

The AQUARIST AND PONDKEEPER

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Editorial

IN this issue we include a further article about a reader's fish house, this one being the practical and attractive-looking design of Mr. E. Foster. It is inevitable that thoughts of owning such a structure must arise in the mind of the keen aquarist, for as his collection of aquaria begins to grow it becomes obvious that only by grouping them together can he cope with the routine tasks of maintenance and feeding. There is, too, the other point made by several readers, that the patience and interest of other members of a household are apt to flag when fish tanks are upstairs, downstairs and in my lady's chamber. A separate room for his collection is seldom available for the family man, so that it is towards the garden that his attention is turned.

For most of us the shock of the discovery of the costs of erecting and maintaining the magnificent structure that we have dreamed about for months and built in thoughts on scores of bus rides and train journeys leads to the adoption of less ambitious and less satisfying plans. And yet a fish house is not a thing to be skimped; not only does it need to be a strong structure and of durable materials but it should incorporate heating and ventilation that will make it suitable under all weather conditions for both the fishes and the aquarist who must work in it. These features all add to the cost, but it is likely that anything of standards less exacting will be a disappointment to its owner. Of nothing else but a fish house was it ever so true to say that if it's worth doing at all it's worth doing well.

This conclusion emerges quite clearly from the articles we have published so far. Each owner has built more than one house in constant attempts at improvements and to solve the various problems encountered, and aquarists sometimes confess that they would alter even their final design if they were starting again. Aquarists who in articles have described the snags and discussed solutions to the difficulties deserve the gratitude of all would-be fish house owners.

Breeding Tropical Egg-Layers

by AQUARIUS

MANY breeding methods are shown by the egg-layers, some building a kind of nest and caring for their young whereas others lay their eggs and take no further interest in them or the fry afterwards. With most of the egg-layers when the fry hatch they are as a rule so tiny, weak and defenceless that they easily succumb to the slightest set-back and so present difficulties in rearing which are not present with livebearers.

Although many fishes of the same genus may breed in a similar manner, certain kinds are much more difficult to succeed with than others. The several methods of egg-laying vary considerably. Such fish as *Brachydanio rerio* scatter their eggs over or among water plants and these eggs are non-adhesive and so drop to the bottom. Others such as rosy barbs (*Barbus conchanius*) lay eggs among plants and which stick to the leaves or anything with which they come in contact. Then there are the bubble-nest builders such as paradise fish (*Macropodus opercularis*) and fighting fish (*Betta splendens*), which tend the eggs whilst they are incubating and then care for the young for a few days. In the cichlids the eggs may be laid in a form of nest on the bottom and are cared for by the parents. Then we have the mouth-breeders such as *Haplochromis mossatii*, which hold the eggs in the mouth until the fry are free swimming.

Ready Breeders

Different techniques are required to deal with each type. Many aquarists find that it is easier to breed some of the nest-building types than the others. The fact is that with fishes like the paradise fish, provided that all goes well the male fish will guard and tend the eggs during the period of incubation so that the possibility of any of the eggs being attacked by fungus is remote. Against this is the possibility that one or both of the parent fish may eat the eggs or fry and that often the female fish must be removed once the eggs are laid. No hard-and-fast rule can be made over this process as fish vary in temperament, but often even good parents can be worried and put off their natural bent by too much watching and interference by the owner.

One thing is fairly certain, it is far better to gain experience at rearing some of the easier egg-layers than to try any of the more difficult ones first. Two fairly easy ones for the beginner are rosy barbs and zebra fish. The first need some plants or artificial material on which to lay their adhesive eggs; the zebras lay non-adhesive eggs and so must be prevented from eating the eggs once they are laid. This egg-eating is one of the hazards which the breeder must overcome. It seems that as long as the excitement of the chasing and egg-laying business is proceeding there is little fear of many of the eggs being eaten. It is when chasing has stopped and the drive has been expended that some fishes turn to egg-eating.

With the types which lay eggs which stick to water plants there are two main methods to adopt. Either remove the parent fish from the spawning tank and so leave the eggs to hatch in safety or else remove the plants holding the eggs to another tank for hatching. It is generally better to remove the parent fish, and if they are placed into another well-planted tank they may lay again.

Do not try to breed egg-layers in a community tank. It can be done but it is not at all satisfactory. Sufficient tanks must be possessed so that as each species appears to be



Photo:

Laurence E. Perkins

Rosy barbs (*Barbus conchanius*), an egg-laying species with which the beginner can expect success

ready for spawning the pair or more can be placed into a tank by themselves. The type of set-up will vary slightly with the various species but most species prefer water about 6 inches deep and a thoroughly clean tank as well.

Foods Before and After Spawning

Feed the prospective spawners on as much varied food as they will eat and do not forget that small garden worms, cut for small fishes, are one of the best conditioners known. If these are not available then white worms, cleaned *Tubifex*, *Daphnia* or broken maggots can be fed. All healthy well-fed fishes will want to breed. This is a natural procedure and it is their most important function. Temperature of the water plays an important part in the successful hatching and early start for the fry. About 80° F. seems to suit the majority of species. At this temperature many kinds will hatch in about 2 days. It is imperative to get the fry hatched as soon as possible as once they are out of the egg there is less danger of them being eaten by such things as snails or of being attacked by pests.

The provision of suitable first food must not be overlooked and Infusoria is a suitable food for a few days.

Where many aquarists fail with egg-laying fry is that they do not provide enough small live food in the first week or two in the life of the fry. In some cases, where the parents can be left with the eggs and fry, the owners do not realise that the fry must be almost continuously feeding on foods such as Infusoria to exist, and many thousands of fry are lost each year through starvation alone.

Fish House Design

by E. FOSTER

(Photographs by J. S. RHODES)

THE term "fish house" brings looks of bewilderment from our non-aquarist friends, and even the experienced aquarist has only vague ideas on what he really wants in such a structure. I heartily agree with Dr. F. N. Ghadially in his article (*The Aquarist*, December, 1958) that it is well-nigh impossible to describe the ideal fish house, let alone design and build one.

I started in the usual way, first with one ornamental tank in the lounge, followed by a battery of tanks in the hall. This received no opposition from my wife but ambition drove me on and one day I installed a 3-ft. tank in a bedroom (we lived in a bungalow at the time) while she was out. On her return, however—oh, dear! Ultimatum: I had gone too far! Outside—the lot! I could have the one tank in the living room—but no more! And so—the first step to owning a fish house.

My first attempt was a small shed about 8 ft. by 6 ft. with no windows. This was not at all successful and so I decided to have a larger one (will we never learn?). This was going to be on the same lines as the old one. However, before this prospect was carried out we took possession of another house. For the meantime fish-keeping was dropped, and I was back to one tank in the lounge. Finally, with all the odd jobs done, back came my old ambition to build a fish house.

As my wife was and still is very keen on flower-growing we decided to have a fish-house-cum-greenhouse. I purchased a greenhouse complete with boiler and pipes, and built a strong two-tier staging all around the inside. I wired it and installed my tanks, and at last here was my fish house—or was it? No, it was not big enough. So up went a 6 ft. extension and immediately this space was filled! At last I was satisfied we had a place where I could breed my fishes and the wife could grow her flowers and cacti, although naturally there were times when we got in each other's way and if we had visitors it was a tight squeeze to get two in at a time.

Came winter time: imagine my feelings when I received the electricity bill for the first winter's quarter: £20! After all, I had burnt about a ton of coke in my boiler as well. After that I cut down on my tanks for the winter. I kept this place for about 5 years before I finally decided to build my present fish house. By now, apart from about 40 tanks, we had about 600 cactus plants as well as a large collection of potted plants.

About this time I was contemplating leaving the district and taking a job at the other side of the country, so I decided now was the opportunity for dismantling my fish house and disposing of most of the plants, leaving the way clear for us to move if we so wished. In the meantime plans were being made for a new fish house. By this time I knew what I wanted and planned my fish house to suit my requirements. We decided to stay in Beverley so work was commenced. From past experience I knew I wanted a building that would not lose heat too easily; I wanted plenty of room to move about and also I wanted a system that was easy to service.

I submitted the plans of the building to the local authority and received permission to build, although I could not have water laid on. The dimensions of the fish house are 22 ft. long by 9 ft. wide, 6 ft. to eaves and 7 ft. 6 in. to ridge.

I had two wide concrete footpaths which would make

part of the foundations, the rest being made of large concrete blocks spaced about 1 ft. apart over the whole area. This was quite a long job as levelling was difficult. The next stage was the laying of the wooden floor. This comprised 5 in. by 3 in. joists, spaced 9 in. apart and running the width of the building, with tongued and grooved floor boards 1 in. thick.

The side frames were made of 2 in. by 2 in. timber, the outside being covered with asbestos sheeting. Each side was made in two sections, one 12 ft. and one 10 ft. The two ends were of the same materials; the doorway was in the centre of one end. For reasons which I will explain below, I had planned the fish house to have two rooms,



General view of the rearing room. In the centre is the "table pond" shown in another picture



An opening of the fresh air duct that runs beneath the staging is seen beneath the large aquarium and in front of it is an oil heater for use on cold nights



Main ventilator housing the air extractor



In the rearing room: the method of tank lighting is shown. Cacti are included in the furnishings



"Table pond" in the rearing room. Made from chipboard, it is lined with polythene and is usually divided into small compartments used for rearing male fighting fish

one 16 ft. long and the other 6 ft. The roof over the smaller room is covered by asbestos sheets and into this is built a chimney-type ventilator. The rest of the roof is all glass, double-glazed. The inside of the framework is covered with $\frac{1}{2}$ in. Celotex insulation board, the 2 in. cavity being packed with glass wool.

When planning the fish house I decided on a neat, com-

Two-Room Lay-out

fortable lay-out, instead of a jumbled array of tanks with no room to move around. That is the reason for the two rooms. The smaller room is for spawning purposes and the larger for rearing. I am using only four tanks for spawning. In the main room I have 20 tanks, from 18 in. by 12 in. to 48 in. by 12 in. Two of these are used for conditioning the fishes, the rest for rearing. After spawning I rear my young fish in the same tanks until they are on small live foods. They are then moved into one of the rearing tanks. This enables me to keep my rearing tanks in a clean condition. I also get luxurious plant growth in

these tanks. All young fishes are fed four times a day with my own dried foods, fresh and live foods. I keep a fair number of snails in these tanks; I also rely on the services of several *Plecostomus*.

Stepped Staging

In the rearing room the staging is right round the walls and is two-tier but stepped. The lower stage is covered, as there are not so many tanks on it. It is also covered with an adhesive plastic sheet, which makes cleaning easier. The whole of the staging (2 in. by 2 in. timber) is very strong and is covered with hardboard. It includes cupboards, enabling me to keep all equipment out of sight and also out of the way of little fingers. The spawning bench is all on the same level, the top being covered by 1 in. thick blockboard, also covered by adhesive plastic sheet. Again this is panelled into cupboards, one being used for bowls, buckets and nets, etc. The other is slightly heated, as I use this for breeding micro and Grindal worms. White worms and *Tubifex* are kept outside. At the back of the

fish house I have a pond for *Daphnia*, which is stocked once each week. Alongside the fish house are two worm pits.

The whole floor is covered with lino, with heavy-quality coconut matting over this. Below the glass roof I have green plastic curtains, which reduce excess of light, and with this I do not have too much trouble with green water. All electric cables are out of sight; sockets are placed right round the building, two being provided for each tank, one for heating, one for lighting. All cables are polyvinyl-chloride covered. The system is broken into eight fused circuits, switch-controlled, giving 54 outlets. A check meter is also installed on the main switchboard. On the other side of the small room is a work bench and desk.

Heating

During very cold weather I use a good oil heater, which easily keeps the room temperature at 75°F. when there is hard frost outside. With this I get no fumes and very little condensation. I have, however, found that in spite of having cover glasses over all tanks I get a white film on the water surfaces after prolonged use of this heater. This, however, is easily removed and has no effect on the fishes. For tank lighting in winter time I have strip-light shades over all tanks. These have only 15 watt lamps fitted, and serve the purpose of keeping my stock awake, sparing them the shock they would get if I went in and switched on the main lights during the dark evenings. All cover glasses are in two pieces, the front piece being fitted with a handle made from aluminium glazing bar stuck to it. Both these ideas are in use at the magnificent aquarists' shop in Burnley—Taylor's Aquarium.

Each tank has its own thermostat and is fitted with a flexible heater, also all the tank fronts in the rearing room



Part of the spawning bench with, towards the back, the author's brine-shrimp hatcher made from a 2-gallons polythene bucket. In cupboards below this bench are nets and live foods



"The wormery". *Micro* and *Grindal* worms are kept here at a temperature of 70°F. Wooden boxes for white-worm culture are stacked below but are normally kept outside the fish house

are covered with removable masking panels, so that no steel framework is visible. Between the lower tanks stands my wife's cactus collection, adding a distinctive touch to the place.

To keep the fish house cool in the hot summer days the ventilation system is as follows. At the far end of the building a duct runs through the staging to a small door at the back. Both ends of the duct are covered with aluminium diamond mesh. In the chimney ventilator there is fitted a Vent-axia air extractor. This ventilator is also covered with diamond mesh. The extractor can be controlled at three speeds, ensuring a constant stream of fresh air throughout the building. The door of the fish house opens inwards, and on hot days a wire-mesh door can be swung into position from the outside. On very hot days I have no worry of overheating.

Aeration

Aeration is supplied by two pumps, although I do intend to install one large pump. All tanks are of 1 in. and 1½ in. angle-iron and glazed with quarter-plate polished glass. As I possess a small workshop equipped with welding plant, etc., I am in a position to make my own tanks. The interior of the fish house is painted pale green and ivory, giving a very pleasing appearance.

I certainly cannot throw water on the floor and I do have to sterilise my spawning tanks outside, but apart from that I have not lost any efficiency. This year I have successfully bred many types. I have plenty of room to move around and to entertain the inevitable visitors. The building is warm in winter, cool in summer and has cut down expenses by 66 per cent. Now it is complete, I could pick holes in it, but no alterations will be made for the next few years at least.

German Aquarists' Congress

AT the invitation of Dr. Hans Lange, who is vice-president of the East German Federation of Aquarists and Herpetologists, I journeyed to Germany to attend the Fourth Annual Congress last October.

On arrival at Tempelhof Airport in the Western Sector of Berlin, I was met by Dr. Lange and Mrs. Lange, and first of all spent an enjoyable two days in that sector, before making the first trip into the Russian Sector.

Thanks to the great kindness of Mr. Roy Skipper and Mr. Haines, both of Hendon Aquatic Society, I was able to take a collection of some 180 coloured slides, and the first showing was made to the See Rose (Water Lily) Club, of which Dr. Lange is chairman. Some 60 members were present, and many questions were raised, as our ideas of shows and furnished aquaria differ from theirs. Invitations came fast and furious from aquarists who wished to exchange ideas, and a great deal of time was spent making visits here and there.

On the 16th October, a 250 km. trip on the Autobahn was made to Leipzig, where we settled down in the Park Hotel. The first day of the Congress started with a welcoming speech from Mr. Hans Frey, President of the Deutsche Kulturbund, who is also well known as author and editor of the German monthly *Aquarien und Terrarien*. A number of guests from Federal Germany were present, including Mr. Ewald Somann, who is general secretary of the Federal German Federation. Both he and I made our speeches of welcome, which found favour with some 350 delegates present.

This was followed by speeches by some of the German personalities, Dr. Hans Schiemenz, Dr. Wolf Dietrich Beer and Dr. Heinz Wermuth, who dealt with natural areas and protection of wild life, water shortage and the basics of scientific names and their foundations respectively.

After a short interval, Mr. Hans Joachim Franke spoke of breeding and dealing with some of the new imports of fishes. He dealt with some 30 species, and gave precise details of sexing and spawning each of these species. *Inter alia* he mentioned *Belonesox belizanus*, *Notopterus chitala*, *Exodon paradoxus* and *Rhynchobdella aculeata*.

As it is customary in East Germany to bring one's own tanks to a show, and then to fill them there, much surprise was evident when I gave my talk with Mr. Skipper's slides. I showed cold and tropical furnished aquaria slides amongst others and our ideas of competition found much favour.

The first day of the Congress ended at about 10.30 p.m. The second day started at what we consider an impossible hour, i.e. 8.30 a.m.

Further lectures were given by Professor Dr. G. Sterba, Dr. Johannes Jahn, Mr. Joachim Knaack and Mr. Hans-Gunter Petzold, and discussion followed each talk. The subjects were as follows: Care of the young, with particular emphasis on aquarium fish, biology, breeding and keeping of *Nannochromis nuluiceps*, embryology of the Osteichthyes and the practice of herpetology in the East Berlin Tierpark (Zoo).

After lunch the specialist groups, i.e. herpetology and the German Guppy Society, commenced separate meetings.

It was evident right from the onset that our German colleagues are far more scientifically minded than we are and the German love of method and order is also very pronounced. On summing up, I would mention that on reading the programme of the lectures, I had the impression that it might be dull apart from taking into consideration the fact that the lecture period would total some 13½ hours, and that this would not only necessitate listening but also looking, as each lecture was accompanied by coloured slides.

Visits were made to the Leipzig Zoo and Aquarium, which is a good one, and to the West Berlin Aquarium. Apart from two tanks with white spot, and one or two incorrectly spelt names, the show was a very good one, but the tropical sea-water tanks were magnificent. The East Berlin Zoo has not as yet an Aquarium, but I understand from Mr. Petzold that this omission will soon be rectified.

It was also noticeable how closely bound together are herpetology and fish-keeping, even more so than in Britain, and one had to go a long way to find someone who did not keep both reptiles and fishes.

For readers who might like some details: anyone could attend on payment of 3 Ost marks (5s.), and many aquarists in Leipzig acted as hosts to visitors. Those who had not booked accommodation were immediately shown to a small section dealing with lodgings and rooms, and no one failed to get fixed up overnight. Refreshments were moderate, as were all meals. The meeting place held all delegates quite comfortably, seated at tables, and a complete loud-speaker installation carried to every corner of the hall. Slides were shown on a large screen on the stage and ample opportunities were available for those speakers who wished to illustrate a point with a blackboard. Press and film coverage was also available.

On the way back on the Autobahn, a picnic halt was made so as to meet once again Mr. and Mrs. Somann and Dr. and Mrs. Stoerzbach (German Guppy Federation), then back to East Berlin. The next days were also spent in visiting aquarists at home and pet shops. These had amazing collections of fishes from the tropical regions of the U.S.S.R. and were considerably cheaper than the general run of fishes known over here.

I could not say that I found any outstanding specimens of those fishes which are well known over here, and I particularly looked for Siamese fighters, but I regret that I was disappointed.

The experienced aquarists seem to be battling with the problems of dealing with the breeding of the discus, but so far, every attempt has been unsuccessful. Some wonderful lay-outs were shown to me, the largest being a tank of 1,000 litres (nearly 220 gallons), and the news that the discus was first bred over here by Mr. and Mrs. Skipper does not appear to be generally known.

I would add, that despite seeing quite a few hundred Russian Occupation troops, complete with armaments, no political bias, influence or undertones raised their heads during the course of the Congress, and as far as I was concerned, the welcome for a Westerner was overwhelming and at no time during the whole of the 14 days that I was there, did I feel that the welcome was not genuine.

R. O. B. LIST

BRIGHTENING UP THE TANK

WHEN a furnished tank has been set up for a long time the base often takes on a dull and dingy look. This can be quickly altered if a cupful of clean washed river grit is tipped into the water to fall along the front of the tank base. It is surprising what a difference this makes to a tank, at once giving it a brighter appearance. It is best done after the weekly servicing. At such times a small quantity of the base compost may be picked up with the surplus mulm and in time the front of the tank can become almost denuded of compost. The extra sand can then serve two purposes and the whole task takes only a minute.

Variation of Leaf Form in Native Aquatic Plants

by C. D. SCULTHORPE

(Photographs by the author)

MOST aquatic plants are very plastic in their vegetative structure, the size and shape of their leaves varying at different stages of development, and in different conditions of water depth, current speed, light intensity and mineral-nutrient supply. This occurrence of different types of leaf on one plant, known as heterophylly, has always intrigued naturalists, and still causes difficulties in the classification of plants and identification of them in the field. Many tropical species such as the cellophan plant, *Echinodorus rostratus*, are fine examples of heterophylly. The use of similar plants from our lakes, ponds and rivers brightens the underwater scene in coldwater aquaria, for

which there are often thought to be very few suitably decorative plants.

Though the majority of British aquatics are heterophyllous, not all are as familiar as the arrowhead, *Sagittaria sagittifolia* L., with its ribbon-shaped submerged leaves, lanceolate to oval floating leaves and long-petioled, sagittate, aerial leaves. In the same family is *Baldellia ranunculoides* (L.) Parl., the lesser water plantain, which used to be known as *Alisma ranunculoides* L. and earlier still as *Echinodorus ranunculoides* (L.) Engelm. This is a less distinctive plant which forms a dense tuft of submerged, lanceolate leaves scarcely differentiated into petiole and blade. This



Left: Floating leaves and surface flower of *Luronium natans* (*Alisma natans*)



Right: These nodal plants arising on the floating stem of *Luronium natans* show a gradation of leaf types



Left: A group of fresh spring cuttings of water crowfoot (*Ranunculus aquatilis*)



Right: Bushy submerged foliage of marshwort (*Apium inundatum*)

erect petioles bear lanceolate blades horizontally on the surface, or at an angle in the air. From June to September the plant forms umbels of long-stalked flowers of which only one or two are open at a time; they are white, flushed with rose, about half an inch in diameter, and they last only a few hours.

The related plant *Luronium natans* (L.) Rafn., the floating water plantain, previously known as *Alisma natans* L., is rarer and occurs in lakes, canals and tarns with acid water. It has only submerged and floating leaves; when first planted in the aquarium or pool it produces ribbon-shaped, translucent, flattened petioles up to 6 inches tall, similar to those of *Sagittaria natans* Michx. Later, long thin petioles bear the shining, dark-green surface leaves. From the crown of the plant, the stem grows out and floats just beneath the surface, producing at the nodes young plants which show small, linear leaves and elliptical, floating leaves. Each solitary flower is borne on a long stalk from a leaf axil and rests on the surface. It is frail, transient and white, with a golden centre.

Ranunculus aquatilis L. emend., the water crowfoot, resembles *Luronium* in having floating and submerged leaves, though the latter are dissected. One of many species known as the water crowfoot, *Ranunculus aquatilis* makes a decorative aquarium plant, particularly in the spring, when its thick, branching stems are producing many fresh-green, finely dissected leaves. It is then as attractive as the *Cabomba* and *Limnophila* species of the tropical aquarium. From late May onwards through the summer the submerged leaves turn brown and die, and only the palmately lobed, floating leaves and five-petalled, white flowers remain. This common native plant flourishes in the garden pool, rooted in sand or gravel; as an aquarium plant, it is of only temporary use.

Similar to the submerged leaves of *Ranunculus aquatilis* are those of the straggling, submerged perennial, *Apium inundatum* (L.) Rchb., known as the marshwort. This plant, together with the arrowhead, occurs all over the country in river courses where the current slackens and silt is deposited in the shallows. There the plant grows into a tangled mass of foliage, but if the young, slender branches are selected and then planted in groups in sand, a tidy bush of bright-green, finely cut foliage soon develops.

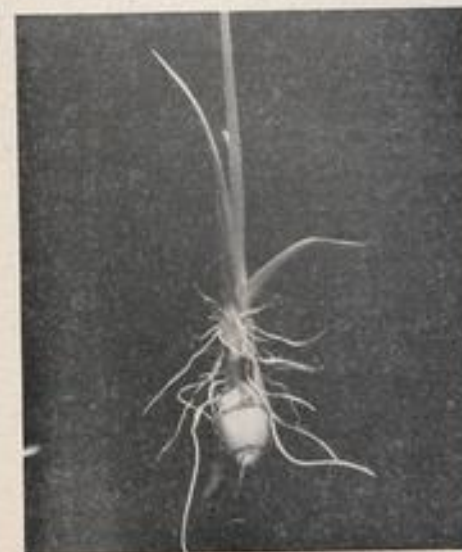
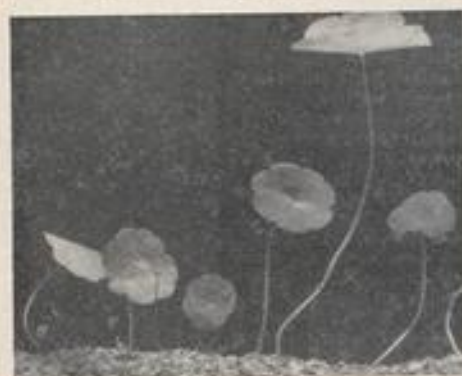
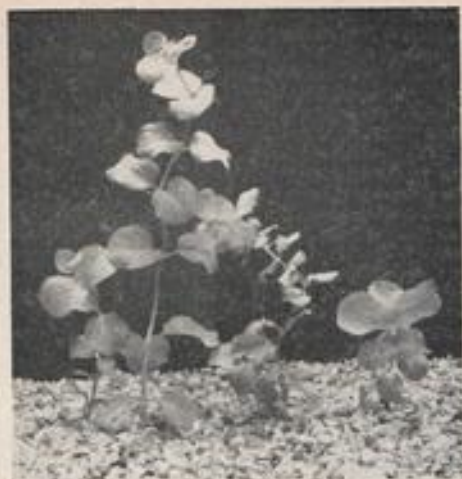
Few aquatic plants flower under water; *Ceratophyllum demersum* L., the hornwort, is one of them. A species of unique appearance, it is an interesting pool or aquarium plant, though in aquaria the plumes of foliage are rarely as dense as they are in full daylight. The young, bright-green leaves are unusually tough, because of a covering of cutin. From July to September inconspicuous male flowers are released from the axils of the leaves to the surface, where they dehisce, shedding pollen which has a high specific gravity and therefore sinks gently down to the bifid stigmas of the solitary female flowers. Pollination occurs by this curious method frequently, but the plant never fruits. Far back in 1894, H. B. Guppy discovered that the rarity of flowering and fruiting stages in the lives of certain aquatics is due to thermal conditions. *Ceratophyllum* requires tropical heat of 80° to 90° F. to mature its fruit. The



Top : Hornwort (*Ceratophyllum demersum*)

Centre : *Myriophyllum verticillatum*; the deep rich-green leaves are borne on the stems in whorls of four

Bottom : *Myriophyllum spicatum*; the bronze-green leaves of this slender species often assume a copper-red hue and are borne on the stem in whorls of three or five



gibbous duckweed, *Lemna gibba* L., flowers in this country only if it is living in water heated to about 85° to 95° F.

Ceratophyllum demersum never forms roots and I find that they cannot be induced by hormones of the beta-indolylcarboxylic acid series or by alpha-naphthoxyacetic acid. Occasionally, rhizoidal branches grow into the soil which differ from the normal leaves in being thin and colourless. The normal leaves of *C. demersum* are forked once or twice, whereas those of *C. submersum*, a rarer but easily confused species, are thrice-forked. In the autumn both species are very brittle and the branch apices have dense, dark-green leaves. The plants spread by fragmentation, and by renewed growth of these apices in the following spring.

Species of *Myriophyllum*, the milfoils, are always popular with aquarists; planted in groups, their feathery plumes make a fine display. The rhizomes of all three British species creep in the mud and produce erect, branching stems bearing whorls of finely cut leaves, each with some 15 to 30 segments, and aerial spikes bearing terminal male flowers with hermaphrodite and female flowers below. The male flowers are the most conspicuous, those of *M. verticillatum* L. being greenish yellow, those of *M. spicatum* L. dull red and those of *M. alterniflorum* DC. yellow streaked with red. The foliage of the three species is scarcely distinguishable, though *M. alterniflorum* is the smallest species and inhabits peaty, non-calcareous waters, especially in the north-west, whereas the other two species prefer calcareous lowland waters.

All the *Myriophyllum* species flourish in coldwater aquaria and pools, in a sandy compost, under bright illumination. Probably the most beautiful species for the outdoor pool is *M. proserpinacoides* Gill., a native of Brazil naturalised in North America, and probably in one or two places in the British Isles after escape from gardens and ornamental waters. It needs intense illumination for the full development of its dense whorls of pale, bluish green leaves, which are aerial and, like those of *Limnophila sessiliflora*, *Symma triflorum* and *Hygrophila stricta*, show sleep movements, closing up round the apex in the evenings.

In late summer *M. verticillatum* forms turions at the apices of its lower branches; these are club-shaped buds, laden with stable food reserves such as starch, and they fall to the substratum when the plant dies. In spring they germinate into young plants attached to the sand or mud by white, spirally-coiled, tendril-like roots. These turions, and those of *Utricularia* species, *Hydrocharis morsus-ranae* L., *Stratiotes aloides* L. and *Sagittaria* species, are often considered to have been devised by the plant specifically to pass the winter and ensure perennation. This idea is quite erroneous as they are produced in direct response to any unusual conditions. *Myriophyllum verticillatum*, for instance, will form turions in spring or early summer when grown in poor light and in the absence of mineral salts. Within a few weeks of planting on land it forms many turions in the soil. If the foliage of many of the *Sagittaria* species is drastically cut back, the plants send out many horizontal stems, each terminating in a small but swollen tuber. It thus seems that turions are naturally produced as a response to the approaching, unfavourable winter conditions. That

Top: Moneywort (*Lysimachia nummularia*) growing in an aquarium

Centre: Pennywort (*Hydrocotyle vulgaris*) showing the short flower stalks with their bi-lobed fruits

Bottom: Turion or bulb of *Sagittaria sagittifolia*. The new year's shoot with its roots springing from its base are seen above the turion, a store of food, at the base of which is the remnant of the stolon on which it was borne terminally

they may be formed at any other time of year indicates their function to carry the species through any harsh conditions, rather than as an annual body produced specifically for overwintering.

Littorella uniflora (L.) Aschers., the shoreweed, reproduces vegetatively, not by turions but by runners. A perennial plant from the sandy shores of non-calcareous lakes and ponds, each inch-high tuft of cylindrical leaves sends out in spring slender runners bearing young plants at the tips; by late summer these have become independent plants. In soft-water lakes, for example Ennerdale, this bright-green species forms an extensive carpet in the shallows. It is heterophyllous, since in water of about 3 feet depth its leaves become flatter and longer, whereas out of water the plant bears dwarf leaves and eventually flowers. Both the submerged forms are unusual plants for the foreground of an aquarium.

Two other species, amphibious like *Littorella uniflora*, may be used in coldwater aquaria. One is *Lysimachia nummularia* L., the moneywort, cuttings of which grow bushy if their apical buds are periodically nipped. This garden plant normally has creeping stems with dark-green, shining leaves and rich, golden flowers; under water the leaves are thinner, emerald green and the flowers are not produced.

The other species is common in *Sphagnum* bogs and on acid soils all over the British Isles; it is *Hydrocotyle vulgaris* L., the pennywort. The habit of the lobed leaves, borne erect from the nodes of the creeping rhizome, is very characteristic. The tendency of the petioles to elongate and raise the leaves into the air may be controlled by pruning; maintained at a height of an inch or so above the gravel, this plant is of striking appearance in the aquarium foreground.

Gudgeon for the Coldwater Enthusiast

by WILLIAM J. HOWES

A GUDGEON, seldom reaching 8 inches in length, is rather like a miniature barbel in appearance, so much so that they have at times been mistaken for each other. Yet the gudgeon (*Gobio gobio*) differs fundamentally from barbel (*Barbus barbus*) in that its dorsal fin has no spine, and only two barbules, or feelers, depend from the upper lip at the corners of the mouth.

The gudgeon may also be mistaken for either one of the two British species of loach, which are also small and dappled in general colouring. Yet a gudgeon should be distinguished by its forked tail and two barbules, because a loach has a rounded tail and six barbules. The gudgeon has the flattened belly characteristic of bottom-loving fish species.

In colour gudgeon are inclined to vary, being generally grey or brown mottled with green, and with silvery or bronze tints on the sides with scattered dark spots. The dorsal and caudal fins are speckled. When fully grown gudgeon average some 5 inches to 6 inches in length, so



Photo: :

W. J. Howes

Even at full size the gudgeon is a suitable fish for the coldwater aquarium

even at their largest they make suitable inmates for the aquarium.

The bottom of an aquarium containing these fish should be siphoned regularly to prevent an accumulation of sediment, because it is a gudgeon's habit to grub along the bottom stirring up the mulm and sediment, and the water will therefore always be cloudy. Moreover, they will uproot your plants if they are not well rooted. It may be preferred to set each plant in a small pot; small fish-paste jars are useful for this.

Gudgeon are shoal fish, and their spawning activity takes place in April, May or June, as with most British freshwater fishes, and where possible in shallow water running over gravel. A female will deposit some 2,000 eggs, but the actual spawning is normally spread over a period, as a few eggs only are released at a time. These eggs are sticky and adhere to the stones among which they are laid. The incubation period is reckoned to be anything from 10 days to 28 days. This depends upon the suitability of the water.

The garden pool is the place for gudgeon if it is hoped to breed them. Unless, of course, the aquarium is a very large one in which they might be induced to breed.

Gudgeon are not very often seen if kept in the garden pool because they will keep close to

(Please turn to page 155)



In the delightfully natural stretches of the Wey Navigation Canal, Surrey, gudgeon are plentiful

One of the Housekeeping Brigade

by DIANE SCHOFIELD

IT is a poor tank that does not sport at least one *Corydoras aeneus*. Whenever a new tank is set up this catfish is almost automatically installed as the garbage disposal for the rest of the tank's inhabitants. This is a role not especially coveted by the *aeneus*; no doubt they would much prefer to eat at the "first table," but as they do such a sterling job as "mop-up" crews, they seem destined to be thought of as the housekeeping brigade.

Corydoras aeneus are satisfactory in a number of other ways also. Since they have a tough hide the white spot organism has difficulty in obtaining a hold. The catfish has a series of armoured plates in place of the usual scales. A rather wide temperature range of 70° to 90° F. is tolerated by them, and a crowded tank doesn't cramp their style a bit. They have an air-breathing apparatus in addition to the more conventional gills, so the *C. aeneus* has only to swoop to the top of the tank for a quick breath and then down again.

To top it all, this fish is also a bit of an entertainer. It's hard to suppress a smile when one of his eyes moves in what is apparently a big wink. Although *C. aeneus* does not have an eyelid, he does have the faculty of rolling his eye in its socket—a feat not shown by many other fishes.

Not a Ready Spawner

Corydoras aeneus is admittedly co-operative in most things but spawning is not one of them. One cannot make ready a neat little set-up as for barbs or tetras and say, "To-day we are going to spawn *aeneus*!" You may set it up and say that, but the catfish is going to have no part of it. Catfish seem only to spawn when "the wind is in the right direction" and when the spirit moves them. With the great numbers of these fish in community tanks it seems surprising that more spawnings are not reported. This, I believe, is due in part to inadequate feeding.

The first spawnings of *C. aeneus* that I ever had happened in a 40 gallon tank of angels that I was feeding heavily with live food. There were six catfish in this tank, requisitioned as the usual janitor crew. One Thursday morning after approximately a month of gluttony, as the angels had let a great deal of live food go by, I noticed a frenzied activity on the front of the glass. A female was being rapidly pursued by two of the smaller males. She had eaten so much during the past weeks and had filled up so with spawn that she had been spending her time rocking back and forth on her belly, not being able to touch the sand on either side with her pectoral fins. Her spawning seemed to follow a pattern. A male would tip over on his side. The female would apparently place her mouth at his vent to obtain the sperm. Then she would lay approximately four to eight eggs which were received into her anal fins that were placed together like little praying hands. A mad chase ensued, all over the front of the tank and likely looking leaves, to find an appropriate place for her cargo, which she neatly patted into place with her anal fins, never so much as laying one egg on top of another.

Fertilisation by Mouth

She touched the spots on which the eggs were to be placed with her mouth, thus fertilising them. Apparently she looks so long and hard to find a suitable resting place that some of the sperm is lost or else it loses its effectiveness, as a large portion of the eggs seem to be infertile. This procedure is followed again and again over a period of several hours, until all her supply of whitish-yellow, rubbery, sticky little eggs are disposed of. She would only



Photo:

Corydoras aeneus

Laurence E. Perkins

pick the clean front glass, clean rocks, or a clean firm leaf such as that of an Amazon sword plant or a *Cryptocoryne*.

Seeking to save some of the eggs from the eager angels, who had by this time discovered what tasty tit-bits catfish eggs can be, I removed the eggs to another smaller tank by carefully placing a finger on a group of eggs and then scraping them off into the new tank by means of a stiff leaf. As *C. aeneus* eggs are very adhesive, this had all the beauty of trying to remove a piece of very soft bubble gum from your fingers. To this smaller tank I added 5 milligrams of aureomycin hydrochloride which had first been mixed to a paste. Methylene blue probably would have done just as well. This was to hinder fungus development on the eggs. Even so, due to infertility, a great many eggs were lost. In approximately 3 days, it was possible to observe small miniature editions of their parents swimming about the bottom of the tank.

Large Fry

The *C. aeneus* do not have a period where they are not free-swimming as do other egg-laying fishes. Since they are rather large as newly hatched fry go, they can be started immediately on newly hatched brine shrimp. I found that the frozen shrimp was especially good as it falls to the bottom of the tank immediately. They can also be fed a paste of a good fine dry food. If it is fed dry it will float on the top of the water, where it will be useless to the small cats. A few small snails should be added to help them clean up any food.

Exactly 1 week to the day after their first spawning the catfish were at it again. This was unusual because most egg-layers take longer than this to fill up with spawn. The next week on the same day the same thing happened. I never needed a calendar to tell me that it was Thursday morning. On the following Wednesday, thinking that I was doing them a favour to get them away from the encroaching band of angels, I moved them to their own 25

gallons tank. This did not meet with their favour. It took them a month to get around to spawning again and then it was only for a single time. They never spawned again.

Many commercial hatcheries have a battery of several rows of bare 10 gallon tanks set up with a trio of *C. aeneus* in each of them. One of our local hatcheries even has a great deal of success breeding the more difficult *Corydoras robustus* in this manner. The female and two males are left to their own devices and are fed heavily on *Daphnia* and other live foods. Sooner or later, when they are quite ready, the catfish spawn.

Occasionally one hears of some other rather radical methods that are "sure-fire" for getting *C. aeneus* in the spawning mood, such as adding cold fresh water to drop the temperature overnight to 60° F. This method is used by a large dealer with rather spectacular results.

Unless the babies are in a bare tank, they are almost

impossible to see. They do not develop the greenish metallic hues of the adult *C. aeneus* until they are at least $\frac{1}{2}$ in. in length. Until then they resemble nothing as much as an animated grain of sand, being tan and brown. Once they are hatched nothing seems to dismay them and, with a proper assortment of foods, they progress rapidly.

Although they are such innocuous little fish, the aquarist would not think that he had to beware of them. Sooner or later everyone has had the experience when netting them and grabbing them in the net of receiving a nasty little wound from one of their pectoral fins or from their dorsal fins. This wound stings and bleeds longer than such a small opening normally would. This leads some authorities to believe that possibly there is a venom at the base of these fins which *C. aeneus* uses to defend himself from his enemies. At least nobody ever seems to bother *C. aeneus*, even a very small *C. aeneus*!

The Garden Pond in January—by ASTILBES

PERIODS of hard frost are usually experienced at this time and the garden pond may freeze over fairly thickly. The question whether the ice should be broken or not often arises; some say leave it alone, and quote successful adherence to this rule, whereas others are equally insistent that the ice should be opened.

There cannot be a hard-and-fast rule about this but it may be as well to examine the pros and cons. A lot depends on the size of the pond and its composition. Any large pond can obviously be left to nature, as whatever expansion there may be due to the formation of ice can occur without causing too much pressure on the inhabitants of the pond. On the other hand, if the pond is small then there may be a real danger if the ice is allowed completely to cover the pond and no opening is made. Another important point is that when the pond has a more or less natural bottom, and there is plenty of soil and mulm at the base, then this material can take up much of the pressure which a clean-bottomed concrete pond is unable to do.

Concrete Pond

The concrete pond with no soil is the easier to keep clean and pure, as much of the decaying matter can be removed at the beginning of the winter. The pond with plenty of matter at its base, although able to withstand more pressure from the expansion of the ice, has also more matter which might decay and so cause pollution. As has been emphasised many times before it is not the cold which harms fishes in an outdoor pond but the foul gases trapped in the water under the ice. The pondkeeper must, then, consider the type and size of the pond before he makes up his mind about what can be done.

Unless the pond is very large it is almost certain that if the water is completely covered with ice for several days the water cannot exchange foul gases for fresh oxygen. Water plants in the pond are unlikely to be of use at this time of the year as they are practically dormant, and so any fresh oxygen for the water must come from the atmosphere. Water which is sealed off from the atmosphere for any length of time is bound to become impure for fishes and if there is a quantity of foul matter in the water the conditions are sure to deteriorate.

The opening of some part of the ice seems then to be almost a must for the smaller pond and a matter for individual action by the pondkeeper according to the type and size of the pond. When any pond has been covered with ice for at least a week the water often takes on a slightly brownish hue. Although this may not be dangerous for a time it is a

safe plan to remove a quantity and top up with fresh tap water. Thick ice can remain in the water for some days, especially if the weather remains cold. This can make it very uncomfortable for the fishes and so as much as possible of the ice should be removed. This has to be done very carefully when there is any water plant embedded in the ice. A sharp-pointed instrument will soon break up the ice, when pieces can be dragged out with a rake or smaller pieces with a large net.

The fact that pieces of water plants can become embedded in the ice is another reason why most of the dead vegetation above the water should be cut down and removed each autumn. Do not be afraid of running in some fresh tap water if the pond water starts to smell or looks a bad colour. It is far safer to renew some of the water than to chance matters and be sorry after. Remember that with a little care it is easy to keep fishes healthy in a pond but once any are upset it is not so easy to cure them.

Inexpensive Breeding Tanks

USEFUL aquaria in the larger sizes can be made from marine-plywood sheets of three-quarters of an inch thickness. Ends, base and back of the aquarium are formed from the plywood and fixed together by rabbet joints and glue. Slots made in the ends and along the front of the base permit the front viewing panel of quarter-inch plate glass to be bedded in aquarium cement. Water-proofing of the container inside is done by applying several coats of fibre-glass resin, sold for boat and car-body repairs. Additional protection from leaks at the seams of the plywood aquarium can be obtained by fixing one of the proprietary waterproofing tapes sold for home use along all the inside angles. The exterior of the aquarium can be painted in the ordinary way.

This aquarium is particularly suitable for use with sea water, since none of the components can be corroded by the action of salts and poisoning of the marine animals is avoided. If sufficient care is taken in the building of this kind of tank there is no reason why it should not be as decorative as any other form, but its value is likely to be greater for the fish house or room of the breeder of fishes and for the marine aquarist.



Photo:

Egyptian mouthbreeders (*Haplochromis multicolor*)

Laurence E. Perkins

Breeding the Egyptian Mouthbreeder

by E. WALLWORK

AT first acquaintance these fish appear drab and uninteresting compared with recent imports of more colourful tropicals, but kept in a medium-sized, well-planted tank, they really look very attractive as adults. The general overall colour is silvery olive with numerous bright-green spangles on the anal, caudal and dorsal fins; these fins are tipped with orange. Four or five vertical dark bars are sometimes present on the upper half of the body, their intensity varying with conditions. As the scientific name of the fish, *Haplochromis multicolor*, indicates, it really possesses more colours than we give it credit for, but these are only in evidence if the fish is well kept in suitable planted surroundings.

Difference in the sexes is very obvious after the fish are about 1 inch long. The male is of conventional shape with a long dorsal fin having an upturned rounded end, instead of the extended dorsal fin which is so common in other cichlids. His colours are more intense, his fins generally larger than those of the female and, when he is in breeding condition, the tip of his anal fin seems to be almost red rather than orange.

The female is slimmer than the male, her mouth is much wider than his and the head appears more square when viewed from the front. When first purchased, it is often found that the female will not eat and that she has a mouthful of eggs, as these fish will often breed in a community tank.

Of the four fish that I had, three were males and one was a female. It was soon very clear that one male was mildly aggressive towards the other two, especially at feeding times, when he monopolised the feeding area until he could eat no

more, afterwards allowing the others to eat. He did not disturb the female, who was very shy and found plenty to eat at the "off-peak" periods. This male was left in the tank with the female, the two others being removed.

Feeding was on the whole carried out with live foods, *Tubifex*, white worms and *Daphnia* mainly. It is my experience that these fish, as with cichlids generally, are not partial to dried food.

The breeding tank was 18 in. by 10 in. by 10 in., though only 8 inches water depth was used. Fine gravel covered the bottom of the tank, which was planted fairly liberally with *Cabomba*, *Myriophyllum* and *Hygrophila*.

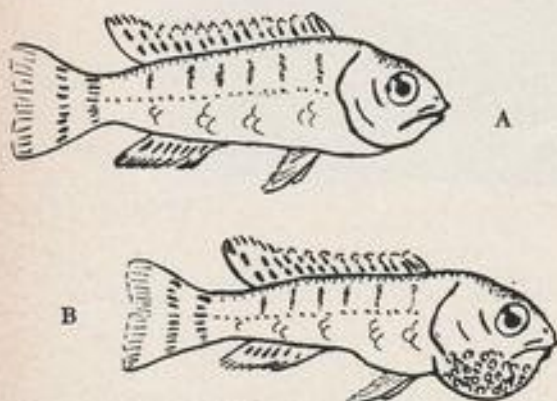
Water, as siphoned from the community tank, showed a pH of 7.2 and the temperature was maintained around 76° F. This is only mentioned as a matter of interest as the fish will accept a fairly wide range of water conditions as long as the water is clear and supports normal plant life.

Feeding continued for 2 more days and, in the absence of other males, this male paid more attention to the female, spreading his fins, showing his full colours and looking more like what we usually associate with cichlid behaviour. At the end of the second day, both fish were found to be circling around a shallow depression in the gravel and were close to the bottom of the tank, the female going down into this depression from time to time. I did not see any eggs but assumed that I was watching the spawning action of these fish. There they remained that night and a small light was left on at one end of the tank.

Next morning, when food was offered the female refused to eat and her mouth was closed tight, her lower jaws bulging: it was assumed that her mouth was full of eggs.

The male was then removed from the tank. Although *Daphnia* and *Tubifex* were still present in the tank, the female could not be tempted to eat and, at the end of the same day, she had adopted a chewing action of her jaws, which resembled that of an animal chewing the cud. This was to keep the eggs clean and free from fungus and dirt and this action continued throughout the long incubation period of the eggs.

The eggs continued to develop and the mass could be clearly seen through the distended sides of her lower jaw after a few days. At about the eighth day, the eggs had so developed that she had difficulty in fully closing her mouth, and the young embryos could be seen quite clearly inside her mouth as she often approached the front of the tank in her curious, almost defensive, concern to know who was looking at her through a lens. The chewing action was continuing throughout this time and the eggs were rolling about in the manner of clothes in an automatic washing machine, though more slowly. By this time, the embryonic eyes could be seen with good top lighting quite clearly through the sides of her lower jaw.



Drawings of the author's female mouthbreeder made before spawning (A) and 8 days after spawning (B)

Lack of food had reduced the body of the female until it was quite hollow in the middle and, by contrast, her head seemed extra large and almost square in side elevation, until at the twelfth day or so, she was seen to be eating *Daphnia* and I feared the worst. Switching on the light, I saw the female dash deep into the plant masses with her mouth once again closed tightly. At that time I did not see any young fry, but later when it was semi-dark in the tank, I saw a shoal of about 40 fry close to their mother, and when I approached closer to see them they dashed into her capacious mouth so quickly that some of the late arrivals left their tails protruding, but these were soon tucked in.

The whole action resembled a crowd of people entering an Underground train in the rush hour! It was most amusing to watch and this has no doubt endeared this fish to many who would not normally give it a second glance, or so it was in my family. The fry were of a dull drab colour, about $\frac{1}{2}$ inch long but with fairly large eyes. If too frequently disturbed the female will sometimes eat the youngsters, as I had found out before with an earlier attempt, so the female was removed.

As they were too large for Infusoria, feeding of the fry commenced with micro worms, progressing on to *Daphnia*, *Tubifex* and white worms; they did not seem to appreciate dried food very much.

It must be admitted, however, that the young did not

grow as rapidly as was anticipated and, when the time came to remove them to another tank (they were then $1\frac{1}{2}$ inch long), some of the young females could be seen to have adopted the chewing action of the mother. They were, in fact, carrying eggs in their mouths, having spawned in the community tank of their own kind.

The Egyptian mouthbreeder is one which gives a favourable impression of the maternal care so typical of cichlid behaviour. It is a good community fish (unlike most cichlids), does not damage plants and does not grow to more than about $2\frac{1}{2}$ inch long, at least in the amateur's tank, though they will breed at half this size. It is the impression of friends and myself that this fish is not one with a long life span, the local average being about 12 to 15 months.

FRIENDS & FOES

No. 78

Ramshorn Snails



Segmentina nitida (enlarged side and edge views)

Mollusca (continued)

FAMILY: Planorbidae, from Latin *planus*—flat, and Latin *orbis*—ring or circle.

THE Planorbidae is a comparatively large family of British aquatic snails, consisting of 14 members, 13 of which are in the genus *Planorbis*. The fourteenth, with which we will deal first, is the sole species in the genus *Segmentina*. Its specific name, *Segmentina nitida*, roughly translated means "bright, with little zones," referring to its shiny appearance and the peculiar internal partial divisions of its shell. These are visible through the shell as white lines.

In size it hardly reaches $\frac{1}{2}$ inch when fully grown. It is most likely to be found in hard-water areas, in drainage ditches on marshland and sometimes in ponds, and is regarded as being a somewhat rare species.

Like many another snail, it is hardly worth making a special effort to secure, but if it is found it can be used as a live food or an additional tit-bit for our fishes. Most of these appreciate snails if they are not too large to swallow or the shells too hard to crush. Crushing the shell before dropping the snail into the aquarium can surmount any difficulty in this respect.

C. E. C. Cole

AQUARIST'S Notebook



by

RAYMOND YATES

ALTHOUGH I have not seen any reference to this from other writers I feel that fish diseases are not what they were. One just does not hear nowadays of the hundred-and-one ailments which were once taken as part of the hazard of the hobby. Why is this? Probably because the fish-keeping public is now much better informed as a result of the huge increase in reliable books on all aspects. Dealers, of course, are now almost all of long experience and have found out, by trial and error, the do's and don'ts of dealing with fishes. Chemical cures are also more readily available than was once the case. One can be sickened looking through the chapter on fish diseases in any aquarium book, and yet how few of these maladies ever appear in modern tanks?

White-spot disease is perhaps the only one which is ever ready to reveal itself and we are still a long way from wiping out this wretched pest. If only some inventive man could discover a wonder drug at once both inexpensive and invisible and with no harmful effects. I have given extended trials to all the suggested remedies for white spot in many and varied circumstances, and only one, mercurochrome, really does the trick every time. The trouble with mercurochrome is that it is so messy, hard on some plants and is suspect in its after-effects. Then, again, you must keep a stock by you or when needed it will be unobtainable. I find that 2 drops of a 2 per cent. solution to the gallon needs to be in the tank for 7 to 10 days to effect a cure, the longer period being the safer. Some fishes after a few days may develop "fuzz" on fins and tail and this can be worrying, although it rapidly disappears when the water is changed; very occasionally an odd fish is found with a sort of galloping stage of this growth and this must be discarded as it is beyond saving. As a rule this occurs as a body growth all the way from the tail, enveloping the after portion of the fish in "fuzz."

After a period of treatment with mercurochrome it is often a good plan to add peat to the water for a week or so. My own very rough-and-ready method is to fill an old sock with peat, and to sink this in the tank with the aid of rockery. Fishes quickly look improved but aeration is helpful; they can stand changes in pH which are not too sudden if heavy aeration is used. However, although the peat method is a good freshener and works well it tends to yellow the water, which may still bear traces of mercurochrome. Furthermore, it may have a peculiar effect on plants. I well remember one instance where my fine spatterdocks absolutely went haywire: although they remained green and with massive leaves the leaf stems seemed to shrink to an inch or two and remained that way for many weeks.

One of the great advantages of the hobby is the fact that it is almost impossible to get any form of infection from dealing with our finny friends. Fish diseases are almost all not transferable to man, however unpleasant they may be to the fishes. It may be possible to "catch" something from handling *Tubifex* but then who does handle this beastly stuff? I always ladle it with an old spoon. No, fish-keeping is just about the safest pet hobby available. Consider the position with other pets. More than a hundred diseases have been tabulated as being transferable to man from dogs and cats. Ringworm is one of the more common ones, often caught by children coming into contact with the animal's fur. I understand that a less common malady is a fever, possibly accompanied by jaundice or a stiff neck. This is rare but can be contracted through nursing a sick dog. Tuberculosis is not uncommon in animals and there is

a faint chance of infection. Animals and birds can be infected with the *Salmonella* group of germs which cause food poisoning, hence the reason for the prohibition of dogs in food shops. Fever can follow a scratch from pussy, although this is not usual. Budgerigars are probably susceptible to polio virus, but can give you psittacosis, a virus disease which can be caught through being bitten by the bird or by inhaling the virus when cleaning the cage. Modern antibiotics now cure this disease so it is no longer the danger it was a few years ago. However, budgerigars are not the only carriers; 97 other species of birds can give you psittacosis. I am indebted to a member of the medical profession for the foregoing, most of which was new to me. I can only say that, taking the long view, it's much safer to be an aquarist!

The hot weather of last summer produced queer happenings off the Cornish coast, where fishermen brought up rare pilot fish (purely tropical fishes), Mediterranean black fish, Norwegian haddock and a huge ling.

Some time ago I had to take a man to hospital as a casualty case. This hospital was some 40 miles from the sea and it seemed odd when I described the accident as being due to a boat falling on him! Nearer home a friend who is an aquarist had to go to hospital last autumn and three stitches were inserted in his wound. When asked how it had happened he had to admit that he had been bitten by a fish. In this case the fish was a piranha which had jumped up at the surface as food was being introduced and removed a sizeable piece of flesh from the hand. My friend did not experience any pain at the time and is now quite proud of the recollection, although cautious with his pet. Aquarists can get their fishes to bite at their fingers if they are patient; goldfish will often oblige and paradise fish rush to do the honours. Visitors can be given quite a thrill this way. Cichlids with a family will attack anything which disturbs their abode but this is not quite the same thing.

I have now had a single specimen of the newly imported silver shark for over 12 months and I cannot speak too highly of it. It has grown enormously (now 7 inches long), eats anything, is not fussy or shy, goes up and down the glass, goldfish manner, begging for food, is peaceful with even the tiniest fish and does not lose colour at all with increased size. It has always erect finnage and in splendid health this fish is to be recommended as attractive and very hardy. However, it is obviously intended for large tanks. I have found it untouched by white spot in a heavily infested tank and chemical cures seem to worry it not a jot. A fish for the enthusiast.

A northern club recently enjoyed an outing to Blackpool, where they were shown over the Tower Aquarium there and also given the opportunity to look behind the scenes. In their newsletter reference was made to Blackpool Aquarium being probably the finest in the north of England. This seems to have brought forward the information that Blackpool Aquarium is now rated first in England, third in

Europe and sixth in the world. When some new arrangements are completed the number of varieties on display will make it the best aquarium in Europe. This opens fascinating fields for conjecture. Just who decides how or what makes a public aquarium top-notch? What is the yardstick by which comparisons are made? It would be most interesting to see a list of the best public aquaria in order of merit, for Britain, Europe and the world, with details of pointings. There is no doubt that Blackpool Aquarium is really first class by British standards and perhaps Mr. Legge, the curator, could furnish readers with data on continental and world aquaria, information which I think has never been summarised for publication before.

It is reported that 30 people in a coach recently all saw the Loch Ness monster. A correspondent suggests that it is surprising nobody ever seems to have a camera around when this creature is on view . . . aquarium fishes are not as shy as all that!

Some time ago I mentioned my surprise at finding the canal at Llangollen devoid of any form of water-plant life although set in such rural surroundings. I have since heard from a reader (Mr. T. H. Evans of Wrexham), who tells me that just before my visit there had been a National Boating Week there, sponsored by the *Daily Mirror*. During this period a house-boat rally was held and the canal had been dragged of plant life to facilitate the passage of boats.

Thousands of fishes have been transported from Northern Rhodesia to stock the new man-made lake created by the Kariba Dam, which will in time cover some 2,000 square miles. The fishes, mainly bream, are carried in a special 1,500 gallons tank mounted on a diesel-engined truck chassis. The fish were "anaesthetised" by an injection of oxygen at high pressure to prevent them fighting or becoming too active during the journey. On arrival they were

placed in a special recovery area on the lake, protected by nets from crocodiles, until the effects wore off. In time to come it is estimated that this new lake will provide a "catch" of some 20,000 tons annually.

Israelis are fond of the carp as a food fish and have made good use of the fact that their land and climate are ideal for raising this fish in quantity. The Israelis believe, according to reports, in keeping the fish growing. This is done by scientific feeding and control of the density of the fish in the vast ponds used. Faults or spells of cold weather apparently ruin a "crop" worth £300 per acre. Slow or unchecked growth ruins flavour and makes for coarseness. Breeding begins in a small pond containing a bridal bed of tree branches, soon to be superseded by a plastic contraption. The females here spawns her eggs, fertilised by the two males who share her pond. Fertiliser is used in larger ponds for the fry to encourage the growth of algae, but not so much that the water would be robbed of oxygen and the fish would be killed or stunted. Main diet is spoiled grain. When the fish reach 1½ lb. in weight they are considered fit to market. Such ponds yield 16 cwt. an acre five times every 2 years. The best farmers get over a ton of fish an acre. It is interesting to note that the sides of the ponds grow luxuriant vegetation, so the soil must be very rich.

A little while ago I happened across two freshwater crayfish in a tank and was delighted to meet again this so rarely kept denizen of our hard-water streams. They can be kept quite easily in aquaria provided that the water is of reasonable hardness and can be caught by those with a quick eye to detect them in the usually fast-flowing streams of limestone areas. I have often hunted them in the River Wye near Bakewell, where they are quite common. Although hardly colourful they are certainly pets with a difference. One dealer kept a specimen in his show tanks in the shop for many months.

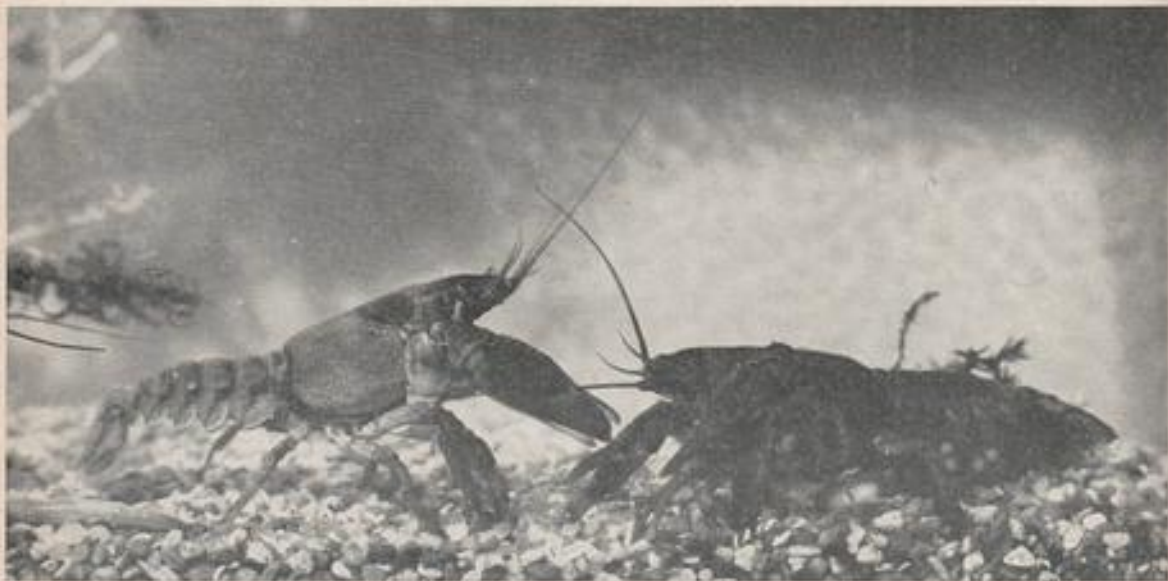


Photo:

The female (right) of this pair of freshwater crayfish is carrying eggs beneath the rear part of her body

W. J. Hewitt

Walking Sea Flowers

by L. R. BRIGHTWELL

THE so-called sea cucumbers or holothurians seldom, if ever, make their way into the aquarium books. They are seldom even figured in pictorial natural histories, and all attempts to photograph them have without exception produced foggy muddles. Even to see a model one must go to the informative and go-ahead Truro Museum. When pickled the holothurians suggest unpleasant anatomical relics!

Starfishes and sea urchins amply repay the naturalist who keeps them, but the nearly related holothurians seem to escape all save a few laboratory workers.

Sea cucumbers can be had by any marine aquarist within an hour or two's run of the sea, and I have kept these picturesque and active animals for well over a year. They possibly live for many years in their natural haunts, all rocky shores, and their only requirements are sea water, lit of course by daylight to encourage a healthy growth of algae.

All of our half-dozen or more native species, with the exception of such burrowing forms as *Synapta*, hide between stones or in rock crannies but an aquarist will display them well in full view. At rest a sea cucumber does almost justify its silly popular name, suggesting a gherkin, anything from a few inches to 2 feet in length according to species. One of the commonest is *Cucumaria caspicola*, of a uniform milky white. Nearly related *C. normandi* is an olive brown. The form is cylindrical, bluntly pointed at either end, and covered sparsely with soft finger-like warts or soft spines.

Once the aquarium aerator makes itself felt a change takes place. It is seen that there is an underside, from which protrude tube feet just like those of the starfishes and sea urchins. Taking a firm grip of any surface, they pull the animal along. Then at one end is seen the "head" itself. It takes the form of a circle of ten blunt arms, surrounding a rather key-hole shaped or circular mouth. In some species the arms each end in an almost fern-like or many-branched "hand". These arms, with their terminal hands, are in constant but stealthy movement.

The clock round, these arms are in action, provided their owner is hungry, whereas an urchin will sit on a shellfish quietly and drill its way to the interior, and a



The cotton spinner, feeding (above) and "in action" against an interfering crab (below)

common starfish will fairly grapple with it, forcing the shells slowly apart. But the holothurian is always "at it", the arms, one by one, perhaps two or three at a time, daintily clutching at plant or animal fragments unseen by us, and, as they are collected, putting its findings into that insatiable central mouth.

In *Cucumaria nigra*, one of our largest species, there are four rows of tube feet on the underside and these, working in relays from the eyeless head to the blunt tail, move the beast along in a very purposeful manner, at the very appreciable rate of about a foot per minute.

This large species is commonly known as the "cotton spinner", and well lives up the title. If an inquisitive crab or even a lobster molests it the defenceless creature exerts itself in a startling manner. From the hinder end it pours out dozens of glaring white cottony threads. They belch from it like in some sort of conjuror's trick. The aggressor, such as a crab, protests, even struggles violently, and the more it does so the more does it become involved. Claws and legs are at last manacled. This is not the worst. The threads become entangled with

comb-and-brush-like mouth parts. Even the breathing apparatus is brought to a standstill.

The "cotton", which feels like half-dried rubber solution, rots to pieces in about an hour. The lobster or other aggressor may or may not recover the use of its faculties. Whatever the issue, the "spinner" will have meanwhile slowly crawled its way to safety.

The holothurians go through a complex metamorphosis, very like that of the urchins and starfishes, and place their larvae to swell the seething myriads of the plankton.

In this country mere rubbish from the fisherman's view-point, they are of considerable commercial value abroad; they are eaten in Italy and most other tropical and sub-tropical countries. Throughout the Far East

they are fished, gutted and smoked dried to be of the first importance, their import to restaurants bringing a revenue of many thousands of pounds. In London's Soho, one can buy boxes of them as *beche de mer* at a price—and they look very like burned sausages. The chef turns them into a rich, glutinous soup, in itself more or less tasteless, but of course the cunning of the kitchen soon alters that.

Whatever one may think of them at the table, and I have tried them with the greatest satisfaction, their interest and attraction for the aquarist is beyond dispute. The burrowing forms are largely beyond the novice's hankering, but the creeping rock-dwellers deserve to be more widely known.

Microscopy for the Aquarist—50 by C. E. C. COLE

IN the article I last wrote for this series I promised to start dealing with the treatment and mounting of subjects of particular interest to us as aquarists. There has been an appreciable lapse of time since that article, however, and I feel that a little recapitulation is necessary to bring new readers into the picture, and to refresh the memories of those stalwarts who have followed me so far.

To begin with therefore let me outline as briefly as possible the various processes required to produce satisfactory temporary or permanent slides of aquatic animal and plant life.

No one can possibly examine in detail the form or structure of living organisms possessing even a small degree of movement. The observation of their habits and private lives is fascinating in the extreme, holding one spellbound for hours at a time, but no slides can be made without killing the specimens. This process is usually combined with the next—fixation or fixing. The primary object of this is to "fix" the cell contents of the plant or animal in as life-like a condition as possible. The process of fixation usually results in a degree of hardening of the subject treated. Different fixatives have varying effects as far as this is concerned. Where an organism is to be sectioned (cut) later on the harder it is the better.

After fixing, the specimens are washed to remove surplus, unwanted fixative. After washing, as much moisture as possible is removed by dehydration—the moisture being replaced by the dehydration solution, usually alcohol or alcohol substitute. At a varying stage in this process of dehydration, various dyes are used for staining. This introduces contrast into our picture, and renders visible some parts of our subjects which would otherwise have a refractive index almost the same as glass and hence remain unseen. A great many of our subjects have little or no need of staining, being sufficiently "contrasty" without. Almost all the drawings so far published in this series have been of unstained specimens. But for Protozoa, polyps and similar clear hyaline organisms, a degree of staining is essential to bring out details of structure.

Whether staining is done or not, the next process is that of clearing. This consists of the immersion of the specimens in one of several penetrating materials which will make them more transparent. From the clearing liquid they are transferred to the mountant, which has to be "in harmony" with the clearing agent.

Finally the mounted specimen is covered by a piece of very thin circular, rectangular or square glass (the cover glass) and ringed with a sealing compound to ensure an airtight, and air-bubble-free slide.

Having reached thus far in reading this article, you may

be tempted to ask "Why bother? I'll buy all the slides I want".

If you are easily satisfied—go ahead! But if you get all the slides of aquatic subjects mentioned in all the catalogues of all the firms advertising such things you will still possess only a fraction of those you could make yourself. There will be many failures, but you will be learning in the process.



Figure 1. Mouth parts of the mayfly nymph *Chlaen* (from an unstained preparation seen with a $\frac{1}{4}$ in. objective and $\times 8$ eyepiece)



Figure 2. Part B of Figure 1 is shown with the extra detail revealed by microscope observation with a $\frac{1}{4}$ in. objective and $\times 8$ eyepiece

Time, of course, is at a premium. The vast majority of us are hobbyists purely and simply, devoting the greater part of our days to earning a livelihood. In the evenings and at weekends—chores, wives and television programmes permitting, of course—we are free to indulge our hobby.

It follows that we are not always able immediately to process anything we discover in our ponds, aquaria or

on fishing expeditions. If we are unable to keep the specimens alive until required, we must kill them immediately and place them in a preservative for future use.

There are several of these available to us at very reasonable cost. Perhaps the best known is 40 per cent. formaldehyde solution or formalin.

This solution is far too strong for our purposes, but can be diluted by the addition of distilled water. For accurate dilution you need a measure, and this may take any form—a teaspoon, eggcup, wineglass or even an eye-dropper. With such a measure, any desired percentage solution may be obtained by remembering one simple rule: the percentage required is the number of measures of the original solution to be used. The difference between the percentage required and that of the original solution is the number of measures of diluent to be used. Thus to make a 3 per cent. solution from a 40 per cent. solution, mix 3 measures of original solution with 37 of diluent (3 plus 37 equals 40).

For 5 per cent. take 5 measures of original solution to 35 of diluent (5 plus 35 equals 40).

Where the percentage is an exact proportion of the diluent, the measures of original liquid can be reduced to, say, as with 5 per cent., 1 to 7. The above procedure is simpler to the average person, however, as there is an automatic check.



Figure 3. Head of *Notonecta* (back-swimmer beetle) seen with a 2 in. objective and $\times 8$ eyepiece. The stylets (B) are normally hidden within the sheath



Figure 4. Greater magnification of part A in Figure 3

Formalin shrinks tissue appreciably and hardens it considerably. For this reason it is sometimes combined with other substances which increase its usefulness. Distilled water is not always the diluent. For formal-saline solution, an aqueous 0.9 per cent. solution of sodium chloride (common salt) is used. Formal-saline can be made "strong" (10 per cent.) or weak (5 per cent.). The solutions can be used to preserve animal tissue indefinitely. Many small aquatic and marine animals can be preserved in strong formal-saline solution.

Formalin is also one of the ingredients in the well-known Bouin's fluid. Bouin's is a most useful solution, as it kills, fixes and stains. The hardening and shrinking action of the formalin is largely offset by the swelling and softening action of acetic acid. Picric acid adds the yellow stain which acts rapidly upon any chitinous parts. *Daphnia*, *Cyclops* and small crustaceans generally can be usefully killed, fixed and partially stained in Bouin's fluid. It is also

useful for *Hydra*, planarians and some algae, but more of this later.

The illustrations this month are drawn from home-made slides, unstained. The complicated mouth parts of a mayfly nymph (*Chiron*)—something impossible to see with a live specimen—are sketched in Figure 1, and an enlargement of quite a small part is given in Figure 2.

Figure 3 shows the head of *Notonecta* (back-swimmer), unstained but otherwise duly processed. Figure 4 shows the stylets with which *Notonecta* pierces its prey. Normally enclosed in a hairy sheath, these have been extruded under pressure. Figure 5 shows an enlarged view of the barbed ends of the stylets. Figure 6 is a sketch of some of the innumerable lenses of the compound eye of *Notonecta* under high magnification.



Figures 5 & 6. Enlarged views of parts of the head of *Notonecta* seen in Figure 3. Left: barbed ends of the stylets; right: a few of the facets of the beetle's compound eye (C in Figure 3). $\frac{1}{4}$ in. objective and $\times 8$ eyepiece

Gudgeon for the Coldwater Enthusiast

(continued from page 146)

the bottom, favouring clean gravel on which they grub and root in search of food. This consists mainly of insect larvae, small crustaceans, worms and a proportion of vegetable food. They will, however, eat dead matter when they come across it during their grubbing around. For this reason, a couple of gudgeon kept in a tank of other fishes will help to keep the bottom clean.

Aquarium specimens will live quite happily on a diet of *Daphnia*, *Tubifex*, white worms and chopped earthworms. A small amount of dried food can be fed to them occasionally, but the food should be soaked before offering it to the fish, so that it will sink slowly to the bottom of the tank where they will accept it. Moreover, if other fishes are kept in the gudgeon's tank, which they can be because the gudgeon is a peaceable fish, they would consume the dry food as it floats on the surface and leave little to reach the bottom and the gudgeon!

Gudgeon are widely distributed over Europe and Western Asia. They are common enough in England and Ireland, but rare in Scotland. In their natural environment gudgeon are constantly preyed upon by the predatory species, the pike and perch. Suitable aquaria specimens are easy enough to come by, but should the aquarist have difficulty in purchasing gudgeon then an angling friend will help him out, for gudgeon are easily caught. In fact at some times of the year gudgeon are sold in fishing-tackle shops as bait for about 3s. 6d. a dozen fish!

Our Readers Write

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

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

Anostomus anostomus

THE *Anostomus* is one of the larger characins, attaining a length of 5 inches. It is a very striking fish; the body colour is gold with one broad black stripe and two narrower ones running horizontally along the body. The roots of the caudal fin and fore part of the dorsal are blood red in colour.

They have a reputation of being chasers but my specimen does not chase, except when a fish comes too near to its "hide-out" he will ward it off. I don't think they are bullies by nature but I do not recommend keeping them with small fishes.

I have found that apart from eating dried and live foods my fish eats algae with relish. The manner in which it is eaten is very singular, for it turns right over on to its back and, using its upturned mouth which is almost useless for eating algae in the normal way, with its sharp teeth it crops the algae and completely denudes the rocks of this pest.

All this makes *Anostomus* an ideal occupant for a community tank with larger fishes. Also I think that these fish may have possibilities as algae-eaters.

P. STILES,
London, S.W.9.

Correspondents Wanted

HERE are some further names of German aquarists who wish to correspond in English with aquarists, received from the Federation of British Aquatic Societies.

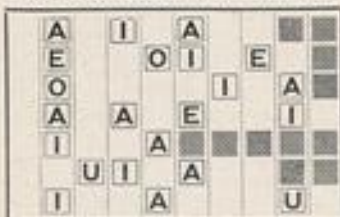
Heinrich Gaber (Heddesheim, Poststrasse 9); interests: cichlids and boa constrictors.

Erwin Casemir (Warendorf/Westfalen, Sassenbergerstr. 33); interests: catfish (tropical) and barbs.

Volker Duehring (Karlsruhe-Rueppurr, Resedenweg 15); interests: *Apistogramma*, labyrinths, tooth carps and tropical catfish.

Heinz Deppe (Hamburg, Oderfelderstrasse 18); interests: tooth carps and plants.

DO YOU KNOW THE NAMES?



The vowels of specific names of plants are given horizontally in the squares. Fill in the consonants from the jumbled list below to complete the names. One of the vertical columns will give the specific name of a well-known aquarium plant.

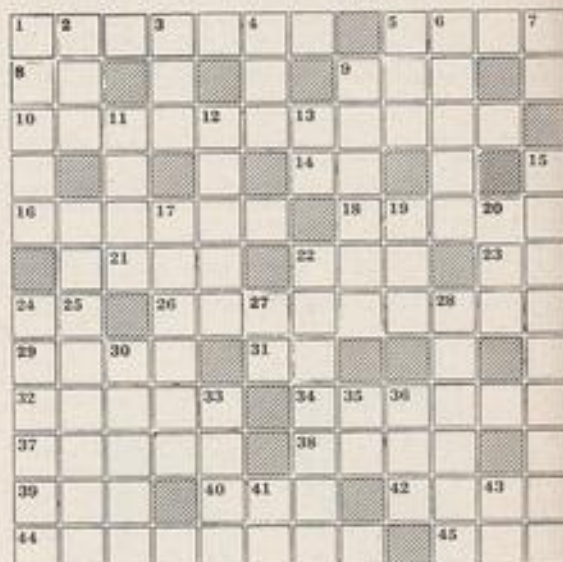
B B C C C D D D D D F G H H
L L L M N N N N P R R S S S S S S
T T T Y Y Z

(Solution on page 158)

G. F. H.

The AQUARIST Crossword

Compiled by J. LAUGHLAND



Clues Across

- Favoured bait of sea-fishermen (3, 4)
- Softly after the vehicle for this fish (4)
- Tar (1, 1)
- Offering of salmon (without middle cut) (3)
- The fish branch of natural-history study (11)
- Mixed type (2)
- Albino? Miss Dors, certainly! (6)
- D-shaped tract of land at mouth of a river (5)
- Cask, certainly; water garden, perhaps (3)
- Here we have some knowledge of the genus (3)
- His decision is final (2)
- In short this is inaccurately described as a lavatory or toilet (1, 1)
- Adorned as Cora to a T in deed (9)
- Natterjack, perhaps (4)
- "Et —, *Brunas!*" (2)
- A small advertisement in Rio without wises (5)
- Ditches (6)
- Division of fishes (5)
- Mixed name (4)
- Employ (3)
- Odd sort of drink (3)
- Skin (4)
- Emydidae (8)
- Such a fly may not be a fly but a bait (3)

Clues Down

- Salmo trutta* (7, 5)
- Proverbially simple (1, 1, 1)
- Opposite of 45 Across (3)
- Marine flatfish (3)
- Cockney exclamation (3)
- Scalare (5)
- Potential hydrogen (1, 1)
- Re sild he should watch his step (6)
- Not the way an aquarist catches fishes (4)
- This hog is a prickly fellow (5)
- Werk (abbrev.) (2)
- The aquatic larva of this creature builds its shell of grit and debris around it (6, 3)
- Donkey (6)
- She begins to enact (3)
- Golfer's small sand hill (3)
- With a rum go I make this fish (7)
- In angling these are the opposite of game (fishes) (6)
- Grade of gold but not of goldfish (2)
- Sardines in this country are usually in this state (6)
- Viper (5)
- Odd in Scotland (4)
- Her Majesty (1, 1)
- Yes, in U.S.A., but in this country, nope! (5)
- If you read this down it isn't (2)
- Royal cypher (1, 1)

(Solution on page 158)



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.

AT the annual show of the Middleton Borough Chrysanthemum Society, famed for the quality of exhibits though not the biggest show, Middleton & District A.S. staged an exhibit of ten 18 in. by 10 in. by 10 in. and 30 in. by 15 in. by 15 in. tanks furnished by members. This is the biggest exhibit this society has made at these shows and it attracted much attention.

THE activities of the **The Merseyside A.S.** may be described as steady expansion during the past year. A considerable increase in membership has been obtained rather surprisingly, as during the year the headquarters were changed three times. The present meeting place is "Pete's" Cafe, Hacking Hey, Liverpool, 2.

In the sphere of show activities the high spot of the year was the first annual open show held at the Waterloo Playground, in conjunction with the Liverpool Show, and this attracted a large number of entries from many parts of the country. The Society has also participated in most of the local Societies Shows. A very interesting idea which was started by this club is a local league which consists of only three clubs at the present time. No doubt in ensuing years this will be expanded to incorporate other local clubs. The competition briefly is that each of the clubs certifies each of the others to a Table Show including five classes, while the judging is taking place a quiz is held. Both the Table Show and the quiz are set and judged by the Society not taking part.

Coach trips to Chester Zoo, where the visitors were allowed to go behind the scenes in their very fine aquarium, Blackpool, where a similar privilege was accorded, and finally to the British Aquarists' Festival at Manchester, which was unanimously agreed was a very entertaining and educational trip, were also included in the Annual Programme.

Another interesting event is that this Society provided nine furnished tanks at Messrs. Lewis's Ltd. to form a part of the Grotto which had as its theme "Tom and the Water Babies." The invitation to partake in this Grotto was obtained through earlier provision of six furnished tanks at the Company's Toy Floor which apparently met with their approval.

MR. R. E. LEGGE, curator of the Tower Zoo and Aquarium, has been invited to attend an international congress of aquarists at Monaco next November.

It is being organised by Captain Jacques Cousteau, the undersea explorer whose exploits have been the subject of films.

He is the director of the oceanographic institute of the Monaco Museum, which lies near the royal palace.

Prince Rainier is keenly interested in its work and his predecessor, Albert, Prince of Monaco, who founded the museum had an international reputation for his marine research.

Talks will be in English, French and German and translations will be available.

The congress will be in three sections—location and choice of stock; equipment; and plans, construction and upkeep.

This is the first international congress of its kind to be held. It marks the museum's jubilee.

Two representatives will be present from each of 40 nations.

As Mr. Legge said, "It should be a most rewarding experience. It is quite a feather in the cap of the Tower Company to be invited." It is also, of course, a feather in the cap of Mr. Legge.

RESULTS of the N.W.L.G.A.S. meeting held at Hampstead A.S. headquarters were as follows:—Plants: 1, Mr. Bevon (Willesden); 2, Mr. Prince (Willesden); 3, Mr. Coyer (Hampstead); 4, Mr. Prince (Willesden). A.O.V. tropical cichlids: 1, Mr. Walters (Independent); 2, Mr. L. Cozman (Hampstead); 3, Mr. Tomkins (Independent); 4, Mr. Morrice (Hendon). Tropical breeders: 1, Mrs. Large (Willesden); 2, Mrs. Large (Willesden); 3, Mr. Walters (Independent); 4, Mr. Tomkins (Independent). Total points to date: Willesden 99, Independent 53, Hendon 26, Hampstead 21, Arnold 11. The lecture with combined coloured transparencies and tape recording was in the hands of Mr. L. Cozman.

GOLDFISH SOCIETY OF GREAT BRITAIN'S CONVENTION

THIS was held at the Brotherhood Hall, Hendon. R. J. Affleck M.Sc., warned against the myth that aquariums for goldfish could be scientifically "balanced" by the use of plants. He advocated the use of a base filter and the keeping of plants to a minimum. He explained how G.S.G.B. divided all shapes of goldfish into three groups, "metallic," "macroseous" and "mott." The "macroseous" group does

not breed true and he explained which proportions of each group would be obtained by cross-breeding the groups. R. E. Isaac, R.S.C., in an illustrated lecture said that G.S.G.B. tried to cover all the varying characteristics of goldfish in the smallest reasonable number of varieties. The standards were passed in a way that made it impossible to obtain specimens of any of the approved varieties by selecting throw-outs from other varieties. Newer variations such as pearl scales, bubble-eyes and Pom-poms had been accepted by the society and their standards improved since they were imported from China a few years ago. The open competition for twintails was won by Mr. P. Upchurch, who also was awarded third and fourth places. Mr. J. Goodman obtained the second place and was awarded the Challenge Cup for metallic twintails. Forty-six lots of very good quality fancy goldfish were then auctioned and so some good strains are now widely dispersed. The next quarterly meeting of G.S.G.B. will be at Kingsway Hall, 19th March, 1960 at 2.30 p.m.

AT a meeting of the **Leeds and District A.S.** members enjoyed talks by Mr. Graham, well-known Yorkshire aquarist, who now has great interest in water gardens and colour photography. Firstly he gave a talk on the various pitfalls one can encounter on buying fish. The ways to pick them, isolation and feeding. The highlight was a talk on gardens and plants wonderfully illustrated by colour transparencies, supplemented by a tour of the Continent and the Dolomites also in glorious colour.

The Table Show was Coldwater fish, and the result was: 1, Mr. Wilson; 2, Mr. Wilson; 3, Mr. Lennard.

THE third meeting of the season of the **Dundee A.S.** was held in the Y.M.C.A. and was well attended.

There were four entries for Breeders (Egg-layers) Class and six entries for Breeders (Livebearers) and the results were as follows:—Egg-layers: 1, P. N. Greening (Apostogonism ramirensis); 2, E. J. Seymour (Apostogonism viviparum); 3, P. N. Greening (Ripidistia chaperi); 4, A. J. Roger (Barbus titzei). Livebearers: 1, A. Cross (Black Swordtails); 2, A. R. Bell (Mollanisia valera); 3, A. R. Bell (Black Mollies); 4, A. R. Bell (Gold Lower Swoed Gruppies).

The remainder of the programme was devoted to talks by the successful exhibitors on the methods used in breeding their prize-winning entries. Several discussions ensued and many questions were fired at the breeders from the body of the hall.

THE annual general meeting of the **Stroud and District A.S.** was held recently in the Science Laboratory at Redborough Secondary School with Mr. Isaac, of The Surrey Trout Farm and United Fisheries, Nottworth, in the chair. It was reported by the treasurer that the Society was in a better financial position than ever before.

The officers elected for the following year were as follows:—Chairman, Mr. R. A. Isaac; vice-chairman, Mr. B. Hewlett; treasurer, Mr. T. N. Arns; secretary, Miss P. A. Rusford; committee, Mr. A. Rainbridge, Mr. F. Dainty, Mr. L. C. Griffiths. Press correspondents, Messrs. B. T. Timbrell and K. A. Riddiford.

AT the last general meeting of the **National A.S.** the programme was the showing of coloured transparencies ranging from fish ponds to pit ponies and was compiled by Messrs. Armstrong, Heasman, Stone, and L. Cozman.

The new prospectus, giving details of membership, meeting place and aims of the Society, can be obtained from E. H. Mann, 63, Whitchurch Avenue, Edgware, Middlesex.

THE second Annual Fur, Feather and Aquaria Show of the Metropolitan Borough of Hackney, was held recently and the results were as follows:—Walthamstow 1st in Club Furnished Tropical Aquaria and 1st in Club Furnished Coldwater Aquaria; Mr. J. Goodman of the



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 here (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 2s. 6d. together with the **Aquarist's Badge Token cut from page 8**, to Aquarist's Badge, *The Aquarist*, The Dots, Half Acre, Brentford, Middlesex, and please specify which type of fitting you require.

Goldfish Society of Great Britain 1st and 3rd in Veiltails; Mr. F. Barry of the Bethnal Green A.S. 1st in Moors; Mr. F. A. Ahrens of the Romford A.S. 1st in Fantails, 1st and 4th in Fancy Coldwater, and 1st, 2nd, 3rd and 4th in Breeders Coldwater; Mr. D. Goodbody of the Walthamstow A.S. 1st and 2nd in Course Coldwater; Mr. J. Wylie of Southend Leigh A.S. 1st in Breeders Egglayers, 3rd in Platies and 2nd in Characins; Mr. J. E. Cobden of the Catford A.S. 1st and 2nd in Breeders livebearers, 1st and 2nd in Platies, 1st and 2nd in Fighters and also Best Fish in Show; Mr. A. L. Stebbings of Ilford A.S. 1st in Mollies; Mr. L. F. Clements of the Tottenham A.S. 1st in Barbs and 4th in A.O.V. Tropical; Mr. G. W. Baker of the Erith and District A.S. 1st and 2nd in Guppies; Mr. H. G. Rondle of the Slough A.S. 1st in Characins and 2nd in A.O.V. Tropical; Mr. J. Northam 1st and 2nd in Swordtails; Mr. A. J. Roth of the Walthamstow A.S. 1st in Danios and 2nd in Catfish; Mr. J. A. Horne of the Friends A.S. 1st and 2nd in Cichlids; Mr. P. Evans of the Catford A.S. 1st and 3rd in Catfish; Mr. A. H. Huntley of the Friends A.S. 1st and 4th in Egg-laying Toothcarps; Mr. L. G. Coombs of the Bethnal Green A.S. 1st in A.O.V. Labyrinths; Mr. L. Cozman of the Hampstead A.S. 1st in A.O.V. Tropical. The annual challenge shield for the Aquarist Society obtaining the most points at the show was won by the Walthamstow A.S.

ON Sunday the 29th November the Burnley A.S. held their annual Open Table Show and thanks to the support received were able to hold one of the largest table shows of the year (168 entries). While the fish were being judged the competitors were entertained by a slide show and comments by Mr. Pengilly, the well-known Burnley aquarist.

Mrs. Proctor (Skipton), with her exhibit, a red tail shark was first in the Labeos, the best barb in the show and also had the best fish in the show. The winners were as follows: Dwarf Gourami: 1, Mr. Smith (Accrington); 2, Mr. Crossley (Skipton); 3, Mr. Taylor (Accrington). Fighters: 1, Mr. Whitsey (Blackburn); 2, Mr. Walsh (Blackburn); 3, Mr. Whitsey (Blackburn). A.O.V. Gourami: 1, Mr. Chapman (Burnley); 2, Mr. Hodgetts (Burnley); 3, Mr. Shore (Osram). Small

Barbs: 1, Mr. Savage (Middleton); 2, Mr. Crook (Blackpool); 3, Mr. Wainwright (Middleton). Large Barbs: 1, Mr. Isherwood (Accrington); 2, Mr. Bateman (Salford); 3, Mrs. Wainwright (Middleton). Labeos: 1, Mrs. Proctor (Skipton); 2, Mr. Duckett (Skipton); 3, Mr. Warrick (Skipton). Small Characin: 1, Mrs. Bannister (Burnley); 2, Mr. Neal (Salford); 3, Mr. Taylor (Accrington). Medium Characin: 1, Mr. Walsh (Blackburn); 2, Mr. Bloom (Salford); 3, Mrs. Proctor (Skipton). Large Characins: 1, Mr. Mallinson (Colne); 2, Mrs. Mooney (Skipton); 3, Mr. Wainwright (Middleton). Platys: 1, Mr. Bloom (Salford); 2, Mr. Smith (Accrington); 3, Mr. Taylor (Accrington). Swordtails: 1, Mrs. Wainwright (Middleton); 2, Mr. Strapp (Salford); 3, Mr. Stevenson (Accrington). Mollies: 1, Mr. Crook (Blackpool); 2, Mr. Neal (Salford); 3, Mr. Whitsey (Blackburn). Veiltail Guppies: 1, Mr. Bloom (Salford); 2, Mrs. Wainwright (Middleton); 3, Mr. Whitham (Burnley). Double Sword Guppies: 1, Mrs. Milton (Skipton); 2, Mr. Smith (Blackburn); 3, Mr. Smith (Blackburn). A.O.V. Guppies: 1, Mrs. Bannister (Burnley); 2, Mr. Shore (Osram); 3, Mr. Smith (Blackburn). Top Minnows: 1, Mr. Talbot (Lancs Breeders); 2, Mr. Duckett (Skipton); 3, Mr. Preston (Burnley). Rasbora: 1, Mr. Hodgetts (Burnley); 2, Mr. Chapman (Burnley); 3, Mr. Wainwright (Middleton). A.O.V.: 1, Mr. Duckett (Skipton); 2, Mr. Lewis (Burnley); 3, Master Spencer (Burnley). Catfish loaches: 1, Mr. Shore (Osram); 2, Mr. Mallinson (Colne); 3, Mr. Hodgetts (Burnley). Fancy goldfish: 1, Mr. Stevenson (Accrington); 2, Mr. Stevenson (Accrington); 3, Mr. Shore (Osram). Dwarf cichlids: 1, Mr. Bloom (Salford); 2, Mr. Wainwright (Middleton); 3, Mr. Whitsey (Blackburn). Angels: 1, Mr. Taylor (Accrington); 2, Mr. Smith (Blackburn); 3, Master Morgan (Lancs Breeders). A.O.V. cichlids: 1, Mr. Walsh (Blackburn); 2, Mr. Crossley (Skipton); 3, Mr. Hodgetts (Burnley).

AT the recent A.G.M. of the Three Counties Group the chairman, Mr. G. Thompson, and the secretary, Mr. Masters, were re-elected to office. Mr. and Mrs. Kitching were there to represent Slough who have recently joined the group. It was stated that Reading would be responsible for staging the popular "Three Counties Group Show" at Reading in 1960.

Reading Aquarists were at home to Basingstoke, High Wycombe, North Ham, Oxford and Slough Aquarists Clubs at the "Black Boy," Shinfield, the home of Mr. Crisp, their president for many years. Excuse for the get-together was a club furnished aquaria competition, to be set up in 20 minutes, excluding the addition of sand and water, which had been done beforehand. Oxford were the first to finish, in a record time of four minutes, the winners, however, being Reading, the judging being done by one member from each club. Mr. Frane brought along his colour slides of various events in which the clubs had taken part in during the past year, including the "Three Counties Show" at High Wycombe.

CORRECTION

IN our report on the 1959 British Aquarists' Festival, Mr. G. Griffiths was shown in the list of winners under Plants, as being a member of Burnley A.S. This should have been North Birmingham A.S.

Crossword Solution

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

DO YOU KNOW THE NAMES? (Solution) From above downwards the specific names are: *radicans*, *deltoidea*, *polyrhiza*, *canadensis*, *gibba*, *fluitans* and *distachyum*. Thus the fifth vertical column reads: cordata.

Bacopa Species in Flower

These two water hyssops grown by Mr. Frank Stone have been identified by botanists at Kew Gardens as (left) *Bacopa caroliniana* (Walt.) Robinson and (right) *Bacopa monnieri* (L.) Wettst.

Photo: Alan Brown

