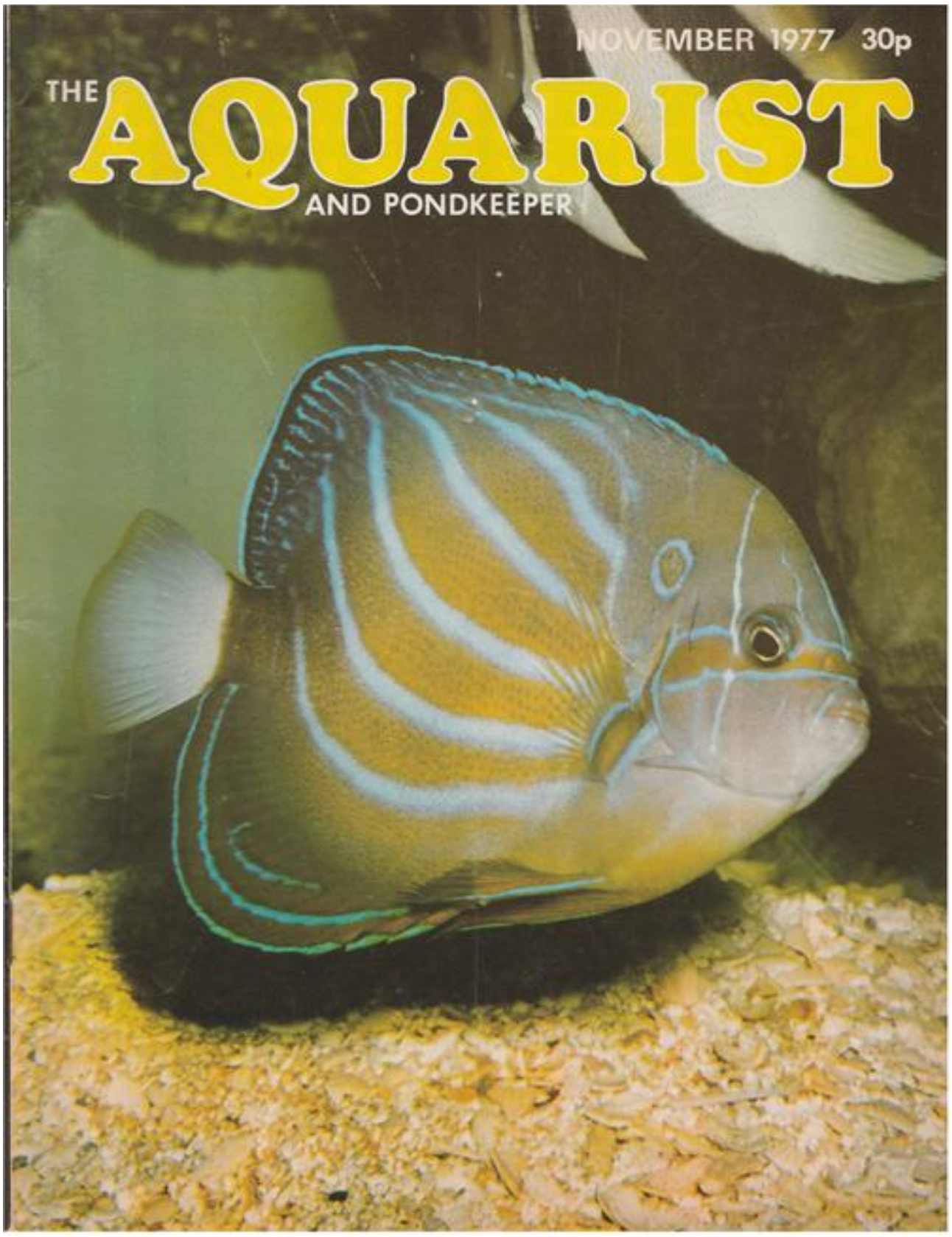
NOVEMBER 1977 30p

THE AQUARIST AND PONDKEEPER



THE AQUARIST AND PONDKEEPER

The Aquatic Magazine with the Largest Circulation in Great Britain

Published Monthly 30p

Printed by Buckley Press
The Butts, Half Acre,
Brentford, Middlesex.
Telephone: 01-568 8441

Subscription Rates:
The Aquarist will be sent post free for one year to any address for £5·30. Half-yearly £2·65.

MSS, or prints unaccompanied by a stamped addressed envelope cannot be returned and no responsibility is accepted for contributions submitted.

Founded 1924
as "The Amateur Aquarist"
Vol. XLII No. 8, 1977

Editor: Laurence E. Perkins
Advertisement Manager:
J. E. Young

Our Cover:

Ringed Emperor Angelfish
(*Pomacanthus annularis*)
Courtesy of Waterlife
Research Ltd.

Contents

The Editor accepts no responsibility for views expressed by Contributors.

CHRISTMAS NUMBER

The December edition of "The Aquarist" will include a special article on Killifish, illustrated in full colour, plus a report on the British Aquarists Festival and many other features.

ORDER YOUR COPY NOW

FISH HOUSE ELECTRICS

by Pete Watson

A CLOSE friend recently telephoned and asked if I could pop over and have a look at his fish tank electrics. The water temperature of his community tank had dropped to about room temperature and he suspected electrical trouble. On my arrival he boldly announced that it was the thermostat that was at fault. Knowing that he was not particularly electrically minded I asked how he had arrived at that decision. He replied that whilst I was on my way over he had decided to start investigating himself, and had unplugged the tank electrical circuits from the mains and disconnected the heater and the thermostat. He went on to say that he then "fiddled" the heater across a live 13 amp socket and found that it did in fact heat up. To my horror, he then said that he had done exactly the same with the thermostat and (luckily) nothing had happened.

He was right as it so happened; the thermostat was faulty, although he didn't know why, nor how lucky he had been that the thermostat contact points had been open-circuit. The contact points were actually in the closed position but were electrically open circuit due to high resistance and heavy pitting at the contact faces. Electrically minded hobbyists will no doubt scoff at this chap's foolishness, but equally there may be many non-electrically minded hobbyists who are wondering just what he did wrong.

A thermostat is basically a switch which opens and closes automatically with changes in temperature, and is used in a fish tank to switch the tank heater on and off automatically. The thermostat is pre-set to a desired temperature (in community tank use this is usually around 75°F) and it will then close when the water is below that setting, to switch on the heater, and open when the water temperature is above that setting to switch off the heater. If the thermostat that my friend had placed across the mains had been (electrically) closed, as indeed it should have been as the room temperature was below 75°F, he would have placed what electricians term a "dead short" across the mains. This, at best, would have blown a fuse, but could have exploded the thermostat glass envelope into his hand, or face, with far more serious consequences.

Even though it happens to be true, the anecodote of my friend and his thermostat has little to do with fish house electrics; however, it does serve to illustrate the dangers to which hobbyists can expose themselves if they dabble with things that they do not fully understand. The combination of electricity and water can create potentially dangerous conditions anywhere, but in a fish house where there is the extra igredient of a humid atmosphere even more caution is required. Electricity is not a subject to be taken lightly, it can be lethal if mishandled. Fiddling around with electrics without a full understanding of what you are doing is akin to giving a five year old child a fully loaded shot-gun as a plaything.

Danger points

Before discussing some fish house electrical circuits I would like to maintain the theme of electrical dangers and the need for safety awhile longer, and have a more

detailed look at some potential danger areas. Most hobbyists would probably consider the greatest danger from electrics to be the risk of an electrical shock and whilst this is in part true, and should never be overlooked, a greater, and far more likely danger is the possibility of a serious fire resulting from what could be quite a small electrical fault. It is ironic, is it not, that even with the large volume of water that is usually contained in a fish house there is still a serious fire risk, especially in fish houses constructed from wood?

The new electrical regulations recently invoked have provoked much verbal and literary comment, but more to the point they have given a greater protection to the user of submersible electrical equipment. And though it may now be much safer to put our hands in a tank when the supply is on, we must remain aware of all the old dangers that are still present outside the tank. The first, and perhaps the most susceptible item that could present us with trouble is the electrical connector. The connector may take the form of a plastic terminal strip, or a small plug and socket in the 5 amp capacity range. In general these are used to connect the tank electrical equipment with the mains supply. The danger here is not so much from direct electrical shock, but that they may (and they very often do) become wet from water splash, or condensation, which then creates ideal conditions for internal tracking (the shorting of the live terminal to neutral, or earth, by the film of water). Should the film of water extend to the outside of the connector it will, of course, present you with an unpleasant surprise should you touch it at the wrong moment.

Condensation is really enemy number one; eliminate condensation and many electrical problems will go with it. However, this is an extremely difficult thing to do in a fish house, where for most of the year the temperature of the water in the tanks is greater than the outside air temperature. The humid conditions thus created give rise to a great deal of condensation, especially in the lower levels of the fish house where the air temperature also tends to be lower causing the humid air to condense on the colder items in this region. When this condensation forms on electrical connectors it soon leads to electrical tracking. Yet strangely, this tracking is very often a relatively slow process by electrical speed standards, and one can often see and hear the sparking as it tracks from one terminal to the other. This tracking process causes the connector to become extremely hot, often hot enough to burn out the connector and/or start a small fire, and if there is combustible material close by—well I need not go on.

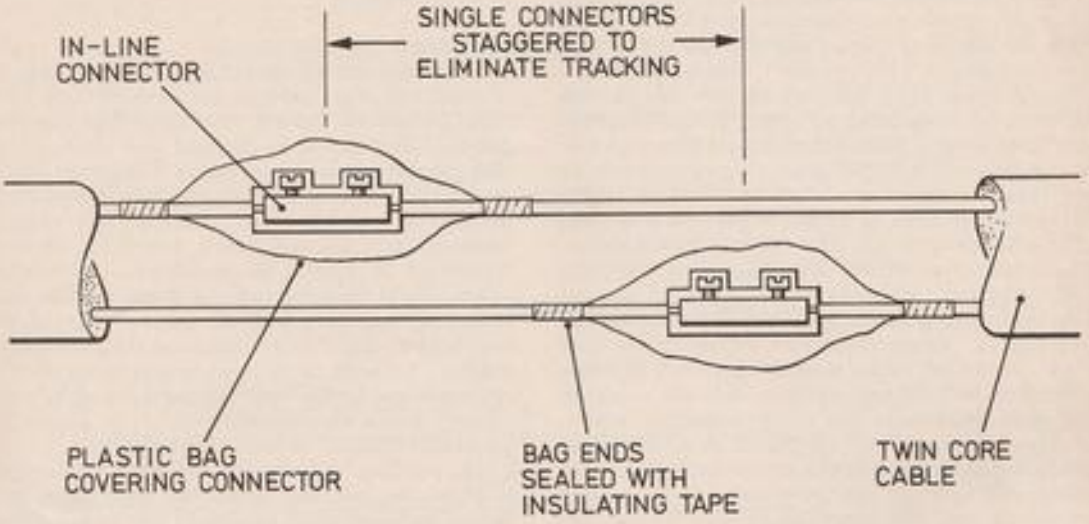


FIG 1

Every electrical connector in a fish house is a potential danger point. Thus the fish house electrical safety factor can be greatly improved if the total number of connectors used is reduced to the absolute minimum. For instance, it is wiser in the long run to buy a new length of cable than, through attempted

thrift, join two shorter lengths with an in-line connector. If heaters are used in the fish house it is better to use the heater and thermostat combined type and eliminate the need for the connector that would be needed to connect the separate heater and thermostat. Or when fitting a single-pole switch, carefully cut the outer insulation of the cable to which the switch is to be fitted and break only the live wire, leave the neutral unbroken, thus eliminating the need for a connector in the neutral line.

Where the use of connectors cannot be avoided problems with condensation often occur, and I have yet to find a 100 per cent condensation-proof connector suitable for use in a fish house. Wholesalers and retailers serving the hobby do not seem to have anything suitable, and although there are a variety of water-proof connectors available to the electrical trade, few are suited for fish house use.

The plug and socket connectors are usually favoured for quick and simple connection, and disconnection from the electrical supply, and are well suited to a now you need it, now you don't situation, such as a portable power filter, but they do have the big disadvantage of being difficult to protect from condensation when used in more permanent positions, such as the heating or lighting circuits. For circuits that do not require frequent disconnection from the supply it is probably better to fit the in-line connector and plump for safety, at the cost of a little inconvenience. To combat the effects of condensation on these connectors cut the cables to be joined to unequal lengths and stagger the positions of the connectors (see Fig 1). Single connectors will of course have to be used, but their resultant positions virtually eliminates the tracking problems that can occur on the more usual twin, and triple connection blocks. If the single connectors are placed in a transparent plastic bag as shown, they will be protected from water splash and although they may still "sweat" a little within the bag, little harm can be done by the condensation, especially if the "bagged" connectors are suspended, or are laid on a non-conductive and non-combustible material, such as asbestos. I particularly mention a "transparent" plastic bag because this allows the condition of the connector to be seen without too much trouble.

Positioning of connectors

The basic wiring out of a fish house is usually carried out before the tanks and tank support framework are installed, and whilst this is a sensible move, one should be careful to position power points so that they are fully accessible after the framework and the tanks are installed. Similarly, when wiring up heating and lighting circuits the tendency might be to hide the cable and connectors behind the tanks, or in positions where they will not be seen, but in a fish house this is unwise. Whilst it is desirable to hide the electrics on a home community tank, where they could constitute an eyesore, a more practical view should be taken in the fish house and the connectors should be positioned so that they are fully accessible for any maintenance that might be required at a later date. Having learnt the hard way that it is far from convenient, or comfortable, laying and kneeling on a wet floor trying to reach connectors that were placed neatly out of sight (and out of reach) I would strongly recommend that all electrical connections, no matter what type, be placed in the most accessible position possible. As a result the fish house electrics may not have aesthetic beauty, but they will be practical when the time comes for maintenance and renewal of electrical equipment. There is also the consideration that items that are out of sight are out of mind, and whilst this might be desirable with some things it is hardly the policy to adopt with electrical connectors in a fish house.

Earthing

When electrical equipment is used in a fish house it is important that there is adequate earthing of all metal framework, and any other equipment that could become "live" should an electrical fault occur. If the tank support framework is manufactured from Dexion, or similar, it should be earthed from more than one position to minimise the effects of any electrical resistance at framework joints, especially when the framework is painted or enamelled. All earthing cables should be connected to a common point which is in turn connected with the earth of the electrical supply by a cable of at least the same size as that of the supply. An earth circuit must have minimal electrical resistance, and for this reason the earthing cables within the fish house should always be of the largest size possible, within the bounds of practicability.

The earthing of tanks and the water they contain is often not practical, unless the tanks have metal frames, and even when the frames are earthed there is little protection for the user should the water within the tank become live. In the first instance, because of the glass and the putty, or in the more modern tanks the sealant, it is unlikely that there would be any contact of the water in the tank with the tank frame, and even if there were the inherent electrical resistance of the water would probably be high enough to prevent sufficient current leakage from the defective equipment to the earth circuit, to blow a fuse. What I am suggesting is that if you should have an old design heater or thermostat, or some other equipment where the live components of that equipment can come into direct contact with the water should a fault occur, the water in the tank will become "live" even though it may be earthed in some way. Although conductive, the resistance of water is quite high when compared with most metals, and the chances are that if a live cable were deliberately placed in one end of a tank

and an earth cable were placed in the opposite end of the tank, the fuse would not blow. This is not an experiment that should ever be tried in a fish house, or anywhere else for that matter, but it does illustrate that whilst a tank may be earthed there is still a real possibility of a lethal electrical shock should there be an electrical fault within the tank which brings the water into contact with "live" components. This perhaps also illustrates one of the reasons for the new safety regulations appertaining to heaters and thermostats. And whilst still on the subject of earthing, it is perhaps worth mentioning that it is not advisable to have copper wire in contact with the tank water, because over a period of time the copper deposits in the water could build up to a toxic level.

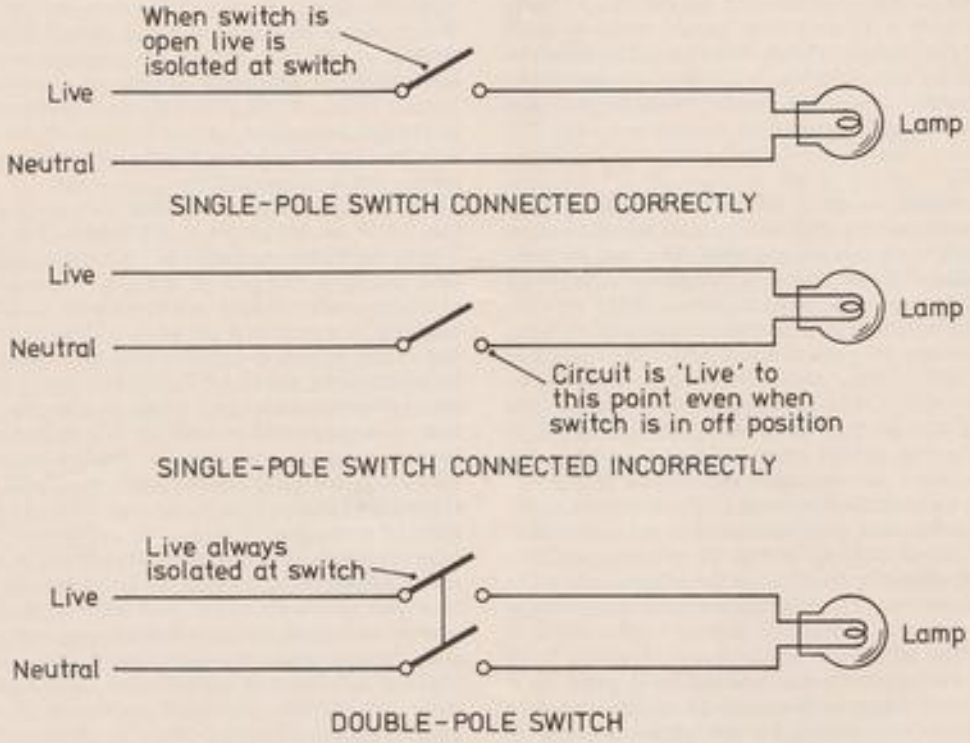


FIG 2

Fuses

Fuses are not the nuisance items that some hobbyists may feel they are when they are in need of renewing. A fuse is an electrical safety device which is designed to protect both the circuit and the individual should a fault occur. And bearing in mind the electrical dangers that are likely to be encountered in a fish house, the fuse is probably the most important component in the fish house electrical circuits. A fuse is purposely designed to be the weak link of the circuit, so that should a fault develop it will be the item that breaks first to isolate the electrical supply. The reason it will break is that the circuit is trying to draw more current from the electrical mains than the circuit wiring, and/or equipment used in the circuit is capable of handling. If the fuse were not there this excessive "fault current" would cause the circuit wiring, or the equipment to become extremely hot, and one or both would eventually become hot enough to cause a fire.

When a fuse blows, ninety-nine times out of a hundred it blows for a reason, it did not just happen, and as soon as it is renewed everything will be back to normal. The reason for a blown fuse must always be discovered. It may be an intermittent fault which could be very difficult to locate, but it still must be found and rectified. Increasing the rating of the fuse to a point where it will no longer blow is never the answer. Although it could indirectly solve the problem by allowing the fault to start a fire, which

when extinguished will possibly indicate where the fault was, that is if there is enough of the fish house left by then to worry about.

The cretinous act of putting nails or silver paper in the place of fuse wire causes me to think in terms of such a person deserving all they get, but unfortunately it might not be them that get it. Sadly, electricity has not the ability to direct its lethal qualities against only the fool, it is just as likely to strike at the totally innocent wife, child or friend. The same undesirable effects can be obtained from the seemingly less serious up-rating of the fuse capacity. For instance, a 30 amp fuse should never be used instead of a 13 amp, and similarly a 13 amp fuse should never be used instead of a 5 amp. Think of the fuse in terms of the friend it is, because when it blows it has saved you the expense of new equipment, possibly your fish house and possibly your life.

Switches

Most switches used in fish house electrical circuits are of the single-pole type, which means that they make, and break only one of the two (live and neutral) wires when they are operated. A double-pole switch will make and break both the live and the neutral. When fitting single-pole switches care must be taken to ensure that they are fitted in only the live (red or brown) wire. They should not be connected in the neutral (blue) wire. When correctly connected (see Fig. 2) the live line of the electrical supply is isolated at the switch, when the switch is open, and the remainder of the electrical circuit is "dead," and safe to work on if necessary. In the event of the switch being incorrectly connected in the neutral line the equipment (a lamp in Fig. 2) will be electrically live even when the switch is in the off position. The consequences of this incorrect wiring should now be readily apparent, and should anyone in this situation assume that all is well just because the switch is off and the equipment is not working, they could be in for trouble if they attempted to work on the equipment whilst it was still connected to the mains.

Special care must be taken in instances where the circuit is connected to the electrical supply by a two-pin plug and socket arrangement. The plug and socket of this type of circuit should be marked in some way to ensure when they are connected together the live pin on the plug aligns correctly with the live pin of the socket, otherwise there would be no guarantee that the switch would be in the live line. To avoid these problems, and any possibility of mistakes, it is advisable to fit double-pole switches whenever possible. However, no matter what type of switch is fitted the equipment should always be unplugged from the electrical mains before any work is carried out on the circuit or the equipment. If it is not practical to disconnect the equipment from the mains, the mains supply should be switched off, and then tests should be made to ensure that the equipment is electrically dead. Expensive test equipment is not needed, a small neon-light, test screwdriver, that can be purchased from any DIY or electrical store for a few pence, is all that is required.

Fish House Circuits

Having emphasised a few of the problems that might arise from fish house electrics we can, with these in mind, move on to discuss a few circuits that could be incorporated in a fish house. However, from the start I would stress that in the interests of safety, and economy, electrical circuitry within the fish house should always be restricted to the absolute minimum. And in an effort to reduce the circuitry we can (a) space heat the fish house as opposed to individually heating tanks, (b) fit only sufficient power points as is absolutely necessary and (c) place all fuse boxes, switches, etc, outside the fish house away from water splash and condensation.

For the dual reasons of safety and economy most fish house owners prefer to space heat, and although I have no figures to back up the economy claims, I tend to follow that line of thought. The alternative of individually heating each tank is a somewhat daunting prospect from the start. There is the initial cost of the heaters and thermostats to consider, added to which there would be the cost of the heater clips and the thermometers that would be necessary in each tank, and the overall cost of the wiring and circuitry needed to supply these heaters. And as we have seen previously, for each heater circuit we would require at least one electrical connector, and for each connector there is a potential danger point. There is also the lesser problems of the heater units getting in the way, and possibly being broken by knocking against the tank glass as fish are netted, and the routine and daily maintenance of checking individual tank temperatures and renewing heater clip suction cups, etc.

If the fish house is space heated there need be no electrical circuitry involved, especially if gas or paraffin heaters are used. However, without elaborate control systems non-electrical space heaters can be difficult to temperature regulate, and thermostatically controlled electrical space heaters are probably the better bet for hobbyists who are away from home during the day and cannot rely on the family to keep an eye on the fish house. The type of heater used depends much on personal preference, but the choice usually narrows down to either a forced air fan heater, or a convection heater. In my experience there is little to choose between the two types, although the fan heater does have the slight disadvantage of being directional, and any tanks in direct line can overheat if suitable precautions are not taken to avoid this situation. If the heater selected has a built-in thermostat control, all supply connections, switches etc, other than those within the heater, can be taken

outside the fish house where there is less danger from condensation and water splash.

If we now assume that the fish house will be space heated we have only to assess what other power points we are likely to need within the fish house. For those that prefer to use a power filter there must be a power point to which this can be connected, and as it would normally be used as a portable item a plug and socket type connection would seem the most suitable type. Similarly a power point might be required to facilitate heater units for one or more tanks that for some special reason would be required to be kept at a higher temperature than that of the fish house. These power points are probably better protected from the effects of condensation if they are fitted in the upper levels of the fish house where the temperature tends to be high and the condensation slightly less.

Other electrical circuits that will be required in the fish house can, in most instances, be supplied from outside the fish house. For instance the lighting circuits and the circuits for the air pump or blower can be supplied and switched from outside with little or no adverse effects. Which leads us nicely to the third suggestion that all switches, fuse boxes, etc, be positioned outside the fish house. The equipment itself must in most cases be inside, but this is not where the problems usually develop, because almost all electrical equipment gives off heat whilst operating, and this heat has the effect of driving off the harmful condensation. It is the stationary connections and power supply points that gradually succumb, and if these can be removed from the danger area then so much the better. It is an easier task to build a small (wooden) water-proof, switch box outside the fish house that will keep out the worst the British climate has to offer, than it is to combat the conditions within the fish house.

The next important factor is to ascertain from where the fish house will receive its electrical supply and how it will be distributed. The most common electrical supply source will no doubt be the household mains, but caution should be exercised, and the supply should not be taken from the most conveniently situated outlet socket and connected direct to the fish house circuits. The socket might well be capable of supplying the electrical demands of the fish house but a fault on any of the fish house circuits would then cause the household fuse to blow, and this might not be taken too kindly by other members of the household if it happened during Coronation Street, or Match of the Day.

The fish house electrical supply should be taken from a spare power fuse at the main switch box, not a spare lighting circuit fuse, and led to a main switch and fuse box at the fish house. At the fish house switch box the supply can then be separated into the power and lighting circuits that will be required. The power circuits can be separated into three basic circuits, as previously discussed, (i) power circuit for space heater, (ii) power circuit for auxiliary equipment, and (iii) power circuit for air supply equipment. Each of these circuits should be individually fused so that a fault on one circuit will not affect the working of the others, and the fuses should be down-rated from the main supply fuse so that in the event of a fault the fish house fuse will blow first. I have avoided mentioning actual fuse ratings because these will depend on the size of the fish house and the power required to heat and light it, and similarly where a 2 amp fuse would be adequate for a diaphragm air pump circuit, it would not be suitable for a motor driven air blower.

The lighting circuits could possibly be confined to two basic arrangements, the main fish house lights, and a night light circuit. The main lighting circuit is I think self explanatory and the only problem that might arise is the question of whether the lights should be of the tube, or the bulb type. The night light circuit might not be quite so familiar and is perhaps worth a few words of explanation. It is what the name suggests, a lighting circuit that is put on during the hours of darkness, mainly to discourage the fish from jumping out of the tanks, which they have a tendency to do when the main lights are switched off. They also have the advantage of creating a twilight, or moonlight effect which some fish require for breeding purposes. The circuit is basically the same as the main light circuit except that it would have its own fused supply and consists of lights with very low wattage output. There are many other minor reasons for fitting night lights in a fish house, not the least of which is that whenever the fish house has to be visited whilst it is in darkness, these lights can be switched on first, thus avoiding the mass panic of startled fish and the unprofitable consequences.

In keeping with previous articles in this series I have again purposely avoided offering advice on how the work should be done. However, whereas before it was reasonably safe to assume that the hobbyist was a fairly competent DIY enthusiast, it is an entirely different situation were electricity is involved. Unless a person has a sound knowledge of electrics it can be extremely dangerous to operate on a DIY basis. If there is the slightest doubt as to what size of cable should be used, what the rating of a fuse should be, or whether the circuit is capable of handling the equipment that has to be installed, then seek the advice of a fully qualified electrician, *not* a fellow DIY enthusiast, a fully qualified electrician. Mistakes with electrics have a nasty habit of being rather permanent. And as for visiting fellow hobbyists' fish houses where the electrical wiring resembles the web of a drunken spider, and looks just about as safe, I can only suggest that you keep your hands firmly in your pockets.

OUR EXPERTS' ANSWERS TO YOUR QUERIES

READERS' SERVICE
All queries MUST be accompanied by a stamped addressed envelope.

Letters should be addressed to Readers' Service, The Aquarist & Pondkeeper, The Butts, Brentford, Middlesex, TW8 8BN.

TROPICAL QUERIES

by Jack Hems

Flying Fox

I should like some information on the flying fox.

The flying fox or pal is known to science as *Epalzeorhynchus kallopterus*. It inhabits running waters in Thailand, Sumatra and Borneo. It grows to a length of about 6 in. in the wild state and to a fair size in the aquarium. It is peaceable but given to sudden mad dashes about its tank. Any food suitable for an omnivorous species suits the flying fox and it is particularly fond of browsing on mossy algae. It is a member of the family *Cyprinidae*.

Please let me know the preferred food and maximum size of *Pantodon buchholzi*.

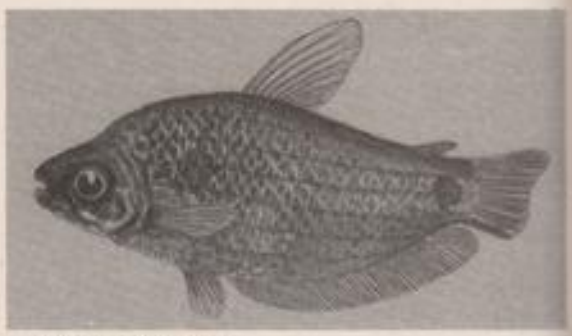
You can hardly go wrong if you offer flies, gnats, gnat larvae, spiders, surface-cruising fry (livebearer or oviparous) or whiteworms or *tubifex* worms dispensed from a perforated worm-feeder fixed an inch or two above water level. It is easy to hatch blow-flies from anglers' maggots. *P. buchholzi*, popularly known as the African butterfly fish, attains a length of about 5 in.

How long must I wait until it is time to separate a pair of *Cichlasoma severum* **from their young?**

As soon as the fry are taking food and start bickering among themselves, it is time to separate them from their parents. Bear in mind though that the growing-on tank must be as spacious as possible, well-aerated and kept scrupulously clean.

Please give me some advice on the care and behaviour of *Chaca chaca*.

C. chaca is native to India and the Malay Peninsula. It grows to about 8 in. and is sluggish or quiescent during the day. At night, however, it moves about the aquarium and searches the bottom for food. Feed it on worms, raw lean meat, flake food, and the like, and keep its water at a temperature in the middle to upper seventies (°F). It has a large mouth and can swallow small fishes at a gulp. Ordinarily, it does no harm to fishes it cannot swallow, that is to say well-built fishes or fishes that keep near the middle or upper levels of the water. Even these, however, are best if on the large size.



Markiana nigripinnis

I should be grateful for some information regarding the country of origin and maintenance in the aquarium of a characin called *Markiana nigripinnis*.

M. nigripinnis is native to tropical South America and reaches about 4 in. It is characterised by a

very long based and narrow anal fin, a short-based dorsal fin and strongly compressed flanks coloured green enlivened with red spots and a silver horizontal band. It eats anything and is not to be trusted among smaller fishes in a community tank.

I have just acquired a small *Serrasalmus nattereri*. Please advise me on the size of tank best suited to this fish and whether the tank should be left plain or furnished with rocks and plants?

S. nattereri can attain a length of about a foot. Therefore it requires a roomy tank to allow for good growth. Growth, however, is not all that rapid after the first nine months to a year. So, for a couple of years or so, a 24 in. × 15 in. × 12 in. tank will be all right. Decorate it in the usual way with plants such as *Vallisneria spiralis* and suitable stones or plants alone. Do not forget to keep the top of the aquarium well covered with a stout sheet of glass, for *S. nattereri* is an accomplished jumper. Needless to say, a red-bellied piranha jumping about on the floor is something of a problem. It has razor-sharp teeth and a terrible bite.

Has the catfish *Pimelodella pictus* ever bred in the home aquarium?

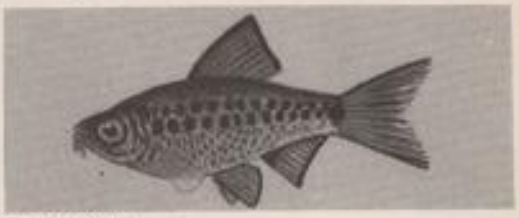
I have found no record of this catfish breeding in captivity.

Can you recommend any way of ridding a tank of the pest *Hydra*?

It has been said time and time again that species of *Trichogaster*, kept short of live or dried food, will search out and devour hydras. A more certain way of killing them is to add five grains of ammonium sulphate to every gallon of water in the aquarium. At this concentration fish and plants should suffer no untoward effect. If you have a spare tank lying empty, then remove all fishes and plants into this and raise the temperature of the hydra-infested tank to 110°F. and hold it there for at least half an hour. At the end of this time all hydras should be dead.

I wonder whether you could shed any light on my problem? I have a 48 in. × 15 in. × 12 in. tank well-stocked with a variety of tropicals, yet they never seem to make any growth. The light is bright and the plants are all right. Food given is a mixture of dried food, white-worms and shredded meat.

You failed to mention the number of fishes you are keeping in your tank or, of almost equal importance, their names. Not more than about thirty platy-sized fish should be kept in your tank. Further, all very boisterous or non-peaceable fishes should be excluded. Medium to large-growing fishes require plenty of swimming space to reach full size. If too much chasing about and bullying takes place in a tank the growth of most fishes will be retarded.



Checker Barb

I am a beginner in aquarium keeping and up to now I have not enjoyed any success. My tank is 2 ft. long and I have a cement bridge in it and a lump of stone brought back from the seaside. The few plants I have bought have turned yellow and pulpy and guppies, swordtails and checker barbs have all died. Where am I going wrong?

Siphon all the water away and throw out the cement bridge and the lump of stone from the seaside. In all probability the first is dissolving out lime and the second too much lime or salt or both. Make certain the compost on the bottom is non-calcareous. Always buy your aquarium compost from a reputable dealer. Any old grit or sand will not do. Plant your non-calcareous or mildly calcareous compost with a mixture of *Hygrophyla polysperma* and species of *Cryptocoryne* and give your tank about 14 hours a day of electric light. A 20-watt flourescent lamp would prove adequate. Alternatively rig up two 40-watt tungsten lamps in a reflector hood. Introduce a single pair of guppies or platies and see how they go on. If they are still flourishing after a month is out then, I think, it would be reasonable to assume that the tank is in a healthy condition. Read plenty of books on the subject of aquarium keeping and pay careful attention to feeding and food.

Is it possible to construct an all-glass tank about 5 ft. × 15 in. × 15 in. without fear of the weight of water forcing the sides or bottom out?

The answer is yes provided you use a proper silicone rubber aquarium sealant and the correct thickness of glass. Quarter-inch plate glass would suit your requirements satisfactorily.

I have been told that if I scrape the dark green algae from my plastic aquarium, I will end up with a mass of hair-fine scratches on the sides. Is this true?

If you use a razor-blade scraper then you will make scratches on your plastic tank. Try and remove the algae with a piece of sponge or foam rubber. If this is not very successful, empty the tank of its contents and rub it well with a piece of scrim saturated

Continued on page 351

COLDWATER QUERIES

by Arthur Boarder

I would like to breed Golden Orfe, and wonder if it will be beneficial to create moving water in my pond?

I would not try this experiment. Unless you are very fortunate, your pond will have a lot of mulm at the bottom and moving water will disturb this and make the water cloudy. This is a condition which the Orfe do not like. You must have clear, well oxygenated water to encourage your fish to spawn. Make sure that this is so and then you can help matters by running in some fresh tap water. If the pond has no adequate overflow, you should remove some of the water. Then run in the fresh water from a hose fitted with a rose fitting. Fix the hose end a couple of feet or so above the water. A garden fork stuck in the ground with the hose through the handle is a good idea. When you want the fish to spawn run the water in either late at night or very early in the morning. This encourages the fish to spawn. The fine spray ensures that the water in the pond is not disturbed and that it is well oxygenated. Any effects of chlorination will be largely neutralised. Have some fine roots or fine-leaved plants anchored at the side near the surface to receive the eggs. You can then collect them for hatching and rearing in safety.

I am trying to breed Bitterling, but although I have seen the fish apparently spawning in a mussel, I never see any fry. How long do the eggs take to hatch?

It is usually four or five weeks before the fry leave the mussel. A lot will depend on the temperature of the water. It is probably fairly cool at the bottom of the tank and so plenty of time must be allowed before the fry will appear. When you are sure that your fish have laid and fertilised the eggs you could then remove them so that there is no fear of the fry being eaten by them.

I have a goldfish with a large lump on one side of its body which makes it swim erratically. What is this and how can I cure it?

This appears to be a cyst and there is little that you can do at present. If you try to remove the contents of this lump you could kill the fish. It is possible that the lump will burst of its own accord and you can then deal with the wound. Hold the fish in a wet cloth and gently press out any matter from the spot. Then treat it with a disinfectant such as T.C.P. or Dettol. Use a pad of cotton wool after seeing that as much moisture as possible is removed from the wound first. You can repeat this treatment every two days and the fish might recover. A little sea salt in the tank water could help, but do not use more than a desertspoonful to the gallon of water. The fish is sure to swim on an uneven keel owing to the deformity.

I would like to try my hand at breeding good quality fancy goldfish. Can you recommend any book to me which deals with the subject, and which varieties do you suggest that I try?

As you have had experience with the breeding of tropicals you could have some veiltails or Orandas. As you intend to breed them in tanks, you can have fish with flowing finnage, such as the two mentioned. These fish are not quite as hardy for keeping and breeding in an out-door pond. You will find all the information you require in my book, "Coldwater Fishkeeping." The methods I have described are the result of very many years of successful breeding of fancy goldfish. Should you come up against any snags, after reading the book, I shall be pleased to answer any query you may have.

There is a pond in the garden of the house I recently bought with water plants and goldfish. Three weeks ago I saw that the fish were spawning. I have now seen some fry near the surface which range from half an inch to an inch in length. Could they be from the spawning I saw and if so, why the difference in size?

It appears that the fry you saw are from different spawnings as the fry from a three week ago spawning would not be an inch long, if hatched in an outdoor pond. The larger ones could be at least two months old. If you wish to make sure of getting plenty of youngsters at future spawnings, it will be advisable to remove the plants with eggs attacked to a safe place for hatching and rearing.

I have a pond about 6 ft. × 6 ft., and my dealer tells me that it should be cleaned out every five years. Is this correct?

My advice is that you clean the pond out every year. A pond the size of yours will certainly collect a quantity of detritus on the bottom which soon become very smelly. If this is not removed each year it can build up to a dangerous level, especially if the fish have been well fed during the year. Once any leaves from trees or bushes have fallen from near

the pond is the best time to clean it out. Early winter is the best time as the water has a good chance of remaining pure for the winter. During this time hardly any feeding is necessary unless there is a very mild spell of weather. Most pond fishes are fairly quiet during the winter and if they had been fed well during the late summer and autumn, they should be able to go through the winter without being artificially fed. There is usually some form of food in the average garden pond on which the fish could find some nourishment by searching around.

Why does pond water turn green soon after the pond has been cleaned out?

This is the old question and the simple answer is that any water exposed to the sunlight will soon become green in colour. This is because of the presence of thousands of tiny single-celled plants known as algae. These plants are oxygenating and so do no real harm in the pond. They only make it difficult to see the fishes. If you put two containers of water in the garden and cover one up completely leaving the other open, you will find that the covered one will remain quite clear whilst the open one will be green. To get a clear water in the pond it is necessary to ensure that there are plenty of water plants present. Not only are the oxygenating ones very important but water lilies also serve a very useful purpose. Their leaves can shade out much of the sunlight. If your pond is very green, then it is well to empty all the water, and although fresh water can become green again, the useful water plants will have a chance of growing stronger and so tend to choke out the algae. Once you get a very good growth of plant life you will find that the water will remain clear. It is unusual to find a pond with a thick planting that is infested with algae.

I can get plenty of duck weed. Is this a good medium to use in the breeding pond to catch the fish eggs?

I do not recommend that you should use duck weed as a spawning medium. When introduced to a pond it will soon spread all over the surface. This is a fine happening if one wants to clear the pond of green free-floating algae but the trouble with it is that the fish could spawn all over the pond and many eggs could be lost. For controlled breeding of goldfish it is necessary to encourage the fish to spawn in one particular spot. This will enable you to gather the plants with eggs with no trouble. Although eggs would adhere to the roots of the duck weed, many would be lost as the fish spawn in most parts of the pond. I have found that the best plant for the purpose is Hornwort *Ceratophyllum demersum*. This plant has advantages not found in most other water plants. In the first place it has many very fine-leaves which are ideal for the reception of fish eggs. It has no roots and so when a bunch may have to be in position in the pond for a month or more, the plant does not die or become weakened. Another feature which I found very good is that bunches of the plant with eggs can be placed in a clean tank with no base compost and keep alive and giving off oxygen for the benefit of the eggs. A tank without base compost is more likely to keep in a good condition. When preparing for breeding it is necessary to have the bunches of plants for the eggs in position early in the season. The bunches should be washed up and down a couple of times every day, to clear off any detritus which is likely to form. This lying on the leaves will prevent many of the eggs from adhering properly. If you used duck weed all over the surface of the pond, many eggs would fall to the bottom where they would soon be eaten by scavengers, such as water lice (*Asselus*).

I would like to go in for breeding good shubunkins but I do not know a lot about them. I understand that there are two distinct kinds and wonder which would suit me best?

There are two recognised types of shubunkin, the Bristol and the London. Both should be similarly colourful but the London type is rather more suitable for breeding and keeping in the garden pond. The Bristol type has more flowing finnage which could give some trouble in a pond during a severe winter. In a pond the London would not look so very different from the Bristol. When the term "Bristol blues" is used this does not mean that the fish are all blue. A good shubunkin should have a good rich blue as a base colour marked with red, yellow violet and black. The brighter the colours the better the specimen. I consider that a well coloured shubunkin is as handsome as any Koi I have seen and much easier to keep in the average garden pond.

Is there a chemical which would kill the blanket weed in my pond?

The simple answer is yes. However, it must be realised that this is a plant and so anything which is strong enough to kill it will also kill all the useful plants in the pond as well. Blanket weed is a filamentous algae and once introduced to a pond can soon become a nuisance, covering most of the plants and sides of the pond. It can be controlled by having plenty of water plants and by pulling out any blanket weed seen. If a broken green stick is twisted among the weed, a large quantity can be cleared out. Repeat this process regularly and with the stronger growth of the other water plants you should be able to keep the pest in check.

My son wished to construct a garden pond and I shall be obliged if you could advise on which is better, a concrete one or a Butyl-lined one?

continued from page 353

KOI QUERIES

by Hilda Allen

I have been running a 24 volt mains-transformer type of submersible water pump to operate my undergravel filter but the transformer becomes quite hot after a few hours use. Is this usual and is it safe to use?

The small mains and transformer-operated water pumps are only really suited for intermittent running and the transformers do certainly overheat after several hours. It is a fairly simple matter to connect a 200 watt light bulb in series with the mains input side of the transformer. This will have the effect of reducing the voltage and current passing through the transformer which will thereby be protected against the risk of overheating. The pump is thus slightly under-run and its service life will be extended to meet the needs of continuous operation necessary for undergravel filtration. I can explain that the 200 watt bulb is connected in only one lead to the transformer and thus acts as a cheap, safe form of resistance. This is a proven, practical arrangement that can be applied to the low-efficiency electric motors driving such small water pumps, but is quite unsuitable for the larger, more efficient types of either submersible or external pumps.

Is it possible to keep Koi without any sort of filtration being used? As a beginner I find some of the information given about filters to be quite alarming.

My apologies for causing any alarm, it was not intended and the short answer to your query is "Yes, I suppose so." However, much depends upon the number and size of Koi you wish to keep successfully in your pond. I can only speak from experience and fish-keeping for most of us is at best a compromise between nature and what we can provide. Having decided that Koi were the most beautiful pond-fish I had ever seen, I promptly began adding them to my existing stock of goldfish, shubunkins, orfe and tench. That was the end of a previously well-established, balanced pond with clear water because I had failed to appreciate that Koi are so capable of swiftly changing the chemistry or condition of a limited volume of water. The following warm summer brought green water and the alternatives of making a larger pond, filtering the existing one or moving house. We decided upon the former two as being the cheapest and proceeded to filter the first pond in order that we might be able to see the Koi whilst their new pond was under construction. This proved highly satisfactory, indeed I believe we would not have kept all the fish we had, without filtration of the water; needless to say that under-gravel filtration was incorporated into the new pool and both filters are still in continuous operation today. I suppose we could have managed without filtration if we had been content to keep a few small Koi, with the aid of massive water-changes. However, being "hooked" on Koi we now have the pleasure of keeping large healthy Koi in acceptably clean conditions made possible by filtration. I doubt if anyone can keep or grow Koi without the use of a pump for aeration (always depending, of course, upon the size of both fish and pond) so if a pump is necessary why not use it to its best advantage by operating a filter?

I have been reliably informed that when stocking natural waters with carp the recommended stocking rate is 50 carp to an acre of water. The growth rate of the carp depends upon whether the water is considered "fertile" or "barren," that is with or without an abundance of natural food. Koi are coloured carp which we wish to keep; because few of us can have acres of water then we filter (clean) what we can have.

Perhaps time will decide whether or not water-filtration is necessary in your plans to keep Koi, but do remember that large Koi create bigger problems than small ones.

Can you tell me if and when I should stop feeding my Koi during the winter? I have six Koi between about six and twelve inches long at present.

I cannot give you a ready answer to your query as much will depend upon the weather we shall get during the next few months. I am not in favour of witholding all food during the winter months regardless of the weather conditions. By November generally the Koi are less active and require less food which should be of the "sinking" not "floating" type such as earthworms, maggots, bread-paste, cooked wheat or rice in limited quantities. Only food with which they are familiar should be offered. Two observations to be made are that with a sudden drop in temperature Koi may stop feeding, but if the cold weather continues for a few days they appear to become accustomed to it and will resume feeding to a certain extent. Secondly, there is a marked difference in the winter behaviour of Koi that have been over-wintered here previously and that of newly-imported Koi. The latter will sit miserably on the pool-bottom whilst Koi that have experienced our

Continued on page 340

MARINE QUERIES

by Graham F. Cox

READERS' SERVICE
All queries MUST be accompanied by a stamped addressed envelope.

Letters should be addressed to Readers' Service, The Aquarist & Pondkeeper, The Butts, Brentford, Middlesex, TW8 8BN.

I have been an avid regular reader of your excellent magazine for the last three years. Through the help of your informative articles I have progressed from one community tank to a fifteen tank tropical freshwater breeding house. I do also have a marine fish set-up and it is with this in mind that I decided to write to you for assistance.

Would it be possible to feature in your magazine any articles dealing with the treatment of marine fish using an ozoniser. I have scoured our local library of all books and other than a passing mention on the use of ozone, ultra-violet and protein skimmers there is no proper information on their use. The sort of thing I have in mind being, does prolonged use of ozone have any harmful effect on either the fish or invertebrates. What dosage does one start treatment with, do you build up the dosage or give the maximum. I am sure a series of articles featuring this type of treatment would be of interest to other marine fish keepers other than myself, as I have been unable to find such information elsewhere.

Regarding your searches for literature concerning the usage of ozone in the home aquarium, I must first inform you that similar to your own experience, my own lengthy searches of the technical literature have drawn a blank.

I have, in the interval between receiving your query and making this reply, spoken to a number of professional scientists engaged in fisheries research, and the consensus of opinion as to why there is nothing in the literature concerning the usage of ozone in fishkeeping is that none of them use ozone.

The many reasons given by these workers as to why they will not use ozone could be condensed as follows:

(*a*) The amount of ozone produced by an ozoniser cannot be effectively regulated accurately because the amount of ozone gas produced by an ozoniser is a function of *at least* seven (7) different factors which are:

(1) Mains voltage at the time of usage. The voltage at any point will vary from 210-240 volts during the day depending on demand on the grid.

(2) An ozoniser which produces 10 mgms. of ozone/hour when supplied with air at 4 litres/minute (i.e., a smaller type air pump), would obviously produce much more ozone if supplied with an air flow of 8 litres/minute. In other words when an ozoniser manufacturer says his machine is capable of producing 0-50 mgms/0_3/hr., what rate of airflow is he talking about.

(3) The state of internal cleanliness of the actual ozonising cell greatly affects ozone production.

(4) The humidity level of the atmosphere on the day of test will greatly affect the amount of ozone produced.

(5) Air temperature on the day of test will affect the level of ozone production.

(6) Ozone dissolves much more readily in liquids of low pH value (e.g. "blackwater" prepared for Discus species) than in liquid of high pH value, e.g. seawater.

(7) The amount of ozone going into solution in water of *any* chemical type will be largely dependent on the surface area of ozone gas exposed to contact with that water. That is to say that if one passed one litre of ozonised air or oxygen through Water Sample X in the form of minute bubbles one would dissolve more ozone in Sample X in unit time than if one passed the same litre of gas through Sample X in the form of coarse, large bubbles. This is primarily due to the well-known physical phenomenon that

any given volume of fluid will be characterised by a much larger surface area in small-bubble form than it will in larger bubble form.

These seven major factors (one could additionally list many minor factors influencing any given ozonising device's ability to produce ozone, such as the percentage of oxygen in the atmosphere, the amount of dust in the air, etc.), seem to have convinced professional fisheries workers that ozone production and usage is so unreliable as to be of no use to them.

(*b*) Owing to the substantial health hazard involved in ozone production and usage, the Ministry of Health publishes rigorous guidelines concerning its usage. These Government advices are continually circulated to fish farms and seem to frighten off workers who are not deterred by 1 above.

Notwithstanding these difficulties it is very well known that ozone is an extremely potent oxidising agent and as such may be used as a bactericide. I have personally used the gas on several occasions to cure Aeromonas Pseudomonas/Vibrio infections on the body and finnage of coralfishes and so have many other people. However, the difficulties in subsequently reproducing these results with other fishes and at other times may well be due to *A*(1) to *A*(7). Furthermore no-one seems to know whether the exact curative mechanism is that the ozone bubbles cause a decline in the count of pathogic bacteria in the seawater thus allowing the fish's own natural disease-defence mechanisms to overcome the disease, or if enough ozone goes into solution to destroy the bacteria which are actually *in situ* on the fish's body or fins. Indeed, the cure may be affected by both these effects occuring simultaneously, but whatever is the case, it would greatly increase the popularity of ozone usage if a scientific study could be made of the exact means by which ozone is effective as a bactericide in different waters.

I would add that all aquarium-hobby ozoniser manufacturers make the claims that ozone is not only bactericidal but will also cure oodiniasis, white-spot, fluke infestations, oxidise nitrite to nitrate and so on. The hobby would greatly welcome the publication of a paper or papers which *scientifically* establishes these claims.

In view of the notable lack of reliable data, I can only provide information from my own notes which arose from experimentally using ozone some ten years ago. These are as follows:

(1) **Amount of ozone.** Working on the basis of a RENA 301 as the air supplier, passing this aid through a commercially-available ozoniser and diffusing it through a 3 in. × ¾ in. × ¾ in. wooden block at a depth of 18 in. below the water surface, it was seen to be dangerous to exceed *an indicated* 1 mgm/0_3/hr/5 gals. of seawater. Ozonisation of the seawater in excess of this level caused severe respiratory problems for almost all the more delicate coralfishes in the aquarium. **However, one must stress that since none of seven influential factors (1) to (7) above were monitored at the time of conducting the tests, these results must be regarded with some circumspection.**

(2) **Duration of ozonisation.** It soon became obvious that the ozone was best used in two ways as follows:

Continual background ozonisation at 0·5 mgm/0_3/hr./5 galls.

Intermittent short bursts of ozonisation at 1·0 mgm/0_3/hr./5 galls. for a maximum of one (1) hour in any four (4) hour period as necessary to attempt to clear up bacterial infections.

KOI QUERIES *continued from page 337*

winters before will roam the pond, even swimming about under ice. Healthy Koi should be offered small amounts of food if the water temperature is 45°F or above.

Observation is the golden rule; no food must be left uneaten to pollute the water. Below 45°F the Koi generally become quiet, their rates of breathing and food digestion become slower and no food should be offered. The Koi must be left as quiet and undisturbed as possible during periods of hibernation. Let them choose when to be on the move again; their body temperature will fluctuate with the temperature of the surrounding water. At the risk of becoming boring I will again stress the advantages of deep ponds. Deep water largely protects the Koi from widely fluctuating water temperatures between night and day which may prove too exhausting for them. Relatively constant temperatures mean less stress for hibernating Koi.

Filters should be kept running but the water return may be directed slightly below the water surface. This prevents excessive cooling during frost and will usually keep a hole open in the ice. In cold water Koi still breathe and move, using up valuable energy; they should be kept as inactive as possible during hibernation but lightly fed at other times to replace this energy, otherwise they are unnecessarily weakened. There are no hard and fast rules; observation and winter conditions decide if and when Koi should be offered reduced amounts of food.

BREEDING CORAL FISHES IN CLOSED CIRCUIT SYSTEMS

Written & Illustrated by Graham F. Cox
(Director of Waterlife Research Ltd)

Introduction

The following is a brief record of the endeavours of the original Seaquariums Ltd., (1968-1970) and its later daughter-successor company Waterlife Research Ltd. (1970 to date) to breed coralfishes by the more difficult route, i.e. in closed-circuit marine aquaria using continually recirculating synthetic seawater.

The claim is made that the results currently being obtained with these methods and materials (i.e. 60-70 per cent survival working with those species of coralfish which attach adhesive eggs onto a solid underwater surface) are the first recorded large-scale successes of their kind supported by photographic evidence.

The claim is *not* being made that this is the first successful attempt to breed and rear coralfishes on a large scale. Full honour for that achievement must be accorded to Martin Moe jnr. and his co-workers in Tampa, Florida who as early as 1974 were rearing large numbers of demersally-spawning coralfishes by using the continual flow throughput system facilitated by their acces to unlimited supplies of free, clean, warm seawater and plankton, on the shores of the Gulf of Mexico.

The Past

When the author first kept coralfishes in 1961, the most frequently heard remarks were to the effect that, although the fishes were undoubtedly the most exotic members of the entire piscean family, keeping them alive in itself was virtually impossible and breeding them would never be achieved. This attitude still persists in diehard circles to this day and it is hoped that this paper will go some way toward dispelling these beliefs.

Our first (accidental) spawnings of coralfishes occurred in 1969-70, when a large pair of *Amphiprion ephippium* (= Tomato or Fire Clown) repeatedly spawned on a piece of rockwork adjacent to their anemone. Despite sustained attempts with every spawning no real rearing success was achieved.

When the eggs were left with the parents, hatching always occurred in the early hours of the morning (0300-0500 hrs.) and most attempts to remove the fry from the large (48 in. × 18 in. × 24 in.) spawning tank in a still viable condition were abortive. Attempts were then made to hatch the last two spawnings artificially along lines previously used by the author in successful breeding work with many members of the freshwater Cichlid family. That is to say that the egg-laden rock was carefully removed from the parents 2-3 hours before hatching was due to occur and transferred to a separate smaller tank filled with seawater from the spawning tank. A strong current of seawater was caused to pass over

The two parent fishes with a spawning of eggs laid some 55 hours previously. Male is on the left.

Same clutch of eggs six hours prior to hatching. Male is showing most interest in the spawning whilst the female makes angry gestures toward the camera lens.

Young *A. percula* fry at 18 days after hatching. The "boulders" are particles of oolitic coral sand—actual size 1.0mm dia. on average.

One of the two larger fry photographed on 8.6.77 at approx. 23.15 hours. Small dots are Phyto/Zooplanktonic organisms introduced as food and to facilitate water quality control.

the eggs by means of a wooden aerating block, and the water was treated with methylene blue. No filtration of any description was used. None of the eggs hatched. The eggs from the final spawning were similarly treated but not removed from the spawning tank to the smaller hatching tank until hatching had actually commenced. This resulted in the hatching of only seventeen (17) fry, the remaining 300-odd eggs failing to hatch and eventually turning the typically whitish-grey colour of dead eggs. The seventeen fry all succeeded in becoming free-swimming but eventually starved to death owing to their refusal to eat any of the microscopic particles of prepared food offered. Shortly after this the parents died in October of 1970 probably as a result of the debilitating effects of *nitrate* build-up.

At this time, we had not developed a sensitive nitrate test kit due to the then-current belief that ammonia/nitrite were the only nitrogenous toxins which one needed to monitor in closed-circuit marine biosystems. As a result of that belief the artificial seawater in this breeding tank was almost two (2) years old at the time of the parent fish's deaths, its pH and trace element content having been maintained within acceptable parameters during this period by the use of proprietary pH buffers and trace element additives manufactured by the Company and freely available to us for this maintenance work. With the benefit of hindsight, the large amounts of fresh and prepared foods which had been necessary to keep this large pair of wild Singapore clown-fishes in good spawning condition throughout this long period must have resulted in a huge nitrate concentration since neither algae-harvesting nor partial water-changes were effected throughout the entire period. It is now possible to estimate, in the light of our current knowledge, that at the conclusion of these early experiments, the nitrate content of the system's synthetic seawater would have been of the order of 300-400 parts per million (ppm = mg/litre) of nitrate. However, the level of nitrate-N on a coral reef down to a depth of 60 feet below the water surface rarely exceeds 0·000002 ppm (equal author's extrapolation from data published in **Discovery Reports,** volume 4) and is normally undetectably lower than even this minute trace.

Thus it is easily seen that our early, and admittedly primitive, attempts at seawater management produced nitrate levels which were 200×10^6 times higher, or, in other words, two hundred million times higher than those ever recorded on a normal healthy coral reef, and therefore we should not have been surprised that these early batches of eggs either failed to hatch or hatched into weak deformed fry. Equally, the deaths of the parents in seawater of such colossal nitrate concentration would not surprise us today.

Rather, perhaps we should be amazed that the parents even survived for two years in this increasingly nitrate-enriched seawater, let alone spawning several times before the nitrate levels rose to such orders of magnitude above coral reef normality that the effects upon their normal metabolism became terminal.

Throughout the period 1971 to 1976, we steadily refined our water management techniques/materials and our animal husbandry methods were steadily improved to the extent that by 1975 we could determine the sex *in vivo* (i.e. without the need for dissection) and spawn within 3 months (of importation from the wild state) and hatch over 22 species of demersally-spawning coralfishes. These species mainly consisted of damselfishes (Family-Pomacentridae) clownfishes (same Family as above) and gobies.

However, except when using very large, fallow Biosystems which supported "accidental" populations of Plankton, we never raised more than a half dozen of the fry beyond the *critical period*—a concept which has been differently defined by various workers, e.g. Fabre-Domergue and Bietrix (1897), Hjort (1914), Gulland (1965).

The present author's preferred definition (at least in regard to its application to the reproduction of demersal spawning coralfishes) is that of the Norwegian researcher Johan Hjort and for this reason the concept is referred to here as *Hjort's critical period.* This original concept, in greatly simplified form, may be represented as follows:—

That the massive mortality rate typical of marine fish reproduction in the wild state might be attributed to two principal causes as follows: (i) inadequate populations of species of planktonic food organisms (ii) unfavourable currents which carried the egg, larvae or fry into regions of seawater which, for whatever reason, were unfavourable to their (equal the eggs/larvae/fry) further normal development.

That as a result of the mechanisms (i) and (ii) above acting singly or in conjunction, a **critical period** *or* **catastrophic mortality stage** *can be identified in the reproductive cycle of marine fishes which chronologically correlates very closely with the period shortly after the yolk sac has been fully absorbed.*

By 1974-75 the present author's experimental work had shown that owing to the multiplicity of significant differences between the coralfishes reproducing in small closed-circuit aquaria which we were working with and the Norwegian spring-spawning herring reproducing in the North Atlantic system which Hjort had worked with, we would have to modify Hjort's ideas as to the *causes* of the critical period but not the validity of the critical period concept itself.

By a careful review of all the spawning/hatching/rearing laboratory notes accumulated since 1969, it was possible to show that with particular regard to the goal we had set ourselves (i.e. the successful reproduction of coralfishes in closed circuit aquaria

using synthetic seawater), there were at least four critical periods which are listed below in what the author regards as a diminishing order of importance:—

(i) The time when the developing larva had almost completely absorbed the yolk-sac and thus acquired sufficient strength to break away from the rock on which, as an egg, it had been laid and fertilized. NB: For logistical reasons we had, by this time, developed the system of removing the rock/shell containing the clutch of eggs away from the parents when microscopic examination of sample eggs revealed that hatching was due to commence in a short time. Consequently it must be recognised that, contrary to natural procedures, these developing larvae would receive no parental assistance in breaking open the egg-membrane when hatching was due.

(ii) The 1-36 hour period immediately after hatching when a sufficient density of plankton of acceptable species and ingestable size must be present at all times if the fry are not to reach the "point of no return"—so named by Blaxter and Hempel to describe that condition of starved herring larvae kept in laboratory aquaria without food until they reached a stage whereat, even when normally-acceptable food organisms were made available, the young fishes would not (or could not) show any feeding behaviour and proceeded to death by starvation.

(iii) Any period of time during the first 20-30 days after hatching, if the *nitrate* content of the culture water was allowed to proceed beyond a concentration of 7-10ppm. despite otherwise normal water quality parameters. NB: Throughout the whole period of development, from the laying of the eggs to the young fish reaching a total length of 15-20mm., normal water quality parameters (= "N.W.Q.P." in notes below) were defined as follows.

Nitrite/Ammonia/Ammonium

Never allowed to reach detectable levels on a test kit capable of reading levels as low as 0·125ppm.

Nitrate

Never allowed to exceed pale-pink viewing vertically down the test vial of a commercial test kit = less than 2·0ppm.

Diurnal pH Variation

Fawn/brown/mauve on a sensitive colorimetric kit (= Ph 7·9-pH 8·3).

Temperature

78°-82°F (25·5°C-27·7°C).

Specific Gravity

1·020-1·022 in the above temp range.

Oxygen Tension

90-100 per cent saturation.

Trace Elements

Maintained within natural seawater limits by the once-weekly addition of a commercial additive.

Algal Growth

Secured at a high level using "SEAGREEN"—commercial algal food.

Nitrite/ammonia/ammonium levels were controlled by filtration over beds of nitrifying bacteria. Nitrate and pH levels were controlled by the twin procedures of algae-harvesting (*Caulerpa* species) and partial water changes which were effected when, despite the addition of a proprietary brand of pH buffering solution to the seawater once weekly, the pH of the seawater did not remain in the range pH 7·9-8·3 for more than 24 hours after addition of the buffer to the system—thus showing that the alkaline reserve of the seawater had diminished to below the level at which it would be economically sensible to continue pH buffering at normal levels.

(iv) The transitional phase of adapting to and striking at a "new," larger species of zooplankton after the fry had become accustomed to eating the "old," smaller species. To a large extent this critical period can be reduced to extremely low limits by overlapping the availability of the smaller zooplankton with the larger species for 48/72 hours.

Finally, by late 1975 we were resigned to the prospect of having to develop plankton culturing techniques and we had temporarily abandoned our search for a prepared-food substitute for living phytoplankton and zooplankton on the grounds that our post-egg-yolk fry had never been seen to strike at any particles of the many and varied blends which we had produced or bought, and fry mortalities were massive using these materials. Never more than 3 fry were raised from a batch of 400-450 eggs by these means (= approx. 99·5 per cent mortality).

The Present

We have now refined the equipment, test kits, synthetic sea-water and water-additives to the point where, given adequately large and matured cultures of the six species of plankton necessary (= 3 species of phytoplankton and 3 species of zooplankton), we are able to reduce total mortality to as little as 30 per cent.

The following is an unedited report from the Company's records of an experimental rearing conducted to evaluate the efficacy of a new type of rearing box.

Spawning No. 83

Apmphiprion percula

0500 hrs. Tuesday 7.6.77. (Jubilee Day).

Larvae began hatching during early hours of this morning and by now I have 100 fry hatched. At 0630 hrs. still hatching apace and too numerous to

enabling suitable food organisms to be isolated and cultured.

Mr. Martyn Haywood, Livestock Manager, Waterlife Research Ltd. Mr. David Craske, Senior Aquarist with this Company during the period 1976-77 for his devoted assistance and support during the latter period of this work.

To all the members of Staff of this Company past and present for their unending support and encouragement, and finally to the members of my family for their tolerance of all the missing hours.

References

Blaxter, J.H.S., 1965
"The feeding of herring larvae and their ecology in relation to feeding." Calif. Coop. Oceanic Fish Invest., Rep. 10, 79-88.

Blaxter, J.H.S. and Staines, M.E., 1971
"Food searching potential in marine fish larvae." Proc. Fourth European Marine Biol. Symposium, 467-485.

Bowers, A.B. and Williamson, D.I., 1951
"Food of larval and early post-larval stages of autumn spawned herring in Manx waters." Red. mar. biol. stat. Pt. Erin 63, 17-26.

Fabre-Domergue and Bietrix, E., 1897
"Role de la vésicule vitelline dans la nutrition larvaire des poisson marins." C.R. Mem. Soc. Biol. (Paris) 10 Ser., Tome 5, 466-468.

Gulland, J.A., 1965
"Survival of the youngest stages of fish, and its relation to year-class strength." Spec. Publ. ICNAF 6, 363-371.

Harvey, H.W., 1955
"The chemistry and fertility of seawaters." Cambridge University Press.

Hjort, J., 1914
"Fluctuations in the great fisheries of northern Europe in the light of biological research." Rapport Process—Verbaux Réunion Couseil Perm. Intern. Exploration Mer. 20, 1-288.

May, R.C., 1973
"Larval mortality in marine fishes and the critical period concept." Proc. Inter. Symp. Scot. Mar. Biol. Assoc., 3-19.

PRODUCT REVIEW

TetraTest Laborett. *Distributed by TetraMin (U.K.) Ltd., Waterhouse Lane, Chelmsford, Essex, CM1 2UQ.*

Knowledgeable aquarists are well aware that many species of fish require water that is either hard and alkaline or soft and acid (within reasonable limits). All the same, in not a few cases the chemistry of the water is of no great importance provided the fishes kept are adaptable to varying conditions and their demands, apart from a proper temperature and proper food, are of the simplest. For all that, it is with the complete well-being of our fishes that we, as fanciers, are absorbingly concerned.

One of the reasons—nay, the paramount reason—why so many newcomers and comparative newcomers to the hobby fail to keep some, if not all, fishes alive for any length of time or indeed breed them (if they are of the sort likely or most likely to breed in captivity is due entirely to the water. In short, it has nothing to recommend it. Or put in another way, it has become tainted with built-up impurities (fish and vegetable wastes and so on) or is of a quality very unlike the water the fish are used to in the wild.

But how to overcome or remedy this difficulty? Well, an answer to this problem has been provided by TetraWerke of West Germany: the TetraTest Laborett. This water-testing kit, which comes neatly packed in a box some 12 in. × 10 in. × 1½ in., can be used by the marine or freshwater aquarist alike with complete confidence. There is nothing gimcrack or slipshod about its design or manufacture. Everything necessary for ascertaining the quality of your aquarium water is to hand as, for example, strong plastic vials clearly engraved, as to measurement scales, up to 10cc/ml, a rubber-bulbed pipette or dropper for adding the correct quantity of indicator to a vial, six bottles of indicators covering a low range of pH (4·8-7·5), a high range of pH (7·8-9·0), carbonate hardness, general hardness, concentration of nitrous salts (nitrite) which, in excess, soon prove lethal and 3 in. diameter wheels, with translucent coloured panels and serrated edges, for easy insertion and turning in a colorimeter (an instrument broadly speaking for comparing various colours against a measurement scale). All this makes water-testing simplicity itself. Therefore I urge all serious or enthusiastic aquarists to buy a TetraTest Laborett at the earliest possible moment. Its regular use will ensure healthier tanks, longer life for the fishes and, perhaps, explain why certain plants from widely differing environments refuse to grow in a particular set up.

JACK HEMS.

count. Began adding fresh Synthetica/Natura water at 0815 hrs. N.W.Q.P. Because phyto/zoo cultures are at an "unfortunate" period in their cycle, will have very little Phyto 2 and 3 and zoo 2 to play with. Accordingly 0830 hrs. transferred 10 fry to experimental rearing box in Tank 2 and 10 fry as a control in small stainless tank.

1200 hrs. Tuesday 7/6. N.W.Q.P. 9 of fry which were placed in experimental, rearing box dead—latter now rejected for this purpose but *Memo* investigate its usefulness at the Artemia stage, when fry would not be so easily trapped in it.

1540 hrs. Tuesday 7/6. Remaining 10 fry in stainless tank still looking good and occasionally striking at plankton introduced at 1530 hrs. though not seen to ingest any. N.W.Q.P. *but* No's *climbed slightly !*

2330 hrs. Tuesday 7/6. Only 9 fry found in stainless but all with fat abdomen—definitely now striking and ingesting. 20 per cent water change to reduce No's.

0200 hrs. Wednesday 8/6. Still 9 fry—all "hopping" with usual jerky motion and occasionally resting for up to 10 minutes on tank floor before setting off in search of food. N.W.Q.P. Bed.

0630 hrs. Wednesday 8/6. Still nine good ones. Size differentiation already possible—two larger ones now not resting on bottom but swimming continuously though still with jerky motion. N.W.Q.P.

0900 hrs. Wednesday 8/6. Still nine. Two superfry no longer hopping but cruise steadily through water in total 3D spatial control of movement. Other 7 fry still hopping jerkily but now no longer resting on tank floor at all N.W.Q.P.

2355 hrs. Wednesday 8/6. Can only count 5 fry but suspect we've entered secretive phase as usual—anyway too tired to search N.W.Q.P. Bed.

0745 hrs. Thursday 9/6. Prolonged search—found 7 fry all of which healthy and have clearly graduated to zoo 2 at which they snap on average once each 5-8 minutes. Suspect other 3 fry bought it during critical period. Have become very secretive and difficult to find N.W.Q.P.

2350 hrs. Thursday 9/6. 2 largest fry now 3·5 to 4·00mm. long overall and pale orange all over—both taking zoo 3 at rate of one zoo 3 each 69 minutes. These 2 superfry show no trace of melanin pigmentation whatsoever though other 5 weaklings still heavily melanin pigmented on all areas except cranial area N.W.Q.P. Bed.

0120 hrs. Sunday 12/6. Quite definitely seven fry remaining of original 10 introduced. Largest of the 2 superfry now swimming with a faint Clown waggle N.W.Q.P. Bed.

0220 hrs. Monday 13/6. 7 fry still remain. Thin white headband now clearly visible on 5 largest fry. 2 smallest fry still looking good but no headband yet N.W.Q.P. Bed.

1200 hrs. Tuesday 14/6. Can only count 6 fry although since missing one is the largest specimen. I suspect he is hiding—all fry now extremely secretive and taking many minutes to locate for a head count as usual. N.W.Q.P. but No's still mounting faster than algal removal coping. *Memo* 20 per cent change tomorrow a.m.

2345 hrs. Wednesday 15/6. Definitely seven fry and possibly 8—accurate count impossible because of usually secretive behaviour. 5 fry now have white waist band as well as head-band and have clearly visible first dorsal fin. All fry bright orange with vivid blue/white bands N.W.Q.P. Bed."

The author did not maintain written records of the subsequent development of these young fish since they would exactly parallel the development of many preceding spawnings for which adequate records already existed. However, their progress was recorded photographically (see accompanying prints) for the purpose of this publication and, at the time of writing they measure 20-28mm. in total length, and are fully pigmented as per the adults of the species. All being well they will join other coralfishes of our breeding for second generation reproduction experiments in 1978.

The Future

Our short and longterm objectives are as follows:—

A. To convince our coralfish suppliers in the tropics that, just as the tropical freshwater aquarium hobby only assumed appreciable proportions when neon tetras could be sold for pennies instead of pounds, so will the equally fascinating tropical marine hobby only become available to the man in the street when coralfishes are bred on a wholesale scale at correspondingly low prices instead of being hunted for, one at a time, on frequently dangerous coral reefs.

B. To either (i) successfully complete our development work on a prepared liquid suspension food which will produce *at least* a 50 per cent survival rate with coralfish fry, or (ii) greatly simplify our presently very sophisticated and expensive methods of culturing phytoplankton and zooplankton.

The effects of achieving (i) and/or (ii) above would be to enable the more advanced home marine hobbyist to breed his own coralfishes.

C. To assist in a small way in Man's advancement along the lengthy road he has travelled towards making this planet a beautiful farm instead of preserving it as a ferocious jungle—a jungle where the fisherman/whaler is now the most vicious and feared hunter out of all Earth's creatures.

Acknowledgements

I would extend my grateful thanks to the following:—

Dr. Richard Lincoln, his wife and Mr. Stephen Baynes for their invaluable assistance in supplying cultures of many species of marine plankton and thus

THE THIRD YORKSHIRE AQUARISTS' FESTIVAL

IT IS OFTEN said that, "*the longer one lives, the more one learns*", and this has certainly proved to be true of some of the organisers of the three Yorkshire Aquarist Festivals which have now been held. It had been stated, by some of them, that the quality and standard of the various society's tableaux on display at the Y.A.F., 1975 and again at Y.A.F., 1976, was of the highest possible level.

How wrong can you be? The standard of the competing tableaux at Y.A.F., 1977 outshone them all, and it is difficult to imagine how it was possible for some of them to be designed and built by the members of the various Aquarist Societies in just a few short weeks prior to the festival.

The future may prove that they can be bettered, yet again, but in what way I really cannot envisage.

The truly artistic design, and the very high quality of workmanship, would certainly not be out of place at an "Arts and Crafts" exhibition, and they were indeed, a credit to the many aquarists who had made them.

The panel of judges for the tableaux competition were Mr. Gerry Rhodes, and Mr. John Igoe who are both very well known and respected aquarists, and Mr. Anderson, manager of the Doncaster race-course, together with his secretary, Margaret. They had a very formidable task indeed, which they carried out in a most diligent and painstaking manner. I am sure that their final decision could not be faulted.

The first prize went to York and District A.S. for their wonderful accurate model of "York Minster" which had been built and carved out by hand, in Polistyrene; a truly magnificent piece of work.

Second place was won by Bridlington A.S. for their "Ship Wreck" which was a very close runner-up, beautifully made and finished off. It must have been a very difficult decision, for the judges to separate these two. Third place went to Worksop A.Z.S. for their very realistic "Shooting Gallery," very nicely done indeed. Fourth place was taken by Chesterfield A.S. with a "Silver Jubilee Crown", highly topical and very well done, and fifth place went to Castleford A.D.A.S. for their "Bingo Stall", another outstandingly fine exhibit. The remainder

of the tableaux entries were of the same very high standard, and were all a great credit to the members of the various Societies taking part. May I take this opportunity to congratulate them all on a truly magnificent effort. There were some 31 or so trader's stands in the hall, and they were kept very busy from the time the doors were opened until closing time on both days of the show. They had an excellent stock of fish and equipment, etc., the quality of the fish for sale being very high indeed, and there were many happy aquarists, (perhaps with empty pockets), taking home their new acquisitions which had been purchased at very reasonable prices.

"Best Fish in Show" was won by Mr. and Mrs. Scarle of Goole with a very fine Pike cichlid. "Best Exhibit" went to Mr. and Mrs. Fletcher of Doncaster for a beautiful Chang species of plant.

First in the "Fish of Fishes" was a fine *Amblydoras hancochii* owned by Mr. D. Harris of Mexborough; second place went to Mr. and Mrs. Vernon of Retford with a Green Chromide and third place was taken by Mr. M. Jordon of Bridlington with a Pink-cheeked Barb.

The trophies were presented by Councillor A. E. Gammage, chairman of the Doncaster racecourse.

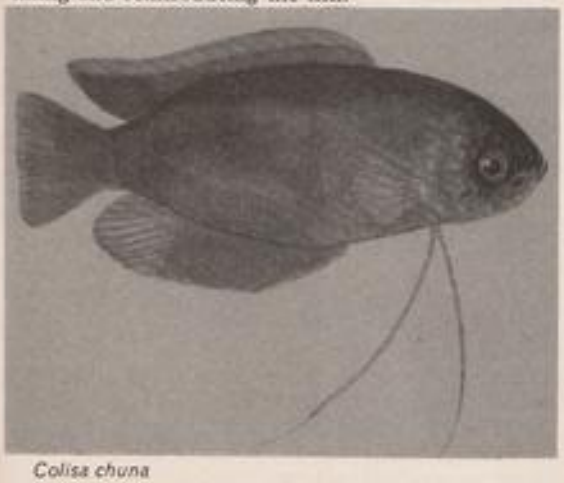
Upwards of 20,000 people passed through the doors over the two days of the show and there were many who were so delighted with the festival that they came to the management stand to offer their congratulations, so much so that a number of them, to whom we offer our sincere thanks, felt compelled to donate trophies which were on sale at the Y.A.A.S. management stand, to be presented to winners of classes which were without annual trophies, up until that time.

Yes, Y.A.F., 1977 was a resounding success, and we are sure that it will continue to be a permanent feature of the Aquarist scene for many years to come.

DENNIS GREENWOOD,

TROPICAL QUERIES *continued from page 333*

with dish-washing liquid. Rinse the tank well before filling and reintroducing the fish.



Colisa chuna

I have acquired a pair of *Colisa chuna*. Please fill me in on this gourami's requirements in the way of food, size of aquarium and breeding procedure.

C. chuna or the honey gourami seldom grows larger than about 2½ in. It is a timid species that is best kept by itself in a smallish tank of about 18 in. × 10 in. × 10 in. Plant it well with *Hygrophyla polysperma*, species of *Myriophyllum*, *Najas* or *Nitella*. For normal care a temperature of 72°F (22°C) to 75°F (24°C) is about right. Raise this to 78°F (26°C) for breeding. This species breeds like the dwarf gourami (*C. lalia*). That is to say it blows a bubble nest for the reception of the eggs and assumes much brighter colours. Food for adult fish must be small: dried or live.

I would like to set up an aqu-vivarium with the area above water level filled with moisture-loving or moisture-tolerant plants. Can you give me the names of some plants that would grow in an habitually moist and peaty bed?

Plants that jump to mind include *Microsorium pteropus*, the more miniature species of *Acorus*, various species of *Cryptocoryne*, *Ceratopteris thalictroides*, *Helxine soleirole*, *Vesicularia dubyana*, *Ficus pumila*. Acorus and helxine are quite happy at ordinary room temperature. The others require sub-tropical or so-called tropical heat. Bear in mind, too, that plants such as *Ceratopteris thalictroides* can attain a height of above two feet. *Ficus pumila* is rampant growing and requires room to spread.

I have just bought a pair of well-grown green sailfin mollies. Will they be all right in my community aquarium or should I give the fish the tank to themselves? What other basic needs are recommended?

I strongly recommend that you give your mollies a tank of about 36 in. × 15 in. × 12 in. with no other fishes present. Provide a bright light (natural or artificial) for about 14 hours a day and add about a teaspoonful of cooking salt (not refined table salt), to every gallon of water in their container. Mossy green algae should be permitted to clothe the back and end glass panels, for mollies—all mollies—flourish best with some greenstuff included in their regular diet of live food and dried food. Maintain a temperature in the middle to upper seventies (°F).

From a Naturalist's Notebook

by Eric Hardy

"Bufonid Love Song" was not the headline to a popular newspaper article on toads, but a learned paper in the Bulletin of Philadelphia Herpetological Society discussing the toad chorus down Texas way. Alas, there is less concern for the endangered New Mexico poisonous Gila monster *Heloderma horridum* than for the ficticious monster of Loch Ness; but recent research ranges through much of public interest, from panting lizards to vipers raiding bird nesting boxes to destroy titmice and flycatchers.

One of the puzzles of the common frog is the reason for reversing its sex when the temperature is raised to 80°F (26·6°C), a change caused by hormones. Prieau a French zoologist, has obtained this sex reversal by temperature only in larval amphibia and in embryos of tortoises and turtles. But the freshwater shrimp *Gammarus deubeni*, driven almost out of this country by the commoner *G. pulex* to inhabit brackish pools, except for a haunt at The Lizard, produces female offspring in high temperatures and males in low temperatures and males in low temperatures. Spring mating calls of frogs are stimulated by water-temperature more than by air or body temperatures, it has been shown, while water-temperature and density of numbers control the growth of frog-tadpoles.

Russians have shown that newts are influenced by smell as well as sight, while salt-excretion, well known in sea-snakes and sea-turtles, has been found in the American beach-lizard *Ameiva quadrilineata*. Sea-turtles are good subjects for experimental research. Some of the longest turtle-migrations have been disclosed by tagging leatherbacks breeding in the Guianas and subsequently caught on the coasts of U.S.A., Mexico, Venezuela and across the Atlantic in Ghana. 72 Ridley's turtles, probably the commonest turtles in the world today, marked in the same area, were recovered so far west as Barbados, Trinidad and Isla Margarita and as far east as Amapa, Brazil. All but one of 91 Guianan green turtles were recovered in Brazil where they mingle with Ascension Island green turtles at the states of Ceara and Alagoas. Five species breed in Surinam: green, loggerhead, leathery, hawksbill and the olive Ridley. One of the fascinations of sea-turtles often shown on TV films is that when their eggs hatch in the seashore sands, the hatchlings return at night direct to the sea. However, nocturnal observations on the Virgin Islands show the hatchlings are disorientated by stadium lights.

Turtles, like alligators, are troubled by leeches. Why do alligators gape at the zoo? Mouth-gaping is an effective temperature-control with these reptiles, according to an American biologist, but a similar contrasting pink gape against a dark body, suddenly revealed when the nightjar (a bird) yawns, is used as a threat display to predators. According to a Californian researcher, rainfall influences the activity and social behaviour, as well as egg-laying and egg-retention, in lizards. It certainly influences the movements of frogs and toads.

Eight aquaria from Miami Seaquarium and Florida Marineland to Amsterdam Zoo, Tokyo, Mexico, Duisberg (Germany) and Albany Zoo, Georgia (U.S.A.) currently possess captive West Indian manatees; even in the last century London Zoo and Brighton Aquarium exhibited this endangered tropical semi-marine mammal. Apart from Miami's 17 year specimen, they have little success in keeping it for long periods, especially calves, due to so little being known of its biology. Few captives were weighed and measured regularly in relation to feeding. More successful are those kept semi-captive in South American irrigation canals, and breeding occurred in in the pools of Georgetown botanic gardens, Guyana.

Sandra Husar of New Mexico University, whose treatise on the dugong I reviewed in 1975, has followed with an important 22-page treatise on *The West Indian Manatee* (U.S. Wildlife Research Report 7). Discovered by Christopher Columbus in 1493, this silent estuarine mammal may have originated the mermaid myth because of the human-like position of its mammae or breasts, though the dewlaps are unlike the legends; but it has no hind limbs. Unlike cetaceans, its bones are extremely dense. Like seals, its heart-beat declines as it dives, when its muscles are completely isolated from the circulation and there is no increase in exhausting lactic acid as carbon dioxide increases until it recovers from the dive. Exceptional hearing powers are apparently not used in navigation, and it has good night vision for this. Two recognise each other in encounters by a smell-taste mouthing 'kiss'.

Despite Stephens in 1972 predicting to national parks officials that the Florida manatee would be extinct by 1992 without better protection, it appears

to be increasing from the proliferation of introduced aquatic plants it browses, notably our water-milfoil, hornwort, Vallisneria and what Americans still call *Hydrilla verticillata* but our botanical pundits renamed years ago *Elodea nuttallii* just to make the confusion in plant-names more confounding. Despite its small brain, it has been taught simple tricks in captivity, but not to equal the unrelated bottle-nosed dolphin. Attempts to use it to control weed growth for malarial mosquito reduction in Florida and Mexican waters has had limited success, but mechanical and chemical methods are more costly.

The agamalizard is no more natural to Britain, than a new British beetle, the New Zealand pine-borer, *Prionoplus reticularis* (their biggest beetle), which I found recently on the edge of Liverpool after it had been imported with timber. But at Kirkby, a nearby industrial estate more famed as the home of TV "Z Cars", an agama was found torpid in a timber yard and found its way to a naturalist friend, and the museum.

Many amateur aquarists, anglers and waterside walkers find the staggering number of aquatic insects, crustaceans, shellfish, worms and lesser life overwhelming when it comes to identification. They find the famous keys of the Freshwater Biological Association too technical. To meet this problem, Michael Quigley's well-illustrated paper-back *Invertebrates of Streams and Rivers* (Arnold, £2·95) is an 84-page key to identification down to families. It will prove most useful for schools and amateur naturalists; but of course it does not include everything. Unfortunately, it lacks an index and omits the vernacular names commonly used for many animals, such as alder fly, freshwater shrimp and water hog-louse where these could have been helpfully linked with the Latin. I see no reference to the Nemertinea (ribbon worms).

Lack of an index likewise makes it slow to trace anything in Dr. R. H. Lowe-McConnell's 64-page *Ecology of Fishes in Tropical Waters* (£1·80), from the same publishers. This is a concise, almost indigestible mass of information with a bias towards commercial fish, a good account of coral communities and their cleaner fish, and a disappointing dismissal of aquarium fishes in one small paragraph. No mention even of the Great Barrier Reef marine park idea. The red grouper, one of several serranids which change sex from female to male after egglaying, thereby obtains a longer life without overcrowding reef communities. Fishes are the only vertebrates exhibiting such hermaphroditism. Cichlids evolved spectacular adaptation to East Africa's great lakes. When female Mossambique tilapias, acclimatized in Malaya, are crossed with imported Zanzibar tilapia, *hornorum*, only male young are produced. The reciprocal cross gives a sex ratio of 3 males to 1 female. The hybrids were not sterile, which suggests they are seggregates of the same parent species. The author draws upon fish-pond studies where fish-culture has higher yields than in Temperate waters. It is the future source of increasing protein for under-developed countries. Warm waters evolved 40% of fish species compared to only 5% inhabiting cold seas. 41% of species live in freshwater—over 1,000 in the Amazon compared to 250 in the Mississippi.

COLDWATER QUERIES *Continued on page 336*

Having made both types, I have no hesitatation in recommending the Butyl-lined pond in preference to the concrete one. The latter is very hard work and the finished pond has to be carefully treated before any plants or fishes can be introduced. The lined pond could be stocked right away if necessary. Unless a concrete pond is very well constructed, it could give trouble by leaking after a few years. It used to be quite cheap years ago to make a concrete pond when best cement was 5/- a bag and gravel and sand was a few shillings a yard, but the prices today could be many more times as much and it is questionable as to which type of pond would turn out the cheaper.

Do you think it an advantage for an angler to also be an aquarist?

This may assist a club argument. If you mean should an angler keep fishes at home in tanks or pond, the answer is a definite yes. A lot can be learned about fishes when they are viewed in a tank, especially their feeding habits. When a boy I noticed that fishes in a tank would immediately rush towards a falling object going through the water, be it food or a pebble. This taught me that instead of baiting a hook and throwing it in to sit and watch the float for hours on end, it paid to quietly withdraw the line and cast out about a yard away. If this is done every four or five minutes, the chance of a fish seeing the bait is increased many times. As for keeping fishes in a pond, a lot can be learned about breeding habits. The closed season for coarse fishing is from 15th March, to 15th June, to allow the fishes to spawn. However, I bred green tench in my pond for many years and they never spawned until July, usually the second week. Of course, they may do so in the wild earlier but as my pond warmed up sooner than large ponds or lakes, it seems to me that tench should not be fished for until well into July. Another advantage for the angler when a pond is available is that live bait could be kept alive without trouble.

WHAT IS YOUR OPINION?

by B. Whiteside, B.A., A.C.P.

Photographs by the Author

ALTHOUGH IT'S still late August, I've begun work on the November feature because next week will bring the return to school, after the summer holidays, with all the additional work and strain as those who have been human beings for a couple of months revert to schoolteachers and pupils until the next school holiday. Cynicism seems to evolve with the ageing process!

Requests for samples of Java moss still pour in: this morning's post brought six such requests from readers who, unfortunately, will be disappointed as I have not yet got enough moss to supply those who didn't get their requests in early August. Five of the letters were straight requests for starter samples of moss; one request was extended into a letter for this feature; and the seventh letter that reached me today was a good old ordinary letter for inclusion in this feature. It seems logical to begin with the latter letter—that was written by Mrs. S. Elowe, of 9 Ramney Drive, Enfield Lock, Enfield, Middlesex. She wrote: "Firstly I would like to congratulate you on your column. What a refreshing change from housework! Your feature has always been interesting and helpful, especially the letters about fish houses. At the moment we are waiting for ours to turn up, like kids waiting for Christmas. It will be a concrete construction, 10 ft. × 6 ft. My husband and I have been keeping Malawi and other cichlids for about the last 8 months. We find them very rewarding and interesting—although expensive in this area. The only difficulty, believe it or not, is getting rid of the fry! We have numbers of *Pseudotropheus microstoma*, *P. johanni* and *Labeotropheus fuelleborni* on hand at the moment. We would be interested to hear from other Malawi addicts—especially any in our area; also of experience in sending/receiving these fishes by rail and whether it is worthwhile."

I must admit that each time I hear of fellow aquarists who have bred excess fishes or plants and who cannot get rid of them to people who would appreciate having them, I feel that we should try to take some steps to ensure that such stocks of fishes and plants do not go to waste, i.e., end up being fed to adult fishes, or thrown out. My Java moss offer has certainly shown that there is a large demand for less common aquatic plants. I'll admit that my experiences have shown me that it takes up a lot of valuable time to send out free samples or letters telling people that supplies have run out; and one can end up out of pocket if one does not make a reasonable, small charge. Yesterday I asked an aquarist in England to send me four adults of a rare species that I have not seen before. I forwarded a cheque for £7·00, together with a special, insulated, wooden box that I have used on previous occasions some years ago. I hope the fish will arrive here, in N. Ireland, alive and well. I'll let you know what evolves. Plants are a much simpler matter as one can send small numbers by first class letter post. If you have sent fish to another aquarist in a fairly distant part of the U.K., or received fish sent from another part of the country, please send me details of your experience. I'm sure other aquarists would like to know the methods of packing used, the mode of transport employed, and the success rate or survival rate of fishes thus sent or received. If we can disseminate some practical information concerning these problems we may be able to ensure that those amateurs who breed uncommon species are not left with dozens of young fish for which they have no space, and that those who would like to keep such species could find a source of supply if local dealers do not stock the species in question. Such activities should not affect the business of retail aquarium shops because, obviously, one will still prefer to buy a particular species from a local dealer if he can supply it. I look forward to hearing from those who have sent fish to or received fish from distant aquarists.

Stuart Wilson is only 12 years old and his home is at 135 Queen Alexandra Road, Sunderland, Tyne & Wear. He writes: "I wish to tell you of a cheap baby saver/partition that my father and I made. Straighten out a wire coat-hanger and thread it into a length of aquarium air tubing, making sure that there is enough tubing at each end to seal in the wire. To seal the ends apply heat at the ends of the tube and pinch shut with a pair of pliers. The next step is to get some fine grade plastic netting—onion bags—and sew on to the wire frame with nylon fishing line or nylon thread."

Mr. L. Stacey resides at 32 Queen's Road, Skegness, Lincs. He writes: "I have just got my August issue of *The Aquarist* and swallowed it in one gulp, as usual—though I go back to it later. I have just read of your kind offer of Java moss, and I would like a portion if you still have any left to spare. I appreciate

that you will have been swamped with requests." (No comment!). Mr. Stacey continues: "I keep a 36 in. × 12 in. × 18 in. tank with home-made U/G filter. It houses 8 angels—3 marble and 5 silver. One pair of silver have produced eggs twice but on both occasions the eggs have fungused. Next time I shall take the eggs from the tank and rear them separately. I also have 1 catfish, 1 red platy, 1 black molly, 4 black lined tetras, 3 scissortails and 1 ageing black widow. I am gradually switching to angels. I have very little luck with plants though I have two 3 ft. (coloured) tubes, each of 30 watts, which are on for most of the day. I really think daylight is best for growing plants. Unfortunately my tank is in an alcove in the back of the sitting-room. The only plant I have growing well now is *Ludwigia*, which I have just pruned and re-set. My tank water is slightly acid but otherwise in good condition. Do you think those plant plugs are worth trying? They got a good plug in the August issue of *The Aquarist*.

"One of the finest aquariums I have visited was the Edinburgh one. It had a very varied selection of fish. Though I do admit I have not seen a great many here at Skegness, at 'Natureland' we have a very good aquarium." (Currently I'm trying out some plant plugs I bought about a month ago and have recently placed in my tanks. I think they should do a good job). Regarding your plant growth problems: if *Ludwigia* grows well in your tank you should buy more plants of it and cultivate flourishing thickets. Many species of plants and fishes appreciate slightly acidic water—a'though they do not like extreme conditions. You might care to try *Cryptocoryne* species, *Cabomba*, Java moss and Java fern in your tank. These species also seem to appreciate slightly acidic and fairly soft water. Try a plant or two of each and if they thrive then buy some more. If I were you I'd try switching off the U/G filters for a period to see if plant growth improves; in some tanks such filters inhibit plant growth, while in others they seem to encourage it. I'd also supplement the coloured fluorescent tubes with a couple of tungsten bulbs; or replace them with a different colour of fluorescent lighting. A fairly new, rather expensive type of fluorescent tube has given good plant growth in one of my tanks (the one that had the Java moss growing out over the edges of the frame before I began to send samples off to readers) although I have it supplemented by a 40 watt tungsten bulb. Unfortunately my rather expensive tube, which I have not had for very long, is showing signs of going down. No doubt the damp atmosphere above the cover glass, and the high temperatures generated in the aquarium hood, have played their part. The plastic leads and bi-pins at the end of the fluorescent tube are showing signs of wear and would need replacing; but unfortunately electrical wholesalers in my area seem unable to get me a replacement pair. Can any reader help?

I should like to make a couple of requests to readers: please don't send me any more requests for Java moss at present; and please do send me some more opinions for this feature. I'm still reeling from the shock that has resulted from the number of requests I've been receiving for samples of Java moss. At its peak I was receiving up to ten requests daily—and, unfortunately, my surplus stock of moss went down quite early on. Bales of letters landed on my mat each morning and I was left with the boring task of scribbling letters of apology to those whose requests reached me when it was too late. I don't know exactly how many requests I received; I do know that it certainly passed the fifty mark as I got though one complete packet of fifty envelopes, and before and after that I used up numbers of other envelopes of different sizes. And letters continue to reach me—although, fortunately, now in much smaller numbers. My apologies to those disappointed people who received my scribbled notes of apology: they resulted from my first-hand experience of writer's cramp. In a moment of despair last week I wrote to the secretarial staff at Brentford and asked them if they would be kind enough to produce a duplicated letter for me and send it to those whose letters continue to arrive.

I received many requests from all parts of the U.K., including a variety of islands off the coast. Strangely enough, the only request I received from a reader in N. Ireland was a verbal one delivered by a young chap who called at my home; and he left looking happy with his sample of Java moss and a number of other plants for his tank.

I kept a small piece of moss for myself and it has now begun to grow in a newly set up tank. If it thrives I *may* have more pieces to offer later in the year. If so I'll give details in future editions of this feature. When the time comes I'll have to ask readers to enclose a small polythene bag and a s.a.e. with their request—and arrange some short message, such as 'Regret supplies exhausted,' to write on their letters to prevent me from having to write longer letters of apology. Perhaps some of the people who were lucky enough to get a sample from me may now have pieces to give away. I hope so!

I must now relate the sad tale of the four fish that were sent to me from England. The container did not reach me until *six* days after the fish were sent off—by which time I knew that there was little chance of my fish arriving alive. The brown paper covering the wooden box was clearly marked: "Live biological specimens. URGENT. Do not chill." When the package reached me I noted that the outside paper was damp; I removed the wrapping and opened the wooden box. Water dripped out of the box as I removed the polystyrene tiles I had used as insulation. When I removed the polythene bags I discovered four beautiful fish, all very dead, and very little water left in the bags. I could have cried!

£7 worth of a beautiful species that I had never seen before had obviously suffered a horrible death in transit. I quietly placed corpses, bags and the remaining small quantities of water in the dustbin and felt angry, annoyed and saddened. I'm still wondering how the transport people managed to burst the polythene bags through a wooden box and polystyrene tiles. Had the box been kicked, like a football, from England to Ulster, it would have been quite difficult to burst the bags. Such a method of transport, were it possible across the Irish Sea, would probably have been quicker than the six days taken. I'm left speechless by the thought that it takes only one hour, by jet, to fly from London to Belfast once the plane starts moving. (I add the latter comment as I spent seven boring hours at Heathrow last month waiting for a flight to take off for home. I'll console myself with the thought that it could have taken six days!). In years gone by I received guppies sent to me from England and they always arrived safe and well. No doubt my latest experience indicates how much progress has been made since those days.

I'll leave that sad and sordid incident £7 poorer and a lot wiser and move on to a question: what has happened to all those people who used to write to this feature? To date I've received only about four or five letters for this feature during the past few weeks—and even allowing for the summer holidays that is as poor a response as I can remember. I've concluded that many of those who might have written a letter for publication, instead sent me a request for a sample of Java moss. A sore writing hand, four dead fish, illness and few letters for *W.Y.O.* haven't exactly made it my month. I'm hoping that the now dark, wet evenings will inspire more of you to put pen to paper once again so that *W.Y.O.* and I will get a bit of a boost.

Mrs. M. Thornton's address is 'Apsley,' 41 Crooks Lane, Studley, Warks., and she sent me the following letter dated 26th August. "Could you please send me a sample of Java moss? I would very much like to try it in one of our tanks. Three stamps enclosed. Thank you for printing my letter about the tortoises, Wilson and Kennedy, in the June edition. Both pets are healthy and still growing quite rapidly. I trust that the friend you almost swilled with blackcurrant juice, in the hospital, is now fully recovered. Could we have some tips on showing fish, please, in a future feature? Wishing both you, sir, and *W.Y.O.* a long and happy life." (Unfortunately Mrs. Thornton's request arrived long after my Java moss had gone down; very sadly, the friend who was in hospital died shortly after I wrote the piece—and he was only in his early forties; and the shortage of letters for *W.Y.O.* is a little disappointing. I gave up showing fishes in the late 'sixties and it's something about which I know little. I'd be very pleased to hear from any of the many readers who show their fishes regularly—whether or not they win prizes. Please pass on any tips you may have about showing fish—unless you wish to keep secret your winning methods—and I'll include them in a future feature to assist beginners. How successful have your fish been on the show benches this year? Do you show fish for fun, glory or both? I look forward to hearing from *you*).

Lace gourami

Photograph 1 shows an attractive pearl gourami. Please send me details of your experience with this beautiful species.

No. 63B Ambleside Gardens, Cavendish Road, Sutton, Surrey, is the home of Mr. M. Danton. He writes: "Like Mrs. Sue Whittenham I was impressed by the Public Aquarium in Looe, Cornwall. The owner obviously takes great care of the tropical fish and birds he displays to great effect. It was this

display that persuaded me to purchase a pair of red eared waxbills from him, to supplement my contrasting sea and freshwater aquaria. I may be mistaken but I believe the owner utilises rising water vapour, from the aquaria, to provide a humid atmosphere for his healthy birds. Visitors to Looe may also find the Marine Aquarium interesting as it displays locally-caught marine fish, as does the Aquarium in Mevagissey . . ."

Mrs. Daphne Moore writes from 'Langdale,' 36 Moorfields, Willaston, Nr. Nantwich, Cheshire. "My opinion of recently imported coldwater fish is that they are disgraceful. I am particularly sorry for people with long-standing ponds who have recently added an odd fish or two—together with ulcerative dermatitis—and lost most of their stock. I have, until the last year or two, looked upon my coldwater fish as being indestructible; but you may be interested in hearing of last year's disaster.

"On constructing a new pond I required more fish; and so orfe, goldfish and shubunkins were purchased from a well-known water garden. With difficulty, healthy-looking specimens were selected, and after a week in the bath, on discovering white spot, they were pronounced cured and were liberated in the pond. Before long I observed dropsy, fin rot, mouth fungus and the most dreaded ulcerative dermatitis. There was nothing else for it but to bale out the pond—all 750 gallons—with a bucket, sterilize the pond and plants, and examine and sort out the fish. The bath had to be used for the healthiest specimens and the rest were separated into groups according to their ailments. Baby baths, tanks, buckets and bowls, inside and out, held sick fish. Pounds were spent on crystals, potions and paints. Mouth fungus and ulcers did not respond to anything I tried, but I now believe that vets may have an antibiotic to solve the ulcer problem.

"Sterilized scissors proved to be the most effective remedy for fin rot—followed by a combined antibiotic and fungus cure. One shubunkin did surprise me, however, by surviving after losing a fin and chunk of body through fin rot. The fish is now four times as big and a proud father. Every week the bath produced more patients, despite frequent water changes. Eventually I was left with about one-third of the original number and our bath was restored to us. I am pleased to report that I do not possess a single sick fish at this moment.

"I have obtained a few fish since for breeding; but I am careful to select fish from shops which display fish without any sign of disease whatsoever. One sick fish in a tank is enough. One or two split fins due to injury, but quite free from fungus, seems to indicate a fish able to fight off infection due to good conditions. In a poor batch of fish, fungus and bacteria attack immediately.

"In this area I have found that home-bred and American fish are by far the healthiest. I have now found the surest way of obtaining healthy fish—and that is to breed them myself. It's easier on the pocket too!"

Mr. E. Pessok's letter is headed 1 Rivermead Close, Haughton Green, Denton, Nr. Manchester, and like many other readers he has trouble with plant growth. He states: ". . . Like most, I have trouble growing plants in my three aquariums. I have always blamed the U/G filters; but even with outside or power filters the same problem arose: dying back within a few weeks. Recently I set up a tank, only half of which is fitted with a U/G filter; the other half is made up of plants planted in a seed tray with John Innes No. 2 compost covered with gravel. It is too early to measure success—but after three weeks the plants are still growing away." (I should be interested to hear how the plants in each half of your tank grow, Mr. Pessok. Perhaps you'd be kind enough to drop me a few lines after a month or two).

Michael Hinkley is only 16 years old and he sent me his letter from 24 Malvern Road, Ashford, Kent. ". . . I have had limited success with plants. I have grown Java fern and had it reproduce by approximately twenty-fold; but the parent plants have died and the young plants do not seem to be doing very well at all. All my attempts with Amazon swords seem to be a waste of time and money as the plants only grow new leaves, while the outside leaves die off until in the end the plants fade into a decaying mess in the tank. Some plants do well with me: *Vallisneria* settles down quickly and soon spreads around the tank. *Cabomba* grows well when left alone; but in my main tank, with 3 five-banded barbs, a pair of scissortails, a fighting fish and a firemouth all eating it when they feel bored, it soon dies away; however, in my small tank, kept at room temperature and with no tank lighting, I find it grows beautifully well, being left alone by the white cloud mountain minnows. In this tank there is no gravel on the base so it does not look too good; but as long as the fish and plants are looking healthy and growing rapidly I shall not object."

No. 38 Glendale Crescent, Lostock Hall, Preston, Lancs., heads a long and interesting letter I received from Mr. Neil D. Swindlehurst. He wrote: ". . . In August you asked for information about the best aquarium visited while on holiday. Having visited four such public aquariums while on my travels I feel qualified to reply. If you will permit me to give a piece of information on each I visited then you will see why I decided to choose one particular aquarium as being the most attractive. The four aquariums are as follows: (a) Chester Zoo—fee 80p, supplementary entrance fee 5p; (b) Peel Aquarium, Isle of Man—20p fee; (c) Marine Biological Station, Port Erin, I.O.M.—admission free; and (d) Rushen Abbey Aquarium, Ballasalla, I.O.M.—free admission, but 20p into abbey grounds in which the aquarium is

situated. At (a) the tanks were well planted, with some magnificent plant specimens including some huge spatterdocks. Usually the labels were accurate; but occasionally a number of fish were kept in each aquarium and to the non-aquarist it was difficult to identify the species. Some reptiles and an axolotl shown. At (b) the aquarium was part of a shop, the first few tanks being for selling stock." (Mr. Swindlehurst goes on to say that he was not over pleased with some of the latter). He continues: "... The Aquarium tanks were by and large unplanted. Some interesting specimens were, however, on view, e.g., five 15 in. *Plecostomus plecostomus*, an *Arowana*, six beautiful green discus and a medium sized snakehead.

"At (c) marine fish, both *Teleosti* and *Elasmobranchi*, and crustacea were on show. The Aquarium is part of the Marine Biological Station run by Liverpool University. Regrettably most tanks were not labelled; but a couple of wall charts in the foyer showed the fish and their names. The crustacea tanks were interesting, and some anemones were on show—as well as some tube worms and fan worms. At (d) eight large tanks were on show; they were tastefully planted and gravel covered the base. The tanks, apart from one, contained one species of fish—or a number of easily identified fish. The exception was a tank containing a large number of small species, with just a list of the fish in the tank. The one I would select as the best is the Chester Zoo Aquarium, with the Peel Aquarium last.

"Recently you asked for details of readers' experiences with petrified wood. I had ordered a large 6 ft. 6 in. L-shaped tank last Easter and wanted something special in the way of decoration. The dealer from whom I was purchasing the tank suggested a tree stump with roots flowing out to fit into the right angle of the L shape; however, he had difficulty in obtaining such a piece. As fortune would have it it would not have been a good idea as with the tank set up a blind spot, due to the refraction of the water, was created blotting out most of the corner at the rear; thus the effect would have been lost. Luckily I was given a piece of bog wood—and I purchased three other pieces from a dealer. Since setting up the tank I have re-arranged the bog wood pieces once and am quite happy with the set up. So are the fish! The various holes and caves in the wood pieces prove very popular with the nocturnal inhabitants, chiefly the catfish—*Plecostomus*, *Xenocara* (*Ancistrus?*) black and ruby sharks, spotted cat and target cat (*Doradidae* family), plus the bumble-bee cat. Many fish browse on the mossy algal growths on the bog wood—particularly the sucking catfish. The smaller occupants of the tank, mainly inhabited by ten large angels and two brown discus, find ample refuge in the caves in the bog wood.

Golden gourami

"While the visual and ecological effects have been terrific, there are two drawbacks to this method of decoration. One is cost: the four pieces of bog wood are worth about £15. The other is the curing period when the bog wood is soaked in successive changes of water for a few weeks to reduce the humic acid concentration which would turn the water brown. This, while having no effect on the fish, reduces the available light for the plants. Even after this curing period the water is tinted amber, and occasional water changes are still necessary to benefit the plants as the water gradually darkens in colour. One last thought on this subject: I have not had a single disease in the tank. Presumably this has been due to the slightly acidic conditions prevailing in the aquarium restricting bacterial action.

"I should like to tell you of my experiences with opaline and golden gouramies. In the L-shaped tank I have a pair of golden and two male opaline—father and son—gouramies. This unbalanced state resulted from the two female opalines dying from old

age recently. The goldens have just bred and about 300 fry are swimming merrily around one half of the tank; all the other inhabitants are cowering in the other half. They are being kept at bay by the male golden gourami *and* the two male opalines! The latter are acting as foster fathers, both helping dad to keep his flock in order by blowing any strays back into the bubble nests they have built. It is very doubtful whether or not this golden female could have mated with either or both of the opalines as the fry are the same age. She would have had to be going some to achieve two matings in one day. Regrettably I have no spare tank at the moment—they are filled with previous hatchings of golden gouramies—and so the young will have to manage in the L-shaped tank. I will probably be unable to grow them on to see whether or not the golden female did mate with a male opaline." (Photographs 2 and 3 show golden and opaline gouramies).

Opaline guorami

Mr. Swindlehurst concludes: "I was wondering if any of your readers have experienced similar occurrences of foster parents . . . I have a few common reeds in my pond which I can give away to callers; also some water spearwort seeds—again, for callers. Perhaps some of such callers might like to swop some plants with me."

Readers are reminded that I do not necessarily agree with the views expressed in this feature, nor do I accept any responsibility for the views expressed by contributors.

Mr. John F. Dyason's home is at 39 Beaufort Road, Strood, Kent. He has the following to say: "My letter is in response to your request for opinions on treating rusty, angle iron tanks. For many years I have tried various tins of rust remover and rust preventive on my couple of angle iron tanks, all, unfortunately, to no avail. Then a couple of years ago I saw an advertisement for a children's clear casting kit—to set small objects in clear plastic for such things as paperweights—which set my mind thinking about coating the angle iron, after cleaning down to the bare metal. I took my stand-by tank, stripped off all the paint—and a considerable amount of rust—and gave the metal a good rubbing with wire-wool to be sure of removing all extraneous material; I washed the angle iron and then left it in a warm place to make sure that no moisture would be left under the coating to start rust off again. Then, having mixed the casting fluids I applied three coats to the angle iron, leaving each coat to dry for the time recommended in the literature supplied with the casting kit.

"When doing this I was particularly careful to ensure that the angle iron which forms the top of the tank was completely sealed with the coating—especially under the lip where water from air stones or filters can do its work and re-start rust. I coated the frame with the glass still in, thereby also covering the thin layer of putty between the angle iron and the glass; and since have had no trouble with slight leaks such as those that occasionally occurred in the past. Once the casting material had dried I primed, undercoated and painted in the usual way; and despite constant use—both with the filter pipe causing splashes in one corner, and more recently a continuous stream of bubbles from an air stone—for two years, there is no sign of rust anywhere on the frame. I would certainly recommend this procedure to anyone wanting to rust-proof an angle iron tank, and hope this tip will be as useful to other readers of your column as their tips have been to me in the past."

The Bourne Laboratory, Department of Chemistry, Royal Holloway College, University of London, Egham Hill, Egham, Surrey, is the lengthy address that heads a letter I received from Mr. M. Stephens.

He wrote: "In *W.Y.O.* in your March issue you asked for opinions on how tortoises fared through their winter hibernation. I think I must say that the old belief of tortoises having to hibernate is unjust; as long as they are kept indoors, warm and well fed from September onwards, they can be as active as they were during the summer months. I personally have two tortoises: *Geochelone elongata* and *Testudo graeca*. The latter has survived two winters in a small sun porch during the day, and in the house overnight or in very cold weather. The former was only purchased this Easter but I intend to keep her awake to accompany the other one through the winter. If it is not desirable to keep a tortoise in the house then a heated greenhouse or conservatory would do admirably.

"Care of tortoises' health is important during the winter as they do not get the benefit of the summer sunshine and the wide choice of fresh food. This is overcome by providing them with extra vitamins—either by supplementing their food or by an injection by the local vet. Tortoises may enjoy a wide variety of foods and I have found that the following are eaten readily: non-acid fruit, corn salad, tomatoes, cress, bread and strawberry or blackberry jam, cabbage heart and a nice, large cuttlefish to gnaw on for extra calcium. Also, a monthly bath in lukewarm water, for about 30 minutes, will be found to be most beneficial and will aid the digestive system. So it is quite possible to enjoy the company of your pet tortoise all the year round if you are willing to take a little trouble. You also do not run the risk of losing him during hibernation.

"I must add that if your tortoise is used to hibernating let him carry on doing so; but if he was purchased this year—and especially if he is quite small—I certainly recommend that you keep him awake and enjoy his company through the winter."

I'll conclude this month's feature with a letter I received from one of my most faithful contributors over the past ten years—Dr. Neville Carrington, of Interpet, Dorking. Dr. Carrington writes: "I read with interest your article in the September issue of *The Aquarist* and hope you will forgive me for saying that I believe your comments regarding electrical consumption of aquariums are unjustified. I have at home seven tanks, besides coldwater ones, electrically heated, and I have two Night and Day pumps running. The 53 in. aquarium in our living-room needs a boost of Grolux lighting every evening. You will see from the copy of my latest electricity bill that the costs of running my household are nowhere as high as the ones you quote.

"I should explain that the bill for electricity covers running a five-bedroomed house, with four children. I think the difference lies probably in the use of electricity for heating water and space heating. Even through the summer we tend to heat most of our domestic water through our gas central heating boiler and we do not use any electrical space heating. I suspect that you are heating your domestic water with an electrical immersion heater.

"When we first moved into this house I was horrified by the electricity bills and I managed to cut them down by having a rigorous campaign for the family to turn off lights when they were not needed and then by replacing as many lights as possible with fluorescent ones and cutting down the wattage of the bulbs to a minimum level, e.g., do not use a 100 watt on the stairs when a 60 watt will do. Always remember to turn the television off when you are not using it. By adopting measures like this I am confident you will find that your bills drop dramatically. It may also pay to install gas central heating rather than to use electricity. I assume that you have already taken steps such as insulating your roof and filling the walls of your home with plastic foam; also stopping draughts around front doors, etc., as much as possible. All these procedures are very cost-effective in saving fuel. If you are still worried about the cost of running your aquariums, although I do not believe that these are the culprits of your problem, then I would suggest that you cover unnecessary sides of the tanks with polystyrene ceiling tiles which can also be placed inside or outside the aquarium hood according to design and can be painted to look rather attractive." (Dr. Carrington's current bill, rendered on 8th September, amounted to £41·56; each unit cost 2·51p plus 0·145p fuel cost adjustment. I await, with trepidation, my latest bill. My previous one, rendered on 9th June, amounted to £86·54; each unit cost 2·6p plus 0·139p fuel cost adjustment. Dr. Carrington's total unit cost was 2·655p; mine 2·739p; a difference of only 0·084p per total unit. Although we do try to save electricity, I must admit that I am unable to afford roof or wall insulation—which, I assume, is false economy. All heating and lighting is electrically powered. Unfortunately North Sea gas does not reach Northern Ireland, hence I do not have access to mains gas—and oil and coal have to be imported into N. Ireland. In any case, Dr. Carrington has convinced me that I can retain my six tanks. If I were to get rid of my hi-fi . . . No way, as they say! Perhaps winter woolies would be the answer . . .).

For a future feature please send me your opinions on any of the following: (a) aquarium pumps; (b) U/G filters and their effect—if any—on plant growth; (c) unusual livebearers; (d) small tetras; (e) sources of live foods in winter; (f) the effects of different types of fluorescent lighting on plant growth; (g) aquarium shows you have visited this year; (h) aquariums on display in public buildings; (i) the effectiveness of the most recent type of aquarium thermometer; (j) Christmas presents for aquarists—what would you most like to receive? I hope you'll send me your opinions this month. Happy fish-keeping!

SOME THOUGHTS ON AQUARIUM FILTRATION

by W. E. Thompson

AS A REGULAR READER of this magazine I noted at the end of an article in the July issue a request by the contributor for information on efficient methods of filtration for aquaria. Being a discus keeper and aquarist of about 25 years experience I have had to overcome the problems he outlines and offer the following in the hope that it may help others.

Regular readers will already know from the excellent articles by Mr. Eberhard Shulze, President of the British Discus Association, the kind of water required by the discus fish and how he obtains and maintains it. The methods Mr. Shulze advocates are most efficient and can be highly recommended. Many readers, however, have more limited means and cannot afford multiple power filtration systems. It is to these aquarists who require an efficient filtration system using airlifts that I hope the system described will prove useful.

Mechanical, biological and chemical methods are all aspects of the complete filtration process all carrying out different functions within this process. None can be left out if complete filtration is to be obtained. I will try therefore to explain simply the function of each and then describe how all can be combined in a relatively simple piece of apparatus.

Mechanical filtration is the method by which particulate matter is removed from the water by the use of filter wool or similar media. Outside and inside filters have been used to carry out this aspect of filtration. Used alone, mechanical filtration can visually clear water but cannot remove dissolved matter or poisonous compounds. Its purpose within a complete system is to remove the matter which would clog other components within the system.

Biological filtration, by the use of undergravel filters, has been the subject of controversy for a long time. Underground filters have been regarded as a complete system in themselves capable of mechanical filtration; this they are not. Used in this way they are soon prevented from carrying out the function for which they are ideally suited, by becoming clogged with waste particles which should have been removed by mechanical filtration. Any similarity between fertilizer in a garden and waste in a gravel filter is fictitious. In reality the similarity is more like keeping waste products in a living room piled around a fresh air inlet. The function of the gravel filter within the system is to provide a large area of surface on which useful bacteria can congregate and multiply and through which oxygenated water may pass. The participation of these bacteria in the system is in the breaking-down and conversion of poisonous waste products in the water into harmless matter which is removed during water changes. The process involved is a complicated one and is fully described in any good book on aquarium technology or water chemistry. Enough to say that the process called the nitrogen cycle will not operate when filters are clogged with particulate waste.

A word of warning here to beginners. Gravel beds need a number of weeks to mature, though the process can be speeded up by 'seeding' with gravel already coated with bacteria from an existing aquarium. Before this bacteria build-up, readings show that a highly poisonous build-up takes place which dramatically falls to a safe level as a balance is experienced. A similar rise in poisonous matter can also take place when the filter becomes clogged!

Chemical filtration is the part of the system where chemical substances, which cannot be removed either by mechanical or biological filtration, are made harmless. Resins such as SURI or charcoal are frequently used in this part of the system. Where charcoal is used to make harmless poisonous material by adsorption, positively charged ions attract negatively charged ions of dangerous metals, etc., rendering them safe. Charcoal, however, becomes exhausted and should be replaced as the time comes when it will only act as a surface upon which the biological bacteria can congregate.

All of these methods must be combined if we are to provide adequate filtration for our aquaria. My first attempts to do this without using my power-filters resulted in a series of experiments with filters mainly outside the aquarium but all required a fairly powerful airlift to lift the water out of the tank. My final system used for air economy within the tank is illustrated in Fig. 1. Water is airlifted into the

container where the air escapes and the water falls by gravity through the filter wool (mechanical filtration) and resin or charcoal, etc., (chemical filtration) before returning, still by gravity, to the area below the gravel filter, then up through the unclogged gravel in a relatively clean condition. Most of the bacteria in the gravel filter is contained in the top 3 in. making a very deep filter unnecessary. Where baby fish are involved, a sponge block is placed over the water inlet. The whole unit can be lifted off the shortened tubes of the conventional undergravel filter for regular cleaning and replacement of wool, etc. Regular water changes are always desirable and essential for discus, but the tank need not be dismantled at such regular intervals for gravel cleaning. Syphoning off of large waste matter which falls on the gravel filter surface is done when water changes are made.

The materials used to construct my units were plastic drainpipe, plastic plumber's pipe and bends, cemented together with PVC cement. Pipe can be flattened by the pressure of an iron if warmed in a low oven.

I am sure that ingenious aquarists will devise many methods of obtaining a similar result. I know of no such filter commercially available and we must wait until some enterprising manufacturer adds one to his range as an undergravel filter accessory before it can be bought.

This system of filtration need not only be used for a completely gravel-bottomed tank. Fig. 3 gives a method using a plastic seed or cat litter tray (no holes) to provide a filter which can be removed from the tank. The use of a small internal power filter such as the one illustrated can also be considered along with the tray illustration.

Where a base completely free from gravel is required, power filtration can be used returning through a gravel bed situated outside the tank and of course ozone and ultraviolet can be used (with great care) in all systems. Much experiment is being carried out along these lines and in the use of resins both here and in America. For a cost effective system, however, I believe none can compare in simplicity and effectiveness with the one I have outlined.

FIG 1

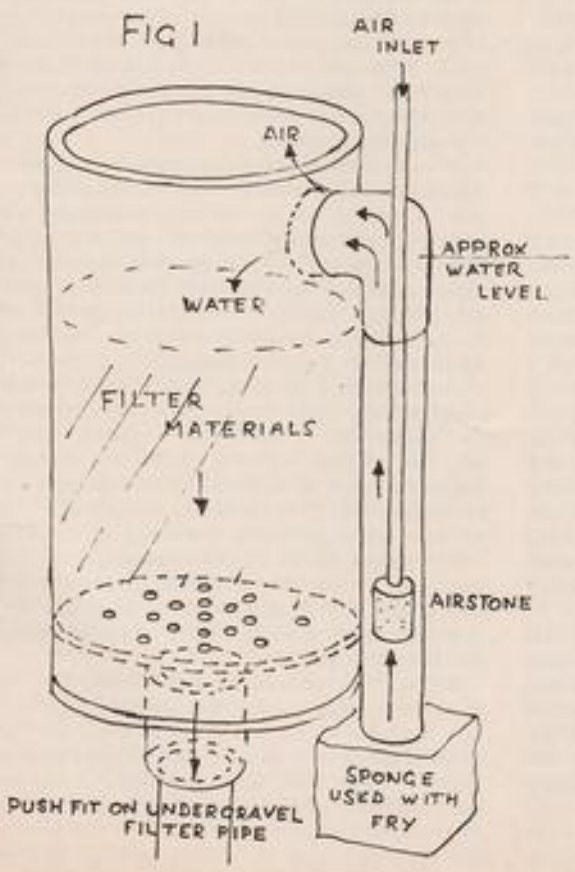


FIG 2

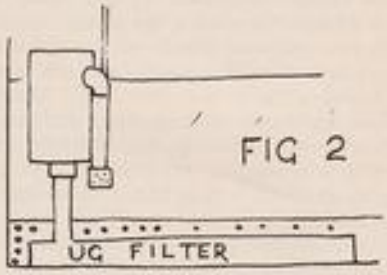


FIG 3

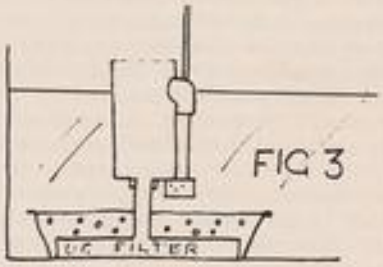
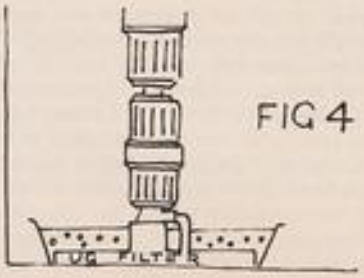


FIG 4



News from AQUARISTS' SOCIETIES

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

THE results of an inter-society table show held recently when **Atlantis F.S.** were hosts to **Sandgrounders A.S.** and **Southport A.S.** were as follow:—Livebearers A.V.: Mr. and Mrs. R. Houghton (Southport). Anabantids A.V.: Mr. and Mrs. Underwood (Southport). Sharks & Foxes: Mr. and Mrs. Baldwin (Sandgrounders). Cichlids A.V.: Mrs. P. A. Taylor (Atlantis). Rasbora, Danios, Minnows: Mr. and Mrs. Baldwin (Sandgrounders). Characins A.V.: Mr. and Mrs. Houghton (Southport). Barbs A.V.: Mr. and Mrs. Baldwin (Sandgrounders). Catfish, Botia's Loaches: P. and S. Taylor (Atlantis). A.O.V. (not listed): Mr. and Mrs. Tasker (Sandgrounders). Pairs A.V.: Miss J. Baldwin (Sandgrounders). Coldwater A.V.: Mr. and Mrs. Baldwin (Sandgrounders). Best Fish in show: Mr. and Mrs. Baldwin (Sandgrounders). Points result: 1, Sandgrounders; 2, Southport; 3, Atlantis. There were 119 entries.

* * *

MEMBERS and guests of the **King's Lynn A.S.** were given an interesting talk at the September meeting by Mr. R. Cooper from Hunstanton about local native marines. Results of the bench show for A.O.V. were: 1, 2, and 3, P. Eyles; 4, T. Turner.

Club meetings are held on the second Thursday of each month at the North Star Public House, Lady Jane Grey Road, North Lynn K.L., at 7.45 p.m. and new members or visitors are always very welcome. Club secretary is Mrs. S. George. Tel: KL 671610 for further details.

* * *

IN August the open show of the **Oldham & District A.S.** was held. The following were the results:—Best Fish in show: Miss S. Goddard (Macclesfield): Hemigrammus Pulcher. Guppies: 1 and 2, K. Miller (Heywood); 3, R. O. Connell (Osram). Mollies: 1, Mr. Houghton (Southport); 2, J. Tinsley (Sandgrounders); 3, Mr. Tasker (Sandgrounders). Swordtails: 1, A. Goddard (Macclesfield); 2, T. McCarthney (St. Helens); 3, C. Calow (Coral Reef). Platies: 1, T. McCarthney (St. Helens); 2, Mr. Hodge (Southport); 3, Mr. Muckle (Southport). A.O.V. Livebearer: 1, K. Thompson (Merseyside); 2, Mr. Campbell (Macclesfield); 3, D. Tomlinson (Macclesfield). Anabantids: 1, D. Algie (St. Helens); 2, Mr. Baldwin (Sandgrounders); 3, Mr. McCarthney (St. Helens). Fighters: 1, Mr. Campbell (Macclesfield); 2, M. Lawson (St. Helens); 3, D. Tomlinson (Macclesfield). Small Barbs: 1, N. Stevenson (Osram); 2, Mr. and Mrs. Muckle (Southport); 3, K. Thompson (Merseyside). Large Barbs: 1, Mr. Houghton (Southport); 2, Mr. Gough (Wynnstay); 3, I. Liversedge (Oldham). Dwarf Cichlids: 1, N. Stevenson (Osram); 2, K. & A. Aldred (Hyde); 3, I. McCarthney (St. Helens). Large Cichlids: 1, Mr. Widd (Osram); 2, P. A. Taylor (Atlantis); 3, J. Corbett (Merseyside). Angels: 1, Mr. Aspinall (Southport); 2 and 3, N. Stevenson (Osram). Rift Valley Cichlids: 1 and 2, B. Wilson (Sandgrounders); 3, B. Mason (Bridgewater). Small Characins: 1, Miss S. Goddard (Macclesfield); 2, K. Thompson (Merseyside); 3, Mr. Houghton (Southport). Large Characins: 1, 2 and 3, Mr. Houghton (Southport). Rasboras: 1, K. Thompson (Merseyside); 2, Mr. Muckle (Southport); 3, Mr. Houghton (Southport). Danios: 1, B. Wilson (Sandgrounders); 2, Mr. Hodge (Southport); 3, I. McCarthney (St. Helens). Minnows: 1, Miss S. Goddard (Macclesfield); 2, Mr. Aspinall (Southport); 3, Mr. Houghton (Southport). Sharks: 1, Mr. Dawson (Heywood); 2, Mr. Wido (Osram); 3, Mr. Hodge (Southport). Flying Foxes: 1 and 3, Mr. Hodge (Southport); 2, T. Selby (Wythenshawe). Toothcarps: 1, E. Birchwood (Oldham); 2, K. Thompson (Merseyside); 3, Mr. Tasker (Sandgrounders). Corydoras, including Brochis: 1, K. Thompson (Merseyside); 2, P. & S. Taylor (Atlantis); 3, J. Corbett (Merseyside). A.O.V. Catfish: 1, K. Thompson (Merseyside); 2, Mr. McCarthney (St. Helens); 3, J. Corbett (Merseyside). Loaches & Botias: 1, Mr. Muckle (Southport); 2, M. Hay (Oldham); 3, E. Jones (Wrexham). Breeders Egglayers (A.B.): 1, D. Mason (Bridgewater). Breeders Egglayers (C.D.): 1, Mr. Gough (Wynnstay); 2, M. Lawson (St. Helens); 3, W. Brannan (Oldham). Breeders Livebearers: 1, A. Goddard (Macclesfield); 2, C. Thompson (Merseyside). Pairs Egglayers: 1, Mr. McCarthney (St. Helens); 2, A. Goddard (Macclesfield); 3, Mr. Widd (Osram). Pairs Livebearers: 1, R. Thompson (Merseyside); 2, Mr. Muckle (Southport); 3, M. Lawson (St. Helens). A.O.V. Tropical: 1, E. & B. Calow (Coral Reef); 2, M. Hay (Oldham); 3, I. Liversedge (Oldham). Mini Jars: 1 and 2, N. Stevenson (Osram); 3, E. Jones (Wrexham). Common Goldfish: 1 and 2, Y. Buckley (Oldham). Shubunkins: 1, A. Bibby (Wythenshawe); 2, B. Downie (Sandgrounders); 3, P. & S. Taylor (Atlantis). Fantails: 1 and 2, R. Dingley (Heywood); 3, Mr. Hewitt (Osram). Lionheads: 1 and 2, R. Dingley (Heywood). Moors: 1, R. Dingley (Heywood); 2, Mr. Aspinall (Southport). Orandas: 1, Mr. Hewitt (Osram); 2 and 3, R. Dingley (Heywood). A.O.V. European Coldwater: 1, Mr. Widd (Osram); 2, Mr. Aspinall (Southport). A.O.V. Asian or U.S.A. Coldwater: 1, Mr. Houghton (Southport). A.O.V. Fancy Coldwater: 1, 2 and 3, R. Dingley (Heywood). A.V. Marine: 1, K. Miller (Heywood); 2, Mr. Harris (Oldham); 3, F. & P. Fisher (Wythenshawe).

* * *

THE new Membership Registrar of the **British Killifish Association** is Mr. W. D. Joyce 2 College Down, Kilmeston, Alresford, Hants SO24 0NS. The secretary is Allan Brown, 173, Parr Lane, Unsworth, Bury, Lancs. BL9 8JN. Tel. 061-766 9835.

* * *

THE **Longridge and District A.S.** first Open Show in September proved to be a huge success with 687 entries in 50 classes. Results: Best Fish in Show—Mr. and Mrs. Walsh (Blackburn). Best Local Exhibit—Mr. and Mrs. B. Durham (Longridge). Section A: Livebearers. Guppies (broadtail): 1, B. Morris (F.G.A.); 2, Mr. and Mrs. Greenhall (Leigh); 3, Mr. and Mrs. B. Durham (Longridge). Guppies (narrowtail): 1, Mr. and Mrs. J. Riley (Castleford); 2 and 3, D. and I. Matthews (Longridge). Mollies: 1, Mr. and Mrs. Tinsley (Sandgrounders); 2, Mr. and Mrs. Houghton (Southport); 3, B. W. Carter (St. Helens). A.O. Poecilia spec.: 1, Mr. and Mrs. B. Durham (Longridge); 2, Mr. Kirk (South Humberside); 3, N. Wallbank (Loyne). Platies: 1, Mr. and Mrs. B. Durham (Longridge)—Section winner: 2, Mr. and Mrs. R. Holden (Longridge); 3, Mr. and Mrs Underwood (Southport). Swordtails: 1, B. W. Carter (St. Helens); 2, Mr. and Mrs. B. Durham (Longridge); 3, Mr. and Mrs Houghton (Southport). A.O. Xiphophorus spec.: 1, K. Corbett (Merseyside); 2, Mr. and Mrs. A. Goddard (Macclesfield); 3, Mr. and Mrs. B. Durham (Longridge). Gambusia and Heterandria spec.: 1, A. Whittaker (Macclesfield); 2, D. and I. Matthews (Longridge); 3, Mr. and Mrs. Baldwin (Sandgrounders). A.O.V. Livebearers: 1, Mr. and Mrs. Baldwin (Sandgrounders); 2, Mr. Kirk (South Humberside); 3, Mr. and Mrs. J. Riley (Castleford). Section B: Characins. Characins up to 7·5cms: 1, Mr. and Mrs. Walsh (Blackburn)—Section winner and Best in Show; 2 and 3, Mr. and Mrs. Houghton (Southport). Characins over 7·5cms: 1 and 3, Mr and Mrs. Houghton (Southport); 2, Mr. and Mrs. Underwood (Southport). Section C: Barbs. Barbs up to 7·5cms: 1, P. and H. Batchelor (Loyne)—Section winner; 2, Mr. and Mrs. Houghton (Southport); 3, Mr. and Mrs. Underwood (Southport. Barbs over 7·5cms: 1, Mr. and Mrs. Houghton (Southport); 2 and 3, Mr. and Mrs. Baldwin (Sandgrounders). Section D: "Minnows." Rasboras: 1, Miss Hawthorn (Heysham); 2, Mr. and Mrs. Lake (South Humberside); 3, B. Wilson (Skelmersdale). Danios and Minnows: G. Kenyon (Skelmersdale)—Section winner; 2, B. Wilson (Skelmersdale) 3, Mr. and Mrs. Lake (South Humberside). Section E: Killifish, A.V. Killifish: 1, J. Noon (Leigh)—Section winner; 2, J. Gamalves (Leigh); 3, A. and B. Brown (Bury). Section F: Anabantids. Anabantids up to 8cms: 1 and 3, Mr. and Mrs. A. Lyons (Longridge); 2, Mr. and Mrs. Lake (South Humberside). Anabantids over 8cms: 1, Mr. and Mrs. J. McCartney (St. Helens) 2, Mr. and Mrs. A. Lyons (Longridge); 3, K. Miller (Heywood). Siamese Fighting Fish: 1, D. Francis (Merseyside)—Section winner; 2, R. Clint (Longridge); 3, Mr and Mrs Campbell (Macclesfield). Section G: Cichlids. Rift Valley Cichlids: 1, B. Wilson (Skelmersdale).—Section winner; 2, Mr. and Mrs. Underwood (Southport); 3, R. I. Payne (Merseyside). A.O.V. Cichlids up to 10cms: 1, A. Bamber (Atlantis); 2, N. Stevenson (Osram); 3, G. and C. Berry (Blackburn). A.O.V. Cichlids over 10cms: 1, Mrs. P. A. T. (Atlantis); 2, N. Wallbank (Loyne); 3, Mr. and Mrs. Underwood (Southport). Angel Fish: 1, Mr. and Mrs. Harvey (Sandgrounders); 2 and 3, J. Harvey (Sandgrounders). Section H: "Scavengers." Corydoras and Brochis: 1, Mr. and Mrs. Underwood (Southport); 2, B. W. Carter (St. Helens); 3, N. Wallbank (Loyne). A.O.V. Catfish: 1, Mr. and Mrs. Dugdale (Blackburn); 2, P. and H. Batchelor (Loyne); 3, Mr. and Mrs. Walsh (Blackburn). Loaches and Botias: 1, Mr. and Mrs. Ham (Lytham); 2, Mr. and Mrs. Walsh (Blackburn); 3, Mr. and Mrs. Underwood (Southport). Sharks and Flying Foxes: 1, Mr. and Mrs. Baldwin (Sandgrounders)—Section winner; 2, Mr. and Mrs. Campbell (Macclesfield); 3, H. Bauer (Merseyside). Section I: A.O.V. Tropical: 1, Mr. and Mrs. Walsh (Blackburn)—Section winner; 2, J. and R. Hinchey (Loyne); 3, P. and H. Batchelor (Loyne). Section J: Juniors, Egglayers: 1, A. Hopwood (Blackburn)—Section winner; 2, P. and S. Taylor (Atlantis); 3, M. Rimmer (Sandgrounders). Livebearers: 1, M. Rimmer (Sandgrounders); 2, L. Grove (Sandgrounders); 3, C. Parkinson (Longridge). Section K: Mini-Jars: 1, 2 and 3, N. Stevenson (Osram). Section L: Marines. Tropical marines: 1, Mr. and Mrs. Iddon (Sandgrounders)—Section winner; 2, P. Caulfield (Skelmersdale); 3, C. Parkinson

THE SAFE CURE FOR FUNGUS IS holamid
Hillside Aquatics London N12

(Longridge). Coldwater marines: 1, 2 and 3, T. Woolmington (Longridge). Section M: Pairs, Egglayers: 1, B. W. Carter (St. Helens). Section winner; 2, Mr. and Mrs. Baldwin (Sandgrounders); 3, Mr. and Mrs. Lake (South Humberside). Livebearers: 1, Mr. and Mrs. D. Hanns (Nelson); 2, Mr. and Mrs. B. Durham (Longridge); 3, Mr. and Mrs. Houghton (Southport). Section N: Breeders, Egglayers A and B: 1, J. Noon (Leigh); 2, D.; and I. Matthews (Longridge); 3, E. J. Brown (Blakeborough). Egglayers C and D: 1, D. Francis (Merseyside)—Section winner; 2, R. I. Payne (Merseyside); 3, J. Clark (Skelmersdale). Livebearers A and C: 1 and 2, Mr. and Mrs. A. Goddard (Macclesfield); 3, Mr. and Mrs. Tomlinson (Macclesfield). Livebearers D: 1, Mr. and Mrs. B. Durham (Longridge); 2, B. W. Carter (St. Helens); 3, Mr. and Mrs. R. Holden (Longridge). Coldwater: 1, S. Foote (Accrington); 2 and 3, Mr. and Mrs. Tasker (Sandgrounders). Section O: Coldwater, Common Goldfish and Comets: 1 and 2, C. H. Whitsey (Accrington); 3, G. Kirkland (Blackpool). Shubunkins: 1, Mr. and Mrs. Hewitt (Oxsam); 2, and 3, S. Foote (Accrington). Fantails: 1 and 2, S. Foote (Accrington); 3, Mr. and Mrs. Hewitt (Oxsam). Veiltails: 1, C. H. Whitsey (Accrington); 2 and 3, C. Wallbank (Accrington). Moors: 1, 2 and 3, S. Foote (Accrington). Lionheads: 1 and 2, Mr. and Mrs. Harvey (Sandgrounders); 3, Mr. and Mrs. P. Hewitt (Oxsam). Orandas: 1, C. H. Whitsey (Accrington); 2, Mr. and Mrs. P. Hewitt (Oxsam); 3, Mr. and Mrs. Harvey (Sandgrounders). A.O.V. Fancy Goldfish: 1, B. Haworth (Accrington)—Section winner; 2, S. Foote (Accrington); 3, C. H. Whitsey (Accrington). A.V. Asian or U.S.A.: 1 and 3, S. Walsh (Accrington); 2, Mr. and Mrs. Houghton (Southport). A.V. European or British: 1, Mr. and Mrs. Mockle (Southport); 2, Mr. and Mrs. Baldwin (Sandgrounders); 3, B. Cottam (Independent).

* * *

ENTRIES for the **Blackpool & Fylde A.S.** open show totalled 270. The results were: Best in show: Mr. and Mrs. Baldwin (Sandgrounders). Class A, Sect. 1: 1 and 3, C. H. Whitsey (Accrington); 2, Mr. and Mr. Baldwin (Sandgrounders). Sect. 2: 1, 2 and 3, C. H. Whitsey (Accrington). Sect. 4: 1, Mr. and Mrs. Baldwin (Sandgrounders); 2 and 3, C. H. Whitsey (Accrington). Class B, Sect. 1: 1 and 3, Mr. and Mrs. Harvey (Sandgrounders); 2, C. H. Whitsey (Accrington). Class C, Sect. 1: 1 and 3, Mr. and Mrs. Holden (Longridge); 2, C. Everton (Sandgrounders). Sect. 2: 1, Mr. and Mrs. B. Durham (Longridge); 2, Mr. and Mrs. P. Ham (Lytham); 3, N. & M. Rimmer (Sandgrounders). Sect. 3: 1 and 2, Mr. and Mrs. Tindsly (Sandgrounders); 3, R. Idden (Sandgrounders). Sect. 4: 1, Mr. and Mrs. Calvert (Loyne); 2, P. & J. Oldcorn (Blackburn); 3, Mr. and Mrs. Baldwin (Sandgrounders). Sect. 5: 1 and 3, Mr. and Mrs. B. Durham (Longridge); 2, N. Wallbank (Loyne). Class D, Sect. 1: 1, Mr. and Mrs. B. Walsh (Blackburn); 2, Mr. and Mrs. A. Lyons (Longridge); 3, Mr. and Mrs. Baldwin (Sandgrounders). Sect. 2: 1, Mr. and Mrs. P. Ham (Lytham); 2, Mr. and Mrs. Underwood (Southport); 3, A. Sweeten (Derwen). Class E, Sect. 1: 1, Mr. and Mrs. B. Walsh (Blackburn); 2 and 3, Mr. and Mrs. Underwood (Southport). Sect. 2: 1, Mr. and Mrs. Underwood (Southport); 2 and 3, Mr. and Mrs. A. Lyons (Longridge). Class F, Sect. 1: 1 and 2, R. Clint (Longridge); 3, Mr. and Mrs. Holden (Longridge). Class G, Sect. 1: 1, Mr. and Mrs. Baldwin (Sandgrounders); 2, Mr. and Mrs. Underwood (Southport). Sect. 2: 1, P. & H. Batchelor (Loyne); 2, Master P. Durham (Longridge); 3, Mr. and Mrs. Baldwin (Sandgrounders). Sect. 3: 1, Mr. and Mrs. B. Walsh (Blackburn); 2, N. Wallbank (Loyne); 3, P. & H. Batchelor (Loyne). Class H: 1, Mr. and Mrs. Baldwin (Sandgrounders); 2, Mr. and Mrs. P. Ham (Lytham); 3, Mr. and Mrs. Underwood (Southport). Class I, Sect. 1: 1, P. & H. Batchelor (Loyne); 2, Mr. and Mrs. Baldwin (Sandgrounders); 3, P. & J. Oldcorn (Blackburn). Sect. 2: 1 and 3, Mr. and Mrs. Baldwin (Sandgrounders); 2, P. & H. Batchelor (Loyne). Class J: 1 and 2, J. Noon (Leigh); 3, F. Reynolds (Blackpool). Class K, Sect. 1: 1, Mr. and Mrs. Underwood (Southport); 2, G. Boys (Lytham); 3, P. & J. Oldcorn (Blackburn). Class K, Sect. 2: 1, S. Harvey (Sandgrounders); 2, Master P. Durham (Longridge); 3, Wendy Kenyon (Blackpool). Sect. 3: 1, A. Cardwell (Darwen); 2, Mr. and Mrs. Mousley (Lytham); 3, Mrs. E. Stillwell (Sandgrounders). Class L, Sect. 1: 1, Mr. and Mrs. Underwood (Southport); 2, W. Underwood (Southport); 3, W. Underwood (Southport); 3, Mr. and Mrs. Baldwin (Sandgrounders). Sect. 2: 1, Mr. and Mrs. B. Walsh (Blackburn); 2 and 3, K. Dugdale (Blackburn Waterlife Society). Class M: 1, Mr. and Mrs. Underwood (Southport); 2, Mr. and Mrs. P. Ham (Lytham); 3, S. Wolstenholme (Heywood). Class N: 1 and 2, P. Batchelor (Loyne); 3, A. Cardwell (Darwen). Class O: 1, W. Caton (Longridge); 2, J. Holden (Longridge); 3, R. Iddon (Sandgrounders). Class P: 1 and 3 Mr. and Mrs. Durham (Longridge); 2, Mr. and Mrs. Holden (Longridge). Class Q: 1, N. Wallbank (Loyne); 2, Mr. and Mrs. Baldwin (Sandgrounders); 3, Mr. and Mrs. B. Walsh (Blackburn). Class R: 1, E. Jones (Leigh). Class S, Sect. 1: 1, L. Cuff (Aireborough); 2, J. Noon (Leigh); 3, F. Reynolds (Blackpool). Sect. 2: 1, J. Noon (Leigh); 2, Mr. and Mrs. B. Walsh (Blackburn); 3, E. Jones (Leigh). Class T, Junior: 1, C. Wilkinson (Lytham); 2, Lee Groves (Sandgrounders); 3, M. Rimmer (Sandgrounders). Class U, Junior: 1, Miss J. Baldwin (Sandgrounders); 2, M. Rimmer (Sandgrounders); 3, G. Lawless (Leigh).

* * *

THE following alterations to the Committee are announced by **Gosport & District A.S.** Show Manager: W. Knight, 19 Priory Road, Fareham, Hants. Trophy Secretary: G. Arnold, 16 The Fairway, Portchester, Hants.

* * *

THE **Castleford A.S.** open show results were:—Guppies: 1, Mr. and Mrs. Bee (Grimsby & Clee.); 2, Mr. and Mrs. Jenkins (Sheffield); 3, Mr. Gent (Barnsley). Swords: 1, Mrs. J. Harrison; 2, Mr. and Mrs. Millington (Sheffield); 3, Mr. and Mrs. Fletcher (Doncaster). Mollies: 1, M. Martin (Scunthorpe & Dist.); 2, Mr. and Mrs. Richardson (Scarborough); 3, S. Harrison (Grimsby & Clee.). Platies: 1, A. Young (Hull); 2, W. Bodfield (Immingham); 3, Mr. and Mrs. K. Walsh (York & Dist). A.O.V. Livebearer: 1 and 2, A. Clayton (Immingham); 3, Mr. and Mrs. Kirk (South Humberside). Small Characins: 1, J. & M. Freer (Swillington); 2, Mr. and Mrs. Richardson (Scarborough); 3, Mr. and Mrs. Lake (South Humberside). Large Characins: 1, A. Cook (Retford); 2, M. Price (Castleford); 3, S. Hay & Son (Hartlepool). Rasboras: 1, A. Cook (Retford); 2, Mr. and Mrs. Bradley (Retford); 3, S. Harrison (Grimsby & Clee.). Danios & Minnows: 1, A. Piggott (Grimsby & Clee.); 2, I. Duncan (Hull); 3, Mr. and Mrs. Lake (South Humberside). Small Barbs: 1, M. Price (Castleford); 2, L. Price (Castleford); 3, S. Green (Castleford). Large Barbs: 1, A. Cook (Retford); 2, D. Lunn (Redcar); 3, Mr. and Mrs. F. Newstead (Scunthorpe & Dist.). Small Cichlids: 1, C. Carrick (Castleford); 2, T. Stansfield (Castleford); 3, Mrs. Bee (Grimsby & Clee.). Large Cichlids: 1, Mr. and Mrs. Vernon (Retford); 2, S. Hay & Son (Hartlepool); 3, R. Smith (Y.D.A.S.). Angels: 1 and 2, S. Martin (Scunthorpe & Dist.); 3, A. Piggott (Grimsby & Clee.). Rift Valley: 1, A. Cook (Retford); 2, Mr. and Mrs. Feasy (Doncaster); 3, Mr. and Mrs. Burman (Scunthorpe & Dist.). Siamese Fighters: 1, R. Turner (Thorne); 2, Mr. Barratt (Thorne); 3, Mr. and Mrs. Riley (Castleford). Small Anabantids: 1, Mr. and Mrs. Lake (South Humberside); 2, Mr. and Mrs. Copley (Doncaster); 3, Mr. and Mrs. Hill (Scunthorpe Museum). Large Anabantids: 1, A. & P. Barker (York); 2, Mrs. Bee (Grimsby & Clee.); 3, R. & A. Johnson (Hyde). Toothcarps: 1, D. Greenwood (Immingham); 2, A. Clayton (Immingham); 3, A. Young (Hull). Loach & Botia: 1, T. Sanderson (Thorne); 2, P. Camfield (Castleford); 3, H. Thorpe (Doncaster). Shark & Fox: 1, Mr. and Mrs. Beaumont (Pontefract); 2, A. Piggott (Grimsby & Clee.); 3, Mr. and Mrs. Dawson (Heywood). Corydoras: 1, Mr. and Mrs. Copley (Doncaster); 2, P. Camfield (Castleford); 3, A. Piggott (Grimsby & Clee.). A.O.V. Cat: 1, M. Price (Castleford); 2, T. Sanderson (Thorne); 3, Mr. Richardson (Hull). Pairs Egglaying: 1, Mr. and Mrs. Bradley (Retford); 2, Mr. and Mrs. Lake (South Humberside); 3, Mr. and Mrs. Copley (Doncaster). Pairs Livebearers: 1, A. Clayton (Immingham); 2, J. Cavill (Doncaster); 3, G. Sanderson (Thorne). A.O.V. Tropical: 1, G. White (Scunthorpe & Dist.); 2, Mr. and Mrs. Caldew (Scunthorpe Museum); 3, A. Frisby (Hull). Junior Egglayers: 1, T. Hopkinson (Darfield); 2, J. Millington (Sheffield); 3, G. Sanderson (Thorne). Junior Livebearers: 1, H. Johnson (Hyde); 2, A. Petty (Castleford); 3, J. & S. Hill (Barnsley). Novice: 1, Mr. and Mrs. Finn (Doncaster); 2, G. Dawson (Castleford); 3, Mrs. T. Rayworth (Hull). Breeders Live, A & B: 1, Mr. and Mrs. Millington (Sheffield); 2, D. Gent (Barnsley); 3, G. Andrews (Hull). Breeders Live, C & D: 1, Mr. Hopkinson (Darfield); 2, Mr. Barratt (Thorne); 3, A. Young (Hull). Breeders Egg, A & B: 1, A. Young (Hull); 2, Mr. Beddow (Ind.); 3, Mr. and Mrs. Snowdon (Ind.). Breeders Egg, C & D: 1, A. Piggott (Grimsby & Clee.); 2, B. Banks (Thorne); 3, Mr. and Mrs. Petty (Castleford). Shubs & Fancy Coldwater: 1, Mr. and Mrs. Wilkinson (Halifax); 2, Mr. Hopkinson (Darfield); 3, L. Waller (Rotherham). A.O.V. Coldwater: 1, K. & M. Wood (Brid.); 2, Mr. and Mrs. Snowdon (Ind.); 3, Mr. and Mrs. Dawson (Heywood). Novelty: 1, K. Lancashire (Doncaster); 2, L. Barrett (Castleford); 3, A. Cook (Retford).

The best in show was entered by Mr. and Mrs. Vernon (Retford), being a large cichlid. The best exhibitor was A. Cook (Retford) and the best society was Doncaster and the entries totalled 667.

* * *

AT the annual general meeting of the **Gloucester A.S.** (affiliated F.B.A.S.), the following members were elected to serve on the committee for the coming year: chairman, L. Griffiths; vice-chairman, C. Freshney; secretary, D. Parry, 49 Oxstalls Way, Longlevent, Gloucester. Committee members: Messrs. P. Cole, N. Washbourne, B. Wattam and S. Grainger. Society meetings are held at the Chequers Bridge Centre, Gloucester on the first Tuesday of each month at 7.30 p.m. Visitors are very welcome.

* * *

SHOW results from **Preseil T.F.S.** for September were:—Livebearers: 1 and 2, P. A. Busby; 3, R. Mayhew; 4, A. MacIntosh. Egglayers: 1, A. MacIntosh; 2, B. Harding; 3, J. Foster Powell; 4, R. Mayhew. Cichlid: 1 and 3, R. Mayhew; 2, R. Purdue; 4, L. Lewis. Pairs: 1 and 2, P. A. Busby; 3, R. A. H. Thomas; 4, R. Mayhew.

* * *

THERE were 527 entries for the **Southport A.S.** annual show which proved to be a great success. There sults were:—Guppies: 1, Mr. and Mrs. J. Riley (Castleford); 2, Mr. and Mrs. Dawson (Heywood); 3, K. Miller (Heywood). Platies: 1, S. Bloor (North Staffs); 2, B. W. Carter (St. Helens); 3, Mr. and Mrs. Houghton (Southport). Mollies: 1, K. and P. Chambers (Southport); 2, Mr. and Mrs. Aspinall (Southport); 3, Mr. and Mrs. Iddon (Sandgrounders). Swordtails: 1 and 3, Mr. and Mrs. Houghton (Southport); 2, T. McCarthney (St. Helens). A.O.V. Livebearers: 1, Mr. and Mrs. Campbell (Macclesfield); 2, Mr. and Mrs. Durham (Longridge); 3, A. Whitaker (Macclesfield). Small Characins:

White Spot vanishes when you use halamid
Hillside Aquatics London N12

1, Miss S. Goddard (Macclesfield) 2, N. Walbank (Loyne); 3, Mr. and Mrs. Houghton (Southport). Large Characins: 1, Mr. and Mrs. Gough (Wynnstay); 2, Mr. and Mrs. Houghton (Southport); 3, Mr. and Mrs. Underwood (Southport). Small Barbs: 1, B. W. Carter (St. Helens); 2, B. Wilson (Sandgrounders); 3, P. and H. Batchelor (Loyne). Large Barbs: 1, Mr. and Mrs. Houghton (Southport); 2, Mr. and Mrs. Gough (Wynnstay); 3, Mr. and Mrs. Baldwin (Sandgrounders). Fighters: 1, Mr. and Mrs. Campbell (Macclesfield); 2, Mr. and Mrs. Ham (Lytham); 3, D. Francis (Merseyside). Large Anabantids: 1, Mr. and Mrs. McCarthney (St. Helens); 2, F. Micklewright (North Staffs); 3, Mr. and Mrs. Ham (Lytham). Small Anabantids: 1, Mr. and Mrs. Underwood (Southport); 2, Mr. and Mrs. M. Rimmer (Sandgrounders); 3, Mr. and Mrs. Mulla (Merseyside). Rasboras: 1, K. Thompson (Merseyside); 2, Mr. and Mrs. Muckle (Southport); 3, N. Walbank (Loyne). Danios and Minnows: 1, K. and P. Chambers (Southport); 2, B. Wilson (Sandgrounders); 3, G. Waterhouse (Sandgrounders). Toothcarps: 1 and 2, Mr. and Mrs. Tasker (Sandgrounders); 3, J. Sykes (David Brown). Small Cichlids: 1, Mr. and Mrs. Underwood (Southport); 2, W. Bamber (Independant); 3, B. Wilson (Sandgrounders) Large Cichlids: Mr. and Mrs. Aspinall (Southport); 2, Mr. and Mrs. Baldwin (Sandgrounders); 3, Mr. and Mrs. Underwood (Southport). Angels: 1, S. Harvey (Sandgrounders); 2, Mr. and Mrs. Harvey (Sandgrounders); 3, Mr. and Mrs. Aspinall (Southport). Rift Valley Cichlids: 1 and 3, Mr. and Mrs. Iddon (Sandgrounders); 2, B. Wilson (Sandgrounders). Corydoras: 1, B. W. Carter (St. Helens); 2, Mr. and Mrs. Muckle (Southport); 3, N. Walbank (Loyne). Loaches and Botia: 1, Mr. and Mrs. Ham (Lytham); 2, Mr. and Mrs. Underwood (Southport); 3, Mr. K. Thompson (Merseyside). A.O.V. Catfish: 1, Mr. and Mrs. Muckle (Southport); 2, P. and H. Batchelor (Loyne); 3, Mr. and Mrs. J. Riley (Castleford). Sharks and Foxes: 1 and 2, Mr. and Mrs. Baldwin (Sandgrounders); 3, Mr. and Mrs. Underwood (Southport). A.O.V. Tropical: 1, P. and H. Batchelor (Loyne); 2, Mrs. Franklin (Wynnstay); 3, N. Walbank (Loyne). Pairs (Egglayers): 1, Mr. and Mrs. McCarthney (St. Helens); 2, B. W. Carter (St. Helens); 3, Mr. and Mrs. Goddard (Macclesfield). Pairs (Livebearers): 1, Mr. and Mrs. Durham (Longridge); 2, D. Francis (Merseyside); 3, Mr. and Mrs. Holden (Longridge). Breeders (Egglayers Easy): 1, D. Francis (Merseyside); 2, Mr. and Mrs. Tasker (Sandgrounders); 3, J. Buckley (Northwich). Breeders (Egglayers Hard): 1, Mr. and Mrs. Tasker (Sandgrounders); 2, B. Wilson (Sandgrounders). Breeders (Livebearers): 1 and 2, Mr. and Mrs. Goddard (Macclesfield); 3, Mrs. Tomlinson (Macclesfield). A.V. Junior: 1, P. and S. Taylor (Atlantis); 2, D. Baker (Southport); 3, K. Corbett (Merseyside). A.V. Ladies: 1, Mrs. P. A. Taylor (Atlantis); 2, Mrs. Muckle (Southport); 3, Mrs. J. Hodge (Southport). Common Goldfish: 1, Mr. and Mrs. Holroyd (Morecambe Bay); 2, C. H. Whitsey (Accrington); 3, Mr. and Mrs. Dawson (Heywood). Fancy Goldfish: 1, C. H. Whitsey (Accrington); 2, R. N. Dingley (Heywood); 3, Mr. and Mrs. Holroyd (Morecambe Bay). A.O.V. Coldwater: 1, Mr. and Mrs. Houghton (Southport); 2, Mr. and Mrs. Baldwin (Sandgrounders); 3, D. Heywood (Sandgrounders).

* * *

A very interesting lecture on Corydoras Catfish was given by Mr. Cyril Brown at the September meeting of the **Mid. Sussex A.S.** This contained a great deal of information on the different fish which make up the Corydoras family.

During the evening the club President judged a club fish show, and awarded the cards as follows:—Dwarf Cichlids: 1, E. and T. Tester. Large Cichlids: 1, E. and T. Tester, 2, 3 and 4, B. Perrin. Barbs: 1, A. Temple, 2 and 3, E. and T. Tester, 4, J. Birch. Anyone interested in fish are always welcome to attend a meeting and further details may be obtained from the Secretary, Mr. B. Slade. (Phone H. Heath 53747.)

* * *

THE open show of the **Stroud & District A.S.** was held in August when the total number of entries (621) were received from a vast area. Main winners were:—Best Tropical Fish: D. Sheridan (Newbury). Best Coldwater: M. Butcher (Trowbridge). Best Killie: C. Morrison (Port Talbot). Best Ladies & Gents: P. & Y. Watts. Best Club Coldwater: Bristol A.S. Best Club Tropical: Newbury. Best All Rounder: V. Cowles (Bristol). Best Stroud Member: C. Hodges.

The **Stroud A.S.** apologise to fifteen class winners at being unable to present the main awards. The reason was that fifteen trophies were not returned to the Society from the 1976 show. These trophies should be returned as soon as possible so that they can be passed on to the 1977 winners. Please return them.

* * *

ALTHOUGH most of the time at the September meeting of the **Longridge & District A.S.** was spent finalising details for the open show, members still found time to listen to a very interesting talk given by club member T. Woolmington on his coldwater marine fishes. He told how he went out to collect his own fishes from the sea shore and made periodical boat trips to make sure he had enough fresh sea water to keep his fishes healthy.

In the Table Show the Best Fish in Show award went to R. Clint for his Siamese Fighting Fish. The other results were:—A.V. Marine Fish: 1 and 3, Mr. and Mrs. J. Holden; 2, T. Woolmington. A.V. Goldfish: 1, C. Parkinson. A.O.V. Coldwater fish: 1, 2 and 3, Mr. and Mrs. B. Durham. A.V. Livebearer: 1 and 2, Mr. and Mrs. R. Holden; 3, D. Garstang. A.O.V. Egglayer: 1, R. Clint; 2, D. Hughes; 3, Mr. and Mrs. R. Holden. The final placings in the Society Show League are: 1, Mr. and Mrs. R. Holden 103 pts.; 2, Mr. and Mrs. B. Durham 79 pts.; 3, J. Marsh 28 pts.; 4, Mr. and Mrs. A. Lyons 19 pts.; 5, N. Bland 12 pts.; 6, D. & I. Matthews 7 pts.

* * *

THE joint exhibition in which **North Avon A.S.** and **Severn Area** took part was very successful with a number of excellent displays from other societies. The **Bristol A.S.** had a waterfall and pond display with two extra stands of tanks, all coldwater. **North Avon A.S.** had a suspension bridge tableau with four tanks of fish in the towers and a marine display on the bridge. Underneath was a pool with Koi and Goldfish. The B.K.A. stand consisted of a fine display of small tanks of Killifish all well lit with descriptions. **Nailsea A.S.**, although short of helpers put on a fine display of Tropicals in nine well laid-out tanks and managed to staff the display all day. The **Yate & District A.S.** also put on a good three-tier stand with a selection of Tropicals and Coldwater. The top tier was a model of the Coronation coach with Guards band going down the Mall which was very effective. Although only a small club, **Knowle & District A.S.** managed a display and the Post Office display depicted a large parcel made of brown paper into which were let two four-feet tanks full of various fish with decorative rock-work. The **Independent A.S.** display was based on a balcony with french windows. On this and around the windows were tanks in various sizes.

A projection unit was set up and an F.B.A.S. slide show on Fish Feature was shown using an entirely automatic pulse-synchronised tape. This was running for five hours and caused considerable interest.

* * *

FROM 31 August the new officers of the **Killingworth Aquarist Association** are as follows: chairman, J. Askell, 19 Park Drive, Forest Hall, Newcastle-on-Type 12; secretary, D. Horsefield, 4 Garden Croft, Forest Hall, Newcastle-on-Type 12.

* * *

THE **Loughborough & District A.S.** meet on the second and fourth Thursdays of each month at "The Three Nuns" Loughborough. All visitors are welcome. In July Mr. David Keilley proprietor of "The Underworld Aquatic Centre," Loughborough, entertained the Society with a Quiz. The members greatly appreciated the knowledge and enthusiasm which Mr. Keilley injected into the evenings proceedings. A visit to Chester Zoo in August proved to be a great success for club members and their families. While the animals and gardens proved very popular, the aquarium undoubtedly was the centre of attraction.

At the meeting also in August, club members joined in an informal discussion entitled "What makes a good Aquatic Society." Many opinions were expressed and it is the Committee's intention to include many of the suggestions in the winter programme. The evening entertainment also included a Table Show with the following results:—A.O.V. Catfish: 1, I. Purdy; 2 and 3, J. Booth. Livebearers: 1 and 2 A. Onslow; 3, I. Purdy. Twin-Tail Goldfish: 1, 2 and 3, G. Howe. Best Fish in show: A. Onslow (Porthole Livebearer).

Aquarists are reminded of the Society's 1978 Open Show which will be held at Burleigh Community College, Loughborough, on Sunday 4th June.

* * *

THE main item at the September meeting of the **New Forest A.S.** was a talk by Mr. J. Walker of Bournemouth A.S. on live foods. He touched on Grindal Worms, White Worms, Brine Shrimp and Daphnia etc., and explained how to produce and feed the cultures!

During the interval a Raffle was held, followed by an auction of fish, plants, and Daphnia. Table Show Results:—Swordtails: 1 and 2, L. Menhennett, 3, S. Harmon, 4, P. Wheeler. Cichlidsm: 1, J. Menhennett, 2 and 3, T. Jefferies. Rasbora: 1, B. Dosen, 2, R. Trayer. Goldfish: 1, 2, 3 and 4, L. Menhennett.

* * *

RESULTS of the **Macclesfield A.S.** Open Show were as follows:— Guppies: 1, D. Porter (Warrington); 2, T. Bloor (North Staffs); 3, E. Hampson (Wythenshawe). Platies: 1, H. Buckley (Northwich); 2, Mr. and Mrs. Houghton (Southport); 3, K. Wood (Buxton). Swordtails: 1, Mr. and Mrs. Houghton (Southport); 2, Master K. Corbett (Merseyside); 3, Mr. and Mrs. Goddard (Macclesfield). Mollies: 1, Mr. and Mrs. Aspinall (Southport); 2 and 3, Mr. and Mrs. Tinsley (Sandgrounders). A.O.V. Livebearers: 1, A. Whittaker (Macclesfield); 2, K. Thompson (Merseyside); 3, Mr. and Mrs Campbell (Macclesfield). Small Anabantids (up to 8cm): 1, Mr. and Mrs. Baldwin (Sandgrounders); 2, K. Thompson (Merseyside); 3, Mr. and Mrs. Underwood (Southport). Large Anabantids (over 8cm): 1, G. Waterhouse (Sandgrounders); 2, F. Micklewright (North Staffs); 3, D. Potter (Warrington). Fighters: 1, Mr. and Mrs. Campbell (Macclesfield); 2, D. J. Francis (Merseyside); 3, H. Buckley (Northwich). Small Cichlids (up to 10cm): 1, K. Wright (Sandgrounders); 2, Mr. and Mrs. Underwood (Southport); 3, D. J. Francis (Merseyside). Large Cichlids (over 10cm): 1, Mr. and Mrs. Aspinall (Sandgrounders); 2, K. Ankers (North Staffs); 3, Mr. and Mrs. Underwood (Southport). Angels: 1, Mr. and Mrs. Harvey (Sandgrounders); 2, S. Harvey (Sandgrounders); 3, Mr. and Mrs. Aspinall (Southport). Rift Valley: 1, Mrs. E. Stilwell (Sandgrounders); 2, R. Riddon (Sandgrounders); 3, S. Wolstenholme (Heywood). Small Barbs (up to 7·5cm): 1, K. Thompson (Merseyside); 2, Mr. and Mrs. Underwood (Southport); 3, Mr. and Mrs. Muckle (Southport). Large Barbs (over 7·5cm): 1, Mr. and Mrs. Houghton (Southport); 2, Mr. and Mrs. Baldwin (Sandgrounders); 3, A. Oldham (Wythenshawe). Small Characins (up to 7·5cm): 1, Miss S.

PREVENTS
halamid
ALGAE
Hillside Aquatics London N12

Goddard (Macclesfield); 2, S. Wolstenholme (Heywood); 3, G. Waterhouse (Sandgrounders). Large Characins (over 7·5cm): 1 and 2, Mr. and Mrs. Houghton (Southport); 3, Mr. and Mrs. Underwood (Southport). Toothcarps: 1, K. Ankers (North Staffs); 2, K. Thompson (Merseyside); 3, Mr. and Mrs. Tasker (Sandgrounders). Minnows: 1, Mr. and Mrs. Houghton (Southport); 2, Mr. and Mrs. Underwood (Southport); 3, Miss S. Goddard (Macclesfield). Danios: 1, A. Bolan (Wythenshawe); 2, Mr. and Mrs. Mulla (Merseyside); 3, G. Waterhouse (Sandgrounders). Rasboras: 1, Mr. and Mrs. Houghton (Southport); 2, K. Thompson (Merseyside); 3, Mr. and Mrs. Muckle (Southport). Corydoras and Brochis: 1, Mr. and Mrs. Underwood (Southport); 2, K. Ankers (North Staffs); 3, Mr. and Mrs. Harvey (Sandgrounders). A.O.V. Catfish: 1, K. Thompson (Merseyside); 2, Mr. and Mrs. Muckle (Southport); 3, H. Carr (Ind). Loaches: 1, K. Ankers (North Staffs); 2, Mr. and Mrs. Houghton (Southport); 3, Mr. and Mrs. Underwood (Southport). Sharks: 1 and 2, Mr. and Mrs. Baldwin (Sandgrounders); 3, Mr. and Mrs. Campbell (Macclesfield). Flying Foxes: 1, H. Baver (Merseyside); 2, E. Hampson (Wythenshawe); 3, H. Carr (Ind). Breeders Egglayers (Easy 1 to 10): 1, J. Buckley (Northwich); 2 and 3, Mr. and Mrs. Tasker (Sandgrounders). Breeders Livebearers: 1 and 2, Mr. and Mrs. Goddard (Hyde); 3, S. Tomlinson (Macclesfield). Two Pairs Egglayers: 1, Mr. and Mrs. Aldred (Hyde); 2, M. Shenton, 5 Towns Fishkeepers, 3, Mr. and Mrs. Baldwin (Sandgrounders). Two Pairs Livebearers: 1 and 2, K. Thompson (Merseyside); 3, D. J. Francis (Merseyside). A.O.V. (any variety not listed): 1, Mr. and Mrs. Baldwin (Sandgrounders); 2, Mr. and Mrs. Tinsley (Sandgrounders); 3, J. Francis (Merseyside). Juniors (Egglayers): 1, W. McCracken (Macclesfield); 2, Miss J. Baldwin (Sandgrounders); 3, T. Bloor (North Staffs). Juniors (Livebearers): 1, L. Groves (Sandgrounders); 2, Miss J. Baldwin (Sandgrounders); 3, T. Bloor (North Staffs). Common Goldfish: 1, 2 and 3, R. Dingly (Heywood). Fancy Goldfish: 1 and 2, R. Dingly (Heywood); 3, Mr. and Mrs. Harvey (Sandgrounders). A.O.V. Coldwater: 1, Mr. and Mrs. Houghton (Southport); 2, J. Buckley (Northwich); 3, P. Whittaker (Macclesfield). Marine: 1, R. Riddon (Sandgrounder); 2, A. Swann (Macclesfield). Ladies (any variety): 1, Mrs. Tasker (Sandgrounders); 2, Mrs. Tinsley (Sandgrounders); 3, Mrs. P. Thominson (Macclesfield). Mini Jars: 1, D. Potter (Warrington). Best in Show: Corydoras Brochis, Mr. and Mrs. Underwood (Southport).

* * *

OPEN show results of the **Priory A.S.** held in September were as follow:—Guppy (Male): 1, 2 and 3, R. Hill (N.G.L.S.). Guppy (Female): 1, E. Brown (Priory); 2, P. Fry (Houton); 3, W. Walton (Priory). Mollies: 1, E. Connelly (Priory); 2, Weedy (Blyth); 3, M. Robinson (M.P.A.S.). Platties: 1, K. Dobbie (Priory); 2, A. Clegg (Novo); 3, A. Duncanson (Priory). A.V. Swordtail: 1, A. Walton (Priory); 2, H. Davis (Wallsend) 3, P. Fry (Houton). Small Barbs: 1, J. Mackenzie (Priory); 2, A. Walton (Priory); 3, J. Embleton (Novo). Large Barbs: 1, E. Connelly (Priory); 2, Mr. and Mrs. Embleton (Novo); 3, P. Best (Priory). Small Characins: 1 and 3, A. Duncanson (Priory); 2, Mr. and Mrs. Horsefield (Killingworth). Large Characins: 1, S. Hay (Hartlepool); 2, J. Irwin (Stanley); 3, Mr. and Mrs. Smith (Killingworth). Small Cichlids: 1, J. Middlemast (Ind.); 2, M. Lister (Ind.); 3, H. Davis (Wallsend). Large Cichlids: 1, S. Hay (Hartlepool); 2, P. Wright (Sunderland); 3, S. Todd (Priory). R/V Cichlids: 1, S. Hay (Hartlepool); 2, D. Rowntree (Wallsend); 3, W. & L. Grant (Priory). Angels: 1, J. Irwin (Stanley); 2, Mr. and Mrs. Horsefield (Killingworth); 3, M. Morrison (Wallsend). A.V. Fighter: 1 and 2, R. Kirkup (M.P.A.S.); 3, Mr. Campbell (M.P.A.S.). A.V. Labyrinth: 1, Mr. and Mrs. Hall (Novo); 2, L. Cowell (Sunderland); 3, P. Wright (Sunderland). Sharks, Labeo, Flying Fox: 1, Mr. and Mrs. Wright (Houton); 2, J. Irwin (Stanley); 3, J. Mackenzie (Priory). Rasboras, Danio, Minnows: 1 and 2, Mr. and Mrs. Hall (Novo); 3, J. Middlemast (Ind.). E.L.T.C.: 1 and 3, A. Howgate (Stanley); 2, J. Middlemast (Ind.). Corydoras & Brochis: 1, Mr. and Mrs. Hall (Novo); 2, J. Mackenzie (Priory); 3, A. Spencer (C.A.G.B.). A.O.V. Catfish: 1, Mr. and Mrs. Hall (Novo); 2, M. Lister (Ind.); 3, K. Dobbie (Priory). Loach: 1, S. Todd (Priory); 2, K. Debbie (Priory); 3, J. Irwin (Stanley). Breeding Pairs (Livebearer): 1, A. Clegg (Novo); 2, R. Kirkup (M.P.A.S.); 3, G. Allsop (Ind.). Breeding Pairs (Egglayer): 1 and 2, Mr. Campbell (M.P.A.S.); 3, M. Holman (Priory). Breeders Class (Livebearer): 1, R. Kirkup (M.P.A.S.); 2, A. S. Jackson (N.T.F.S.); 3, E. Brown (Priory). Breeders Class (Egglayer): 1 and 2, E. Hodgson (Priory); 3, J. Donnely (Ind.). A.O.V. Tropical (Livebearer): 1, A. Clegg (Novo); 2, Mr. and Mrs. Renton (N.G.L.S.); 3, M. Lister (Ind.). A.O.V. Tropical (Egglayer): 1, A. Walton (Priory); 2, F. Napier (S.S.A.S.); 3, J. Embleton (Novo). A.V. Coldwater: 1, E. Hodgson (Priory); 2, Mr. Humle (M.P.A.S.); 3, P. Wright (Sunderland). Furnished Jars: 1, A. Duncanson (Priory); 2, P. Fry (Houton); 3, N. Thompson (Wallsend). Plants: 1 and 2, W. Walton (Priory). Best Fish in show: Nothobrancius Rachouii. Aquarist Gold Pin duly awarded to A. Howgate (Stanley A.S.).

* * *

THE **Loughborough & District A.S.** meet on the second and fourth Thursdays of each month at "The Three Nuns", Loughborough. All visitors will be made very welcome. The theme of September's club meetings was "Breeding Egglayers," and the principal speaker on both occasions was Mr. G. Howe. Mr. I. Purdy and Mr. G. Taylor contributed their vast experience to the question and discussion session which followed.

Also in September the club exhibited a display of tropical and coldwater fish at the "Brush Gala." The display proved to be extremely popular with the general public and a number expressed interest in becoming members. Aquarists are reminded of the Club's "Open Show" which will be held at Burleigh Community College, Loughborough on Sunday 4th June, 1978.

* * *

AT the first meeting in August of the **Walthamstow & District A.S.** a club member gave a short talk on Aquascopes, and the second meeting was devoted to a discussion on the club breeding programme. A species was agreed on, and an arrangement for fish to be purchased for the club in the hope that the experience and results can be passed around the members who are interested.

For further information of club activities please contact Gerry Smith, tel: 01-527 6303. New members always welcome.

* * *

VEILTAILS were the fish chosen by the A.G.S. U.K. for their Nationwide Trophy at the **Bristol A.S.** Coldwater show and attracted an entry of seventeen excellent fish. A Veiltail was chosen as the Best Fish in Show this again in a well supported class of 24 entries. The prize for the Best Breeders Team of any variety was also won by Veiltails. The Show with its 500 entries drew exhibitors from all parts of the country and the B.A.S. wish to express their appreciation of the support given by members of all the major coldwater societies. The results were as follow:— Common Goldfish Red: 1 and 3, W. H. Ramsden; 2, W. G. Ham; 4, Miss C. Rupert. Common Goldfish Yellow or Variegated: 1, 3 and 4; L. Meehennet; 2, C. Hayes. Bristol Shubunkins 3: 1, W. Leach; 2, J. Amos; 3, J. Whiting; 4, T. A. Ball. Bristol Shubunkins 5: 1, A. E. Roberts; 2, R. King; 3, H. J. Whiting; 4, D. S. Langdon. Veitails: 1, 2, 3 and 4, T. G. Sutton. Moors: 1, 2 and 3, T. G. Sutton; 4, W. H. Ramsden. Telescopes, Celestials, Bubble Eyes: 1 and 4, T. G. Sutton; 2, D. E. Mills; 3, H. Penhall. Lionheads: 1 and 2, F. W. Orme; 3, G. King; 4, T. G. Sutton. Orandas: 1, 2 and 3, A. E. Roberts; 4, T. G. Sutton. London Shubunkins: 1, 2 and 3, Mrs. P. Whittington; 4, W. Leach. Nymphs and Comets; 1, C. Hayes; 2, P. L. Norman; 3, Miss C. Rupert; 4, P. L. Norman. Fantails Scaled, Metallic: 1, J. Kingsland; 2, H. Penhall; 3, C. R. Packer; 4, C. Summers. Fantails Calico, Nacreous: 1, R. Pinnock; 2, J. Amos; 3, H. Penhall; 4, C. R. Packer. A.O.V. Fancy Goldfish, Variegated and Pearlscales: 1 and 3, T. G. Sutton; 2, A. Leisure; 4, F. W. Orme. Koi not exceeding 9 in.: 1, 2 and 3, C. Hayes; 4, J. Moore. Bitterling, Sunfish and Basses: 1, W. G. Ham; 2, H. Penhall; 3, Mrs. C. Packer; 4, R. King. Pond Fish, Golden Orfe, Tench, Rudd: 1, Miss C. Rupert; 2, J. Moore; 3 and 4, J. Day. River Fish, Minnows, Sticklebacks, etc: 1 and 2, L. Meehennet. Bristol Shubunkins bred 1977: 1 and 3, B. M. Rothwell; 2 and 4, A. E. Roberts. Moors bred 1977: 1, 2 and 4, T. G. Sutton; 3, W. H. Ramsden. Orandas, Veiltails bred 1977: 1, T. G. Sutton; 2, A. E. Roberts; 3, B. Cook; 4, R. King. Lionheads bred 1977: 1, 2 and 4, F. W. Orme; 3, T. G. Sutton. A.O.V. Fancy Goldfish bred 1977: 1 and 2, R. King; 3 and 4, S. Lloyd. Team of 4 Bristol Shubunkins bred 1977: 1 and 4, B. M. Rothwell; 2, J. Amos; 3, V. Cole. Team of 4 one variety, Moors, Orandas, Veiltails bred 1977: 1, R. King; 2, T. G. Sutton; 3, A. E. Roberts; 4, W. H. Ramsden. Team of 4 one variety, A.O.V. Goldfish bred 1977: 1, T. G. Sutton; 2 and 3, A. Leisure; 4, P. L. Norman. Team of 4 one variety, Koi, Pond or River Fish bred 1977: 1, R. King; 2, Mrs. J. Amos. Bristol Shubunkins, Matched Pairs: 1 and 4, H. J. Whiting; 2, B. M. Rothwell; 3, C. H. Clark. Novice Class Bristol Shubunkins: 1 and 2, D. Scott; 3, P. Norman. Novice Class A.O.V. Goldfish: 1, P. L. Norman; 2, B. Moore. Furnished Aquaria: 1, S. Lloyd. Nationwide Trophy 1977 for Veiltails: 1, A. E. Roberts; 2 and 4, T. G. Sutton; 3, J. Linale.

* * *

IN September a unique experiment took place which was a Judging Seminar, organised by the **Tyne Tees Area Association** of the F.B.A.S. The idea was to bring the judges and exhibitors together. Four speakers took the floor with a fine array of diagrams and slides. B. Risbridger talked on Corydoras, M. Ruffell and F. Askew gave a combined talk on Egglaying Toothcarps and D. Renton talked about Livebearers. The lectures were solely concerned with the judging and identification of fish in the three classes, incorporating things like:—special characteristics to be looked for when judging; recurring faults etc.

After each lecture, questions relating to the subject concerned were asked for, from both judges and exhibitors. It was explained that as long as the questions were asked in a civil manner, then the judges would be willing to stand up and be shot at, and it proved to be a lively and entertaining debate, with both sides learning from each other. Without exception everyone went away well satisfied and many people were asking when the next one would be held.

* * *

THE **Gt. Yarmouth & District A.S.** held their Exhibition '77 at Hopton and had another great success with nearly 1,500 people in attendance. The standard of fish and tableau were of very high standard this year. One visitor was comedian Larry Grayson who showed great interest in the exhibits. Judging was done by The Catfish Association of Great Britian and the results were: Best Tropical: C. Rumsly; Best Cold water: Ida White; Furnished Aquaria: A. Kemp; Tableau: D. Greengrass.

* * *

AT the September meeting of the **Llantwit Major A.S.** which is the annual meeting for the competition of the trophies and cups presented to the winners at the annual dinner, the results were as follows:— Egglayers: 1, J. Thompson; 2, G. Fry; 3, A. Hillman; 4, G. Lewis. Livebearers: 1, J. Thompson; 2, J. Edwards; 3, A. Hillman; 4, D. Williams. Breeders Egglayers: 1 and 2, A. Ibbertson; 3, G. Lewis. Breeders Livebearers: A. Ibbertson.

During the judging of the fish by C. Turner and C. Harding a very interesting talk was given by W. Gorwill on Cichlids.

Also during the evening the members of the Club voted for the member of the year who wat Mrs. Audrey Ibbertson and will be presented with the Wing Cmdr. W. C. Smith Cup at the annual dinner.

* * *

THE **Wallsend A.S.** hold meeting fortnightly which include at various times, and show's, talks, film shows, auction, Quizes and if enough members are interested trips will be arranged.

There is a jar show every meeting and a twelve meeting cup to be won.

For further details please either write to above address or telephone N/c 669286. D. Rowntree 31, Elton St. West, Wallsend, Tyne & Wear, NE28 8JY.

* * *

OBITUARY

IT is with deep regret that East London record the death of one of its Vice-Presidents, Mr. John Brydon. He was a member of East London A.P.A. for over 25 years. Besides being an enthusiastic member he held many positions on the managing committee, including Chairman.

Indeed, when John was Show Secretary, East London held its biggest show ever which proved to be a great success. Much of this success was due to John's own efforts.

In recent years he was unable to attend meetings as often as he would have liked, but he kept in touch and kindly donated many peizes for presentation at the Annual Shows.

A friendly Geordie, John was regarded as one of the cornerstones of the Society and he will be sadly missed.

To his wife Eileen and his family we offer our sincere sympathy.

* * *

ANNUAL general meeting details of the **Swillington A.S.** are as follows:— Chairman: M. Walker, Secretary: P. Campling and Treasurer Mrs. M. Freer. The Show secretaries duties will be performed by Mr. and Mrs. J. S. Greenwood, 4 Edinburgh Place, Garforth, Leeds. (Tel. Garforth 88805.)

* * *

AT September meeting members of the **Nailsea and District A.S.** had a very excellent F.B.A.S. slide/tape programme on Anabantids. Also held on the same evening was a table show the results of which were:—Sharks, loaches, botias: Open: 1 and 3, P. Fitchett; 2, I. Williams. Novice: 1, I. Williams; 2, S. Bolton; 3, B. Billinger. Characin Open and Novice: 1 and 3, B. Billinger; 2, S. Balton.

* * *

VENUE CHANGE

The **Nailsea and District A.S.** will hold their future meetings at the High Cliffe Hotel, Wellington Terrace, Clevedon on the fourth Tuesday of each month.

* * *

SECRETARY CHANGES

Padiham A.S.: D. Payton, 7 King's Drive Hapton Burnley, Lancs. BB12 7DF.

Wallsend A.S.: D. Rowntree, 31 Elton St. West, Wallsend, Tyne & Wear NE28 8JY.

* * *

AQUARIST CALENDAR

6th November: Halifax A.S. Open Show at the Forest Cottage Community Centre Cousin Lane, Illingworth, Halifax. Schedules sent only on request. S.A.E. to: D. Shields "Cobblestones" Gaincot, King Cross, Halifax, HX2 7DT, or Ring for details Halifax, 60116.

6th November: Blackburn Aquarist Waterlife Society Open Show. Venue at a later date. Secretary, Mrs. Jean Wolstenholme, 39 George Street, Great Harwood, nr. Blackburn BB6 7JE.

13th November: Bradford and District A.S. Open Show at Textile Hall, Westgate, Bradford. Details are available from the show secretary, J. Cornforth, 15 Weymouth Avenue, Allerton, Bradford. Telephone: Bradford 493165.

19th November: Goldfish Society of Great Britain, General Meeting, 2.30 p.m., Small Hall, Conway Hall, Red Lion Square, Holborn, London, WC2.

20th November: Northallerton and District A.S. first Open Show to be held at the Community Centre, Northallerton. Schedules available later.

20th November: Northallerton & District A.S. First Open Show at Community Centre, Bullamoor Road, Northallerton. Send s.a.e. for schedule to: Mr. B. Hood, 3 Castle Hills, Northallerton, N. Yorks DL7 8UP.

20th November: Association of Southern Aquarist Societies Convention at Mullins Road Community Centre, Portsmouth, starting at 11 a.m. Talks by the Cichlid Society and Characin Study Group. Price 25p. Tickets from G. A. Edwards, 4 Hibberd Way, Bournemouth BH10 4EL. S.A.E. please.

1978

23rd July: Gospoul & District A.S. Annual Open Show.

UP-DATED, ENLARGED AND NOW, WITH COLOUR!

COLDWATER FISHKEEPING

by Arthur Boarder

More than 100 pages containing invaluable advice on every aspect of coldwater fishkeeping from one of the world's leading authorities.

Printed on high quality paper with a most attractive Astralux cover, this fascinating book has dozens of illustrations and photographs including many in full colour.

A 'must' for every coldwater enthusiast

Price £1·00 (including post and packing)

Obtainable from:-

THE AQUARIST AND PONDKEEPER

The Butts, Brentford, Middlesex, TW8 8BN.