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April, 1970
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FIRST PRIZE. J. T. Horsecroft, 16 Timber Hill, Catterham. "Don't worry friend. After you've been in SYNTHETICA for a while you'll soon grow as big as we are."
SECOND PRIZE. Mrs. F. Marsh, 13 Kirk Street, Derby. "Another Grimm ferry tale."
THIRD PRIZE. M. B. Rowland, Kensworth, Dunstable. "Another health food fanatic after his 'Seavita.' "

We would like to thank the 1,503 people who responded so magnificently to this competition. Choosing the winners wasn't easy... 5s, once again—well done, and thanks for trying. Incidentally, Mr. Ken Shabbs, the well-known free-lance amateur refuse collector, won the Oxford and Cambridge Dictionary (Unbridged) as a booby prize. When asked how he felt about this stupendous win, he replied in his little-spoken Low English dialect, "I can't say it make no difference to my life. I shall just carry on."

THOSE WERE OUR LIVESTOCK HOLDINGS WHEN GOING TO PRINT

PISHERES. Purple Crescent Angel, Purple Moon Angel, Korans, Blue-Rings, Majestic Angel, Queen Angel, Regal Angel, Kikuyu Angel (P. chrysura), Yellow Angel, Half-Black, Orios Angel, Coral Beauty, Black Angel, Rock Beauty, C. fisheri, Blue-Face Angel. Platax orbicularis, tiera and pinnatus, White Wimple, Yellow and Brown Wimples, Yellow Longnose, Copper-Banded Butterfly, Chaetodontas auriga, lunula, vagabundus, falgula, xantochephalus, ephippium, larvarus semilus-vatus, mesolucus, fasciatus, unimaculatus, citrinellus, collare, rafflesi, Common Fire, Maroon, Saddleback, Pink and Yellow Skunks and Black Clowns, twenty-two species of Damselfishes from Dominoe to 15s. to Blue-Velvet Damsels at £2 5s. 0d., Diamond-Spotted Grouper, Dwarf Orange Grouper, Pantherfish, Royal Grammas, Spotted Grunts, Emperor Snappers, the Peacock, Feathery, Regal and Mahogany Lionfishes, Purple-Spotted Ray, Powder-Blue, Regal, Green-line, Lipstick, Majestic and Orange-line Surgeons, Emperor, Saffron, Japanese and Yellow Tangs, Badgerfish (Lo vulpinus), Moorish Idol, Clown, Royal-Blue, Picasso, Orange-Green, White-tail, Red-tail and Jigsaw Triggers, the Orange-Green and Reticulated Filefishes, the Clown (juv. and adult), Cleaner, Cockatoo, Parrot, Yellow, Spangled, Half-black, Marked and Birdmouth Wrasse, Cowfish, Boxfish, five species of Puffers, Soldierfish, Yellow Jacks, Candy-Striped Catfish, Aponogonis, Soapfish and many, MANY, rares and unidentified species of fishes from coral reefs all over the World.

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There's nothing new about Wardleys Foods!
They've been selling for years
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Name Change

For many years our official name has been T.F.H. Publications (London) Ltd. and even now we rather regret its passing! But after all, quite apart from distributing the world's leading range of Pet Books and 'The Tropical Fish Hobbyist' Magazine we have, for some years, also been distributing Miracle F-D Fish Foods, Pumps, Flake Foods, etc., etc., plus Wardleys Aquatic Products, Split Flake Foods, etc., and the word 'Publications' in our title could be misleading. Hence the need for a small but significant alteration. Our company's new title now becomes

T.F.H. (GREAT BRITAIN) LTD.

This change coincides with an expansion in our activities in Pet Product distribution. (The Miracle Internationals !!!) We thank you for past support and hope to be of even greater service to the British Pet Industry in the future.

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Operated by gentle pressure on the rubber bulb, forcing all sediment into the filter bag — and then allows the purified water to flow back into the aquarium.

16/6

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1/8

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18 in. 13/9
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Tank filter requirements:
Two 18-in. filters for a 36-in. tank.
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Connect air line to the inlet tube and insert the cleaner into the tank, fishtail downwards, then run the fishtail over the sediment, as you would a vacuum cleaner. The water and sediment will be sucked up the main tube and, falling into the sediment receiver and thence into the filter bag, impurities will be trapped and purified water will pass back into the tank.

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The Editor accepts no responsibility for views expressed by contributors.

Editor: Laurence E. Perkins

April, 1970
THE MARINE WOODLICE

By Bill Simms

The cold marine aquarium enthusiast can find creatures on our sea-shores that look as if they might be suitable inmates for his aquarium, but there are so many kinds of these that without a specialised knowledge it is not easy to know whether or not the creature found is suitable. Even the expert has to put some of them under the microscope to find little differences before he can identify them.

One group that may seem to be attractive is the Isopoda: crustaceans that are like the woodlice, and like them are flattened from top to bottom—unlike the ordinary sand-hoppers, which are flattened from side to side.

They frequent stretches of the sea-shore, in different areas according to the species. There, in common with the many kinds of sand-hoppers, they clear up all the debris that would otherwise become objectionable as it decayed. All dead carcasses and other organic matter is fed upon by this vast horde, for all of them are scavengers.

In some places, when the tide is coming in gently, these creatures are so numerous that it is possible to see a wave of them coming up the beach in front of the advancing sea. Even though many of them are equipped with gills, and could live entirely immersed, it seems that these are mainly species that were true sea creatures, but that now are well on their way to a conquest of dry land.

The common woodlouse of our gardens, which is a close relative of all these sand-hoppers, appears to be at a further stage in this conquest, for though they live on the land, they cannot exist for long unless the atmosphere all around them is damp. If removed to really dry conditions they die.

There are various stages of this advance out of the sea to be found among the Isopoda. Some are still
mainly aquatic, swimming freely, although anxious to clamber out onto the wet seaweed left by the receding tide. Some are so nearly divorced from the sea that they live only on the upper shore among stones. When placed in a jar of sea-water, with no possibility of climbing out, this kind will quickly drown.

But the majority inhabit the middle and lower shore areas. These are the ones that move down the beach as the tide goes out, feeding voraciously on the various dead creatures left there. Some of them are minute, and would need a microscope to be seen at all. It is reported that over twenty thousand of them have been found in one dead sea-urchin.

In this same central area can sometimes be found *Janira maculosa*, a small, pale grey creature sometimes marked with brown spots. It reaches a length of one-third inch only, and has feelers that are longer than its body. This little crustacean lives in the middle and lower reaches between the tide marks, and is frequently overtaken by the tide.

A smaller Isopoda, with totally different habits, is *Limnoria lignorum*. Although it is only one-fifth of an inch long, with short feelers, it is so well known that it has acquired a common name—the Gribble. This creature bores into wood that is in the sea, and is a nuisance because of its habit of burrowing into ships and wooden quays. Old pieces of water-logged timber thrown up on the beach may often carry a large population of gribbles, and here these small crustaceans often sail out into the surrounding seaweed and shore debris after food. It prefers being in the sea, however.

An Isopoda that is fairly well known is the Sea-Slater, *Ligia oceanica*. Despite its name of "oceanica" this very woodlouse-like creature lives on the upper shore, among stones and the highest tide debris. It is about an inch long, and its outer pair of feelers are about two-thirds of its body length. In colour it varies between dark grey and greenish.

Because it is more easily observed than some of the others the Sea-Slater has been studied extensively. In spring the female carries her eggs beneath her in a brood pouch, as does the common woodlouse. When these eggs hatch out the babies are just like their parents, but very tiny, and of a pale cream colour at first.

A somewhat larger member of this group is *Idotea baltica*. This one reaches a length of 1½ inches, though this is in the males only; the females are half this size. Its colour is variable, for specimens can be found that are green, brown, or dirty pink, and there are sometimes darker and lighter patches on the body.

Being larger than most of the other species it is easier on the beach to see the features of this kind of crustacean. There are seven pairs of legs, and two pairs of feelers. In this one the outer pair of feelers are about half the body length.

Many species of *Idotea* are found around our coasts, but *I. baltica* is the most common. Another kind is *I. neglecta*, which differs in having a smooth single point at the tail end—not stepped as in *I. baltica*.

*Idotea* species frequent the lower shore, where they can be found in or near the tide edge. They form an important part of the diet of many fishes.

It is doubtful if many of these creatures could be considered as suitable aquarium inmates, though they would perform a useful service in clearing up all waste matter. Their habit of leaving the water freely at times could be hard to prevent. Perhaps their best use, from out point of view, would be to offer the smaller specimens as fish food. They would be popular in this role.
Breeding Goldfish

The value of a Garden Pond

By A. Boarder

Many breeders of fancy goldfish do not have a garden pond but rely entirely on a fish-house in which to keep their spawning fish. Whilst I do not suggest that this is not a good method of breeding I am of the opinion that a pond will be of great benefit in the long run. I consider that most types of goldfish will benefit from a good session in an open pond. It seems to revitalise them and get back any strength which they may have lost when actually spawning. There is no doubt but that the spawning can take a lot out of some fish, especially females which may have had a rough time among a number of males. I have also found that the scaled types can get an improved colour when they swim in the open pond as against being kept all the time in tanks.

My own method for the past thirty-three years has been to keep my breeding fantails in a garden pond throughout the whole year. They seem to go through the winter in good health and it is rare for me to lose a fish. Other of course than the odd one which has become too old. I try to keep up a fair stock in the pond and if the numbers run down at all I add one or two of the best of the previous season’s youngsters. By this means I am keeping up a mixed stock of young and older fish which I think assists in keeping the strain healthy. I do not know the ages of the fish in my pond but am certain that some of them are at least 17 years old before they pass on. By the way, I am not a believer in trying to patch up or cure an ailing fish. Such fish are of no use to the breeder and of course have no place in the breeding pond. In nature a fish which is a weakling or an ailing one would soon be eaten by predators, which is nature’s way of keeping up the strength of the strain.

A pond need not be specifically constructed to act as a breeding pond, although certain features are to be recommended. It is much better to have at least one part of the pond where the side slopes away very shallowly. It is in such positions that most fish prefer to spawn and they will even swim where the water is not deep enough to cover them completely. Where the sides of a pond are fairly straight and deep I do not suggest that the fish will not spawn but it makes it very difficult to gather the eggs once they are laid. The breeding pond will vary considerably from the ornamental pond. My own pond would never win a prize for looks as it is solely for breeding and so the usual flowering water plants and reeds are missing, except for a water-lily which is as much to please my wife as for any other reason.

Female common newt. Newts can become pests in a breeding pond.
If one shallow part is provided the bunches of water weed for egg collection can be anchored at this shallow end and then there should be little or no other water weed in the pond at all. After a year or so the fish get used to spawning in the shallow part of the pond and rarely spawn anywhere else. If my pond was planted with many water plants and had a quantity of underwater oxygenating plants it would be probable that thousands of eggs could be laid all over the pond and lost. The water-lily fills another need as well as looking ornamental, as the roots spread out over the concrete base of the pond and use up much of the waste matter from the fish. It also provides some shade to assist in keeping the water clear in summer and also for some protection for the fish when the sun is hot.

If a special pond is being constructed for the main purpose of breeding only, it would be a good idea to make sure that one part was very shallow and that the pond was not too wide at any part. If the width of the pond does not exceed six or seven feet it is possible to be able to reach any part of it with little trouble. My ideal pond would be one made in the form of a cross so that one could divide the centre square and then each of the four extensions. In such a pond one could house several types of fishes and even some carnivorous ones, such as the Perch, could be kept and bred. The only trouble with a pond of such a shape would be that it would be very difficult to construct it with the Butyl lining.

A pond for the breeders should not have any rocks in it, as not only are they unseen once the water clouds up but they could damage any fish which was being chased when spawning.

I have described how one uses the garden pond for breeding purposes by taking the bunches of weed with eggs to a safe place for hatching, but it is also possible to use the pond as a conditioner and then when any fish are actually spawning, they can be caught up and transferred to special tanks. If the catching is done carefully it will be found that the fish will not appear to be unduly upset by the move and will soon start spawning again if left quietly alone. It is also possible to hand spawn or strip as it is called. To do this one must have very clean tanks already filled with water and either some good clean water weed or some nylon shreds in the tank. If the fish are actually chasing it is possible to strip them of eggs and milt, but do not attempt to do this unless the fish are already spawning. They could easily be injured by the use of any undue pressure. A tank of about 24 × 12 × 12 in., is a good size either for stripping into or for hatching eggs taken from the pond. However, there is no need to fill the tank more than half-way. Deep water is quite unnecessary and in fact I consider that if the water is too deep the fry have some difficulty in reaching the surface of the water when first hatched.

If fancy goldfish have been kept in a fish-house or under cover for the winter it is imperative that they are not placed straight out into a garden pond once the weather gets a little warmer. If the fish have had any form of artificial heating then it is necessary to gradually lower the temperature of the water in the tanks until it is approaching that of the pond. If fish are suddenly put into water much colder than that in which they have been for some time, it is probable that they will contract fungus or fin congestion. Where the temperature of the tanks has been fairly high it would be as well if the fish were not put out of doors until the month of June. The outdoor treatment would be especially helpful to any fish which have already spawned as I am sure that a spell in a good healthy pond would do them a power of good.

Make sure that there are no water snails in the pond as these can eat eggs. Also it would be as well to catch any necta which may enter the pond for spawning. The newt trap I described last year will be of service to me again. This is only a large preserving jar with the lid removed. Get a small plastic funnel and trim it so that the narrow end is half-an-inch across and the

*Lymnaea stagnalis*, a large snail which can be a pest

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top just fits inside the fixing ring. Put a large worm inside, lower it into the pond on a string and you will soon catch all the newts in the pond.

If one intends to allow the fish to spawn in the pond it is essential that only one variety of fancy goldfish is in the pond as they can all inter-breed. However, this is not to say that all varieties cannot be kept together. This is quite safe as long as the spawners are taken from the pond as required for breeding separately. As there is no connection between goldfish before eggs are actually laid it is impossible for any crosses to occur if male and female fish are caught before they have spawned among other varieties of goldfish.

There is one point I must stress in relation to the breeding pond. As there will not be a quantity of under-water oxygenating plants it is quite probable that the water will soon become green with Algae and it will not be easy to clear it again. Any pond with a heavy planting of such oxygenating plants should keep very clear. The difficulty for the breeder in such a pond would be to gather the eggs when laid, as they could be spread all over the pond.

I find that the best water plant for my purpose is Hornwort (Ceratophyllum demersum). This plant never makes any roots and so is ideal for taking from the pond with eggs and placing in a container with no bottom compost at all. This makes it easier to keep free from pests and to enable the container to be cleaned out when necessary. Although this plant contracts to a fairly hard horn-like piece in the cold weather, it soon grows again once the warmer times commence.

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**Junior Aquarist**

**Do you know this plant**

**Egeria densa**

**By Bill Simms**

Because it is known by two Latin names: *Egeria densa*, and *Eleocharis densa*, there is sometimes a little confusion about this plant. It is not a cultivated version of *Eleocharis canadensis*, but a separate species that comes from Argentina. It has brittle stems that branch easily, and these can grow to several yards long.

It will grow in ornamental pools very well, and I have had some in a garden pond that frequently has one or two inches of ice on it during the winter. There it thrives mightily, producing thick dark green whorls of leaves, closely set on the long stems.

In a tropical aquarium—to which it should be adapted slowly if it comes from outdoors—the colour of this plant is pale green, the whorls of leaves are smaller, and they are spaced more widely up the stem. A typical reaction of any plant that is getting too little light. Nevertheless, it will thrive under tropical conditions.

In a cold aquarium, with plenty of light, it displays its qualities rather better than in warm water, which is surprising since it comes from a fairly warm area. If the longest section just above a bud is cut off just above that bud, and stuck into the gravel as a cutting, it will soon produce roots, and anchor itself well.

This is probably one of the most adaptable of all plants for the aquarium. It prefers hard water, but will grow almost anywhere. The only complaint I have heard about it is that it requires trimming so often to keep it within bounds.
MORE ABOUT PIRANHAS

By Jack Hems

The other day a reader wrote in to tell me that his recently acquired piranhas were hugely enjoying a well-known brand of flake food and totally ignoring freshly killed goldfish (strongly favoured as an article of diet by Mr. Mellor’s specimens) and lumps of oozy red meat. He added, also, that they seemed to be quite peaceful.

In my reply I hastened to explain that although piranhas have a legendary reputation for ferocity almost unparalleled in nature, not all species of the genera Serrasalmus and Rooseveltiella are painted with the same bloody brush.

Alan Mark Fletcher, an American newspaperman and an aquarist of long experience to boot, who has taken piranhas on rod and line in British Guiana, Colombia and Peru, drew attention to this interesting fact several years ago in a magazine called Tropica1, published in Chicago. According to the observant Mr. Fletcher, some species of piranha may be harmless in some areas and dangerous in others.

In general though piranhas are the most bloodthirsty and voracious freshwater fishes known to man and anyone falling into their company rarely lives to tell the tale. For example, J. H. Norman, in his History of Fishes (Benn, 1931), tells of a rider and his horse who fell into a river swarming with piranhas. The human and animal remains were “subsequently discovered with all the flesh neatly picked off the bones, although the man’s clothes were undamaged.” Similar stories, true or exaggerated, may be found in many books dealing with travel and exploration in South America.

Piranhas—there are many species ranging in size from five or six inches to over a foot—are well equipped for their dastardly work. Both muscular jaws are studded with closely-set, strong, sharp teeth by means of which, in the words of Albert G. L. G. Günther, a famous ichthyologist of Victorian times, “they cut off a mouthful of flesh as if with scissors.” Willard Price, author of The Amazing Amazon (Heinemann, 1952), adds point to this statement by informing us that piranhas can strip all the flesh from a sheep in three minutes. “In ten minutes the stoutest man is . . . devoured and swallowed.” So Bertrand Flornoy in Jivarí (Blex Books, 1953). The fact that piranhas swim in large schools, thousands strong, and can be attracted to a disturbance in the water, or blood, in a matter of seconds, makes them all the more dangerous.

Over the last few years piranhas have become increasingly sought after as aquarium inmates. For one thing, a tank housing one or more makes a good conversation piece and a point of interest in a room. For another thing, they are not difficult to keep. And lastly, not a few of them are quite finely coloured.

The species most commonly imported by dealers are the banded or yellow-bellied piranha (Serrasalmus spilopleura), the white or spotted piranha (S. rhombeus), and Serrasalmus (=Rooseveltiella) nattereri, the red-bellied piranha, which is perhaps the handsomest of the lot. None of these attains a length of much over six inches in the aquarium.

Although young piranhas of about an inch to an inch-and-a-quarter appear to live at peace together, or with fishes of about their own shape and size, it is safest and advisable to keep well-grown specimens on their own. A tank for a piranha should be of a size to allow for growth. It should be furnished with grasslike plants or driftwood or both to afford shelter; for a newly acquired piranha is more bewildered and scary than bullying or bold. This, of course, until it gets used to its surroundings and settles down. A temperature of about 75° F (24° C) suits most, if not all, species. As for food, young piranhas are less choosy than adults. Chopped or whole earthworms, swallowable pieces of uncooked white fish, meat and, as at least one reader and several dealers have discovered, dried food may be given.

A piranha will soon learn to come to the front glass for its food, but it would be most imprudent to feed such a clever charmer from the fingers. Mr. Mellors

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has mentioned the fact that piranhas are expert leapers and that it is of particular importance to keep the tank properly covered; for a largeish piranha jumping in all directions over a floor will give even the most cool-headed aquarist a worrying time until it is back again in its aquarium. And it hardly needs saying that piranhas are not the sort of fishes to have around where young children can get at them.

In the main the fishes popularly referred to as piranhas or pirayas or caribes, and less commonly as devil fish or freshwater cannibal fish, belong to the genera **Serrasalmus** and **Rooseveltiella**. Like the better known and greenerstuff eating **Metynnis** they have a deep and laterally compressed body, small scales, a serrated ventral keel, a bulldog-like snout, and the usual fatty adipose fin.

No piranhas have yet bred in Europe, including Britain, but more than one species has spawned in North America. The most recent spawning, if I remember right, took place in the Middle West not more than two years ago.

Laws have been passed in America banning the importation of piranhas for sale by dealers to the general public. It is believed by those who made and passed these laws that tropical aquarists would not be above dumping unwanted piranhas in local waters with the resulting loss of bathers, anglers and other folk working or enjoying themselves by or in the lakes and rivers of the U.S.A. Plainly it has not dawned on the legislators that for piranhas to survive they must have what is loosely known as a tropical temperature. Unlike the alligators and turtles of the south, piranhas could not live out a winter in the Mississippi and its tributary streams.

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**An easy Killie: Aphyosemion gardneri**

By Joseph Trusso

If you've been tempted to try a "panchas," but hesitate because they're supposed to be sensitive and difficult to keep, don't believe it. Killies are like other species of fish; some are hardy, others delicate. One of the prettiest, hardiest, and easiest to breed is the **Aphyosemion gardneri** (previously "nigerianum" and most often sold as "calliramum").

Gardneri can be kept in a community tank with no difficulty. As community members they can be a bit shy, but a floating spawning mop or two, or some surface plants will make them feel more secure, and they'll stay in better colour. They breed better in the privacy of their own tank, and a permanent "gardneri" tank will please them most. These fish are comfortable with a temperature of 68-74°F, although they can be kept in water as high as 80 for limited periods of time. Scheel keeps his gardneri in hard, alkaline water with notable success, and has produced some beautiful hybrids in the bargain.

Feeding these killies is not difficult for they will accept paste, frozen, and live food. As with any fish, they prefer live food and thrive on it. Youngsters will readily eat dry food, but as they mature they will eat it only if very very hungry.

Convincing gardneri to spawn is a fairly simple matter. If you have healthy, well fed, mature specimens they will spawn without any more encouragement than the presence of a spawning mop or two. The males are occasionally rough, so two females are recommended. Scheel noted that some male killies who have full colour and even spawn, are infertile because their gonads haven't fully developed yet. If your fish spawn but produce clear eggs that fungus shortly, this may indicate that you have young males.

Eggs should be harvested before the end of an eight-day period. They are reasonably hard-shelled and can be gently picked off the mop with a pair of tweezers. The average egg yield is about 25-30 eggs per day. They can be stored in flat "refrigerator" dishes with some acrilavine or other fungicide added to the water. Incubation takes about 14 days and the fry are large enough at birth to eat newly-hatched brine shrimp or microworms.

After three days the fry should be transferred to a larger container (with the aid of a soup spoon) and then to a rearing tank by the end of the week. From this point on, all you have to do is provide plenty of good food, clean water, and room to grow. Partial changes of water (25 per cent per week) and cooler temperatures (68-72°F) seem to encourage more rapid growth and healthier fish with this species.

Gardneri usually "sex out" in from 7-10 weeks. Many males gain size before they colour out, but it has been my observation that they are usually quite beautiful.

Try a killie. Get yourself **Aphyosemion gardneri**, the guppy of the killie world.
The Aquarist & Pondkeeper

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Ideas for home and office décor in a variety of furnished aquaria—See how the wonders of ocean life can be brought into the home.

April, 1970
MONKEY FLOWERS AT THE PONDSIDE

By Jas Stott

GIVEN THE popular name of Monkey flower because the flowers are supposed to resemble a mask or a monkey's face, the Mimulus species are an obvious choice as a dwarf marginal perennial for the bog edge at the pondside. The clustering form of growth creeping along the edge has a softening effect and the brightly coloured flowers are not only attractive in such a position but also have the necessary brilliancy to provide pleasing reflections in the water when seen from across the pond. One of the mysteries which has puzzled the botanical scene for many years occurred to one of the species in this family of plants and that is how the onetime fragrant musk, Mimulus moschatus, suddenly lost its scent not only in the cultivated specimens, grown especially for the perfume, but also in the wild plants growing in their native N.W. American habitat. Nevertheless, despite the absence of perfume in all the species and their hybrids the Mimulus varieties are well worth consideration for the display capabilities of the plants and their long flowering period.

First of all for the submerged part of the bog edge and in the shallows is the great water-loving Mimulus luteus, a native wildling of the pools and river sides of Chile. It is a clear yellow flowering from late May to August and growing to a height of some ten to twelve inches. This species has given rise to a sub-variety M. luteus maculatus (see colour plate in supplement) with similar yellow flowers only slightly smaller and lightly spotted with red. Luteus also has a double variety where one flower is growing within another and is therefore referred to as the Hose-in-Hose form grown usually not because this gives the plant added attraction but from an interest point of view.

Appreciating a slightly higher level of the bog where the soil is well saturated but not submerged there is M. cupreus, a tight-growing plant of compact habit when suitably sited, native of Chile and bearing copper-orange coloured flowers. It grows to a height of some six to eight inches and blooms around mid-June to early September.

Some delightful varieties have been produced from this species by the plant breeders and hybridists all of which are best suited to a moist spot in the edging receiving medium sun. A position offering early morning and evening sun is ideal yet sheltered from the heat of the midday and early afternoon rays. Holding an Award of Merit from the R.H.S. and well deserved is the lovely copper-scarlet variety M. cupreus Fire-flame growing to around nine inches high can be strongly recommended and following a close second in the popularity stakes is Whitecroft Scarlet, somewhat smaller in growth but a profuse flowerer and, as the name implies, a pure scarlet colour. An attractive deep, blood-red is available with the variety Bees Dazzler and a lovely cherry red with Prince Bismark. One of my favourites in this particular range of cupreus varieties is R. C. Leslie, an impressive speckled bronze which somehow, even when in company with brighter coloured varieties, seems to be distinctive and attracts attention.

For the higher and drier reaches of the bog or at the base of the rockery edging three species should be mentioned. First, because it comes as a surprise to those people who have only known of the yellow and the reddish Mimulus, there is M. ringens (E. America) producing deep lavender flowers and growing to a height of some ten to twelve inches appreciating partial shade. The second is ideal for the rockery slopes needing drier conditions than most species, it is
**M. caespitosum** (N.W. America) growing in the form of a green mat of foliage which becomes covered with short-stemmed flowers of clear yellow. The plant growing three to four inches high makes it a useful subject to include in the planting scheme of a crazy-paved pond frontage where it will usually do quite well. Number three in this selected trio undoubtedly needs the most moisture of the three and partial shade, for the thin, hairy foliage of *M. primuloides* growing in rosettes dislikes the heat of the midday sun. The small garden flowers are lightly spotted with reddish-brown and carried on thin, thread-like stems. A moist, shaded position at the base of the rockery edging should suit the plant well.

Although frequently used as a border subject, though it still does better when grown in boggy conditions, the taller growing species *M. cardinalis* is a useful subject for the bog edging or marsh area of the larger type of pond or in the planting scheme of the laid-out water garden growing as it does to a height of some eighteen inches to two feet tall in fact, some of the lovely varieties bred from this species are even taller reaching some thirty inches when grown as a marsh plant. *M. cardinalis* itself produces a deep scarlet flower with a yellow throat and pinched-back petals and is a native of N. America. Among the many varieties now available there is one I would mention in passing and that is Rose Queen, a delightful rose-pink which can always be relied upon, when conditions are right, to give a good account of itself.

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**THE BEADLET ANEMONE**

By Huw Collingbourne

The most common creatures of interest to the marine aquarist are almost certainly the anemones, and of these the Beadlet Anemone (*Actinia equina*) is the easiest to find and collect. Because this animal is very common does not mean that it is unattractive. In fact the Beadlet is to be found in many different colours, some as brilliant as those of its tropical cousins. This native anemone is well suited to temperatures as high as 25°C (77°F) and as low as a few degrees above zero. The ideal temperature averages at around 20°C (68°F) when they will grow rapidly.

Aeration is enough to circulate the water and sustain a community of these invertebrate creatures but an under-gravel filter is by far the best way to keep their aquarium water clean and fresh. They are, of course, entirely carnivorous and relish pieces of lean meat dropped into their tentacles. The dry type of tinned pet foods are also excellent and very nourishing and the dog foods which contain gravy are very good as long as they are washed before the anemones are fed with it.

In ideal conditions the anemone is a very prolific breeder and can reward its owner with many young fully formed anemones which the adult Beadlet usually ejects through the mouth aperture. Within a month or so the anemone population of a tank may have quadrupled.

Although they are said to frequently harbour disease, I have never found this to be the case with any Beadlet Anemone, and never has one died or spread any disease to the fishes living in the same tank.

For those unfamiliar with the structure of the anemone, it consists mainly of a simple central trunk which has a thick outer wall enclosing the body cavity or enteron. This inner cavity is divided by partitions properly called mesenteries. The hollow part of the anemone copes with the digestion of food and when breeding contains the growing young. The mouth serves to take in food and then eject pellets of indigestible waste material. Food is passed to the mouth aperture by the hollow tentacles which have poisonous barbs at their tips. In nature these shoot into its prey and help to paralyse it. The tentacles push the food into the mouth by means of a muscle at the base of each tentacle.

It is generally agreed that the common name of Beadlet is derived from the description of the bright blue light sensitive beads all around the top of the main column between the bases of the tentacles.

The basic colour of the anemone varies from brown or yellow to green or bright red. One particularly colourful type is the Strawberry Anemone, so called because of its beautiful crimson colour dotted with green or yellow and reminiscent of its namesake.
WATER
THE FISHES’ ATMOSPHERE

By R. C. Mills

Most of us take for granted the atmosphere we live in, rarely does it become noticeable and when it does it is usually because it has become detrimental to our well-being; there are very few places where human life is untenable due to adverse atmospheric conditions. Everyone will remember the outcry before the ‘68 Olympics, at the ‘unfairness’ of holding them at Mexico City 7,000 ft. above sea level. It was thought that athletes not native to these altitudes would suffer physically, in addition to losing every race. Life would be difficult at very low temperatures too, but these are extreme cases; at least we are not forced to live in polluted air, neither are we crowded together where sheer numbers exceed the air supply.

Consider the fishes’ atmosphere—water: this supporter of aquatic life comes in a wide range of colours, temperatures and chemical make up. It has the power to dissolve nearly every known gas and salt to a certain extent; it can be acid or alkaline, hard or soft. (It was known at one time as the Universal Solvent, until some bright spark wanted to know what they were going to keep it in!) Another fact, most important from the aquatic point of view, is the behaviour of the density of water at certain temperatures; like most things, water becomes denser as the temperature falls, but at 4°C the density reaches a maximum and below this point the density lessens. This is why the water in a pond freezes from the top downwards and consequently there is always a layer of ‘warmer’ water at the bottom of a frozen pond, providing that the pond is deep enough of course. This phenomenon is sometimes referred to as the Fishes’ Lifeline, and indeed it is the saviour of many pond inhabitants during the winter months.

We humans take water for granted and accept it as a daily amenity, using it to drink, wash, squat on gardens, swim in and complain about when it falls out of the sky! Although a large number of people might define the source of water as a chromium tap in the kitchen, the majority of water originates from the sea, which covers just over 71% of the earth’s surface. Evaporation occurs from the sea and condenses in the colder atmosphere to fall as rain; other sources of natural water are springs where subterranean waters emerge.

According to their natural occurrence, various bodies of water contain differing substances in solution. The sea contains many dissolved elements, especially sodium and magnesium: spring water, at famous spas, contains calcium, magnesium, potassium, iron and sulphurous gases; rain contains oxygen, carbon dioxide and, in towns and industrial areas, nitrogen, ammonium oxides and sulphurous gases; standing water, such as ponds and lakes, may contain organic compounds from decaying vegetable matter and living micro-organisms. The table shows a comparison between types of water and the dissolved salts therein:

<table>
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<tr>
<th></th>
<th>Sodium</th>
<th>Potassium</th>
<th>Magnesium</th>
<th>Calcium</th>
<th>Total</th>
</tr>
</thead>
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<tr>
<td>Water Chloride</td>
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<td>0.14</td>
<td>0.66</td>
<td>0.10</td>
<td>3.7</td>
</tr>
<tr>
<td>Sea</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fresh (hard)</td>
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<td>0.007</td>
<td>0.007</td>
<td>0.015</td>
<td>0.034</td>
</tr>
<tr>
<td>Fresh (soft)</td>
<td>0.004</td>
<td>—</td>
<td>—</td>
<td>0.002</td>
<td>0.006</td>
</tr>
</tbody>
</table>

‘Fresh’ water, which is more our concern than other bodies of water, can be further classified: where it contains large amounts of dissolved calcium and magnesium salts, it is said to be ‘hard’; water free from such salts is conveniently referred to as being ‘soft’.

Another classification, of some importance to the aquarist, is that of acidity and alkalinity.

Reverting to rainfall again, it will be seen that where the rainfall occurs affects the chemical composition and reaction of the water. Mention has already been made of towns and industrial areas ‘polluting’ the rain, but even given a clean atmosphere, the surface onto which the rain descends plays an important part in determining the chemical nature of the water. Where the rain falls on limestone the water percolates through it and emerges hard and alkaline; on granite the water is not affected by the stone, but usually then runs over moorland or peat and remains soft but this time is acid as well. In the tropics, the rain falls on dense
vegetation and from soft acid pools and streams; mountain streams are usually soft too.

Obviously, fish in different areas get different water conditions, and if they are to thrive in captivity they should be provided with similar water to that to which they are accustomed. This is particularly important for the new species that are constantly being imported, until their needs are understood or they are acclimatised to our natural water supplies. Let us take a selection of localities and see how the water conditions differ.

Asia and S. America— the water is soft, slightly acid to neutral.

India and Malaysia— Barbs, Labyrinths.
The Amazon— Characins and Cichlids.

Australia and Central America— the water is hard and alkaline.

Australia— Rainbows.

Central America— Livebearers and some Cichlids.

Africa— The water conditions depend on locality.

Lakes (hard, alkaline)— Cichlids.

Streams (soft, acid)— Killies.

It follows that if we know the natural habitat of a species, we can provide the approximate conditions in the aquarium, but to do this we need a couple of yardsticks to measure the water conditions by; the two units we use are pH and DH. These are calibrations of acidity/alkalinity and hardness/softness respectively.

**pH**

This may be defined as a number indicating the hydrogen ion concentration in an aqueous at 25°C; most books define it as potential hydrogen.

The pH scale runs from 0 (strong acids) to 14 (strong alkalies). Pure water (in which hydrogen and hydroxyl ions are present in equal proportions, namely 10^-7) having a pH number of 7. Numbers above 7 indicate alkalinity, whilst numbers below indicate acidity; the pH numbers are on a logarithmic scale, so a difference of 1 on the scale indicates a change of ten times that which it was before. The range which concerns the well-being of fish, and the peace of mind of the aquarist, is from approximately 6-8 on the pH scale, i.e., slightly acid to slightly alkaline.

Having got the theoretical part over with, it is now time to study the requirements of the fish, and try to put them into practical form.

Most fish prefer slightly acid water, the exceptions include livebearers, catfish and some cichlids; on the other hand most plants prefer slightly alkaline conditions, so a heavily planted tank with alkaline water should be just the thing for livebearers.

Just as one takes care to equalise temperatures when adding new fish, it is just as important to avoid drastic changes of pH: for instance your dealer may well keep his stock in tapwater (hard and alkaline in my area) whereas you may be a rainwater and peat fanatic (soft and acid—the water—not you!). Damage to the fish may take the form of “Pop Eye” or just a general ill at ease appearance, clamped fins is a good indication of adverse conditions.

There is no need to get an obsession about measuring the pH at all hours of the day, as the pH value will change from morning to evening anyway. Overnight, the plants give off Carbon Dioxide which dissolves to form Carbonic acid, so in the morning there will be an acid reaction to the pH test; during the hours of ‘tanklight’, the plants absorb the Carbon Dioxide and in the evening there will be a more alkaline reaction. These changes in the pH readings are quite small, don’t expect wide differences; if there are wide discrepancies then something is wrong, the tank may be going, or gone foul, or there may be a dead fish somewhere, and such occurrences should be investigated. pH readings should always be taken solely as a guide and not as stringent rules to be strictly adhered to for the average aquarist a pH test kit is not even necessary, but for attempting to keep or breed the more ‘difficult’ fish it is an asset. If you still insist on knowing the pH value of the water, how can it be measured?

pH test kits vary from the inexpensive to the very expensive. The basic idea is that a sample of tank water changes the colour of an indicator, which is compared with a standard colour chart against which is the relevant pH number.

The inexpensive test kits contain sensitive, indicator-impregnated paper rolls, these are simply dipped into the water to be tested and the paper then checked against the colour chart. Moving up the price scale, we come to a liquid indicator (usually bromthymol blue); the tank water is added to a measured phial, the correct amount of indicator added and the resulting coloured liquid is again compared to the chart. An added refinement, in exchange for more money, are chemicals to adjust the pH in the direction desired and at the extreme end of the scale are the electronic pH test meters. These are very complicated pieces of apparatus, which give very accurate readings but as they cost more than the most elaborate complete set up (power filters and all), they are beyond the reach of the average person; however, a commercial breeder could find them useful, or perhaps an Aquarist Society could buy one. If you are determined to pursue water chemistry, all is needed is a few shillings to get your first test kit, and you’re started.

So now you have found that your water has a pH of such and such, it all seems very important and you read up the books and realise that it shouldn’t be that at
all! What can you do to adjust it to your, or rather the fishes' liking?

If the water is too acid, sodium bicarbonate can be added to make it more Alkaline.

Alkalifying water that is too alkaline is a little more tricky; if the water is soft, passing it through a peat filter will acidify it, but this method may not work with hard water. (It pays to be cautious when using this method as some peat mixtures may contain substances that are toxic to fish.) Sodium biphosphate is often recommended, but this has been found to form a scum on the water surface; another chemical advocated by some is Potassium hydrogen tartrate (Cream of Tartar). In his book, 'How to Keep and Breed Tropical Fish,' Dr. C. W. Emmens acidifies water in the following manner: Acid sodium phosphate or alkaline sodium phosphate are used to adjust the pH in the direction required, then a further mixture of both in the correct proportions is added to form a 'buffered' solution. This stabilises the pH, but the author points out that this state of affairs may only last a few days in the aquarium.

Using any of these methods it is important not to subject the fish to any large changes of pH, for reasons given earlier, and steps of 0.2 pH is enough at one go; it is never wise to add chemicals straight to the tank and such additions should be mixed with some tank water separately (in the correct proportions for the whole tank), and then added to the tank. Earlier it was advised to take pH readings at the same time of day; it is also advisable to take them at the same temperature as this has some effect on the water chemistry.

Finally, pH used to be regarded as very important, and variations of 0.2 or so sounded alarm bells in the fish houses; nowadays with more and more fish being tank-raised and acclimatised to 'unnatural' waters, it is not such an important factor in the majority of breeding as it used to be, and 'a little learning is a dangerous thing.'

DH

The other factor of water's properties, which is of importance to the aquarist, is the hardness.

Hardness is due to dissolved salts, usually the bicarbonates, chlorides and sulphates of calcium and magnesium; hardness can be of two types, temporary and permanent.

Temporary hardness, due mainly to the bicarbonates, can be removed by boiling and is responsible for the scale or fur in our kettles and boilers; however it is hardly practicable to boil enough water for an aquarium and there is also the permanent hardness left to be dealt with. Hardness also makes its presence felt by the inability of the housewife to get a good lather in the wash; this difference is particularly noticed when one visits a soft water area, and has to allow an extra five minutes in the bathroom each day to get rid of the lather! Hardness can be a guide as to the probable pH of the water. Hard water is usually alkaline and soft water likely to be neutral to slightly acid.

As with pH, a method of measuring the hardness has to be found; from the foregoing, it would be reasonable to assume that soap could be used as an indication of hardness. This can be a very rough guide—add a few drops of washing up liquid to some rain water until it lathers, then try the same thing with an equal amount of water from the tap and notice the difference in the amount of soap needed. This will give you some idea of the relative hardneasses.

In more accurate measurements soap is used to precipitate the dissolved salts and the hardness is measured as the amount of salts precipitated by a certain amount of soap; another method using soap is to measure the amount of soap needed to produce a certain predetermined amount of lather. In both these cases, the amount of water being tested is kept constant. (Those who can still remember their school days may recollect those titration experiments.)

The hardness kits on the market range from using soap to chemical indicators; the latter, whether liquid or tablet in form, depend on a clear colour change for indicating the hardness and the degree of hardness is proportional to the amount of liquid or number of tablets used in arriving at the colour change point.

Degrees of hardness are expressed either as so many parts per million (p.p.m.) or as 'DH.' (used on the continent). 1'DH is equal to 16 ppm, so that water of 15'DH (hard tap water) has a hardness of 270 ppm. The p.p.m. scales of hardness is a guide to the amount of Calcium Carbonate precipitated under test, whereas the continental 'DH' is a measure of other dissolved salts in addition. Incidentally, your local Water Board will be only too glad to let you have a chemical analysis of your water supply.

The simplest way of reducing hardness is by dilution, replacing the hard water with softer water, this can be rainwater, distilled water or even some boiled water. A more sophisticated method is by means of a water softener; this replaces the dissolved salts with sodium or hydrogen, depending upon the exchange resin used. The resin can be incorporated in an outside filter or purchased complete with a cartridge ready to be screwed to an inside filter; should the resin become exhausted it can be recharged by a simple process of washing it through with salt water.

Hardening water is very simple, simply add calcium chloride until the desired hardness figure is reached. All the previous comments on changing the pH values slowly apply equally to changing or exposing fish to changes of, hardness, although fish seem to tolerate going into softer water suddenly better than a change in the other direction.

Now that we have got the water to the hardness we require, will it remain at that figure?
Water evaporates from the tank, and topping up with tap water will increase the hardness (the salts remaining as the water evaporates); replacing with rainwater or soft water may help keep the hardness figure steady. The gravel in the tank, if it contains lime, will most certainly harden the water and some plants may contribute to a rising hardness figure. (Refer to Gravel, Cryptocoryne haematolana and Hardness, R. C. Mills—the Aquarist April ’69). Using lime-free gravel will prevent this happening, and perhaps the synthetic coral used in marine tanks would also do?

**Salinity**

A further addition to the mineral content of water is salt, sodium chloride. This can occur naturally, as in the sea, and in fresh water it is found in very small amounts, or, it can be ‘aquarist introduced’ as a benefit for certain species of fish. A teaspoonful per gallon of salt (not the table salt, which contains additives to help it stay free running) is equal to about 1000 ppm or 0.1%, and this is usually the recommended dosage for beneficial purposes. I know of one case where the aquarist added a teaspoonful of salt every time he topped up his tank, his mollies were O.K., but the plants didn’t like it much! Some plants and fish may even object to the teaspoonful per gallon amount, but, as a corollary to this, guppies and mollies can be acclimatised to quite saline conditions, a useful tip when feeding young livebearers to marine fish.

The fishes’ atmosphere is quite a complex medium, and it can become very perplexing if you become obsessed with all the technicalities; sometimes it is rather pointless worrying about the water chemistry of a tank; as the inmates often ‘condition’ the tank themselves to their own requirements. Various collections regularly change the water characteristics as set up by the aquarist and the fish seem no worse off for it; there are often reports of spontaneous spawnings of ‘difficult’ fish in community tanks where pH and DH were not paid much attention to. The best thing to do is find out what water conditions suit your choice of fish, or conversely, what fish suit your water conditions and stick to that arrangement. If you want to experiment further, do it in slow, easy stages or you may find yourself in very deep water indeed, and that’s not your natural atmosphere at all!

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**THE AQUARIST & PONDKEEPER FISHKEEPING EXHIBITION**

**ALEXANDRA PALACE**

**WOOD GREEN**

**LONDON N.22**

Sponsored by The Aquarist & Pondkeeper and organised with the co-operation of the Federation of British Aquatic Societies.

So book the dates

**FRIDAY, SATURDAY**

and **SUNDAY 10, 11, 12 JULY**

Further particulars will be published in the next issue.

April, 1970

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**SHOW SCHEDULES**

are now available and are being distributed by the Show Committee. If your Society has not received schedules or you, as a keen aquarist, are interested in entering the competitive classes, complete and send the coupon below to: The Show Organiser, The Aquarist & Pondkeeper, The Butts, Brentford, Middlesex; or the Show Secretary, Mr. S. Mooney, 44 Conislon Road, Muswell Hill, London, N.10.

Please indicate in the space provided, the approximate number of schedules required.

Competitive classes for the Exhibition will comprise the following:

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All lighting, heating and tanks will be provided by the organisers. Handsome trophies will be awarded for each class together with souvenir miniatures and award cards for first, second and third place winners. Fourth place winners will also receive award cards.

Please send me________.schedules for the Aquarist & Pondkeeper Fishkeeping Exhibition.

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British Freshwater Fishes

THE MINNOW
(Phoxinus phoxinus)

By A. Boarder

The Minnow is one of the best known British freshwater fishes and may be found in most clear streams and rivers in the British Isles except in Northern Scotland. It is rather local in Ireland. It is also found in Western Europe and also in some Siberian Rivers. The Minnow is a bright little fish and can be recognised by its almost cylindrical body. The scales are very small and are almost unnoticeable at first glance. The fish rarely exceeds four inches in length and weighs only about half an ounce. The colour of the Minnow is a darkish green fading towards the lower part of the body. A number of vertical dark bars along the body give the fish a very attractive appearance. The fish could be confused by some people with a small Gudgeon, but the latter has barbels whilst the Minnow has none.

The type of water usually preferred by this little fish is a fast running stream or river with a gravelly or sandy bottom. The spawning time is in spring, from May to July. The sexes are not easy to distinguish, except that when in breeding condition the males take on a heightened colour and show the usual whitish tubercles on the head as shown in many of the carp family. The fish will congregate in large numbers for spawning in the shallows and the females can lay many eggs. These are very small and adhere to the stones or any vegetation.

The minnow will do quite well in the garden pond but must have a well-oxygenated water, a fountain or waterfall will assist in keeping this little fish in good condition. As a specimen for the indoor tank, it is not to be recommended and it is probable that success with this venture would only be possible if the tank water was well aerated and not over-crowded with fish. The food consists of small insects and their larvae and in captivity it will take the usual foods as given to goldfish.

In olden days this fish was valued as a food and Isaak Walton describes Minnow-tansy, a dish concocted with Minnows, egg yolks, cowslips, primrose and tansy, all fried together.

The Minnow is a favourite with anglers as a live bait for Perch. The little fish is usually just hooked onto the barb by its lip. Special traps are sold for catching the Minnow and usually consist of a round cage of perforated zinc with one end shaped as a funnel. A little bread is placed inside and the trap thrown out into the stream, and held by a long cord. It is amazing how many fish can be caught by this method. I have seen a trap thrown into a fast running stream where it was impossible to see a single Minnow, yet within minutes of the trap being in the water, scores of Minnows can be seen making their way up stream to the trap. They must have marvellous sense of smell to be able to detect the presence of the bread in the trap from such distances.

Minnows could be bred in tanks but they would have to be fairly large and contain very clear water. Plenty of large clean gravel should cover the bottom and a few larger stones could also be added. The water need not be more than six inches deep and a strong aeration would encourage spawning. The eggs hatch in just under a week, according to the warmth of the water. The fry will take infusoria at first, moving on to mashed white worms and then to Daphnia and other small foods. It will probably take three or four years before the young Minnows are mature enough to breed.

PRODUCT REVIEW

New Fantasy Coloured Aquarium Sand, marketed by Fantasy Pet Products Ltd., 13 Nutley Lane, Reigate, Surrey.

I have reviewed a number of different types of synthetic aquarium gravels, but this is the first sample of sand which has come my way. This new product is available in a range of eight bright colours: jet black, bright red, turquoise, mimosa yellow, azure blue, rust red, bronze and moss green. The sand is very fine in texture, especially the black which looks like tiny garden seeds.

For this reason Fantasy Coloured Aquarium Sand is unsuitable for use on its own, as the particles are too fine for plants' roots. It is used as a covering for normal aquarium gravel as a "top dressing." As a fine layer only is required, a two-pound bag of the sand can cover a reasonable area of gravel. One colour—such as black—can be used to advantage in a tank, or its own, or combinations of two or more colours can be used to create a more exotic picture. I do not know as yet, the retail price of the sand.

B.W.
BASIC NEEDS FOR BREEDING GOOD GUPPIES

By D. Phillimore and G. Goodall

The days when guppies were referred to as “millions fish” are now in the dim and distant past; they have been outstripped by the magnificent specimens available today. This transition has been made possible by the ardent work carried out by guppy fanciers over the past ten years.

Paul Hahnel, an American hobbyist and often called the father of the fancy guppy, after obtaining fish from the late W. G. Phillips, an English breeder, went on to produce the first strain of wide-tail guppies the world had ever seen. On his next visit to England, Paul amazed English guppy-breeders with the progress he had made on what had been mediocre fish. He gave some of this stock to the late Chass Macrae who distributed them to some of the top English enthusiasts. This stock proved to be a good basis for the highly coloured wide-tailed specimens of today, and encouraged more aquarists to try their hand at breeding and rearing these most fascinating fishes. Although difficult, the breeding of top quality show guppies is by no means impossible for the average aquarist as long as he has at least two tanks available and is prepared to undertake the small amount of work involved.

It is our intention, in these articles, to advise the would-be guppy fancier to breed and raise guppies of superior quality and avoid some of the pitfalls. In this article we intend to discuss suitable tanks and other necessary equipment.

Tanks

It is our contention, after trial and error, that the 18 in. × 10 in. × 10 in. tanks are, without doubt, the best sized tanks to use. Guppies fare better in them, and they are the easiest size to maintain by our methods. Before any aquarium is set up, it should be washed in a strong solution of household antiseptic, and then thoroughly rinsed out. It should then be filled to the brim with fresh tap water to ensure that the pressure of water seals the putty to the glass and then should be allowed to stand for 48 hours with liberal aeration to disperse the chlorine.

Filtration

The simplest forms of aeration and filtration are all that is necessary, as the weekly maintenance will ensure the correct conditions for the inhabitants. The filters that we find fill the need are the sponge-type filter or the simple corner filter suitably charged with charcoal and filter medium.

Gravel and Plants

Over the past years we have found that gravel and plants serve no suitable purpose and, in fact, in most cases they prove a severe handicap. Gravel, due to its size, allows uneaten food to sink into it and decompose, thus causing a hot bed of bacteria. Guppies, as with most other fishes, sleep at night when the lights are out and invariably rest on the bottom of the tank where their finnage suffers by attacks from these minute organisms thus causing disease and ragged finnage. Also, when swimming, a guppy is liable to damage his fins when gravel rocks or plants are present. Plants are also a disadvantage to a breeder who wishes to show his fishes. They hinder their capture and subsequently may be damaged in the process which also disturbs the layout of the tank.

We agree that plants do add to the enchantment of a tank and for those that prefer planted tanks we recommend Indian fern or wisteria, the former being an indicator of the state of the gravel which, if foul, will not the root and the rest of the plant will float to the surface of the tank. Wisteria, being one of the softer varieties of aquatic plants, is less likely to damage the guppies finnage.

Heater and Thermostats

We also need a heater and thermostat, the latter being of utmost importance. Many fish are lost through unreliable thermostats due to incorrect maintenance. Other forms of heating will be dealt with in a later article (fish house heating, etc.).

Lighting

Obviously the better the light the better the guppies will look, but all the light that is really necessary is enough light to keep the guppies awake for about 14 hours each day. Fishes that are kept in a well-lit room will stay active so further lighting is unnecessary. All the time they are awake they will eat and consequently grow. In fact, one of us keeps a large fish house of 50 tanks illuminated solely by one 80-watt fluorescent tube.

Other necessary equipment:
One five-foot syphon tube with a half-inch bore;
One two-gallon bucket;
One thermometer;
One small and one large net for each tank;
Jars and salt for brine-shrimp hatching;
Suitable sponge for cleaning the inside of the aquarium glass;
A liquidizer and grinder for making your own food is a definite help, but not a must.

With all the above-mentioned equipment you have all that is needed to breed good guppies.

April, 1970
Crayfish and Crayfishing

By Anthony Wootton

Throughout the summer months, one of the most interesting and pleasurable pastimes available to the outdoor aquarist is to wade out into clear, well-oxygenated rivers and streams in search of our largest freshwater crustacean, the crayfish. It is an activity particularly appealing to those with something of a detective bent because crayfish—miniature relatives of the marine lobster—are somewhat secretive creatures. Almost wholly nocturnal in their habits, they usually hide themselves away during the day beneath large flat stones on the river bed, issuing forth at night to feed on insect larvae, water snails and other sluggish invertebrate life which they seize and rend with their huge nippers or chelae.

A factor in the aquarist’s favour is that in most cases when its protective stone is raised the crayfish just sits tight, legs and nippers hunched up close to its body, relying on its dark olive-green or muddy brown coloration to shield it from discovery. All that is required in such instances therefore is to learn to “see” the creatures against the background of the river bed with which it merges so perfectly. After the fine cloud of detritus, caused by the stone’s movement, has cleared, the hand is lowered slowly (to avoid undue sight-obscuring ripples), and, allowing for refraction, the crustacean secured between finger and thumb and behind those fearsome-looking nippers. Though small as crustacean offensive weapons go, it is as well to be wary of these first limbs for they can bestow a painful pinch on the careless handler—particularly in the case of a big 4-5 inch male. And they don’t let go in a hurry, as I know from personal experience!

Should you stumble the task of picking up your crayfish, it’s odds-on you won’t get a second opportunity, for with a powerful muscular contraction of its armour-plated abdomen and tail-fan the crayfish is able to shoot itself backwards through the water for several yards, eventually coming to rest again on the bottom of the river where it quickly seeks out an alternative retreat. It seems likely that this characteristic if rather primitive method of progress has some value in enabling the crayfish to escape from predators like otter and chub. Perhaps it has surprise value, too, for anyone who experiences a crayfish “kick” for the first time, particularly when held out of water, might be excused for being startled into letting it drop. The strange power generated is reminiscent of some fully-wound mechanical toy!

The curvature of the abdomen and the spreading five-plated tail-fan also combine in another use: in the case of the female, they protect and partly conceal the clusters of soft, gelatinous blackish brown eggs, up to about a hundred of which are attached to the swimmerets of the abdomen. Females—which are smaller than males with smaller chelae—can be found carrying their egg cargoes from about April or May, depending on the warmth of the season, although they were laid very much earlier and fertilised by the male in the privacy and safety of some river-bank hole. It is in such places too that crayfish spend the winter, in hibernation. They also shed their exoskeletons there, remaining hidden until their new shell is hardened.

There are, naturally, mitigating factors in this method of deliberately searching for crayfish. If the current is strong and the depth of water such as to necessitate the wearing of waders or swimming trunks, it can sometimes be very difficult to see the bottom of the river. And if there is a strong wind blowing, there is no point in going crayfishing at all because you won’t even see past the surface! I know this may sound obvious, but I vividly remember once travelling a considerable distance with the sole object of crayfishing in mind only to be foiled by a wicked breeze which rippled the water’s surface continuously.

But of course I have here been referring only to the “sporty” side of crayfish and crayfishing. Those who
require crayfish in quantity or do not want the trouble of physically seeking them out can employ the fisherman’s dodge of baiting special nets with bits of slightly “off” meat. Left overnight, these will nearly always be found to contain several good specimens in the morning. Anglers use crayfish, particularly “softies” (those having just sloughed their shells), for chub bait. And needless to say they also make excellent eating. I have no personal knowledge of crayfish as inhabitants of the aquarium but they must surely make most interesting objects of study. There are many aspects of their biology and habits which can only be satisfactorily studied in captivity.

The only freshwater crayfish indigenous to Britain is Astacus pallipes, formerly called Potamobium pallipes. However, it seems likely that at least one other species is now fairly widely if locally distributed in various parts of the country, having been deliberately introduced in the past from abroad. There have been several reports of the Asiatic Astacus leptodactylus turning up, but the most common alien is probably the continental A. fluviatilis, or “red claw,” which, according to the Ministry of Agriculture and Fisheries’ Bulletin (No. 12) “The Culture of Fish in Ponds” (1936), was at one time introduced into ponds at Nuneham Park near Oxford; these escaped into adjacent backwaters of the Thames and may well by now have spread their domain considerably. The same species may also be found in other counties. My friend Clinton Keeling, Curator of Pan’s Zoological and Botanical Gardens, at Ashover, near Chesterfield, tells me he believes A. fluviatilis to be common in the Chesterfield area, particularly in the River Amber. In appearance he describes it as being of a “very distinct blue-green tint,” quite different from the “brown hue” of the commoner species.

I have never seen A. fluviatilis myself, although I spent some time trying to find it (among numerous A. pallipes) in the Amber in late April last year, but it is interesting to compare Keeling’s description with two accounts of crayfish which I came across in The Field a few years back. One writer, from Askrigg in the Yorkshire Dales, described crayfish in that area as being of a rich dark blue colour; the other mentioned crayfish of a blush-grey tint in the River Sale at Retford, Notts. Whether or not these were A. fluviatilis or simply colour varieties of A. pallipes, I do not know. In any case, coloration alone is not a wholly reliable criterion for distinguishing species and anyone who finds a crayfish about which he is in any doubt should refer to the excellent key to the group published by the Freshwater Biological Association as Scientific Publication No. 19. The booklet illustrates and gives details of the morphological differences between three species of crayfish (in addition to our own) all of which may have been introduced here at one time or another. The full title of the booklet is: “A Key to the British species of Crustacea: Malacostraca occurring in fresh water,” by H. B. N. Hynes, T. T. Macan and W. D. Williams. It may be obtained from the Association at The Ferry House, Far Sawrey, Ambleside, Westmorland, price 3s.

April, 1970
WHAT IS YOUR OPINION?

By B. Whiteside

When I asked about cover glasses, I wondered how readers arranged these in aquaria where a large outside filter was in use. I have several arrangements to allow for the entry and exit of filter siphons and air lifts, and air lines and heater and thermostat cables. With tanks up to 15 in. wide, I cut the cover glasses along the centre, giving two pieces about 6 in. wide. I then usually cut off three of the four corners—the two back ones and the middle right one. I do the same with the front half, removing the two front corners and the middle right one.

When placed together, one has an opening at each of the four corners, and a double 'V'-shaped opening at the centre right. The rear corners allow for the entry of heater and thermostat, and air lines; the two front corners allow for the feeding of the fish. The larger right hand opening allows for the return flow pipe or pipes of a filter. The right hand front and back corners can also be used for siphons out to the filter. A filter can be placed at the left hand side of the tank, if the glasses are reversed.

One can buy plastic dividing tubing which can be slid over the edges of glass to keep it off the metal frame. It may also be slipped onto the frame edge of the tank. If the rear portion of the glass, only, rests on the top of the filter, a piece of plastic tubing, along the front half of the edge of the cover glass, will often enable one to have both halves of glass level. It is possible to use ordinary, plastic air-line tubing for this purpose, if one splits it, along its length, with a razor blade. Take care! It may also be necessary to make some adjustments to the hood of the aquarium, to allow for the entry of filter parts. As hoods are often made of light aluminium, it is often possible to make two vertical cuts in the edge of the hood, with a cheap hacksaw. These can be about 1 in. apart. The piece between the cuts can then be bent up inwards, but left attached, in case one wanted to move the filter at a later date. I've never tried cover glass clips as they do not suit my particular set-ups. I've seen tanks with the glass fitted into the hood. This made the hood very heavy and difficult to move. One would also need to have fluorescent lighting in such a hood as I find that ordinary light bulbs, whether of the older shape, or the more modern compact shape, seem to have very short lives today. I seem to be replacing bulbs every other day. I know that they are made to work in a vertical position, but even those in such a position seem to have a short life. Am I just unlucky with my light bulbs, or have others found that they seem to be built for instant extinction, now-a-days?

I've got a lot of plants by post, as the choice is usually much better than at my local dealer's shops. I have had mixed experiences—some good, some not so good. I do object to paying about 2s. 6d. for postage and packing, only to find that the plants are sent in a single sheet of brown paper, bearing a 4d. stamp. Most plants are, however, well packed. I ordered a few plants from three dealers, two weeks before Christmas. That was nearly three weeks ago. One firm I have not heard from, another sent one plant of those ordered, although I do not know which, as it gave no indication of from whom it had been sent, in the parcel, and the post mark was blurred. The third firm, based in Chorley, Lancs., sent me some plants which were exceptionally well packed (it took me half an hour, with my one hand, to get them out of their parcel). The proprietor of the firm enclosed a letter with the plants, apologising for the delay in sending them. He also told me that the importation of live-stock and plants was becoming very difficult, on a weekly basis, due to strikes at Heathrow Airport. He supplied me with one of the two kinds of plants which I ordered, and sent substitutes for the other. He apologised for doing this, and said that it was not the practice of his firm to send substitutes. He also returned my full postal order, apologising for not being able to supply the full order at present, and hoped that the return of my money would compensate for any inconvenience caused. The plants which I did receive were of good quality, the substitute plants being exceptionally good. This experience would certainly encourage me to order plants from this firm again, as courtesy and good service do not often go hand in hand, in modern society.

A couple of years ago I ordered a selection of plants
AN INFORMAL POND FROM BUTYL-RUBBER

By Laurence E. Perkins

Until the advent of numerous varieties of plastic pool-liners, the prospect of heavy concreting work was sufficient to deter all but the most fanatically enthusiastic pond-lovers from constructing a pond from scratch. Even the most modest little lily-pool requires quite an amount of physical and exacting labour when concrete is the medium employed. However, with the very wide range of materials now available, the labour involved can be reduced to that required for digging the hole.

Plastics of several types and strengths, as well as moulded fibreglass pools, can be pressed into service for pond-construction but for permanent durability as well as flexibility, butyl-rubber has few equals. This material, which is the same as that from which motor tyre tubes are made, is so strong and climate-proof that it is used for canal and reservoir construction in the U.S.A. and has a guaranteed life of fifty years. It can be obtained in sheets of any area—separate sheets being joined with a cold sealant tape to meet really large requirements. Its cost is less than £1 per square yard which may seem expensive until one makes a few comparative calculations.

When planning a proposed pond its an excellent idea to make a small model in plasticine and to site this model on a plan drawn of the garden, noting...
clumps of trailing plants such as creeping jenny 
(Lysimachia nummularia), and interspersed with taller 
growing pondside plants such as yellow loesetifie 
(Lysimachia vulgaris) and variegated manner grass 
(Glyceria spectabilis variegata). Interstices between 
the rocks can be filled with soil and planted with red, 
yellow and white saxifrage, houseleeks, lichens and 
mosses.

Butyl-rubber is completely non-toxic and once the 
pond is complete it can be stocked with no risk of 
fatalities to the fish. It is preferable, however, to 
restrain one's natural impatience a little and to let the 
water weather for a week or so after planting before 
introducing the fish.

If the pond is likely to be quite large the problem 
of what to do with the excavated spoil may arise and 
it is often customary but nonetheless worthwhile to 
carry out two jobs at once, as it were, and build a 
neighbouring rockery. If one side of the pond is 
likely to be widely exposed to the east, a sheltering 
rockery can be sited to give some protection in this 
respect. The pond illustrated is flanked at its widest 
end by a rockery which blends into a grassy bank. 
This feature was built as part of the operation of 
evacuating the pond and the division of interest 
between the twin projects taking place at one and the 
same time appeared to greatly lessen the tedium which 
can result from just digging a hole.

More of the excavated soil was used to build the 
foundations and rockery surround of a waterfall 
incorporating an "Otter" pump, the delivery pipe of 
which was buried under the rockwork and within 
drain-pipe sections so that it can be easily withdrawn 
when required such as when the pond needs draining 
for complete cleaning. The waterfall/rockery is 
planted with ferns, lichens and moss, periwinkle, 
creeping jenny, primroses, etc., and was so 
constructed that numerous little "caves" and crannies 
were left between the rockwork to provide cover for 
newts, frogs and toads.

Originally it was intended that the pond would 
roughly follow the outline of a figure eight with the 
pond forming the base of the "8" covering about three 
times the area of its neighbour. However, the narrow 
neck connecting the two at the pond's maximum depth 
of three feet presented too many difficulties and the 
neck was widened to about four feet which necessitates 
a bridge being added. This was easily made from 
some angle iron with 2 in. by 2 in. runners and cross 
planks of 6 in. by 1 in., large fitting paving slabs being 
employed for their weight to secure each end firmly 
and to link with a stepping stone path leading to and 
from the pond.

Power is supplied to the pump via a 100 ft. cable 
enclosed in hosepipe from a fused plug in the garage, 
along the hedge and into the pond by way of the 
overflow into the ditch. An over-riding switch in the 
lounge facilitates operation of the waterfall pump 
without leaving the house.

During heavy rainfall the garden used to suffer from 
flooding, but surface water now runs into the pond 
and any overflow is carried to a nearby ditch via a 
length of buried drain pipe.

THE AQUARIIST
been a well-known firm. After waiting for the plants, for several weeks, I wrote and asked why they had not been delivered. I received a letter of apology, saying that the plants had been sent, two weeks previously, but that, as they had not arrived, a second lot would be sent immediately. The second lot arrived in a couple of days, and the plants were of good quality. I wrote and thanked the firm for their second delivery, which arrived safely. About a week later, when getting some coal from the coal shed, I found a grubby parcel. It was the original collection of plants. Obviously the postman had called, and finding no-one at home, had put the parcel in what he thought was a safe place. The plants, mostly Cryptocoryne, were very dead, when the parcel was opened. I wrote to the firm again, sending the cost of the second collection of plants, as the original loss was nothing to do with the firm. I received a very nice reply saying that it was a pleasant change to find that honesty was still alive, in at least one part of the country.

In both of these experiences one finds the personal touch—a rare commodity now-a-days. Certainly if one orders plants, one is pleased if one receives good quality plants, well packed, and speedily delivered, but how much nicer to receive a word or two from the sender—even if it's only a label attached to each species of plants, naming it. Many beginners do not know the names of many plants, and even the more advanced aquarist, ordering several different new species of, say, Cryptocoryne, would appreciate having his plants labelled. Garden plants, which I have bought by post, have invariably been labelled. Why not aquarium plants?—after all we are paying for the plants, the postage and the packing!

My “hardest to catch fish”—G. aymonieri, the sucking loach. I have aquaria in three rooms of my home, at present. I dislike glass wool intensely. I would like to decorate an aquarium with inert, all black gravel but I haven't seen any, yet. I agree that the quality of many smaller tropicals has dropped; so has the size!

Mrs. Avriel Harrison lives at Broom, Rotherham, and, she says, don’t send for plants by post. She has been sending for parcels of plants on and off for years, and never has she received value for money. She suggests buying home grown plants, costing a little more, but being of good quality. She has plants which cost her 30s. 0d. each, and more, but they have repaid their cost many times with cuttings and young plants. Mrs. Harrison says that half the plants are sold, especially at open shows, and not away when grown in warm water. Considering how well Mrs. Harrison's plants grow, in her home tanks, she is surprised that there is always a shortage of good quality plants on sale to the general public. She asks why more aquarists don’t sell their spare plants back to their dealers, thus stopping the importation of tropical rubbish. She thinks it common sense that any fish with its wits about it and which is fit, will be hard to catch. She always uses two, dark-green nets and these confuse the fish. The most difficult to catch fish is the spiny eel, she thinks, as it is so astute.

Mrs. Harrison thinks that the quality of fish has sadly deteriorated. Being a dealer, she says that one never seems to get what one orders from dealers to the trade; the lists are beyond one’s wildest dreams until one writes out an order, and sees the fish on arrival. Some neon’s, recently sent to her, had to be put in a rearing tank, and fed for a month, before she dared put them on sale. The same goes for glowlighs, cherry barbs, etc. Things are so bad that she is setting up a fish house, at home, for the sole purpose of getting fish to a certain size before selling them. “One dare not release them near other fish or they would be eaten. I have seen neon’s, sent from one importer, cowering in a corner, after live daphnia have been put in their tank”, she says. “They were bought as medium sized neon’s”.

She wonders why mothers and wives complain about tanks, as she considers that an attractive aquarium is one of the most pleasant sights in a home, as well as being relaxing to both body and mind. She can only suggest that some ladys must be guilty of not making the most of their aquaria. Tanks won't keep themselves clean, and plants can't be viewed through thick, green glass. “Keep your Jack Dempsey or Oscar upstairs by the bed, and let the tank in the front room be filled with small tetras and rich growing plants,” Mrs. Harrison states. She says that after the wife has been won over, more tanks can be added until the Oscar is back in position. “It's the big, ugly fish, and bare tanks, that those delicate felines don’t like. Take one hour per week to look after tanks”, she adds. She caught “fish-nutosis”, a few years ago, and her husband hasn't caught it yet—but he's nearly there, and she has to tread carefully. She already has a 5 ft. tank at one side of her stone fireplace, in the sitting room, and another 3 ft. by 15 in. tank at the other end; she has three breeding tanks upstairs, and a fish house in the garden. Need she say more! She has just spent the night with “Big Fred”, by his tank side, and she is trying to prove to her husband that she thinks more of him. (Big Fred is her heart's desire—a 7 in. Osphronemus goramy—and he's getting bigger each day.

There's a feud going on, in Mrs. Harrison's aquarium society, about the best monthly magazine. Some fancy an American magazine, and some another British one. She is winning, at the moment, with The Aquarist, even though it has gone up to 3s. 0d. in cost. She has also a large pond in the garden, and coldwater items interest her. Last week, at Sheffield's “bring-and-buy”, she got two hide books of bound copies of The Aquarist from 1956 onwards, all for 4s. 0d.—good value!
AN ECONOMICAL FISH HOUSE

By G. A. Pryke, C. Eng., M.I. Mech. E.

Like most aquarists, I started with a single aquarium in the lounge but it was not long before I decided to try my hand at fish breeding. Rather than litter the house with aquariums, the second was set up in the garden shed. In due course, the second was inevitably joined by a third, and a fourth, and a fifth. At this point, I was attracted by some 12 in. x 8 in. x 8 in. plastic tanks costing 15s. each but was deterred by the thought of paying more for the heaters and thermostats than for the tanks. Even more important, I was becoming aware that my electricity bills were increasing in proportion to my fishkeeping activities. The next step, therefore, was to investigate the cost of converting my 8 ft. x 6 ft. timber shed into a fish house, with particular attention being paid to the running cost.

I had already decided that space heating was the answer since it would enable me to use all sorts of inexpensive vessels as fry tanks, without the additional cost of heaters and thermostats. An electrical convector was chosen for ease of thermostatic control, cleanliness, safety and simplicity of installation.

Before starting the conversion, I experimented with a 2 kW heater and it was then that I nearly gave up the idea of ever having a fish house as I discovered that, even on a mild day, the 2 kW heater was unable to raise the air temperature in the shed above 60°F. Since a much higher temperature would be required, not only on a mild day but also in mid-winter, it appeared that I should need much more than 2 kWs, but I had visions of a running cost of £7 or £8 per week, less any saving due to thermal insulation, bearing in mind that a 2 kW heater costs nearly £3 per week to run permanently. Feeling depressed, I discussed the problem with a friend who pointed out that insulation can be far more efficient than is often thought, and suggested I did some calculations before giving up. Without much hope, I looked up the necessary coefficients for ¾ in. thick timber and calculated for an outside temperature of 35°F (mid-winter), I should need 3 kWh/h to hold an average air inside temperature of 75°F, i.e. £7 per week, which verified my tests and, at least, gave me confidence in my calculations. I repeated them on the same basis but with a 2 in. layer of fibre-glass all round, and was delighted to arrive at ¾ kWh/h in mid-winter (9s. per week). With renewed enthusiasm, I considered the pros and cons of using the 2 kW heater, or converting it to 1 kW by removing an element. I decided on the latter, since whilst either would cost the same to run (see footnote) the 1 kW would give slower changes in temperature, longer thermostat life and would require smaller supply cables.

Having decided on the form of heating, I turned my attention to the selection of a suitable thermostat. The conventional aquarium type's contacts are rated at 200 W or, in some cases, 300 W and, therefore, could not be used for directly controlling the 1 kW heater, but I did consider using a thermostat of this type to control a slave relay fitted with heavy duty contacts, which, in turn, would have been used to control the heater. However, I decided against this method on the basis of reduced reliability by using two interdependent pieces of equipment and like the externally mounted type of aquarium thermostat, would mean controlling the whole fish house by the temperature of water in one particular tank. It was then that I reasoned that, since the general air temperature would change more rapidly than the water temperature in the tanks, more sensitive control would be achieved by using an air thermostat. I, therefore, obtained a suitable model, similar to those frequently listed in the small "ads" of various radio and electrical magazines for less than £1.

Next to be considered was the method of insulating the fish house. As previously stated, my calculations were based on using 2 in. thick fibre-glass, but the snag appeared to be that this type of material would require some form of support, such as sheet hardboard, thus increasing the initial cost. I, therefore, compared the cost and insulating properties of 2 in. thick fibre-glass plus a covering of hardboard with other readily available materials, including the granular type, again requiring a covering of hardboard and sheet expanded polystyrene which would, of course, be self-supporting. I found that to obtain the same degree of insulation 3½ in. of the granular type or 1½ in. of expanded polystyrene would be required, both costing substantially more than the fibre-glass and hardboard, which made the choice obvious. The method of fixing that I adopted was to pin the fibre-glass on to the inside of the timber cladding between the shed framework to which the hardboard sheets were nailed. Further calculations indicated that the cost of heat lost through the windows, even if double-glazing were used, would
be far greater than the cost of artificially lighting the
fish house 15 hours a day and this did not take into
account the fact that, due to the inefficiency of electric
lamps, a large part of the lighting cost would be offset
by a saving in heating. I, therefore, decided to cover
the windows with insulated panels which could be
removed during the daytime in summer. The tongued
and grooved floor was covered with a sheet of hard-
board, together with the remnants of carpet and carpet
underlay. A final note on insulation—if you decide
to double or, better still, triple glaze your windows,
make sure that the air gaps between the sheets of
glass, are perfectly sealed since absolutely static air is
an excellent insulator, whilst, even slightly moving air
is worse than useless. It is interesting to note that
most insulating materials are made up of approximately
98 per cent air and 2 per cent supporting medium, the
sole purpose of which is to ensure that the air is
trapped and hence static.

The last item to be settled was the type and layout
of the supports for the tanks. To keep the cost to a
minimum, I chose a framework made from the 2 in. x
1 in. sawn timber, bolted together and carrying 1 in. x
1 in. planed timber bars at 4 in. centres. Whilst this
alone would have been adequate, I decided to cover
the bars with sheet hardboard so that the spaces
between and around the tanks could be used as
shelving for storing food containers, cultures, etc. The
layout which was, of course, governed by the position
of the shed windows and door, consisted of five 8 ft.
shelves, three along one side of the shed and two
below the window along the other. These were made
15 in. wide so that small breeding tanks could be
accommodated end on, giving a maximum utilisation
of shed space.

Finally came the hard work. A fishkeeper friend
kindly offered to make room in his fish house for my
existing tanks whilst I made the conversion. This was
completed in a weekend and the tanks re-installed.
It was time to put the theory to the test. Fortunately,
it rapidly became apparent that my calculations were
remarkably accurate. During the first week the power
consumption amounted to less than 10s. and, since it
had been freezing all week, this tied in almost exactly
with the estimate. Furthermore the temperature of the
tanks on the lower shelves were maintained at 70°F,
those on the centres at 75°F and those on the top at
80°F, all only fluctuating plus or minus 1°F in spite of
an air temperature variation of plus or minus 10°F.

During the last fifteen months the fish house has
proved to be a great success, enabling me to concentrate
on some serious fishkeeping and breeding. More recent
improvements have included the installation of a five
foot fluorescent lamp, controlled by an automatic time
switch, given to me by a generous colleague. Improve-
ments to follow, I hope, include a water supply and

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FROM A NATURALIST'S NOTEBOOK

By Eric Hardy

AN ENTHUSIASTIC WELSH aquarist has written several times to me in anxiety in case he transgresses the law when plant-collecting in ponds and streams to stock his tanks and garden pools. Under the Theft Act, 1968, commercial gathering of wild plants without permission is an offence, though previously test cases had proved no ownership in wild plants like blackberries and mushrooms which had not been planted.

Plant-collecting is, of course, illegal in certain nature-reserves like those of the Nature Conservancy, without authority, and several county by-laws prohibit the uprooting of wild plants from land to which public have access. Otherwise picking, or taking for private use, is not illegal. A recent committee meeting of the Council for Nature which I attended in London discussed the recent Wild Plant Protection Bill which failed to get through the last parliament. As the Nature Conservancy only wished for a law protecting rare plants, and the Council for Nature wanted it to include common ones like primroses near towns, the bill has been redrafted by parliamentary draughtsmen at a cost of £500 (granted for this by the World Wildlife Fund) and is to be presented by Lord Hurcomb to the House of Lords as it has no chance of a lucky draw in the Commons private bills. The Botanical Society and the Council for the Promotion of Nature Reserves support it.

Mr. E. F. Greenwood, keeper of botany at Liverpool Museums, who is rewriting Wheldon and Wilson's 1907 Flora of northwest Lancashire (The Fylde chiefly) tells me he is anxious to trace the localities of a number of rarities he has failed to come across in a survey over the past five years. Some of these are aquatics like the rushy Blymus compressus, (which also seems to have died out in North Wales), the sedges Carex diandra, C. lasiocarpa, C. limosa and C. riparia; the great pond sedge, white-beaked sedge, the many-stemmed spike-rush Eleocharis multicaulis, Juncus bulbifera, the floating clubrush Eleocharis fluctuans; the great and long-leaved sundews, broad-leaved cotton-grass sedge, Tynbridge Wells filmy fern, mudwort, fen-pondweed, flat-stalked pondweed (which grows at the Silverdale Hawes Water); grassy pondweed, great yellowcress (Rorippa), water-dock, lesser bladderwort, globe-flower, marsh-stitchwort, lesser skullcap and glaucous bulrush. It is unlikely that all these natives have become extinct in the past half century, for there are also the dark-leaved and tea willows, and Salix discipens, and several more land plants which were recorded originally but haven't since been traced.

Mr. Greenwood has opened a window of fresh air upon botanical recording since he came to Liverpool from his native Preston, and one wishes he had been here when earlier Floras were undertaken. The Botanical Society of the British Isles, which is compiling a list of museums responsible for each county's plant collections, has made Liverpool responsible for Lancashire excluding Furness, the aim being to have material to substantiate published records. I hope this doesn't lead to collecting the last specimen, as last century's museums and herbaria exterminated the broad-leaved centaury on the Lancashire dunes.

From the Natural History Society of Northumberland, Durham and Newcastle I have received a detailed list compiled by A. Eddy and D. Welch, of some 240 mosses and 75 liverworts recorded from the 9,500 acres Moor House Nature Reserve in the Westmorland corner of Upper Teesdale, where I go to see the wonderful May show of spring gentians, as well as Teesdale violets and alpine Bartsia. Most of these are from limestone haunts and blanket bog.

Aquatic life is far more active in winter than many popular nature-books imply. After the coldest night of the winter in mid-February we found a lot of lesser waterboatmen hunting under the edge of the ice at Cheshire's Tatton Mere, while fresh green shoots sprouted from the blackened winter stems of Canadian pondweed. In January two plastic bags full of frogs galore were collected from mid-Wirral ponds, and brought to one of my Cheshire W.E.A. classes—then taken back again. B.B.C. publicity attracted attention to the plans we have already mentioned to build houses on the natterjack toad's major haunts on Ainsdale dunes, near Shore Road. Though these were marked by toe-clipping and transplanted, they returned last year when the natterjacks had an unusually good breeding season right down the dunes to the pools behind Hightown's old
battery at the edge of Crosby, 35 or more were collected, and put back, from the Wirral colony on West Kirby shore marsh, and many bred equally well in the south of England.

The magazine *Wildlife and the Countryside* ceased publication with its February issue after being sponsored in recent years by the Council for Nature and the National Rural Studies Association.

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The Mosquito Fish

By Steve Forster

The name, mosquito fish, has been applied to more than one species of fish which decimate the mosquito larvae population in the course of satisfying their appetites. In various parts of the world the name can apply alternatively to the Guppy (*Lebias inermis*), Gambusia affinis, the Medaka or Rice Fish (*Oryzias latipes*) and *Heterandria formosa*. In the U.K. however the name “mosquito fish” is synonymous with the *Heterandria formosa*, a fish whose natural habitat is the south eastern states of America.

Because of their size (males average ½ in. and females 1½ in.) and their ability to withstand temperatures between 50 and 90°F, these fish make ideal inmates for small unheated tanks which are maintained at room temperature (60 to 70°F). The ideal temperature for *H. formosa* is around 68°F but when purchasing these fish it should be remembered that most dealers tanks are nearer the 75°F mark and therefore any change to the lower temperatures must be gradual.

Normally the mosquito fish is not a good candidate for the community aquarium as the males are liable to become tasty snacks for other tank inhabitants. A dozen of these tiny fish can be kept quite happily in a small tank and if this is done no harm will come to them. The most energetic action that will be seen will be the males in mock battles, with bodies arched and dorsal fins spread.

As the mosquito fish are a plain, dark olive lined with various dark brown markings, a touch of colour can be added to the tank by introducing some White Cloud minnows (*Tinca tinca*). These fish are ideal companions for *H. formosa* as they are not aggressive, are suited to the lower temperature range and their bright colours contrast with the dark colours of the mosquito fish.

*H. formosa* are livebearers and therefore no special requirements are necessary for their propagation. The parents will not eat the young and although the fry are small at birth, raising them does not present any difficulty. The gonopodium of the males is much larger, in proportion to the body, than that of most other livebearers and in some cases is equal to half the body length. Males will continually chase their mates breaking off only to feed or joust with another male.

In a well planted tank, with plenty of floating vegetation, the mosquito fish will reproduce “ad infinitum”. The female does not drop all the young at once, like other livebearers, but will drop between 1 and 4 fry each day for about eight days. When the females are seen to be gravid, daily inspections of the floating plants are advisable and eventually some fry will be found. After the initial batch, the fry will increase in number every day until the female has completed the delivery.

The fry can either be left with their parents or removed to raising tanks but if there are more than two adult females in the breeding tank it is advisable to remove the fry or over population will quickly occur.

Adult fish should be fed on small flake foods, grindal worm, sifted daphnia and brine shrimp, while the fry will do well on powder foods, micro worm and newly hatched brine shrimp. Given adequate feeding and not subjected to overcrowding the fry will be sexually mature in 12 to 16 weeks.
AN ECONOMICAL FISH HOUSE
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drainage. At present, I have to carry water from the house in well-washed collapsible sherry containers (obtainable from most Off Licences for a shilling or two). I use four of these for storage in the fish house (so that I always have 20 gallons of aged water at a suitable temperature to hand) and even with a supply laid on, I shall continue to use them in this way. I also have to carry the old or dirty water to the nearest drain in a bucket, and, since I believe in frequent water changes, this is a bit of a chore. Hence my reason for wanting drainage.

FOOTNOTE. The mid-winter figure of $1$ kWh/h is another way of expressing $1$ of a unit per hour, i.e. 8 units per day (24 hours) or 36 units per week. Fifty-six units cost approximately 9s. The above is equivalent, for example, to a 1 kW heater on for one-sixth of the time or a kW heater on for one-third of the time, or $1/2$ kW heater on all of the time. A heater of less than $1/2$ kW obviously could not cope.

APPENDIX. The following simplified formula can be used to estimate the mid-winter running costs for a fish house of any size. It is based on the assumption that all surfaces, viz. four walls, roof and floor are covered with the same insulating material and thickness and that the average air temperatures are 75°F inside and 35°F outside. Cost per week (shillings) = 0.3 Ak t

where A = total area of walls, roof and floor in square feet, t = thickness of insulating material in inches. k = coefficient for insulating material given below:

- Expanded Polystyrene 0.21
- Granular type 0.43
- Timber 1.0

Example 1
8 ft. x 6 ft. shed, 6 ft. high without insulation, i.e. only $1/2$ in. thick timber (total area A = 260 sq. ft.).

Cost = $0.3 \times 260 \times 1 = 156s.$ per week.

0.5

Example 2
Same shed, insulated with 2 in. fibre glass (effect of timber ignored).

Cost = $0.3 \times 260 \times 0.26 = 10s.$ per week.

ACKNOWLEDGEMENTS
I should like to extend my grateful thanks to Mr. B. Whiteside for encouraging me to develop my rough notes, which first appeared in his “What’s your Opinion” column (Aquarist, November 1969), to their present form.

PRODUCT REVIEW

“Goby Automatic Fish Feeder,” marketed by Integrity Mail Orders, 15 Whitmores Close, Epsom, Surrey, price 1s 4d. for the pool type, and 7s. 0d. for the aquarium type.

Having read an advertisement for these new products, in the February Aquarist, I was interested to receive the products for review. The aquarium fish feeder consists of an egg-shaped plastic container, with a number of perforations in its lower half. In the base, a wire fitting has a small weight—looking rather like a glass bead—fitted. The upper part of the plastic container unscrews, and the chosen fish food is shaken into the bottom half. When replaced, the air trapped in the upper half enables the feeder to float, while the weight at the base keeps it floating at the desired level in the water.

I put some food in the feeder and floated it in a large guppy tank. The fish immediately investigated and soon had the food coming out of the holes. It was quickly eaten before any reached the base of the tank. The instructions supplied suggest that the feeder is not left in the water for more than fifteen minutes at one time. The feeder is said to exercise the fish as they learn to touch it and are rewarded by food—a simple example of Pavlovian conditioning.

The pond feeder is a much larger item consisting of a screw-top plastic jar, with a series of holes round the top and bottom. The capacity is probably about one-quarter of a pint. Suspended from the base is a short chain fitted with a plastic cup holding a weight—in this case a large, glass marble. Inside the container is an ordinary glass marble, and a ping-pong ball. These items balance each other so that the feeder floats in the water at the required level. Fixed to the top of the container's lid is a plastic water lily—consisting of a multi-petalled orange flower, and three green leaves. When floated in a pond, the water lily rests on the surface of the water, looking quite convincing. As the large pond fish nuzzle the container, food is released through the holes.

I must admit that the items amazed me when I first saw them. They are certainly an interesting novelty!

B.W.

THE AQUARIST
OUR READERS WRITE

Electrical Hazards
Having recently joined the ranks of the amateur "Aquarist," a friend kindly gave me a November, 1969 copy of the Aquarist to read.
I was rather perturbed to read the article by John Lowndes, re electrical hazards. This I found to be very misleading to the do-it-yourself experts!
I agree heartily that all "electrical equipment," especially when in contact with water should be earthed, but it must be done to certain standards. John Lowndes suggests that an earth wire should be taken from the equipment to a 3 ft. stake driven into the ground, and the circuit protected by a 5 amp. fuse.
It is my experience that a stake, as suggested would have an earth impedance of at least 30 ohms resistance, and in the event of a fault a 5 amp. fuse would not "break." A 5 amp. fused circuit must have an earth connection of a resistance of 16 ohms or under. (at 240 volts), otherwise as stated the 5 amp. fuse would not break and current would just leak away down the earth wire, until perhaps someone touched the equipment, and possibly provide a better "earth," with results that could be fatal.
Far better to use the 3-pin fused plug as suggested and rely on the "earth" provided in the general installation.
A. P. C. Moore
(Installation Inspector).

Cottony Growths—A Discus Disease
What I am about to describe has happened, fortunately only once, with one fish. The fish was a Heckel Discus, female and about 4 years old. It was the only true Heckel which I had seen and the sole survivor of some Discus brought back from Hong Kong a few years ago, by a keen Discus fancier. Being still young enough to breed, I did not want to lose this fish.
About a month after getting it, I noticed two white patches about 1/2 in. in diameter just above the eye at the start of the lateral line. They had the appearance of fungus, but when viewed from the front of the fish, they protruded out like two thick worms. Its appearance was quite different from that whereby the fish develop white lumps in the centres of ulcer type patches which quickly spread. In this case the surrounding areas were quite healthy. It was obvious later that they weren't worms as they could be wiped off and easily broke up. A thorough search of the literature brought conflicting causes and cures. According to "Enjoy your Discus," this was the onset of a protozoan disease, the protozoon being Hexamita which will infect the whole body and is fatal when it reaches the brain. A cure was necessary then which would be effective internally. Terramycin and copper sulphate were suggested. According to the Aquarist, January 1969, the cause was not known but it could be cured by touching the infected areas with Rivanol, an acriflavin type compound.
The first cure was tried, using aureomycin and copper sulphate after first wiping off the visible infection. It quickly reappeared accompanied with smaller "cotton puffs" along the depression between the operculum and preoperculum.
The next cure was then tried, the fish remaining in the antibiotic medium. Since Rivanol was not available, acriflavin of unknown strength was rubbed hard on the infected areas, which by now, had numbered about five, mainly on the operculum. By doing this twice a day for four days, all trace of the cottony growth had disappeared and never returned. The Discus was replaced in the tank with about 10 full grown others, the wounds left quickly healed and its appetite after this ordeal was not impaired.
From this it is hard to say how extensively the protozoan infects the fish. It is also difficult to determine the effect of the antibiotic. Since I do not hope to have the chance to experiment with this disease again (I hope no other fish contracts it), I am now imparting what knowledge I have.
B. C. Nicholson,
Ashford, South Australia.

Sticky Problem
In answer to a tropical query on how to stick a piece of seasoned cork to the back of an aquarium.
Jack Hems offers two reasonable but somewhat troublesome suggestions, whereas my answer would be to use a sticker from a child's bow and arrow set.
First cut off a small piece of cane which is inserted into hole of the sucker, then pierce a small hole into the cork, then press cane and sticker into cork, and attach to back of aquarium.
This method enables easy removal of cork for cleaning, also arranging, at different angles.
N. G. Morris,
An Unusual Competition

May I be permitted, via your column, to pass on to other Aquarist Societies who may be interested, details of a competition which has proved to be a great success with our Society during the past season?

Before going into details of the competition, a brief introductory note.

It was felt that a competition was needed which would not only encourage entries and stimulate interest, but also prove to be of some value to the hobby and prove a measure of the aquarist’s ability. This was particularly needed now that the 28-day rule of ownership has been lifted (an almost impossible rule to enforce or disprove, anyway), and to prevent “pot hunters” from filling tanks with “money no object” specimens just for the occasion!

The Irvine Challenge Trophy, as the name infers, was the idea of club member Jim Irvine and is quite simple in operation, like all the best ideas. (We believe that Ealing and District A.S. is the first to run such a competition.)

The basic idea is that an entry consists of a single specimen, but, and here is the difference, it is shown four times over a period of one year; the highest total of points winning the trophy.

Exponents of showing will quickly see various methods of planning for such a competition. If one picks an adult show specimen (for possible maximum points from the start) it may not last a further year, whereas a three-quarter grown fish will obviously pick up on points for size as the year progresses. Another factor is the choice of fish, it must be capable of sustaining condition over the competition period, and also be undemanding in its day to day requirements, otherwise the aquarist will be grey before six months are passed!

Place marks are not awarded, so a good, consistent runner can have the edge, in the final analysis, over a “placed” fish from an earlier round. An interesting spin off from the competition was that it was hoped to find the “ideal” fish from all points of view, plus the added bonus of longevity.

The competition had a “massed start” at Round One with over 40 entries, but Round Two showed a large drop (fatalities, lack of confidence, mistaken beliefs that unplaced fish were out of the running). However, Rounds Three and Four were evenly contested, and 12 fish lasted the course.

Obviously judging presented problems, and it was agreed that the judge would need all his wits about him, plus a good memory. The Club was fortunate enough to engage the services of Harry Towell, the F.B.A.S. judge. At the end of the competition he was kind enough to give a run down of the winning fish, and also praised the idea and aims of the competition. He felt that it helped him to keep up to scratch, and was very pleased to have been involved with the competition.

A wide range of fish were originally entered, characins to cichlids, livebearers to labyrinths; the winner? A Silver Hatcher. Another characin, a Silver Tetra was second, a Black Platy third and a Severum fourth.

From the results, it would appear that the characin family is a fair bet for long life and condition keeping, although the result could well have been different if more fishes had stayed the course.

As the main object of fishkeeping is doing just that, apart from the showing and breeding aspects, to keep worthy specimens in top condition for over a year is a measure of the popularity and sustaining interest of the hobby, and shows just what can be done if you try. Incidentally, the second placed fish was entered by a Junior member, so us “old uns” had better look out in future!

R. C. MILLS,
Ealing & District A.S.,
Perivale, Middx.

Large Cichlids

In reference to Mr. Wootton’s letter in the November issue I would like to say this: I have a four-foot bow front aquarium and in it I have 22 fish, Oscars, Keyholes, Blue Acaicas, Comballs, Severums, a Knife Fish, etc. They all live peacefully. They are fed on Tetramin, once in the morning, and once at night, with some daphnia or tubifex, once or twice a week. The decorations are some Amazon Swords and rocks. However, the most surprising aspect is the breeding. A pair of Tilapia mossambica have spawned five times in five months, while the other fish carry on their normal routine, without disturbing the fish. Also a pair of Jewels spawned on a rock and with one fish over them, the occupants just steered clear of that rock. I find the habits of the fish extremely interesting, the angels going round together and the male Tilapia showing off to his mate, etc. It is a pity people do not give the Cichlids, and larger anabantids a chance to show what they are really like.

T. STRAIGHT,
Ditton Hill, Surbiton.

Young Winner

We went in the car to the car park and there was a coach waiting for us outside the car park. We went to the sea side in the coach, and went in the sea, and went for a swim. We played ball, and then we went back to the fish show, and we looked around and Daddy's fish hadn't won anything.

Then I walked around by myself and I looked, and I had won first prize. I called Daddy to come and see, but before he came he thought I was looking at
the wrong fish. When he came he was ever so pleased.
I had won a trophy, but I hadn't known that you won plaques, and then at the prize giving I got my prize, and then we went home.

RUSSELL ABBOTT (aged 7),
Slough, Bucks.

Fieldwork

As one of those botanists who deliberately spent many weary hours of his "spare" time, despite partial blindness, helping the B.S.B.I. Distribution Maps Scheme with the vetting and collation of records, as well as specially doing fieldwork for them, I feel that I cannot let Mr. Eric Hardy's criticism of the Scheme in your February issue go unanswered.

Mr. Hardy must be aware that there was never a "closed shop" for the Scheme was pleased with all the help it could get. **Those who endeavoured to make the "Atlas" as complete as possible were certainly disappointed with the result**, and this was really caused through an insufficient number of volunteers willing to carry out all the necessary work—which not only included fieldwork (for which there were plenty of volunteers) but also vetting, collating and abstracting records.

Glancing at the acknowledgements at the end of the "Atlas" I find that the Scheme only received 25 more or less complete county lists—and one can only regret that Lancashire was not one of them.

As there are now a number of similar schemes in operation I can only implore Mr. Hardy to abstract Lancashire records on individual record cards (available from the recorders) and submit them to the appropriate schemes if he wants to see them included in the completed maps, otherwise he will have many more similar disappointments.

JOHN L. GILBERT,
Kew, Richmond, Surrey.

Mr. Hardy was shown the above before publication at the request of Mr. Gilbert. We print Mr. Hardy’s reply below.—(Ed.).

I sympathise with Mr. Gilbert, but I've spent 50 years of "spare" time plant-hunting here and 35 years teaching it, contributed records to the old Journal of Botany and pre-war herbarias at Kew, etc., lectured to the local botanical society so far back as 1930, and, as hon. sec. of one of the largest natural history societies, I wrote from long experience of the "apartheid" which operated in Northwestern recording. Accuracy and verification must be the policy; but offers from people not subscribing to the right societies were not wanted. This wouldn't have mattered so much if such an expensive and authoritative tome had not appeared with so many gaps in Lancashire, Cheshire and North Wales, yet at the same time mapping a lizard–orchid entered at Formby flower-show which nobody, I understand, has yet seen growing in Lancashire. My efforts to trace the origin of the specimen were deliberately thwarted, but the authorities at Kew kindly amended the note accompanying their specimen, which had misleadingly given the impression that it was found growing in situ.

We do now fill in some plant-cards for the Nature Conservancy's unbiased mapping centre, which was not then operating. A flora or fauna committee for any county can only be reasonably and scientifically complete if a representative of every society active in its area is asked to join, not confining it to friends and subscribers. It is not that field-records and herbarias specimens were examined and found untrue. Many were not examined at all, though their existence was known. No one person, however active and experienced, can know all the plants in a county. As my friends know well, I am prepared to face any meeting at a suitable place and time and discuss this "closed shop". It did not, however, operate amongst aquarist societies, but chiefly autocrats whose selfish ambitions took over much of modern natural history "recording", despite what Mr. Gilbert states, and made many of us find it a thankless, mentally-unrewarding waste of time, unless one subscribes to the right circle, fauna or flora.

Guppy Associates of Montreal

A am writing to advise that a new tropical fish club has been established in Montreal. We call ourselves the Guppy Associates of Montreal and, while we are essentially a Guppy club, we devote a good portion of our monthly magazine, The G.A.M. Gazette, and meetings to discourse on the breeding and raising of other tropical fish.

Any person in England who wishes to join our society, $3.50 Can. (£1-80) annually, may write to me at the address below. We would like to increase contact with other societies and individuals in your country. We are members of C.A.O.A.C. (Canadian Association of Aquarium Clubs).

Any mention you care to make in your magazine would be extremely helpful to our club.

A. F. HALPERT,
Guppy Associates of Montreal,
1084 Mill Hill Street,
Laval (Chomedey), P.Q.

Algae Cleaner

The best and well tested cleaner for inside Aquarium tanks is a household scourer called "Golden Fleece". It does an expert job, and is not dangerous to fish or anything else and will not scratch the glass.

—Highly recommended.

P. F. WOODS,
Dunmow, Essex.
Our experts' answers to your queries

Tropical queries

By Jack Hems

Please enclose a stamped addressed envelope when writing to our experts or to the Editor for advice on your problems.

Since introducing coloured stone chips into my aquarium several of the fishes have died without showing any external signs of disease. Also, a blackish green algae has appeared in the aquarium and is spreading over the bottom and onto the plants.

Coloured chips marketed by a reputable firm such as Fantasy Pet Products Ltd. are harmless in the aquarium, but there are others which dissolve calcium carbonate into the water. To test for calcium carbonate, an excessive quantity of which would soon lead to all sorts of troubles, hammer some of the coloured chips to a small grit and place this grit in clean glazed saucer. Now spot the grit with neat hydrochloric acid. If the dust effervesces like a health salt, then you can be certain that the chips are not suitable for aquarium (a freshwater aquarium) decoration.

Is there such a fish as a fringe-tailed Hyphessobrycon serpae?

A strain of Hyphessobrycon serpae, with long fins fringed along the edges, has been developed by some hobbyist living overseas. We do not doubt that it will be coming onto the market before long.

What is a tricolor shark?

This is just another name for Balantiocheilus melanopterus, the cyprinid closely related to the labeos and better known to tropical aquarists as the silver shark, or bala shark.

Is it true that all discus fish imported into this country are inhabited by internal parasites that soon kill them?

It is said that discus do carry certain parasitical worms in their insides, but unless the fish are kept in an aquarium not suited to their requirements, or they become very run down, the worms do not endanger their lives. That not a few aquarists keep and breed discus fish year after year is proof of this.

I should use in a tank housing angel fish in spawning condition to guard against fungus disease spreading over their eggs?

Up to 1 milligram of acriflavine to every gallon of water is safe to use.

What must I do to keep and breed a pair of jewel fish without running into any serious trouble?

What you must do is to keep a close watch on the couple all the time courting is going on and immediately egg-laying is over; for the male, and sometimes the female, can be very quarrelsome. The fish, like most cichlids, usually spawn inside fissures in rockwork, inside an overturned flower pot, or even on the cleaned surface of a stone. After the eggs are laid, one or both parents watch over them. This, however, is according to the book. But it is not uncommon for the male to kill the female if she cannot hide away from his brutal drives; so if the female is being bullied too persistently, then the sensible thing to do is to remove her from the tank. The young ones may be left with a parent, or both parents, until the happy family life breaks down and quarrelling breaks out. The fry make rapid headway on a diet of whiteworms, gnat larvae, and similar live food or suitable substitutes for livefood.

I should be glad to receive some advice regarding the suitability of Namacara anomala as an occupant of a community tank.

This charming little cichlid, which I first kept more than thirty years ago, gets on with all fishes with the exception of the smallest which, quite naturally, it is able to swallow. The sort of fishes I would keep it with would include small- or medium-sized barbs, the heavier-bodied tetras, and gouramis. N.anomala frequents the bottom and is rather retiring.

What is a ghost fish?

The fish usually known as a ghost fish is Kryptopterus bicirrhis, the almost glass-clear, mid-water-swimming catfish from Sumatra.

I have bought a small snakehead (Ghanna sp.). Will this fish settle down all right in a 3 ft. community tank stocked in the main with platsys, small barbs, and guppies?

The snakeheads have beautiful markings and ugly
habits. They are too voracious to share a tank with other fish. A snakehead of $2\frac{1}{2}$ to 3 in. is quite capable of seriously maiming or gulping down a platy with a quick snap of its jaws. Give a snakehead a tank to itself.

Is the green panchax a ready-breeder and peaceful enough to share a tank with other fishes?

The answer to your first question is yes; to your second question the answer is yes and no. At full size the green panchax (Epilampus sesfebriatus) has a big appetite and a mouth to size. Small fishes can be bolted with ease. All the same, the green panchax is not a bad tempered fish and will not molest fishes near enough its own size. E. sesfebriatus spawns in plants growing near or at the surface and the eggs, laid at different times, take about a fortnight to hatch out.

I have bought some Lamprologus longipinnis. Please give me some information about their habits and requirements in the aquarium?

L. longipinnis is a shoaling cichlid from Ceylon. In my experience it requires nothing special in the way of water or temperature or food. It cruises and rests near the surface and is quite inoffensive. It mixes well with fishes such as the giant danio and Rasbora elegans.

What sort of tank furnishing is needed in order to breed the Malayan angel fish? My specimens are about $1\frac{1}{2}$ in. long.

As far as I know, this fish has not yet bred in the aquarium. But if you want to have a go, then you will have to wait until your fish are very much larger than they are at the present time. In the wild state the Malayan angel fish, that commutes between fresh and salt waters, exceeds a length of 5 in. You would have to try out different furnishing schemes, with or without living plants and with or without sessault in the water. And one other point, it is reasonable to believe that the tank would have to be a very large one.

Please tell me the scientific name of the porthole catfish, its country of origin, and its behaviour in the aquarium?

The scientific name of the porthole catfish is Diaphema longipinnis. It is a member of the family Callichthyidae and is found in tropical South America. It is quite suited to a community tank provided no very small fishes (small enough to be gulped down) are included.

I have been told that holding a fish in one’s hand, if only for a few seconds, is little different to touching it with a red hot poker. Is this true?

The answer is no. The surface temperature of the skin, particularly that of the hands dipped into the aquarium, is much lower than that of the internal temperature of the body which, in normal health, is about 98°F. It follows, therefore, that a tropical fish can hardly be damaged by burning heat when it is held (momentarily in most cases) in the hand. But fish, one ought to know, should not be held in the hand unless this is really necessary. Another thing to bear in mind is to keep unwashed hands which have been in contact with soap, garden sprays, paint, and the like, away from fish and the aquarium.

My 18 in. by 12 in. by 12 in. tank is equipped with a thermostat, a 60 watt heater and a 40 watt striplight in a reflector hood. Every night, after the light is switched on, the temperature rises to a little above 80°F (26°C), but in the morning the thermometer shows a reading of about 72°F (22°C). The thermometer was recommended as one of the best by a reputable dealer, but I think it ought to prevent this dangerous fluctuation of temperature, don’t you?

A thermostat exerts no control over an external source of heat that causes the temperature of the aquarium to rise above that produced by the submerged heater. What is happening is this: when the temperature of the water reaches 75°F (24°C) or thereabouts, the thermostat switches the current off, but heat directed down from the lamp reflector continues to warm the water. Naturally, when the light is turned off the water cools down and the thermostat switches the heater on again. I do not think a gradual rise to about 80°F (26°C) is anything to worry about. In a larger tank the toplight would make little or no difference to the temperature of the water, that is the middle and lower levels of the water.

It has come to our notice that a neighbour has a large stainless steel aquarium for sale at a bargain price. As our house is kept warm throughout the year by electric storage heaters, we have been wondering whether it would be worth the expense and trouble to buy this tank and set it up for tropical fishes. We have been informed that plants and not a few exotic fishes could be kept at a warm room temperature. Please may we have the benefit of your advice as to the choice of suitable plants and fishes for such a tank if we decide to go in for this aquarium?

There are certainly quite a number of plants and fishes that would flourish well at a temperature range of from about 65°F (18°C) to 72°F (22°C). But I do suggest that if you buy the tank you also buy a heater to maintain a fairly steady temperature of about 75°F (24°C) for a month or so after introducing any of the fishes listed below. Then, after the fishes have settled down, gradually, very gradually, reduce the temperature to that of your room. With regard to the fish, I suggest: White Cloud Mountain minnows, neon tetras, Japanese rice fish, bloodfins, Corydoras paleatus, mollies, half-striped barbel (Barbus semi-
fasciolatus), golden barbs, and ticto barbs. Given the right quality and duration of light, the following plants should grow luxuriantly: Elodea densa, Sagittaria subulata, cultivated hornwort, spatterdocks, and striped or plain acorus rushes.

I wish to use some well-weathered fallen tree branches in my aquarium. But before I introduce them into the tank, after a preliminary soaking, of course, I should like to bleach them white. Can you tell me how to do this satisfactorily?
To every quart of water used to soak the branches in, add ½ oz. of oxalic acid crystals. When the branches have whitened, give them another good soak in several changes of water before placing them in the aquarium.

Can fishes be colour fed like canary birds are coloured fed by giving them special food?
Many years ago reports appeared in one or two American aquarium magazines that some domesticated fishes had developed improved colours after being fed with certain spices and fish roes, but since these reports appeared nothing has been heard of colour feeding since.

When was silicone rubber sealant first used in the manufacture of aquariums without supporting frames?
I do not know when silicone rubber sealant was first used by aquarium manufacturers, but the more advanced aquarists began to use it to make tanks without a wooden or metal frame early in the 1960s.

Is Palmaeochromis kribensis a plant eater?
Exceptionally yes, but generally speaking no. A pair on the point of spawning may pull at plants or even chew them, but they are more likely to do this if there are insufficient plants to afford cover or the fish have been kept on a lean diet or the plants stand in the way of their chosen spawning place.

Is there such a fish as an albino platy?
Yes, there is: and it was through the ever-observant eye of Dr. H. R. Axeldrood, the well-known writer on aquarium fishes, that the natural sport was noticed in a tank of fishes, separated from its fellows, and later bred from that the true albino strain was subsequently placed on the market.

I have seen some Geophagus jurupari in a dealer's shop and think they are very attractive in shape, colouring, and habits. Would a pair of this species behave themselves in a community tank?
Small ones mind their own business, but large ones in a small community tank will chase after and nibble at smaller fishes, or timid fishes. G. jurupari is best kept in a well-planted tank with bold fishes of about its own size.

What is a buckteethed tetra?
This popular name has been given to the beautiful but erratic-tempered Exodon paradoxus.

I have lots of freshwater shrimps in my garden pond. If I introduced a dozen or so into my tropical aquarium would they die on account of the tropical temperature or harm the fishes or both?
Our native freshwater shrimps seldom live for long in a tropical aquarium. If the heat doesn't get them, the fishes do. The larger shrimps are worried by the larger fishes, and the small shrimps are eaten by all but the smallest fishes in next to no time.

**COLDWATER QUERIES**

By A. Boarder

Could you tell me if six-inch tench are suitable for an aquarium and their food requirements?
Tench of this size would only thrive in a tank not less than 36 in. long. Even then you would not be likely to succeed with more than four or five fish. Tench feed on small crustaceans, worms and larvae of insects. In captivity they will take the usual foods as given to goldfish.

We have an eight-foot diameter aluminium pool which we bought for our children to swim in. Now that they have out-grown it we would like to partly bury it in the garden and make a goldfish pool. Will this be suitable and could we have a water lily?
As the pool has held water for some time it is not likely to be harmful to fish. A small water lily could be grown and one of the Nuphmarum pygmaea types would be suitable. There would be no need for a filter as long as some water plants were installed. I am pleased to hear that you look forward to The Aquarist magazine in Missouri, U.S.A.

I have some peacock-eyed bass which I believe are infested with gill flukes. I have read that these fish are sensitive to disinfectives. Would you recommend a safe but sure cure please?

**THE AQUARIST**
I know of no disinfectant which would be powerful enough to kill the flukes without doing harm to the fish. I suggest that you experiment with varying strengths of Dettol or T.C.P. Try a small dose such as a quarter teaspoon to a gallon of water. You must not leave the fish in the solution unattended and if the fish turn over and appear in trouble you will have to remove them to fresh water. Most fishes dash about a bit at first but are not unduly troubled and soon get over the immersion. Make sure at first that the fish are actually suffering from attacks by flukes. I have often described the symptoms in this magazine and a reference to back numbers will help you.

I have “Gro-lux” lighting over my coldwater tank and wonder how I am going to tell if the light is on for long enough each day. How can I judge this?

As with all forms of lighting over a fish tank it is necessary to experiment for a week or so. The condition of the plants and water will indicate if there is enough light or too much. If the plants grow well and the water does not green up quickly with algae you are on the right track. It is impossible to lay down any hard and fast rule as so much depends on the position of the tank in the room and the amount of natural light which can reach it. A tank in a dark room would of course need more light but you can only be certain as to the correct amount by trial over a period.

I have a 50-gallon tank with a filter pump and which is at 75°F. I keep a few goldfish together with a few well-chosen tropical fishes. My problem is feeding, as the goldfish take the food before the tropicals can get it. Also I have all artificial plants but find that there is a better selection of plastic plants in stores other than pet shops. Will these be all right for the tank?

To all true aquarists the thought of using plastic plants in a fish tank is terrible, and such would never be used by such a person. As you live in Palatine, Illinois, you may not be able to get proper plants. You would find that the water would keep in much better condition if you used growing water plants. These give off oxygen in good light, use up much of the foul matter in the tank by root action, and provide a certain amount of food for the fishes. Fishes will browse over water plants eating the soft algae which often forms on them. If you find difficulty in feeding the tropicals together with the goldfish, why not insert a glass partition in the tank thus dividing them off. If the glass was kept clean it would not be very obvious and so you could feed each type of fish according to its requirements. The goldfish being in such warm water would require very much more food than they would do if they were in cooler water.

I have some small leeches in my goldfish pond and I occasionally find one on my fish. Sometimes they drop off by themselves and I wonder if they are feeding on the fish or are they just on for a ride?

The leeches are certainly not on the goldfish for a ride. They are sucking the blood and juices from the fish and often when they are full they drop off. They take some time to digest this food and can swim around until they find another host. It is not easy to rid a pond of these creatures in a pond the size of yours which has so much vegetation. Try using a torch at night when the leeches are more active and may be caught near the sides. If unsuccessful try a piece of meat on a string at night lowered into the pond. Place some fine mesh wire netting round it to stop the fish from eating it and examine every morning.

I have noticed a small nearly transparent lump about a sixteenth of an inch across on the pectoral fin of one of my goldfish. I have placed the fish in a salt solution for a fortnight but it does not seem to do any good. What else can I do?

If the lump is just transparent, does not get any larger and is not inflamed in any way, I suggest that you take no notice of it. It is probably the result of a slight damage in the past, probably caused by a fish louse. If the lump is an actual fish louse the surroundings would have become inflamed by now.

With reference to the query as to cleaning mullm and mud from a pond: I have used an Abol garden spray and by telling the mud out I can kneel down and siphon out some of the mullm, but only clearing about 4 or 5 inches at a time. How I wish I could find a suction pump larger than this to do the job more quickly.

Sorry I do not know of such a pump. Can any reader help please?

I have a pond in a field where Tubifex can be seen but not in any great quantity. Could you suggest anything which would encourage them to increase in numbers?

Tubifex live mostly in filth and so if you can add some farm manure to the pond this would encourage the worms to increase. This would not be possible if the pond is used by cattle for drinking. It is probable that there may be more worms than you think in the pond, they withdraw into the mud on the approach of anyone. Take a fair-sized tea strainer and scoop up some of the mud where you see some worms. Swill this round and round in the water and you will find that the mud will be washed away and the worms will form into a neat ball in the strainer. You may be surprised at the number you can catch.

April, 1970
from AQUARISTS' SOCIETIES

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

THE annual general meeting of the Association of Southern Aquarists Societies (A.S.A.S.) was held at Southampton on the 15th May. Further details may be obtained from the Secretary, Jean Rowl, 7, Burley Road, Wotton, Southampton, Hants.

TWENTY-EIGHT members and their guests attended the March meeting of the Bourne-mouth A.S. and enjoyed the main item, a slide show, with taped commentary entitled "The Story of the Kilifi," during the evening the result of the Inter-club Quiz final was announced, Portmouth A.S. being the winners, by just one point. The Table Show resulted as follows: Breeders Livebearers (except guppies): 7, R. Cost; 2 and 3, B. Watkins, Danilo, Rashburn, Minnows: 1, J. V. Jeffery; 2, R. Cost; 3, W. Merrifield. Then followed an Auction and Raffle, and the evening was concluded by N. Walker, who gave a talk entitled, "Breeding the Danilo."

The annual meeting of the Harrow A.S. was held at the beginning of February and the new committee was elected as follows: chairman, J. Pollard; treasurer, D. Norris; public relations officer, Mrs. Pauline Young; show secretary, R. Morriss; and secretary, D. Young. An interesting and varied programme is being organized by the new committee and any new members will be more than welcome to come along to any of the meetings held on the second and fourth Tuesdays of each month, at the Club Rooms, Harrow, Middlesex.

The West Cumberland A.S. were given a very interesting talk at their February meeting about the setting and planting of an Aquarium, by Bob Standards. The Table Show was judged by E. H. Crocker, with W. W. Wake, R. Oxlade and W. E. Caldicote judging the various classes. The winners were:

Barbs: 1 and 3, B. Hay; 2, R. Frank; 3, L. Sharpe; Catfish: 1, L. Sharpe; 2 and 3, J. Ward; 4, J. Bar. After the judging Mr. Martin gave a very interesting demonstration on the value of the phil and hardkist kits. New members are always welcomed, and further details may be obtained from the Secretary, 122 Main Street, Workington, Cumberland.

The Hoylake A.S. in the Wirral, Cheshire, is causing considerable membership among both seniors and juniors, and is to hold its first Open Show at the Madoc's Hall, Banks Road, West Kirby, Wirral, on the 1st May this year. The members recently engaged in a quiz contest with the Binnersley Port Society, which resulted in a win by a small margin for Hoylake. Regularly fortnightly meetings held during the past few months have made even more interesting from time to time with special features. These have included a talk on "Fish Parasites," given by Dr. Chub of the University of Liverpool, and on another occasion an interesting talk on "Poisons," by A. J. Bland, chairman of the Hoylake Society. Both events were well illustrated with colour slides.

MEMBERS of the Merseyside A.S. recently had a visit from Jim Kelly. His friendliness and humour soon had all the members feeling at ease, and all listened eagerly to his talk, which covered the use of hormones and an ingenious use of pregnant females' urine to induce spawning in "difficult" fish. He also talked of the full revival care for clean, healthy fishkeeping and good feeding. At the conclusion he was asked to accept an honourary membership of the Society and was presented with a Society fish and how he got it. He gave members some extremely useful tips and hints, and a small number volunteered to form a study group. Members interested will be able to arrange their own meetings and he has expressed his willingness to hold the initial meeting at his home. Subsequent meetings will be arranged by those who join the group, to suit their collective convenience. The idea is to study various facets of the hobby—for example, the identification and care of common ailments, simple water chemistry and the adoption of plants to tank environment. Study group members can suggest and conduct experiments and then discuss the results at meetings. Shirley will report findings via the Society magazine, thus allowing all members to benefit from the knowledge gained.

A FILM quiz was the chief event at the first February meeting of the Hyde A.S. This was won by one of the junior members Master S. Johnson, with twenty-one points out of a possible thirty-six.

The second of the month comprised a Table Show and a guest speaker. Mr. Taylor of Belle Vue was the guest speaker. He gave an illustrated talk on the keeping and breeding of marine tropics at the Zoo. The Table Show was well supported by both Junior and Senior members and the defending champion, Ron Howes of Colne, was in a close season in fine style with a second and three thirds to give him third place overall. The full results were:

Seniors—Livebearers: 1 and 2, J. Campbell; 3, A. Pass; 4, J. Price; 5, H. Anderson; Cichlids: 1 and 2, Mrs. J. Barker; 3, R. Andrew; A.O. V.: 1, B. North; 2, R. Parsons; 3, M. Pass; 2, Master C. Pass; 3, Master W. Howell; Senior: Best Fish in Show: Master C. Pass. Junior: Best Fish in Show: Master C. Pass. Further details of the Society which meets every other Wednesday at the White Hart Hotel, Floryfield, Hyde, Cheshire, can be obtained from the Secretary, R. Riley, 133 Manor Park Road, Glossop, Derbyshire.

THEH February meeting of the Cambridge and District A.S. was the annual general meeting, when the following officers and members of committees were elected for the year: Chairman, Mr. Yeates; vice-chairman, Mr. Starrett; junior-secretary, Mrs. Pope; "Celtic" Hydra Lane, Burwell, Cambridge, assistant secretary, Mr. Pope; treasurer, Mr. Freeman; show secretary, Mr. Geoghegan, 16 Leyes Road, Cambridge; committee members, Masters Starrett, Junior, Langley, Love, Smith, Radford, Forrest, Phillips and Cave.

The president, Mr. Elksott, reviewed the previous year's activities stating that this had been an extremely good year for the Society. The membership was up to the seventy mark and the average attendance at meetings was some thirty members. He also made reference to the twenty-first Anniversary Show, indicating how successful this had been, though perhaps not financially. The Show this year will be held on the 21st June at St. Matthews Hall, Northfield Street, Cambridge. This will be purely a Club Show with a tropical furnished aquarium competition. The Society meets on the first Tuesday in every month at the West End Club, Pitney Street, Cambridge, and visitors are always welcome.

Mr. R. Fordier was the guest speaker at a meeting of the Hemel Hempstead A.S., whom he gave a talk on Aquaria Plant Life and how to propagate it.

The results of the Table Show for plants was a first and second for D. Maguire with Hydroplanum striox and Cryptocoryne willisii, the third place being taken by F. Caddick with an Apogonometricum nanum. The Breeders' Pair class attracted a record entry and resulted for A. Dibbsey with P. arboresis and Dwarf Platyfish, respectively. The third place went to P. Tucker with a pair of Brown scales.

There were over fifty members and guests present at the February meeting of the Welling- borough and District A.S. The entertainment consisted of a talk by Bert Jeffs of Bedford on eating fish and how to do it. He gave members some extremely useful tips and hints, and a small number volunteered to form a study group. Members were given a judging sheet and invited to judge twelve of his fish—putting his instructions into practice.

For the 14th April meeting it is hoped to have an evening of films provided by a guest speaker. The first was "Fish of the World," and it was hoped that he could also give a talk on the surface to breath in air as well as their normal method of breathing through their gills.

Prizewinners of the Table Show were:

Large Barbs: 1, Mr. Allen; 2, P. Carey; 3, R. N. Small Barbs: 1, P. Carey; 2, A. Turner; 3, M. Allinon. Best fish of the Show: Mr. Allinon.

At the main February meeting of the Bradford and District A.S., the theme was "Fish purchased from the British Kultisch Association were the main items. The first "Bottom Spawners and Perch Drivers," introduced the live laying technique. The quality of the photographs varied but most were very good. A picture of a male topichromis nigripinnis was really beautiful and was aptly described as resembling the "November Sky." Unfortunately, C. nigripinnis is a rather small annual fish and although 12 in. x 6 in. x 6 in., breeding tanks are sufficient, breeding and raising in cages was in evidence. The first part of this talk had been erased from the tape. Supper was followed by "Small Spawners," and "Spawners and their Petrology," both of which should attract new recruits.

The February meeting of the Table Show were as follows: Livebearers: 1, A. Firth; 2, P. Chorley; 3, J. S. Zemel. Barbs: 1, Mr. Mander; 2, Mr. Chorley.

A MOST successful year and a membership of eighty was revealed at the annual meeting of the Grimsby and Cleethorpes A.S., held in February at the Central Hall, Gainsborough.

Officers elected for 1970 were as follows:

Chairman, R. N. Gordon; Secretary, B. Greaves; treasurer, L. Evans; show secretary, E. Parker; press and publicity officer, C. Epton. Meetings are held fortnightly at the Newby Centre, Wesley Woods, Grimsby, and a Table Show every month.

Fishing 1970 include the first Annual Open Show, and an Exhibition Stand at the Grimsby and District Fish Show during the summer at the Memorial Hall, Grimsby. Fish for the Aquarium Society were maintained at the Grimsby and District Fish Show during the summer at the Memorial Hall, Grimsby. Fish for the Aquarium Society were maintained at the Grimsby and Distric
AN open night was held by the Bishops Grove A.S. to discuss whether to hold an Open Show during the year. This was welcomed as a great opportunity to meet societies from other counties and would also give the public closer insight into fishkeeping. A date for a similar show has yet to be arranged. A discussion on health of fish in home aquarium concluded the meeting.

GUEST speaker at the February meeting of the Harlech A.S. was G. D. Ellis, assistant keeper of botany, National Museum of Wales, who addressed members on the theme "Aquatic Plants," illustrating his lecture with slides. The judging of the evening's Table Show for Ananas-tid was Peter Battista. Results were as follows: 1. Master George Moody; 2. P. Morris; 3. A. Ward.

Following speakers were: 1. 21 April, Mr. J. Mortice (Hendon A.S.); 2. 28 April, Mr. J. Willingham (Horniman Museum, London); 16 June, Roy Skipper (House, Fudens, Herold Horne-stead). The Society's second annual Open Show has been arranged for Saturday, 16 March. Further details are available from the show secretary, A. J. Payne, 54 St. Andrew's Road, Bishop-Airwater, Cardiff (telephone 565552).

An enjoyable evening was spent by the members of South Leeds A.S. at the first Inter-Society Table Show held by The Pioneers A.S., Shipley. This was followed at their next meeting with a very interesting talk on Home Poultry Aquaria, given by G. Skinner, the F.P.S.A.S. lads. If anyone wishes to share the fun of future meetings, please write to the secretary, Mr. P. W. Smith, South Leeds A.S., 89 Green- shope Hill, Leeds, 13.

The following officers were elected to the council of the Society: chairman, R. Saville; vice-chairman, I. Matthews; secretary, C. C. H. Heal; 10 Mensaine Avenue, Acton, W. 3; treasurer, A. King; show secretary, R. Sullivan; general members, R. Tague, J. Bates; social committee, R. W. Chappel, W. H. Millett, would be pleased to exchange newsletters with other societies.

A very enlightening talk by S. D. Hill, district manager of Severnside and Trencher Water Company, was given to the Trencher and District A.S. recently. The Society has decided that the local water has the constituents it demands, and was also given some suggestive ways of making the water acceptable to fish.

The following Table Show, which was arranged for the Society, took place on Saturday, 16 March. The following officers were elected: chairman, I. T. Mathieson; and secretary, G. H. H. McLean.

THE Evesham and District A.S., which was re-formed in 1968 after being dormant for nearly five years, held its first district general meeting in February. It was held in the new meeting hall, which was opened by the retiring president, C. Saunders. The new officers elected were: president, C. Saunders; vice-president, G. H. H. McLean; secretary, M. W. W. T. M. H. H. Cooper; treasurer, J. M. Taylor; show secretary, J. M. Taylor; show society, J. M. Taylor.

BE SAFE BE SURE
Hilside Aquatics London N12

April, 1970

35
the members were entertained by club member Mrs. Rose Brewery who gave a talk on breeding Carthusian Cats. Table shows were well supported by the members of the club.

The club had provisionally arranged to hold their Annual General Meeting on 12th September, 1976, venue to be arranged.

New members are always welcome and meetings are held fortnightly at The Youth Centre, Clifton Road, Ilkeston.

THIR results of the Privates A.S. first inter-club show are as follows: Judges: 1, Mr. Taylor (Privates); 2, Mrs. Holdershaw (South Leicesters); 3, Mrs. and Mrs. Burrell (Aireborough). Bees: 1 and 2, T. A. Whiteley (Aireborough); 3, C. Holdershaw (Privates). 

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<td>Bacopa</td>
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<td>Cabomba</td>
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<th>AIRSTREEM SLIMLINE</th>
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<td>Fits in gap only 2&quot; wide yet has good capacity</td>
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<td>Can be used inside or outside the tank</td>
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<td>Outlet discharges from either side for versatility</td>
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<td>Adjustable hanger to ensure perfect fit for frames up to 12&quot; wide</td>
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<tr>
<td>Made in England by Inter-Pet for Top Value</td>
<td>only 14/6</td>
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| Filter fits snugly at bottom of tank | ✔ |
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A LARGE SELECTION OF HIGH CLASS FANCY GOLDFISH
ALSO OVER 10,000 POND FISH ALWAYS IN STOCK
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IN QUANTITY & VARIETY PLUS OVER 100 TANKS OF
THE USUAL & UNUSUAL IN TROPICAL
FISH & PLANTS ETC.

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Situated 5 Minutes From Gallows Corner Roundabout. A-12

HILLSIDE AQUATICS introduce
new lines from Germany

A new mini-air line, 3mm in diameter, flexible, inconspicuous, which remains in position. It is very much cheaper. Adaptors and 'T' pieces to fit all existing air lines and pumps easily available. All newly imported from Germany.

Air line (Mini hose size) ... only 4d per yard
Adaptors for connecting Mini hose to ordinary air line ... ... ... ... ... ... 3d each
'T' pieces for Mini hose ... ... ... 5d each
Diffuser Stone with stem, two feet of Mini Hose and adaptor ... ... 1/9 each
Diffuser cube shaped stone, with stem, two feet of Mini Hose and adaptor ... ... 2/3 each
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(All these three types of Diffuser stone are suitable for Marine Tanks)
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Hillside equipment is just that little better

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April, 1970
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AGAINST OODINIUM
SEAREM  4/6

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SNAIL-GON  3/-

AGAINST CHLORINE
CHLORINE GON  3/9

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METHYLENE BLUE  4/6

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PLANT NUTRIENT
FLOURISH  3/9

AQUARIUM ANTISEPTIC
DISEASOLVE  3/-

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BY
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BUTYL
JURALENE
POLYTHENE
WAVELOCK
LAKELINER

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NO DIRECT COMPETITION WITHIN 15 MILE RADIUS
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Cables: “AQUAIMPEX”, Moratuwa

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plants situated at: 77-79 Cadzow Street, Hamilton. 24483
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gardening and gives detailed information on installation
and care of ponds, plants, fish, feeding, breeding, etc. Plan your water garden with
the help of our expert knowledge and service. Send for brochure today.
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The Complete Electrical Control Unit
Suitable for all Types of Aquariums
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LIGHTS, EARTH & AIR PUMP
Eliminates Unsightly Wires, Loose Dangerous
Connections and Costly Breakdowns
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NEAT — SAFE — EFFICIENT
Fitted in Minutes With Simple Easy to Follow
Instructions
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HAYES, MIDDX.

April, 1970
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244 Vauxhall Bridge Road, London, S.W.1

Telephone: 01-834 5179

### ANGLE IRON TANKS

<table>
<thead>
<tr>
<th>Size</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>18 x 10</td>
<td>£3  1</td>
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<tr>
<td>18 x 12</td>
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<tr>
<td>18 x 14</td>
<td>£3 11</td>
</tr>
<tr>
<td>18 x 16</td>
<td>£3 13</td>
</tr>
<tr>
<td>18 x 18</td>
<td>£3 21</td>
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### STAINLESS STEEL METAFRAME

<table>
<thead>
<tr>
<th>Size</th>
<th>Price</th>
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<tbody>
<tr>
<td>18 x 12</td>
<td>£4  2</td>
</tr>
<tr>
<td>18 x 14</td>
<td>£4  6</td>
</tr>
<tr>
<td>18 x 16</td>
<td>£4 11</td>
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<tr>
<td>18 x 18</td>
<td>£4 20</td>
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### PUMPS & FOUNTAINS

<table>
<thead>
<tr>
<th>Size</th>
<th>Price</th>
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<tbody>
<tr>
<td>18 x 12</td>
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</tr>
<tr>
<td>18 x 14</td>
<td>£5  5</td>
</tr>
<tr>
<td>18 x 16</td>
<td>£5 12</td>
</tr>
<tr>
<td>18 x 18</td>
<td>£5 22</td>
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</table>

### FILTERS

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<thead>
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<th>Size</th>
<th>Price</th>
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<tr>
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<td>18 x 16</td>
<td>£6 12</td>
</tr>
<tr>
<td>18 x 18</td>
<td>£6 22</td>
</tr>
</tbody>
</table>

### HEATERS

<table>
<thead>
<tr>
<th>Type</th>
<th>Price</th>
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<tbody>
<tr>
<td>Es.8  Standard-25</td>
<td>£3  1</td>
</tr>
<tr>
<td>Es.8  Super-35, 50</td>
<td>£3  5</td>
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<tr>
<td>Es.8  Triple</td>
<td>£3  8</td>
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</table>

### WINDMILL GRAVEL

<table>
<thead>
<tr>
<th>Type</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pale Blue, Black, Yellow, Green, Light Red, Dark Red, Light Blue</td>
<td>£2  5</td>
</tr>
</tbody>
</table>

### ARBE PLASTIC AQUARIUMS

<table>
<thead>
<tr>
<th>Size</th>
<th>Price</th>
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</thead>
<tbody>
<tr>
<td>Bow-fronted</td>
<td>£2  0</td>
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</tbody>
</table>

### RUBBER SUCKERS

<table>
<thead>
<tr>
<th>Type</th>
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</thead>
<tbody>
<tr>
<td>Knob type</td>
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</tbody>
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### OUTSIDE FITTING (Glass of Aluminium ATL)

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<tr>
<th>Size</th>
<th>Price</th>
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<tbody>
<tr>
<td>18 x 12</td>
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### THERMOMETERS

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<th>Type</th>
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<tr>
<td>Es.8  Dumpy</td>
<td>£1  0</td>
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### MOUNTING

<table>
<thead>
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<th>Type</th>
<th>Price</th>
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</thead>
<tbody>
<tr>
<td>’Wondril’ Outside Fitting</td>
<td>£1  2</td>
</tr>
</tbody>
</table>

### ESTIMATED POSTAL CHARGES AT APPROX.

Aquariums, Stands, Gravel, Plastic and Rockwork at owner’s risk. Carriage at cost incurred after dispatch.

2/6 for orders up to £1; £1 2/6 to £5; £5 2/6 to £10; £10 2/6 to £20.

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- One Unusual Heavy Moulded Plastic
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- 4 in. nets
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- 3 x 5 nets
- 5 x 7 nets
- 7 x 9 nets
- 9 x 11 nets
- Breeder short wooden handles
- 6 x 9 nets
- Cameron Nylon nets
- 3 x 5 nets
- 5 x 7 nets
- 7 x 9 nets
- 9 x 11 nets
- Bricker Spring or Daphnia nets
- 3 x 5 nets
- 5 x 7 nets
- 7 x 9 nets
- Wood Holders 7 x 9 nets

### BIRDS

<table>
<thead>
<tr>
<th>Species</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Budgerigar</td>
<td>£1  0</td>
</tr>
</tbody>
</table>

### DUROGLOON

- Water hardness testing kit
- 20g
- 50g
- 100g
- 200g

### COLOMETER P8

- Ph. testing kit
- £1  5

### MISCELLANEOUS

- Hydro Aqua Sealer
- £1  5
- 10g
- 20g
- 50g
- 100g
- 200g
- 500g
- 1000g
- 2000g
- 5000g
- 10000g
- 20000g
- 50000g
- 100000g
- 200000g
- 500000g
- 1000000g
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- 1000000000000000g

### ANGLE IRON TANKS

- Bow-fronted

### STAINLESS STEEL METAFRAME

- Bow-fronted

### WINDMILL GRAVEL

- Pale Blue, Black, Yellow, Green, Light Red, Dark Red, Light Blue

### ARBE PLASTIC AQUARIUMS

- Bow-fronted

### RUBBER SUCKERS

- Knob type
BETTA FISH

Why not give us a look in and see one of the finest selections of tropical and marine fish in the country

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★ AQUATIC PLANTS
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TUESDAY 10-6
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FRIDAY 10-7 SATURDAY 10-7

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Special Tropical Aquarium Fishes During April

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A GOOD SELECTION OF WILD CAUGHT FISHES IN VARIETY DISCUS
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Extra large Green Velifera Molly 40/- pair.
Sailfin Sunset Platy Variatus from 20/- & 30/- pair to £5 pair.

Wonderful selection of Young and Adult Pond Fishes on display. Golden Orfe, Golden Tench, Goldfish and Fancy Varieties—Shubunkins.

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What is Ozone?
An unstable molecule comprised of three atoms of oxygen which readily breaks down to release active atoms of oxygen.

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What is the overall effect? Cleaner, safer water

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HOURS OF BUSINESS—Weekdays 10 a.m.—6 p.m. Sundays 10 a.m.—12.30 p.m. for sale of plants only.

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TERMS OF BUSINESS—Cash with order please. Fish sent by vall. Tropical minimum order £7-10s., insulated container and carriage 30/-.
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