again do go carefully with the feeding.

We have a corner aquarium in a room which we wish to re-decorate. How can we keep the paint fumes from harming the fish?

I take it that your tank has a cover. When fresh painting has been done cover the tank with a piece of sheeting or similar substance, and this can be damped. Once the paint

has dried there will be little danger from fumes. Meanwhile keep as many windows open as possible and do not use any aeration unless it is possible to get your intake of fresh air from outside the room.

I have three goldfish which rub themselves along the bottom of the tank fairly often. Two have small white spots on both gills. Have they gill flukes?

The small white spots are the sign of the male fish in breeding condition. You would not be able to see gill flukes without a magnifying glass. However, they may have gill flukes, as the action of fishes scraping themselves along the sand is typical of fish infected by these pests, although if they rub themselves occasionally it may be for some other reason. An aquarist friend of mine noticed



Photo:

Laurence E. Perkins

A male fantail goldfish showing tubercles on the gill covers—a breeding season sexual character

one fish in a tank doing this frantically and caught it to examine in a special tank. After close examination with a glass he noticed that a small stone had become lodged in the lower part of one gill. This was causing the irritation and when it was removed the fish was quite all right again. A small stone could easily get into the edge of the gill when a fish was rooting about in the sand. If all or most of the fish behave in a similar manner it would be almost certain that gill flukes, or other parasites were responsible. The Dettol cure I have often described is as good as anything for killing these.

I have a community tank and wondered if there is any reason for putting newly bought fish, *Daphnia* and *Tubifex* in any solution to see that they were safe for the fish to eat? Would a salt solution do?

Your query opens up a big problem. So many aquarists are now "pest" and "disease-minded" where their fish are concerned that this disinfecting can be carried too far. It is useless treating fish for some trouble unless this can be correctly diagnosed. Unfortunately, there is no general panacea for all fish ills and pests. What may cure one thing may have no effect on another. Salt is not a cure-all. I suppose that it is one of the most harmless baths for a goldfish but unless it is fairly strong it is not likely to kill many germs. Again a Dettol bath may be all right for some pests but would not be of much use for other complaints. The safest method to adopt with newly purchased fish is to place them in a tank by themselves and then if they develop any trouble this can be treated accordingly. If the fish were quite healthy there is no object in giving any type of bath. As for the *Daphnia* and *Tubifex*, salt

could kill them if in sufficient strength. Any disinfectant strong enough to kill unwanted animals could kill the *Daphnia*. I think the safest method to adopt with water fleas is to place some in a bowl and catch any unwanted pests such as the larvae of water beetles, dragon flies or water boatmen. Then catch the fleas with a net which would allow tiny pests to run through. *Tubifex* are best left under running taps to clean them, say for about twelve hours.

I have in an indoor tank two British river perch which have spawned. The eggs look fertile and I should like to know how to rear some youngsters. There is some blanket weed in the tank, will the fish get tangled up in this?

I do not think the perch fry will get entangled in the blanket weed. Most fry love this weed and browse about in it all day long. It contains many of the tiny life such as Infusoria which the fry need in quantity. In native rivers, etc., it is probable that the majority of fish fry which reach maturity spend most of their early days hidden in tangles of blanket weed. Your fish can be reared in a similar manner to that described for raising the pike fry in the answer above. Both fish are carnivorous. When large they must not be placed among smaller fishes as they have a mouth wide enough to take a fish almost as big as

themselves. They can be fed on earthworms when well grown but they are fond of small fish like guppies or minnows. I have even found sticklebacks inside the stomach of a freshly caught perch. In a fairly large tank perch make a grand show, as they are one of the most handsome British freshwater fishes.

My son has two goldfish and has been told to feed them on ants' eggs, raw meat and worms. The fish don't seem very fond of the eggs, they won't eat the meat and I cannot cut up the worms. What can I feed the fish on?

The so-called ants' eggs are not eggs at all but the dried cocoon of the ant and they are of little use as food for fish. It is a pity you cannot cut the worms as they are a splendid food for goldfish. If you place a couple of small worms in a small cup-like receptacle and, holding it behind you, use a pair of scissors to cut repeatedly, you will have a grand food for the fish and you will soon get used to this method of preparation. You can buy many very good mixed goldfish foods as advertised in *The Aquarist*, and you will find that most firms of repute packet a very good article which will be readily taken by the fish. It is always possible to try one or two small packets to find out which food suits the fish the best and which they prefer to take.

In the Water Garden in MAY

DURING May the results of your earlier pond planting will be seen, and examination of the various subjects will show whether your efforts have been successful. Many water gardeners go wrong by failing to recognise the fact that most water plants are really bog plants; if these are set too deeply in the water they will not flourish and may even die. Apart from the water lilies there are not many plants which are happy when their root-stock is too deep in the water, and even some of the lilies grow better when the crown is nearer the surface. This is especially so in the case of many of the smaller types of lily.

The aim of the water gardener should be to see that the pond, although perhaps primarily intended for fish, will also be an ornament in the garden, and where this fact is kept in mind delightful pictures can be formed even in a small garden. Although I consider that no garden is too small for a pond of some size I also am certain that some fish should be kept therein. To have a pond with no fish may cause trouble during the summer as many insects will come to the water for the purpose of laying their eggs, and the larvae will then swarm in the pond and grow, eventually changing into the insects themselves. If these happen to be mosquitoes the discomfort and nuisance they can cause will soon become apparent!

Suitable lilies were described last month but it must not be thought that plants should be confined to the water only. Many very fine specimens can be grown in a bog surrounding the pond, and where possible one part at least of the pond should gradually shelve from the water and merge into a bog. One of the first subjects for such a position is the *Mimulus*, also known as the cardinal flower, monkey flower, musk and Harrison's musk. The original British species, *M. guttatus*, has been improved considerably and to-day there are several varieties which make a grand show throughout the summer months. One species, *M. cardinalis*, grows about 18 inches high and gives many red and yellow flowers. There is another fairly new strain—Queen's Prize Strain, which is very showy, having well varnished flowers of red, brown and yellow. Red Emperor is an outstanding variety with bright crimson flowers continuing in bloom all the summer.

Seeds of the *Mimulus* can be sown where the plants are to remain, but see that a small space is cleared first and

some peat and sharp sand placed in position to give the seedlings the best chance. The seeds should only be lightly covered and then some form of protection such as fern fronds or moss should be placed over them to keep the position from drying out whilst germination is taking place. In some districts the fancy kinds of *Mimulus* are inclined to die out during certain winters, but it is so easily raised from seed that the loss of an occasional plant should not discourage the enthusiastic gardener.

Another good plant for the pond-side is the *Trollius*. These are of the buttercup family, Ranunculaceae, and will make fine clumps of large leaved plants near the water's edge. The leaves are large, glossy and dark green and the flowers are shapely and yellow, or yellow orange in some varieties. These plants are best propagated by dividing a clump, being careful to see that no more damage is caused to the root stock than possible. They can be grown from seed under similar conditions as were recommended for *Mimulus*. One of the newer kinds, Golden Queen, grows to four feet in height and has flowers of a rich gold with an orange centre. Orange Princess grows about 2½ feet high and has deep orange flowers. When planting any varieties of *Trollius* it is important to know beforehand how high they are likely to grow as the taller ones are best kept furthest from the pond, although here and there around the pond a taller subject can be introduced to break the flatness.

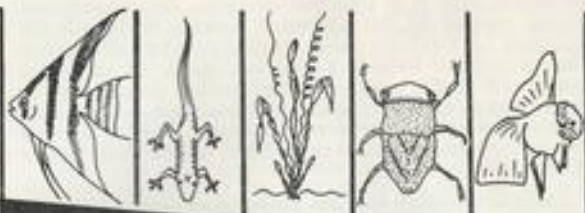
Another showy plant for the shallow water or water side is *Orontium aquaticum*. If grown in the actual pond you must see that either there is plenty of mud or mulm at the bottom, or a large pot must be provided with good loam to give sufficient strength to the roots. The leaves will lie on the surface of the water in a manner similar to that of water lilies, where they look very handsome. The blooms are singular, being shaped like long narrow rods which are covered with small yellow flowers.

If you are planting any fresh water lilies see that the water of the pond is lowered until the plant gets established, or raise the pot from the bottom if a pot is used. Many failures with new subjects can be traced to too deep planting.

Astilbes

our readers

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.



write

Address letters to The Editor, *The Aquarist*,
The Butts, Half Acre, Brentford, Middlesex

Good Service

PERHAPS your readers would care to know of a recent experience of mine. During the cold spell this year the two heaters heating my aquarium broke down. I had no spare, and sent the two small heaters away and purchased a heater of the type that is buried beneath the sand. My dealer had not the correct size for my tank and I was forced to take a smaller one, which failed to heat the water to more than 69°F.

As soon as my two heaters came back I installed them and wrote to the manufacturers of the other heater explaining what had happened. I did not send the heater or its two years guarantee. Imagine my surprise when a week later I received through the post a heater the correct size for my tank and a courteous hand-written letter requesting me to return the smaller heater for inspection. Note this—the mistake, although forced on me by circumstance, was mine, yet this manufacturer acted as if the heater itself was at fault, under the conditions of the guarantee.

Of course, the heater may have been at fault. The heater sent in its place certainly is not. It has one feature peculiar, I think, to this type—after the thermostat has switched it off the temperature still rises for some little time to about two degrees higher. This appears to me to be a distinct advantage, guarding as it does against too quick cooling of the tank if it is standing in some unnoticed draught. Both manufacturers saw to it that I was served very quickly and efficiently. I thought I would like to place on record my appreciation. Theirs is the way to accumulate goodwill.

LAURENCE SANDFIELD,
London, W.13.

Aquarium Unit

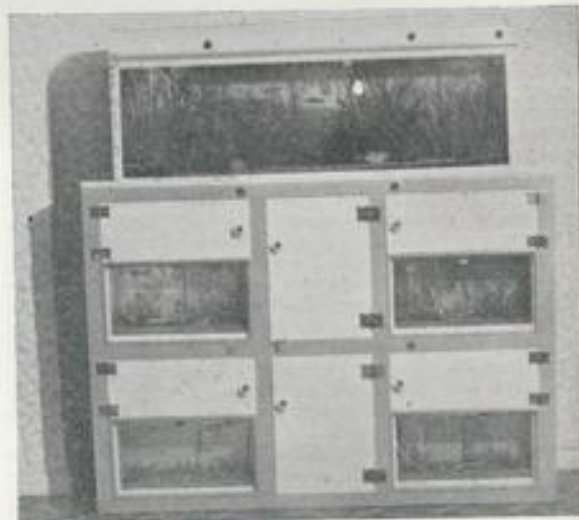
THE accompanying photograph shows my aquarium unit, which in my opinion is ideal for an aquarist who, like myself, lives in a flat and is without space for extensive fish-keeping. The stand is four feet eight inches long, 12 inches wide and three feet four inches high. It is made of one inch by two inch redwood mortised and tenoned, four vertical members being jointed in this way with three horizontal members to form the front, and a duplicate frame forms the back. Front and back are dove-tail jointed together with four struts top and bottom.

Back and ends are covered with plywood and the whole of the interior is covered with half-inch insulation board—this prevents the loss of a lot of heat. The top cupboard

is for the switch panel and aerator controls and the bottom cupboard is for aquarium utensils. Air supply to each tank is independently controlled from the switch panel.

The stand is neat and compact and, I think, a pleasing addition to the living room.

D. A. CASSON,
Hull.



The aquarium unit referred to in the letter above

Fish in their True Colours

FROM my first decision to keep tropicalls I had thought of fluorescent lighting, but had been advised against it as fish would not show their colours well under it. Also, I saw it written somewhere that tubes giving a yellowish light were best to try. However, on reading Mr. W. Harcourt Ellis' article (*The Aquarist*, January) I see that the "north light" tube will suit both fish and plants, and I have therefore decided to obtain such a lighting unit.

The major disadvantage of fluorescent lighting to my mind remains: it cannot be brought on gradually, but

instead comes on with a most disturbing blaze of light, and is extinguished as suddenly. I hope to arrange to switch on the tube while it is some way from the tank, then to bring it into position, reversing the procedure before switching off. I would be pleased to know if there are any more satisfactory methods of surmounting this difficulty.

D. A. BELL,
Birkenhead.

Our Post Office is Wonderful

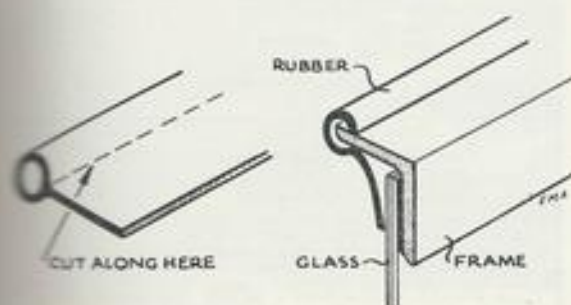


"The Original Monthly Magazine devoted to Aquarium, Pond, Reptile Keeping—England" reads the address on this envelope. It was delivered without delay to "The Aquarist"

Rust Prevention

I WOULD like to pass on to others what I consider to be a good hint to prevent rusting on the top angle iron of the aquarium tank. All that is required is a length of rubber draught excluder, which can be obtained easily at very small cost. The type of excluder needed is the one with a tubular edge. This tube is split all the way along by the use of scissors or a razor blade. It is then slipped over the angle iron edge as shown in the diagram. Experience has shown with my own aquarium that the metal remains perfectly dry.

G. HEARD,
London, S.W.14.



Using draught excluder to prevent rusting of aquarium top frames (see letter "Rust Prevention")

Breeding Experiments

IF you happen to know of any persons interested in participating in exotic fishes experiments which we are conducting in many parts of the world, we would appreciate corresponding with same. "Many parts of the world" sounds officious but I must indeed explain that we merely contact hobbyists who are interested in breeding a particularly hard-to-breed species. We like to hear from those who do not have much luck in breeding and rearing their fishes. We prescribe a certain procedure for them to follow. At the end of this test we are most interested in knowing the outcome of our prescription.

No money is involved. It is merely in the interest of tropicals. We are not commercial breeders. Our living is made by raising and breeding trout and salmon for the State of Oregon and by writing articles and booklets about fishes and their care and treatment, etc.

(Mrs.) RICHARD A. EVANS,
Klamath Trout Hatchery,
Klamath Agency, Oregon, U.S.A.

Tropicals à Pied

I BELIEVE fellow aquarists would enjoy the following true happening in which I took part. I was returning from London with some tropical fish in a container in a wooden case. The coach in which I was travelling stopped at a hotel for refreshments, and as it was rather a cold day I took the container inside and placed it on a radiator to warm it up. Thereupon a certain lady enquired what was in the box, and I replied "Tropical fish." "Oh," she said, "we have some goldfish at home, but I didn't know you had to take your tropical fish out with you!"

A. E. CHAPMAN, Chairman,
Lowestoft Aquarists Society.

Cacti in the Fish House

IT is a good plan to re-pot all cacti once a year, as the soil will get very foul and useless after a year's watering and much of the soluble nourishment will have gone from it. Clean pots must be used and they need not be too large. About an inch clearance should be left between the plant and the side of the pot so that the soil can be seen easily to test for watering.

When re-potting cacti all the old soil should be removed from the roots and any broken or dead roots removed. Place a large crock over the drainage hole in the pot and see that it does not stop the surplus water from running away. Then place some of the coarse compost in the pot and then put the plant in position. Let the soil run in around the roots and see that it gets between them. The roots must not be crowded up together but kept open. Fill the pot with soil, gently pressing it in and then when all is made firm the top of the soil should be about an inch from the top of the pot so that sufficient water can be given at a time. The soil for potting should be crumbly moist, that is, not so dry so that it runs from the pot if tipped on one side after potting, and not so wet that it soils the hands. As long as the soil is just right when potting, the plant need not be watered for about a week.

The time for watering cacti will depend a great deal on the weather and the temperature of the house. As these plants can only take up their nourishment in a soluble form by their tiny fibrous rootlets, the plant will have to become established in its new quarters before it can be expected to start to make new growth.



BOOK

R E V I E W

The Tropical Fish Book, by Ruthven Todd. 144 pages. Photographs and line illustrations. Arco Publishing Co. Inc., New York 17, N.Y., U.S.A. (British Agent: A. F. Bird, 66, Chandos Place, Strand, London, W.C.2. 17s. 6d.).

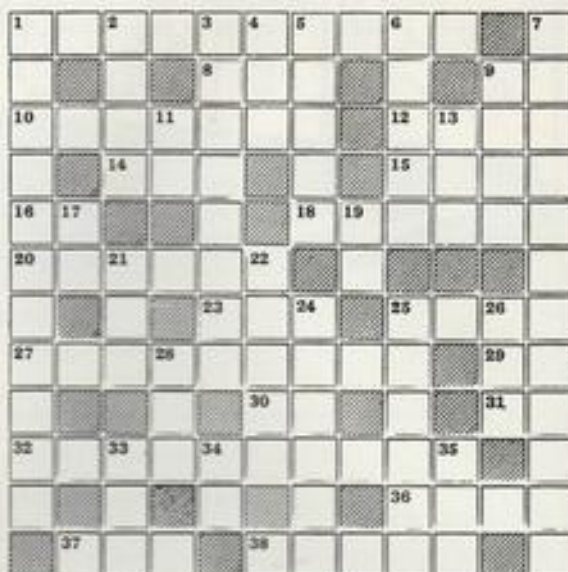
A BOOK for the beginner out of the usual run of books for beginners because its information is largely presented pictorially. Photographs and drawings are included on every page and demonstrate a great variety of subjects and maintenance techniques from aquarium construction and setting up to pH-testing kits. A 76 pages section of the book deals with over 130 tropical fish species, although here again pictures predominate and the printed matter concerning the fish is very brief; the fish pictures are on the whole clear but many of the fish line drawings are poor. These contrast sadly with the excellent pictures and drawings of apparatus elsewhere in the book. It is unfortunate, too, that plant pictures almost without exception show specimens faultily planted—with crowns and lower stems deeply buried in the sand. Practical information is clearly given in a crisp style sufficient to keep a beginner happy throughout his introductory period to the hobby, and *The Tropical Fish Book* would certainly make a good present to the novice aquarist. (Note to the publishers, who have indulged their staff's identities in a page reminiscent of film credit titles: why did you let yourselves down editorially by crediting authorship to "John Bentley" on the title page?)

Keeping and Breeding Aquarium Fishes by C. W. Emmens. 202 pages. Photographs and line illustrations. Academic Press Inc., New York 10, N.Y., U.S.A. (British Agent: A. F. Bird, 66, Chandos Place, Strand, London, W.C.2. 36s.).

IT was a pleasant surprise to receive this book by Professor Emmens, for previous acquaintance with his books and work had not given the hint that he was an aquarist. In *Keeping and Breeding Aquarium Fishes* there is evidence in plenty of his interest in and knowledge of the aquarium hobby, and as might be expected from a professional biologist, the text is concise and accurate, free from speculation and what might be termed aquarium mythology. There is in fact a doubt that Professor Emmens may not have forgotten at times that his book is addressed to non-scientific readers, as when for example he talks of the growth curve and its "flatten out" (page 24), when he assumes that some will have met the "inverse square law" (page 90) and when he advocates 70 per cent. alcohol as a tank steriliser and antibiotics for disease treatment (though, of course, both the latter materials may be more readily available in the U.S.A. than they are here). Detailed descriptions of species will be looked for in vain in this book, and rightly so, for its concern is primarily with techniques. Little that is really new is provided, but quite a bit of information which has not been before collected in a popular book of this sort is given, and because of this it is recommended for the society library. The paper, binding, printing and layout are delightful.

The AQUARIST Crossword

Compiled by J. LAUGHLAND



CLUES ACROSS

- 1 Slipper animalcule (10)
- 8 "Arm" of water boatman beetle (3)
- 9 Squeak of glee, perhaps (2)
- 10 and 7 down. Harlequin fish (7, 12)
- 12 Young male seahorse? (4)
- 14 Female fish (3)
- 15 No difficulty with this answer (4)
- 16 Gourami begins to depart (2)
- 18 Skulker (6)
- 20 Foreign, and a more apt word than tropical for imported fish (6)
- 23 A piece of turf (3)
- 25 Floating waste matter (4)
- 27 The best conditioning food for fish (9)
- 29 Aid from the damio (2)
- 30 Silver to the pharmacist (2)
- 31 Alternative of oranda (2)
- 32 *Ceratosperis thalictroides* (6, 4)
- 36 A little one (4)
- 37 Watering place (3)
- 38 Be (5)

CLUES DOWN

- 1 Hybridism (12)
- 2 Marsh plant in a hurry? (4)
- 3 Platy (8)
- 4 Hears; are confused (3)
- 5 One way of swimming, oddity (4)
- 6 A score, often a sign of a dirty tank (5)
- 7 See 10 across.
- 11 Eloit (2)
- 13 Common British tree (3)
- 17 Bovine part of oxygen (2)
- 19 Although down it is not (2)
- 21 Rowing device (3)
- 22 A mason who has not served an apprenticeship (5)
- 24 Male Reynard (3, 3)
- 25 More than clever hurts (6)
- 26 World peace organisation (1, 1, 1)
- 28 This prefix means three (3)
- 33 Put into water (3)
- 34 Morning (1, 1)
- 35 Egg of fish louse? (3)

(Solution on page 48)

Post-Mortem Examination of Fishes:

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

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

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

Aquarist's Calendar

4th-8th May: **Bury and District Aquarist Society Show.** Show secretary: Mr. E. D. Grimshaw, 1, Garston Street, Bury, Lancs.

14th May: **Kingston and District Aquarist Society** invite visitors to their meeting to be addressed by Mr. McNerny on Marine Fishing. Details from Mr. A. J. Butland, 45a, Twickenham Road, Teddington, Middx.

21st May: **British Herpetological Society (London Group)** meeting "Amphibians," 7 p.m. at the Linnean Society's Rooms, Burlington House, Piccadilly, London, W.1.

26th-30th May: **Rochdale and District Aquarist Society** open show of furnished aquaria, tropical and coldwater fishes at the Pier Station Hall, Rochdale. Show schedules from Mr. N. Gott, Crossways, Kendal Avenue, Norden, Rochdale.

10th-12th June: **National Aquarium Exhibition** at the Royal Horticultural Hall, Vincent Square, Westminster, S.W.1. Schedules from Competition Secretary, Mr. C. R. Macdonald, 25, Tudor Gardens, West Acton, London, W.3.

10th-12th June: **Northenden Community Association Aquarist Club** open show at the Church Rooms, Northenden, Manchester. Details from secretary Mr. E. Almond, 32, Royle Green Road, Northenden, Manchester.

11th-12th June: **Chester and District Aquarist Society Annual Open Show** at the Drill Hall, Volunteer Street, Chester. Details from show secretary, Mr. C. Morrison, 22, Belgrave Place, Handbridge, Chester.

12th June: **Federation of British Aquatic Societies General Assembly**, 2.30 p.m. at Friends House, Euston Road, London, N.W.1.

21st June: **British Herpetological Society (London Group)** meeting, "Crocodiles and Tortoises", 7 p.m. at the meeting room of the Zoological Society of London, Regent's Park, London, N.W.1.

1st-3rd July: **Southampton and District Aquarists' Society** fifth annual open show at the Avenue Hall, Southampton. Schedules and entry forms obtainable from show secretary Mr. E. C. Goleworthy, Westways, Romsey Road, Nursling, Southampton.

2nd-4th July: **City of Salford Aquarist Society** open show at the Drill Hall, Cross Lane, Salford, Lancs. Details from secretary Mr. W. Wainman, 249, Eccles New Road, Salford 5, Lancs.

31st July-7th August: **Blackpool and Fylde Aquatic Society** fourth annual open show at the Victoria Street Congregational School Rooms, Blackpool. Schedules available from show secretary Mr. W. Robinson, 3, Denwood Bank, Warton, Preston, Lancs.



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** taken cut from page ix, to Aquarist's Badge, *The Aquarist*, The Buns, Half Acre, Brentford, Middlesex, and please specify which type of fitting you require.

Brighton Aquarium To-day

SOME time ago I threatened to give Brighton Aquarium no further publicity until it was reclaimed. Now the scene has changed and publicity is likely to play a big part in its reclamation.

It is safe to say that if Brighton's Entertainment Committee had handed over the historic Pavilion—scene of so many musical triumphs—for conversion into a shoddy, fourth-rate fun fair, there would have been a storm of indignation. Yet the fate of the equally famous Aquarium has gone unchallenged until now. To-day, London Zoo, the Imperial College of Science, Chelsea Polytechnic and Brighton Technical College are combining with local councillors and educational authorities to tell the world what is happening, and to bring pressure to bear upon those responsible.



View the tanks—once a platform of planks spanned these for efficient servicing, but this has long since disappeared and has never been replaced



A typical tank to-day. Crude landscapes conceal a lowered water level. In this tank octopuses were bred in 1876 and here Francis Buckland carried out many experiments with food and game fishes

Be it remembered that in 1872 Brighton Aquarium shared world honours with Naples as one of the only two great aquariums and research stations in the world. For many years it was a Mecca and saw the ceaseless labours of the first great pioneer marine biologists and fisheries conservators. It had the largest tanks in the world (they are still the finest on this side of the Atlantic) and did invaluable work not only for general pisciculture but the safeguarding and improving of our food supplies.

To-day only 30 of its 42 tanks remain, and of these only six contain sea water, usually filthy and with a handful of exhibits. There is no guide book and no labelling. Backstage, conditions are unbelievably derelict, so that it is impossible to service the place properly, even if it were adequately staffed. And eighteen pence per head is demanded for what ought to be a jewel in the crown of the Queen of Watering Places.

L. R. Brightwell

TITLE of the Middlesborough Aquarist Society is now to include the words "and District" as a result of the society's re-formation. Meeting place is the Black Lion Hotel, North Ormsby on the third Wednesday of each month.

MR. G. F. HERVEY gave a lecture on the breeding habits of fish and fry formation to the Midland Aquarium and Pool Society in February when a record attendance was registered. The society's new chairman, Mr. W. L. Mandeville, officiated.

AT the annual general meeting of Reading and District Aquarist Society, Mr. A. Gumbrell was elected chairman. At each meeting of the society one or two table shows are held and eight trophies are awarded through the year.

DR. MYRON GORDON has accepted the presidency of Walworth Aquarist Club. At recent meetings talks on tank glazing, wooden aquarium construction and fish breeding have been given and table shows have been held for labyrinth, cichlid and characin fishes, barbs, guppies and swordtails. A junior section to the society with members from 12 to 16 years of age has been formed, and new members to this and the adult section will be welcome. Secretary is Mr. F. L. Howe, 9, Estelle Road, Hampstead, London, N.W.3.

ANNUAL general meeting of West Surrey Pondkeepers' and Aquarists' Club was held in February. All officers of the club were re-elected.

A DINNER was held for members and guests of the West Wilts Aquarist Society last month and a programme of events for future society meetings was announced.

MEETING place of the Worcester and District Aquarist Society is now the Co-operative Social Club, High Street, Worcester. Last month a table show for any variety tropical fish was held, and a tubular heater was employed to maintain temperature in the display tanks. Prize winners were Mr. R. J. Munnlow (1st—tiger barb); Mrs. D. Carter (2nd—pearl gourami); Mr. C. Bevan (3rd—dwarf gourami). Secretary Mr. N. F. Starkey judged the entries and commented on the high standards of the exhibits.

AT the eleventh annual meeting of the West Middlesex Aquarists' Society the president awarded diplomas and cups to members successful in the main competitive events staged by the society during the past year. The annual challenge cup, awarded for the highest aggregate of points gained by a member for fishes and plants during the year was presented to Mr. A. H. Charles for the second year in succession.

A LECTURE on general fish-keeping is to be given by Mr. L. Thompson at the meeting of the Tyneside Aquatic and Biological Society on 25th May. Meetings are held at the Ship Hotel, Wallend, and the secretary is Mr. R. R. Stott, 99, Chillingham Road, Newcastle-upon-Tyne 6.

FIRST annual general meeting of the Stourbridge and District Aquatic Society was held recently, when Mr. H. Smith was elected chairman and a vote of thanks was offered to Mr. D. Hibbard, who retired from this office, for his good work for the society during its formative months. Secretary Mr. F. V. Hillman was re-elected (Brooknook House, Chaddesley Corbett, Kidderminster, Worcs.).

EARLY this month aquarists in the South-Western Aquarists Societies Association met at the Bristol Zoo and heard a talk entitled "Inside Your Fish," given by Dr. G. Cunliffe from the University of Bristol.

HEADQUARTERS of the Southern Amateur Aquarists have been changed to the Level Cafe, Rose Hill, Brighton, Sussex. The speaker at last month's meeting was Mr. A. Warren, chemist and bacteriologist to the



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.

Brighton waterworks, who gave a talk on local water conditions and a demonstration of water testing.

FOR the best entry in the class for common goldfish at the forthcoming show of the Southampton and District Aquarists' Society (see Aquarist's Calendar) the F.B.A.S. has offered a trophy.

Furnished Aquaria Standards

IN order to ensure uniformity in assessment of furnished aquaria at shows throughout the country the Federations of British Aquatic Societies and Northern Aquarium Societies have revised the standards for furnished aquaria as published in the F.B.A.S. Standards Book. The following are the amendments circulated by Mr. J. H. Gloyd (Judges Committee Secretary, F.B.A.S.) and Mr. G. W. Cooke (Judges and Standards Committee Secretary, F.N.A.S.) and these are to replace the affected parts of the F.B.A.S. book. Main differences are the combination of the main headings "Design" and "Technique" and the slight alteration to the detailed pointing under these headings.

Fish 25: Selection 5. In which it is considered whether the selection is appropriate to the general layout; whether the fish of a species are matched in size and natural characteristics and the selection is conducive to a harmonious community, and in which gross overcrowding is penalised.

Size 8. In which is considered the stage of growth in relation to the variety.

Quality 12. In which the degree of perfection is assessed and any faults in colour, condition shape, fins and deportment are penalised.

Plants 25: Selection 10. In which is considered the appropriate relationship in variety, colour and texture to each other, to the fish and the rockwork; and in which overstocking, the indiscriminate mixture of too many varieties and the inclusion of outdated or disapproved varieties is penalised.

Quality 15. In which is assessed the degree of perfection in colour, texture and quality, and in which all damaged or unhealthy plants are penalised.

Design and Technique 50: Design and General effect 15. In which is considered the merits of the layout and general appearance and the grouping of plants. Whether exploitation of materials is to the best advantage in forming a realistic and harmonious picture, and in which any faults in general technique which detract from the finished picture, and whether or not the fish are visible are taken into account.

Originality 5. In which is considered any measure which brings about a practical and effective departure from the commonplace; whether by use of particular rockwork, planting or the use of any kind of legitimate but unusual materials.

Permanency 5. In which it is considered whether measures have been taken to ensure that a mature, well established appearance has been achieved, whether the plants have been treated in such a manner that they are likely to flourish and the pleasing qualities of the tank will last.

Clarity 5. For which only tanks containing water of crystal clarity receives full marks.

Compost, Rockwork and/or other Accessory Features 10. In which is considered the tone and texture of the compost in relation to the plants and rockwork. The composition, natural qualities, texture, colour, character, general suitability and amount of any rockwork or other accessory feature, credit being given for the absence of rockwork if warranted by the layout.

Planting 10. In which is considered the natural posture of the plants, the lie of the stems, the position of crown, stem and leaves in relation to the compost and the concealment of any lead weights, roots, etc., account being taken of any plant where it is natural for part of the root system to show.

New Society

Calder Aquarist Society. Secretary: Mr. J. Hellowell, 6, John Street West, Tuel Lane, Sowerby Bridge, Yorkshire. Meetings: First Tuesday each month, 7.45 p.m., at Bull's Head Inn, Sowerby Bridge.

Secretary Changes

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

Bethnal Green Aquatic Society (Mr. W. Richardson, 16, Whitman House, Roman Road, Bethnal Green, London, E.2); **Inverness and District Aquarist Society** (Mr. J. A. Mackintosh, 19a, Aradale Road, Inverness, Scotland); **North Bucks Aquarist Society** (Mr. K. W. Bird, 56, High Street, New Bradwell, Wolverton, Bucks.); **Rochdale and District Aquarist Society** (Mr. L. J. Anderson, 2, Alton Street, Rochdale, Lancs.); **West Middlesex Aquarists' Society** (Mrs. J. Sheffield, 98, Syon Park Gardens, Isleworth, Middlesex).

Crossword Solution

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