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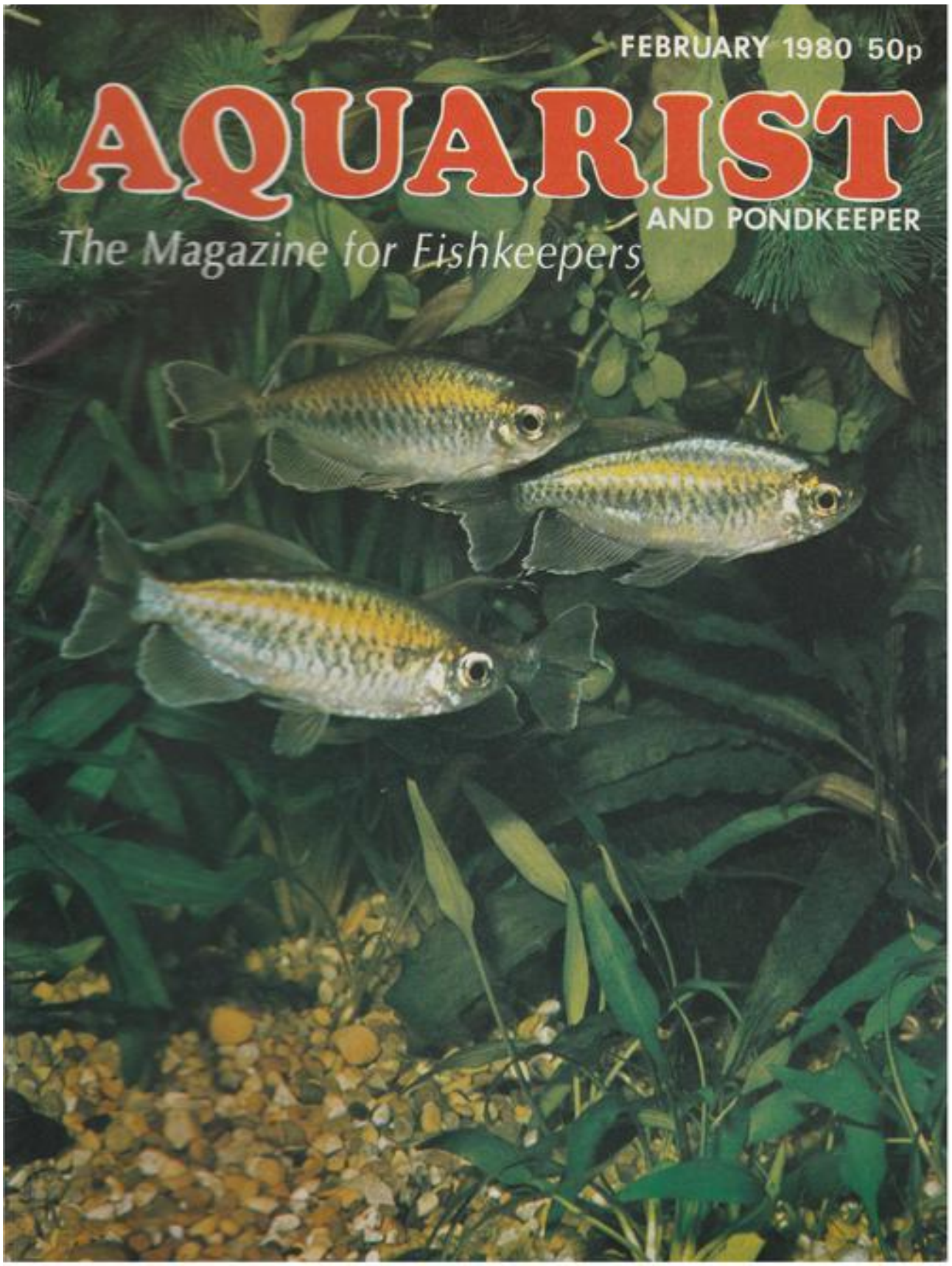
AQUARIST

AND PONDKEEPER

The Magazine for Fishkeepers



THE AQUARIST AND PONDKEEPER

Britain's Leading Magazine for Fishkeeping

Published Monthly 50p

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WHAT IS YOUR OPINION?

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

MASTER ROGER GRIMSHAW is 15 years old and writes from Thornton B, Christ's Hospital, Horsham, Sussex. ". . . Although I have never had an outbreak of disease due to *Tubifex* or white worms, I am still very careful. Before going in they get a double dose of Myxazin to knock out any bacteria. I watch during *feeding and afterwards to see if any are left; very rare* indeed. They are siphoned out with air line tube and the fish get a second bite at the apple. *Tubifex* are bought but my white worms are home-grown. Incidentally, they are fed from an idea I got from *W.Y.O.* some while back: crushed doggie biscuits etc. Although the worms are small, I chop them up just in case one gets stuck. I learnt the hard way and lost ten baby fighters through unchopped *Tubifex*.

"I have bred dwarf gouramies. I bought the pair originally as a community species, but when the female got very plump and the male started giving her his undivided attention I put them in a breeding tank. Within four hours the male had started to collect floating leaves and was knitting them together with tiny bubbles. He looked a truly magnificent sight. The female was not allowed anywhere near until he had finished it.

"They spawned the following morning—luckily, a Sunday—and in no time at all the male was guarding 250 plus eggs. Unfortunately his paternal duties went too far and whilst I was trying to net the female he suddenly rushed at her and she took a nasty blow on the side. She died the day after so he must have hit something vital. After 25-30 hours at 82°F the eggs hatched. The father became even more vicious and if I came anywhere near the tank he would rush at the glass and go a deep red. Three days later they were on Liquifry. I had managed to catch the father and he was back in the community tank. The fry were soon on dried foods and they are now approaching an inch in length. Last week the father died, of old age I think, but at least he had provided 190-200 little dwarves so I think I won't have much trouble getting a new pair."

Mr. Mike Clouston resides at 39 Messack Close, Falmouth, Cornwall; and he is one of the rare breed of people who use a fountain-pen and write neatly. He says: "May I relate to you and your readers how my 12 year old son David and I became involved in fish-keeping, and our experiences since we started about nine months ago. David is very fond of animals but unfortunately is allergic to dogs' hair, cats' fur and birds' feathers. This allergy rules out the normal run of pets for David, but fish-keeping has proved the ideal answer.

"Last Christmas (1978) we visited my wife's parents and David was fascinated by his grandfather's aquarium and garden pond. This gave me the idea of fish as a hobby for David. On returning from our holiday I consulted a very good friend of mine, Mr. Roy Salmon, who has two aquaria. He made David the gift of two 18 in. × 12 in. × 12 in. all-glass tanks which had been used for breeding purposes but were then surplus to requirements. He also gave us various accessories such as heaters, thermostats, U/G filters, a cable tidy etc. As well as all the 'hardware', Roy also gave us a pile of back numbers of *The Aquarist*, going back to 1972, and loaned us his copy of Sterba's *Bible*. Since then Roy has been a wealth of information and advice and we owe him a deep debt of gratitude.

"On getting the two 18 in. tanks set up and the temperature stabilised we visited Tri-Mar Aquaria in Bamborne and bought some livebearers such as guppies and swordtails, plus some neon tetras and zebra danios. We had some initial losses despite reading everything we could lay our hands on and trying to put everything into practice. Are losses inevitable with new set-ups? Can I say how useful the back numbers of *The Aquarist* were—especially your column and that of Mr. Jack Hems. Despite the losses we carried on, I'm pleased to say, because the more involved we've become the more fascinating our hobby has become. At the beginning of this summer (1979) a neighbour sold us two 27 in. × 15 in. × 12 in. tanks plus stand, heaters, thermostats, pump, filters, hoods and lighting for £20-00. Quite a bargain!

"David took over the management of the two 18 in. tanks and one of the 27 in. tanks and I was allowed to keep one of the 27 in. tanks for myself. As finances permitted we have gradually stocked and furnished our tanks. We have continued to suffer the occasional loss for no apparent reason other than incompatibility—or so it would seem. The two larger tanks have been aqua-scaped most decoratively by David, who has

more artistic talent than I can ever hope to achieve. Our tanks are furnished with local granite, bog root etc. and densely planted with *Elodea*, *Ludwigia*, straight *Vallisneria*, and specimen plants such as Amazon swords, *Cryptocoryne*, Java moss and some wisteria. We have had no success in growing *Bacopa*; or *Cabomba*, which seems to attract algae to such an extent it is choked to death.

"Our first breeding success came about in spite of everything seemingly being against it. I had emptied my tank of fish and plants while awaiting the delivery of plants from Everglades. The heat and lighting had been turned off, as had the U/G filter. A neighbour Mr. Trevor Dowle, was visiting when he noticed four fry swimming in the murk. These were removed to one of the 18 in. tanks. We were unsure of their identity but as they grew they turned out to be zebra danios. They have now grown as large as their parents.

"Since then David's guppies and swordtails have bred on several occasions; in fact, the guppies are great grandparents by now. My dwarf gouramies also went through all the motions—the male building a most beautiful bubble nest and carrying out the courtship ritual with his mate. No eggs were seen in the nest though and in the end the male abandoned it and I got back my Java moss. Our present stock of fish consists of guppies, swordtails, neon tetras, glowlights, beacons, pearl, opaline and golden gouramies, dwarf sucking loaches, tiger barbs, and my favourites: a clown loach and zebra and leopard danios; and David's favourites: *Corydoras* and *Pimelodella* catfish and two kribensis. We have had no success in keeping angels, mollies and dwarf cichlids (rams) or harlequins.

"The two bigger tanks are lit by flourescent light, David's with a warm white tube and mine with Gro-Lux. I have noticed no difference in the plant or fish growth in either tank but I must admit I like the way the Gro-Lux tube accentuates the colours of fish—especially the reds. These two tanks are immediately adjacent to a south-facing window and consequently get more than their fair share of sunlight and have suffered from a considerable growth of algae; however, recently they have both been stripped and cleaned and I have put some tablets in which, hopefully, will at least control the growth of algae. The two smaller tanks are lit by 40 watt tungsten bulbs. They haven't suffered from algae as much as their larger neighbours; but whether this is because they are lit by tungsten bulbs or don't receive direct sunlight I just don't know. Perhaps it's a combination. Certainly the fry and larger fish that have been in them have suffered no ill effects.

"I should like to place on record my sincere thanks to my friend Roy Salmon and my friend, neighbour and work-mate Trevor Dowle for all their help, encouragement, advice and company. Can I make a plea to anyone who has surplus equipment to give it or sell it to someone who might appreciate it and so start someone else off in a most enjoyable hobby. My thanks too to you for all the help I have received from your column in particular, and *The Aquarist* in general."

Golden gouramies

Photograph 1 shows a pair of golden gouramies. If you have successfully spawned and raised this attractive fish, please send me details.

Mr. P. A. O'Connor lives at 115 Liberty Lane, Addlestone, Weybridge, Surrey, and addresses me as 'Brian'—which is fair enough, even though it isn't my name. Mr. O'Connor states: "In a recent issue of *The Aquarist* you asked for details of breeding any unusual egg-layers. In February 1976, I was given a large pair of *Tilapia mossambica*. Unfortunately the male died within a fortnight and it took a further year to find another one. The pair were placed in a 48 in. community tank as they seemed very nervous on their own. A fortnight later the male (3 in. in length, as opposed to the female's 6 in.) turned almost black; and though a lot of pit-digging took place in the gravel, no spawning occured. A month later I found that the female had a mouthful of eggs, so the male was removed from the tank. The fry were released after

13 days and it was amazing to see the female suck about 200 young into her mouth when danger loomed. I eventually gave away or sold locally most of the young. When the male was returned to the tank he tended to dig pits all over the place; so I removed him to another tank.

"Eventually the female mated with one of her offspring and this time I witnessed the spawning with the female collecting the eggs from the gravel and driving off the male—which was trying to eat any she missed. I still have about 150 variously sized and sexed young adults to give away if any readers are interested in watching the breeding habits of these fish. They are quite hardy and not prone to disease; they prefer a vegetarian diet; they take any dried food; and they are especially fond of crushed, boiled peas. I found the best way to keep the number of fry under control was to keep a firemouth in the same tank; it soon thins them out!" (Mr. O'Connor's letter was written on 20th October 1979).

Mr. P. B. Ripley's address is Flat 2, 12 St. Barnabas Road, Cambridge. He writes: ". . . I send away for my plants to an advertiser in your magazine, E. Palmer & Son, of Hull, and I couldn't be more pleased with the excellent and prompt service I receive from them, not to mention the superb quality of the plants. If only I had green fingers! In my large, 48 in. × 15 in. × 12 in. aquarium my plants either curl up and die after a few weeks or my fish decide I am offering a salad and soon tear the leaves to shreads. In my small, 30 in. × 12 in. × 12 in. aquarium the plants flourish; and even an old stalk pushed into the gravel transforms itself into a new plant. Both tanks contain a mixture of gouramies, tetras and the usual community fish. The smaller tank also contains snails which seem to confine themselves to the algae on the back and side glass. Water conditions are similar and both tanks use surge filters (?) as I could not grow plants using a U/G filter. Both tanks are situated in my living room in an alcove free from draughts and too much direct sunlight. My smaller tank is lit by a 12 in. white light tube. My larger tank has a 24 in. Truelite and a 24 in. Gro-Lux tube.

"I never strip my tanks completely; I use a siphon to clean the top gravel and change one quarter of the water every fortnight. To clean the algae from the front glass I use a magnetic alage scraper which is easier to use than a razor blade. Also, you can't get blades! An aquarium shop near Cambridge had two tanks full of jewelfish when I was last there. I have taken photographs of my fish but as I do not have a close-up lens the photographs show the complete set-up. . . . If you can write to me I'll be pleased as there do not appear to be any aquarist societies in my area and I have no one to discuss my hobby with. . . ." (Mr. Ripley kindly let me see some interesting photographs of his tanks).

Young angelfish

Photographs 2 and 3 show the young angelfish that I purchased some weeks ago. They were photographed with flash on top of my camera, using the ordinary, standard (50mm.) lens. The flash gun was angled down at 45° to the front glass in an attempt to avoid reflections. When used thus, with the flash held in place using an appropriate flash bracket, the results are reasonable if one ensures that the camera and flash are held parallel to the front glass. If tilted, the flash will probably bounce off the front glass into the lens and spoil the picture—as it did/does in a

number of mine which, naturally, you will not see.

If you have been trying fish photography for the first time you may have found out that it is not so simple as one might think. One has to experiment—and experiments are of no use unless one keeps accurate records of each shot/photograph taken. It's a nuisance when one loads up the camera and gets everything ready to photograph the fish in, say, one's community tank to have to stop before or after every shot to record details of f/stop, distance etc. A much easier way than writing, I have found, is to set up a cassette recorder—a cheap, little portable is perfectly adequate—and switch it on just before taking the first photograph. One can then go ahead and while taking each photograph give a running commentary, recording details. At the beginning of the session one could label the film, e.g. say: "Ilford FP4 film, ASA 125, 20 exposure, 50mm. lens, smallest extension tube, with X brand flash unit mounted on camera at 45°." One could follow this up with, say, "Shot 1: young angel, at f/16, near base of tank. Shot 2: golden gourami, f/11, near top of tank." It is useful to know if the fish photographed was near the base or near the top because gravel that's light in colour can reflect light up onto the fish's belly and improve the photograph; hence a higher f/number (less light) might be required for an exposure of a particular fish if it were photographed near the gravel rather than near the top of the tank.

After the photographic session is over one can replay the tape and write the information in a notebook for future reference. When the film has been developed and prints made, one can then compare the written information (or the tape recording) with the prints and negatives and draw up a list of details of which settings best suit specific fish, in specific places, when using FP4 film, with a standard lens fitted with a small extension tube and a specific flash unit mounted on the camera. Different film speeds, different extension tube sizes and different sites for the flash unit will all affect f/stop numbers.

Mr. R. G. Farrow's neatly-typed letter is headed 9 Wyndham Close, Birch Glen, Colchester. He writes: "I purchased a micro-worm culture from an advertiser in *The Aquarist* for 50p. I split the mixture into two dishes and used porridge as food. First, I placed an amount of food in the dish then poured the culture onto the top. This was the only time the 'worms' were fed; and now, after a number of months, they are still going strong. One small problem was their drying out. After about a week from starting the cultures they were teeming with worms. I feed them to any newly-hatched fry and find them especially good for white cloud mountain minnows and *Corydoras* fry.

"The cultures are kept on top of a tank to provide some heat and it is noticeable that if they are left off the top for any length of time the number of worms drops considerably. I find these worms extremely easy and useful to have as a first live food and I think they get young fish off to a really good start."

No. 95 Long Lane, Chadderton, Manchester, is the home of Mr. Frank Garside, who does not use a fountain-pen and who does not write neatly; but he has something interesting to say and I'm prepared to risk the occasional error or question mark in my copy if he doesn't mind. He writes: "Thank you for printing my last letter in the October 1979 *Aquarist*. Sorry about my appalling writing which caused my surname to appear as Gareth. A recent *W.Y.O.* asked about the frequency of stripping down an aquarium and starting afresh. A recently-published book (1) gives some interesting information on the concentration of nitrifying bacteria in old filter beds—which would be the gravel bed of the aquarium if U/G filtration were employed. The conclusion is that gravel should *never* be taken out and washed as this removes a large percentage of nitrifiers. However, I personally feel, from a purely amateur viewpoint, that about every year or two, depending upon conditions, a good clean-out is a good thing, assuming that the occupants can be given temporary accommodation elsewhere.

"In the 1950s the 'balanced aquarium' was the ideal: water was never thrown away and the minimum possible disturbance was inflicted on the tank's occupants. The longest period for which I had a tank without clearing it out was seven years. It was a 36 in. × 15 in. × 15 in. populated by four, large *Barbus filamentosus*, a number of home-bred *B. titteya* and a number of livebearers. If the tank had held carnivorous species then I feel it would have needed cleaning more often. From an aesthetic viewpoint I get tired of looking at the same layout, dingy gravel etc., after a year or so and a freshen up rejuvenates both me and—I like to kid myself (anthropomorphism)—the fish as well. Incidentally, some time ago there appeared articles concerning (a) delayed hatching of *Pristella riddlei*, (b) the exudation of poision by *Cryptocoryne affinis* and (c) zebras not being compatible with white clouds. Has anyone any idea of the 'conclusions,' if any? My 12-year old son, Martin, who is an enthusiast as I am, has recently spawned goldfish in his fish house—the garage—but is losing a lot of fry. Recently he purchased a 6 in. specimen of *Heteropneustes fossilis*, which lives peacefully—or maybe in a state of armed neutrality—with two *Tilapia tholloni*, a *Cichlasoma severum* and a pair of kribensis in a 36 in. tank. The kribensis rule the tank with a rod—fin?—of iron. (1) SPOTTE, Stephen—*Fish and Invertebrate Culture—Water Management in Closed Systems*, 2nd edition, Wiley—Interscience 1979. ISBN 0-471-02306-X."

Sorry about the error in your surname last time,

Mr. Garside. Occasionally I mention the disintegration of the leaves of *Cryptocoryne* species; I used to postulate a theory or two about the condition. At the moment I have *C. affinis* thriving in two tanks without any signs of leaves rotting or falling off. One of the tanks was treated with algae-killing tablets and they did not affect the *C. affinis*. Incidentally, the tablets appear to be controlling the growth of algae in the treated tanks. I followed the directions supplied with the American tablets and they appear to have done exactly what I wanted them to do. When certain weeds infest my agrden I also resort to chemical means of control because they are often simpler and easier to use than conventional methods of manual or mechanical control; and weeds such as scutch grass are almost impossible to eradicate unless one uses an appropriate weedkiller. Incidentally, recently a friend asked me what weedkiller could be used to control horsetails. He had been through most of the weedkillers and weedkilling techniques listed in a couple of books and his horsetails were as strong as ever. I did come up with a suggestion; but fortunately I have never been troubled by this primitive plant in my garden; and the weedkiller I suggested is not one that I have ever used; indeed I found the information in a recently-published book after finding that older books in my collection stated that horsetails were virtually impossible to kill. I presume they have survived so long because they have been able to resist attempts to kill them—which is a fairly vapid comment because everything that's alive in the world has survived. . . .

It is a long time since I read anything about white clouds and zebras not getting on too well together in the same tank. Could it be one of those myths—such as the one that white worms are fattening to fish—that someone printed in a book and some of those who subsequently wrote books repeated without having checked it out? It is a long time since last I kept zebras. They are lively fish for the upper layers of the aquarium water. I don't think it's indulging in anthropomorphism to think that fish are rejuvenated if their water is changed after a long period. Changes of water do liven up fishes that have been in a given quantity of water for some time. Note the effect next time you make a partial water change. I should be pleased to hear from anyone with any opinions to express on any of the above topics.

Miss Margaret Cairns, B.A., formerly of Portobello Road, recently moved to a new address: 17 Watts House, 105 Wornington Road, London, W.10. No doubt she will tell us of the problems associated with moving home and having to take several tanks and numbers of fishes with her; however, the following letter was written before the move. Miss Cairns wrote: "I live in a small flat and have room for only three permanent, display tanks. The largest, 3 metres, is in the kitchen. It was first put there in desperation as I had no other space. I had set up and maintained the tank for a customer, while working as an aquarist, and she unexpectedly gave it to me when she left the country. The pump draws air from outside; and as the tank is beside a table that I use constantly, the fish soon become tame and will spawn etc. while I take notes from a foot away. This tank once held discus but now contains kribensis and *P. tropheops*. This unusual combination is due to an attempt to line-breed kribs for additional tail spots and reliable parental instincts. I failed with the spots; but the kribs are such good parents that they rear all broods. However, brood defence seems linked to territorial defence in both sexes, and my kribs also seem marginally larger than those on the market.

"The *P. tropheops* are intelligent enough to shun the nests, and therefore hold their own—although I've just lost a male under suspicious circumstances. Four gallons are replaced weekly and the tank is stripped every six to nine months to remove surplus fish. Would anyone like to exchange other young cichlids for kribs or *P. tropheops*? Recently I planted

Young angelfish

Aponogeton and ferns on the exact borders of territories, with road-menders' large gravel weighting the roots. The kribs now actually take waste matter to the plants when cleaning their nests! The tank is difficult to clean as it has many hiding places; it resembles a flooded landslide—but I feel that this labour-saving arrangement is so neat that it is bound to go wrong.

"The other tanks are on a stand in my room. The upper is 24 in. long × 24 in. deep, holds angels, large tetras, *Botia* and a pair of swords, and has both U/G and a peat box filter. The tank is stripped and replanted every five years, on average; but the average has been distorted because, having successfully planted the tank from front to back with *Cryptocoryne*, Amazon swords and ferns, *Aponogeton* and *Nymphea*, and having grown these for a year, I failed to resist the lure of some strange, exotic plants at *The Aquarist* show. These carried a strange, exotic blight—I

hadn't known that aquatic plants got blight!—which not only wiped out much of the vegetation from the roots upwards but also induced some kind of saphrodite (?) growth on a long, slender, twisted bough which had, by spiralling down from the right, branching in the centre and terminating in twigs and small branches on the lower left, provided a highway for *Botia*, a spawning site for tetras and a background for everything else since the tank was set up. This bough, which was less than 3 in. in circumference at its widest point, did not survive the removal of the growth; so I shall be forced to re-design the whole interior of the tank.

"The lower tank is amazingly like the aquarium shown in photograph 2 in the November 1979 *W.Y.O.* The plants and layout are almost identical and, since the picture was relevant to my letter on Malayan burrowing snails, I have found it difficult to convince friends that this is not my tank. Ironcially, the lower tank, which holds small tetras, danios, livebearers and a pair of thick-lipped gourami, is the only one of my aquaria that does not contain these snails. I should be happy to offer any number of these hardy, prolific, livebearing molluscs in the *Exchange and Wanted* column. Children can gain hours of harmless amusement while picking them from the gravel—without perceptibly diminishing the number of snails present. When crushed the snails provide an excellent conditioning food for cichlids etc. These snails are so hardy that they seem indestructible—but suggestions would be greatly appreciated."

On several occasions I have asked readers if they can account for the apparent disapperance of many of the attractive spots one used to see on the tails of many kribensis—correctly known as *P. pulcher*. It's encouraging to learn that at least one reader has been trying to improve the situation—even if unsuccessfully, so far. (I think 'saphrodite' should be 'saprophytic' in Miss Cairns' letter).

Mr. Roddy Moyes sent me the last of the letters for which I can find space this month. He resides at 40 Barra Crescent, Fraserburgh, Aberdeenshire, and wrote as follows: "I have experimented with different rock samples for some time and have settled for two types to use in my tanks. In my 24 in. × 12 in. × 12 in. tank I have utilised rock taken from a dry stone wall near my home, and although I don't know exactly what type it is, it appears to be some sort of sandstone and is very effective for terracing. Its lovely brown colour and its texture make it ideal for the completely natural look I have been trying to achieve.

"In my 28 in. × 12 in. × 12 in. angel tank I have used black, red and grey granite I obtained from a small company that makes headstones. I have found some really effective pieces while looking through the big pile of chippings; many have at least one polished face. Although I don't consider granite for a really natural looking set-up, it gives a very pleasing effect in a purely decorative tank.

"While writing this letter I have decided to experiment with pre-moulding interiors for my tanks. I'll let you know of my success or failure."

Each year at this time I am prompted to remind readers to take great care when working with glass—especially if attempting to remove a cracked pane from an aquarium prior to re-glazing. Ten years ago I had a nasty accident while doing this and seriously damaged my left wrist and hand. Several operations and ten years later I am resigned to the fact that *W.Y.O.*—and any other articles that I produce—will be typed using only the small finger of my left hand and the index finger of my right hand. Please take care when working with glass. Incidentally, speaking of glass reminds me to suggest that you have a quick glance at the glass covers on your tanks. Are they coated with algae, dust, fish food and deposits of mineral salts left behind after water has evaporated? If so, clean them. This will allow more light to get from the hood into the tank and, as a result, you should be able to see the contents of the tank more clearly; and the fish and plants will probably grow better as well. When I wish to clean a cover glass I place it on a rubber (shower) mat in the bath and scrub it with a nail-brush, using a spray to rinse off the dirt. I should be pleased to hear from anyone who uses a top light but does not use a cover glass. Is plant growth much improved when light does not have to pass through a cover glass—as well as the light bulb or fluorescent tube glass? In any case, handle glass carefully.

Please send me your opinion on any of the following: (a) cultivating *Ludwigia*, *Hygrophila* or *Cabomba*; (b) breeding neons, *Corydoras* or large cichlids; (c) photographing fish; and (d) new features that you would like to see in *The Aquarist*. Drop me a line, please.

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

It has come to my attention that a new aquarium has been manufactured that is roughly not more than about 6 in. in height × 4 in. across and a few feet in length. Would you recommend such a tank for a beginner in fish-keeping?

Provided the tank was not stocked with tall-growing or disc-shaped fishes all should go well. Many years' ago, I used to breed and raise scores of live-bearers in large glass trays holding no more than about 3 in. of water. Bottom beat was supplied and the glass floor soon collected a covering of brown sediment. It was, of course, essential to keep the top of the trays covered with a sheet of glass. The surface of the water was greened over with a mixture of duckweed and riccia.

Heterandria bimaculata

Can you give me some information about *Heterandria bimaculata*?

This livebearer was no stranger to Dutch and German aquarium keepers between the two World Wars. A few turned up in a dealer's showroom in North London about the time of the Munich crisis. The species is an inhabitant of running or still waters in central Mexico through to Guatemala and beyond. The male reaches about 1½ in., the female twice that size. Coloration is variable. Fish from mountain streams or pools or lakes are, in general, greenish brown, darker above than below. But fish from lowland areas are brown with dark-edged scales and overcast with a greenish sheen. There may be one or two dark spots spaced some distance apart on the sides. Both sexes are coloured much alike. *H. bimaculata* is not an ideal community fish. It can be quite aggressive towards similar-sized companions. A temperature in the low to middle seventies (°F) suits it well. All swallowable live food keeps it active and, hopefully, prolific. Old time aquarists will remember this fish under its outmoded name of *Pseudoxiphophorus bimaculatus*. Quite a few aquarium books published before the 1960s carried good descriptions of it.

Is there such a fish as a blind cave loach?

At least one species has been reported from one of the remoter parts of Europe (if my memory serves me right). It is known to science as *Noemachilus smithi*. It is a curiosity of the subterranean world and I cannot see it being made available to aquarium keepers in the foreseeable future.

Cubanichthys cubensis

Can you tell me something about the Cuban killie, its maximum size and its preferred temperature and food?

Cubanichthys cubensis was discovered in 1902 in the freshwaters of western Cuba. It reaches a length of about 1½ in. and flourishes best at a temperature in the middle to upper seventies (°F) and a diet of whiteworms, tiny shreds of lean raw meat or white fish, live *Daphnia* and the usual non-parasitical or non-predatory pond life.

Barbus fasciolatus

Can you give me some information about a species called *Barbus fasciolatus?*

This barb is from East Africa. It reaches about 2½ in. The body is blue or grey-blue on the back shading down to green, with yellowish white underparts. The sides are adorned with some short black vertical bars. The two sexes look much alike: that is externally. The species is inoffensive and takes any regular or prepared food.

Please give me some idea of a tank set up and best temperature for *Rivulus cylindraceus.*

This fish does not demand any great depth of water (about 7 in. will do) but it does like a good top light playing over aquatic vegetation lying on or just below the surface. Plants such as species of myriophyllum, limnophila, utricularia and ceratopteris are well-suited to its requirements. A temperature in the low to middle seventies (°F) is quite suitable.

What is the life span of the average molly?

The livebearing fishes embraced by the popular name of molly, derived from the outdated generic name of *Mollienisia* = *Poecilia*, live for about 2½ to 3 years.

I should like to know the geographical range and requirements of the black-banded sunfish.

This attractive little sunfish is found in running and still waters in the south-east of the U.S.A. To be precise, from New Jersey to Maryland. In the natural state it is a frequenter of cypress swamps. Hence in the home aquarium it thrives best in acidic water (filtered through peat moss) maintained at a temperature in the middle sixties to middle seventies (°F). It likes plenty of cover, and plants such as *Vallisneria spiralis* and *Cabomba aquatica* should do well provided they receive a strong top light. Regular live food such as *Daphnia*, gnat larvae, and tiny worms should be placed on the menu.

A week or two ago, I purchased a pair of kissing gourami and the food the dealer recommended was vegetable flake. I feel this is not sufficient to maintain their health and strength. Could you please advise me on this gourami's dietary requirements?

The kissing gourami (*Helostoma*) is essentially a vegetarian. For all that, fresh greens are superior and more interesting, at any rate, to species of *Helostoma* than dried greens out of a packet; so provide your fish with small fragments of scalded lettuce, cooked spinach, cooked young nettles (in spring) and, when available, such non-vegetarian food as gnat larvae and whiteworms.

I have a 3½ in. *Gnathonemus petersi* **which I feed on flake food and live** *Daphnia* **and bloodworms. The fish does not ignore the flake food. All the same, it goes for the worms and the water fleas in a big way. What other eatables can you suggest for my fish?**

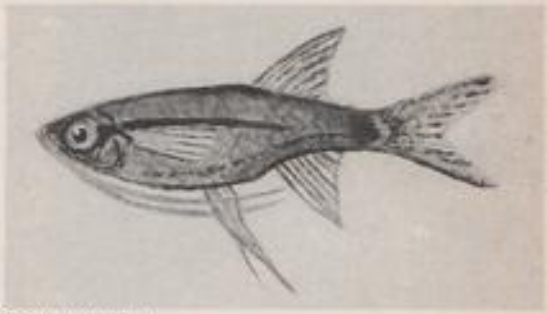
Tiny pieces of raw red meat, uncooked white fish, whiteworms, baby woodlice and small freshwater shrimps.

I am experiencing great difficulty in obtaining the less common coldwater fishes such as basses and sunfish from the U.S.A. Can you suggest a dealer likely to include such species in his stock tanks?

As you reside within easy reach of Victoria, S.W.1., I suggest that you look in every so often at that up and doing aquarium emporium situated in the Vauxhall Bridge Road.

I have been told that undergravel filtration inhibits the growth of water plants. Is this true?

Not if the filter plates are covered to a depth of at least 3 in. with proper aquarium grit (compost).



Esomus danricus

What is a flying barb?

Flying barb is the popular name given to *Esomus danricus* from India. It attains a length of about 5 in. and is a surface frequenter and a great leaper. Thus its tank must be kept properly covered. It is a member of the family *Cyprinidae* and eats all the regular dried and live foods.

About a week ago I bought a tank of tropical fish. They appear to be suffering from some illness. For instance, they have lost their ability to rise and sink in the water. They are off food. They often turn over on a side and then struggle to return to a normal position. What is the matter with them?

Your fish have suffered an abrupt change of temperature. Check your heating system and make certain the water is being maintained at about 75°F (24°C). Adding fresh water to a new tank will cause trouble if the water is not heated to the same temperature as the water in the tank. Make certain the heater has not been switched off for any length of time—accidentally, of course. Perhaps the fishes got chilled on the way home from the place of purchase. Tropical fish must always be insulated against rapid heat loss by wrapping their plastic carrying bag in several sheets of newspaper or an old woollen scarf or cardigan. On arrival home float the plastic bag in the heated aquarium for some ten minutes or so before slitting the top and permitting the fish to swim out into the aquarium. To deal with your present trouble, reduce the level of the water in the aquarium as much as you can within reason). Now raise the temperature very gradually to the low eighties (°F). Keep the temperature high for several days. In all probability some of the fishes will return to normal. The fish that do not return to a normal swimming position write off as incurable. It is the kind thing to put them out of their misery. This can be done by dashing them against a brick wall or onto paving slabs.

I have a tank on a table close to a window facing south. The fluorescent light is kept switched on for about 15 hours a day. Although the tank has quite a number of plants the water is never anything but green. What can you suggest to combat the green water?

Firstly, your tank is getting too much light. Cut out the electric illumination during daylight hours. You mention that your tank has 'quite a number of plants.' Quite a number of plants in a tank close to a window is not enough. Fill up the rear half with plants such as *Vallisneria spiralis* or *Ceratopteris thalictroides* to provide shade. If, after acting on this advice, there is no improvement within the space of a month, then paste tissue paper on the back panel of glass.

Would a pair of kribensis be easy to keep and breed in a community tank?

Surely you are aware that it is not possible to raise fry in a community tank? Even if the eggs come through all right, then the fry will be picked off as soon as they hatch or become free swimming.

Is the black flag tetra a good fish for a community tank?

It is an excellent fish. For one thing, it is peaceable. For another thing, it is showy. For the rest it accepts any small food, alive or dry, and is very active.

Some weeks ago, I purchased a catfish called a chuka. I have no problems with it in my tank, but I would like to know its proper scientific name, maximum size, and country of origin.

I think the fish you have is *Chaca chaca*. This bizarre-looking catfish hails from India and grows, it seems, to about 8 in. Do not trust it in a tank housing the smaller community species. It is quite active after dark and, as you will have noticed, it has a large frog-like mouth.

Please will you tell me if my aquarist friend is right in saying that it is all right to introduce a capful of Dettol into an 18-gallon aquarium to ward off disease?

For a tank that requires sterilization, your friend's advice is quite sound. But after the Dettol has been introduced (into a tank cleared of fish) and swilled about (and under the top edges of the aquarium) then it should be emptied away and the aquarium given several good wash-outs in clean water. To introduce neat Dettol into a populated tank would have a disastrous effect on the fishes.

I have just bought a new catfish which my dealer called a pangasius cat. Can you tell me something about this fish?

There are about 15 species of *Pangasius* catfish known to science, but very few have reached the aquarium keeper. If your fish has a pattern of steel-blue and silver stripes on the sides and is very excited in its movements after irregular periods of quiescence in the plants, or behind rocks, then it is almost certainly *P. sutchi* from south-east Asia. It can grow to 7 in. or larger. It flourishes best if kept with several of its own kind. In its larger sizes it can, and will, make short work of smaller fishes.

I do not appear to have much success in keeping corydoras catfish. I keep them at a temperature of not less than 75°F (24°C) and on a gravel bottom. Soon after I introduce the fish into the tank, I notice that their dorsal fins droop and the barbels become frayed and worn down. Where am I going wrong?

Species of *Corydoras* require a soft bottom or a compost with no sharp edges; for given this they soon rub their barbels to sore-looking stumps. Your temperature, too, may be on the high side for some species. *C. paleatus* and *C. aeneus* (to mention two different species) prefer a temperature in the middle to upper sixties (°F)

COLDWATER QUERIES

by Arthur Boarder

I have a fish pond with goldfish and Koi, together with a number of water plants. I am soon moving to another house some distance away. I can get a pond ready and there will be no problems with regard to the plants, but how can I move the fishes?

The fishes can be safely transported in large plastic bags enclosed in strong cardboard boxes. Fishes are moved thousands of miles in a similar manner but large consignments usually have oxygen pumped into the bags before despatch. If you get in touch with one of the large dealers who advertise in "*The Aquarist*" I am sure that you will be able to get the containers you require. I am enclosing the name of a dealer who will, I feel sure be able to help you. When the weather is cold, will be the safest time to move the fishes but see that the larger specimens have plenty of space.

You often advise to give the smallest amount of food at a time to goldfish in tanks. Why cannot a fair amount be put in the tank at a time so that there is always some food available for the fishes? My packet of fish food states, "Will not cloud the water."

It is unwise to have food available at all times in a tank as it is much better for the fishes to have to search about for their food. They should be seen to be mouthing at the water plants for soft algae etc., and they are likely to remain much more healthy by so doing. I know that more tank fishes are upset and lost by the water becoming foul through the decomposition of uneaten food than from any other cause. Test your packet food in the following manner. Place a small quantity in a small glass of water and cover it up. Leave for three days and then see if the water has not become cloudy and gives off a foul smell. I shall be very surprised if my conjecture is not true. Experienced breeders of fancy goldfish will be able to give their young fishes more food than I advise for beginners, as with extra warmth and aeration, it is possible to raise the youngsters to a good size much quicker than would be the case if the water was cooler. It is an advantage for such breeders to be able to find out which fish are likely to become good specimens with this type of feeding, especially in the case of hooded varieties.

I feed my pond fish with *Daphnia* occasionally. Will some of them remain in the pond and breed?

It would be very unusual for this to happen. When *Daphnia* are put in a pond containing fishes, it is not long before they are all eaten. The only chance for you to be able to breed them in a pond is if there are only one or two very small fish in it and very many *Daphnia* are added. If you wish to breed *Daphnia* then a separate pond should be used. Home bred *Daphnia* are a good food for young fish as they can be free from pests and diseases which could be brought into the pond with *Daphnia* from the wild.

Since my goldfish spawned I have not seen hardly any of them and wonder if they have died?

Some fishes become very exhausted after a vigorous spawning and they may rest at or near the bottom among the water plants for some time. It is also not unusual for fishes to act in a like manner when they have been disturbed, perhaps by a cat or large bird disturbing the water. If you visit the pond at night with a torch, you may see some of the fishes. When goldfish die, they will usually float to the surface. Also you must realise that as the water gets colder the fishes will be very inactive and may hide away in the water plants.

I have been trying to photograph tank fish but so far have had little success. Is there a book available on the subject please?

There is a book entitled "Photography for Aquarists," which should give you all the information you require. I have enclosed an address from where you can obtain this book, price £1·80, post paid.

I have two 3 ft. tanks with Shubunkins, Fantails and Comets. I would like to breed Fantails and Veiltails. I can get good Fantails in my district but cannot find any good Veiltails. Can you give me any information on breeding these fish and where can I get Veiltails?

I am enclosing an address from where you can get good Veiltails. To breed any variety of fancy goldfish you will have to keep each variety apart from any others as all varieties can interbreed. You may find that it is easier to breed good Fantails than good Veiltails and so I advise you to get some experience with breeding the former before trying your hand with the latter. I have found that Veiltails do better when their water temperature is rather higher than that used for Fantails, and their flowing finnage is more likely to be affected by disorders than that of Fantails. You will need some extra containers for the fry as plenty of swimming space must be available for them. You may find that plastic washing-

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up bowls will be very useful as hatching and rearing tanks until the fry get about an inch long overall. By this time you may be able to sort out those which are not worth growing on, and so save space.

I have bought a tank, 18 × 10 × 10 inches to keep my two moors in for the winter. They are 4½ and 5½ inches long. Although I have a filter the water keeps very cloudy. Why is this?

Your tank should not hold more than 7½ inches of length of fish, excluding the tail. I suspect that you have been feeding too much. Do not feed at all for 24 hours, then empty and refill the tank. Do not give any food at all for a week and I think that you will find that the water keeps clear. Even a little uneaten food can pollute the water in a couple of days and the fish will need very little food during the winter months. The fish should have obtained sufficient food whilst in the pond. After a week or so you can offer the smallest amount of food and if the fish do not go for it at once, give no more for a few days. Providing the water in the tank keeps cool, the fish may need very little, if any, food at all.

I have a tank, 39½ × 12½ inches surface area and would like to know how many fishes it will hold? Also is it possible for fish to catch white spot disease from *Daphnia* or water plants added to tank or pond?

The tank will house about 21 inches of fish in length excluding the tail. It is possible to introduce white spot disease to pond or tank with *Daphnia* or water plants. When the parasites on a fish mature, they drop off and fall to the bottom as cysts. In this form they may be introduced with either *Daphnia*, *Tubifex* worms or water plants. From the cysts many more parasites will emerge and search for a host. The time taken for the development varies according to the temperature of the water. In warm water the reproduction of fresh parasites can take a matter of hours, whilst in cold water a few days may elapse. It is always advisable to sterilise all water plants before they are added to tank or pond and as for *Daphnia* and *Tubifex*, well my conclusions as to the safety of these should be well known by now. I never use *Tubifex* nor *Daphnia*, but the latter could be safe if bred and kept free from outside conditions which could bring in pests or diseases.

I have a Veiltail in a tank and its tail has become battered during the last few days. Is this a disease?

As you have other fishes in the tank the damage may have been caused by one of them. As a Veiltail swims about, the flowing tail can look like something to eat by other fishes. If the trouble had been caused by disease, such as Fin-rot or fin congestion, you would have seen signs of this before the tail became so ragged. If the tail is badly shredded you can trim it carefully with scissors and wipe the ends with Vaseline. The troubles mentioned are usually caused by a chill or sudden moves of the fish to much colder water.

If goldfish have been affected by white spot or fungus disease, how long should a pond remain empty of fishes before it would be safe?

The safest way to clear a pond of many pests and diseases is to leave it empty and dry for about a week. This should ensure that pests and germs would have been destroyed.

I have a number of goldfish but one that I won at a fair is very different from any other type of goldfish I have seen. It has a short body but a long, flowing single tail. Can you recognise the variety from my sketch?

The fish appears to be a cross between a fantail and a shubunkin. A shubunkin has a much slimmer body and should be coloured with blue, red, mauve and black. There should be no visible scales and a fantail should have a double tail. Very many types of fish can be obtained by crossing varieties of goldfish and they have very little value. All varieties of goldfish will breed between themselves.

On television recently I saw a rubber ball being thrown in a small pond which it was stated would prevent the sides of the pond from cracking during severe frost. Do you think this is a good idea?

It sounds all right in theory but once ice forms in any thickness around the ball, the pressure from ice a little way away would be nil. One should not take too much notice of what is shown on television regarding aquatic matters. The frequent showing of fairly large goldfish in small goldfish bowls is one of the cases in point. These containers should be banned as they are totally unsuited for the purpose. Enquiries from knowledgeable aquarists before such mistakes would help the hobby considerably.

I would like a pond in my garden for goldfish but I am afraid that the pond would encourage the breeding of mosquitos, your advice would be appreciated?

No mosquitos are likely to breed in a garden pond if it contains fishes. The larva of these insects are eaten avidly by most fishes. I recently saw, on television, a local authority having swampy and pond covered ground sprayed by paraffin to kill the mosquitos. The authority would have saved a lot of money and trouble if they had introduced some small fishes such as Sticklebacks or minnows.

DESIGNING A REPTILIARY

by Dr. Andrew Allen

THE OUTDOOR reptiliary is the most economical way to house hardy European reptiles and amphibians under spacious and natural conditions, with easy visibility and a high probability of breeding success.

Reduced to its essentials, the reptiliary consists of a walled-off area of the garden designed to accommodate a mixed community of frogs, toads, newts, lizards and tortoises. The principles of reptiliary construction are very simple, but successful reptiliary design does involve a number of refinements, particularly in the prevention of escapes.

The very first consideration is choice of site. The location of the reptiliary should give maximum exposure to the sun, and shelter from the wind; a southerly aspect in a secluded corner of the garden is ideal. In addition, the reptiliary should be distant from trees and shrubs, to by-pass the nuisance of a heavy leaf-fall.

The perimeter wall may be of bricks, blocks or any other robust building stone. It need not be unclimbable, but must be continuous and free from holes. The height of the wall depends upon the species that you intend to keep: for newts, salamanders, slow-worms, toads and tortoises, one foot is adequate; for powerful jumpers such as Edible frogs or Green lizards, three feet is a minimum.

Shape

The geometrical shape of the reptiliary is not important; it may follow any curve or figure that fits the dominant lines of your garden. But remember that circles, squares and hexagons require less building material than rectangles or elongated shapes, area for area (i.e., the circumference/area ratio is lower), and often ensure better exposure to the sun. In size, a reptiliary should never be smaller than 6 ft. × 4 ft., given the shadow cast by the walls and the spatial requirements of a viable community. The maximum size depends on the volume of your purse.

The key point in reptiliary design is the overhang that tops the perimeter wall, and renders the reptiliary escape-proof (one assumes always that the inhabitants will be able to climb the perimeter wall, but unable to negotiate its overhang). The overhang should be smooth, with a minimum of joints, and extend for at least one foot horizontally over the reptiliary. The best construction materials are glazed tiles, sheet metal, or, best of all, a reinforced glass. It is wise to expend hours of work on the overhang, as the overall success of the reptiliary depends more on this one small feature than on any other.

To complement this overhang, the perimeter walls should extend at least a foot below the soil, and be splayed outwards at their base—as much to deter ingress of rats as to prevent egress of the inhabitants.

Deep pool

First step in design of the interior is the sinking of a large, deep pool, following the advice regularly presented in this journal. Construction principles do not differ between fish-ponds and ponds intended for amphibians.

Many text-books picture this pond as a peripheral

moat, which converts the land zone of the reptiliary into an island. Such a design is aesthetically pleasing, and may marginally reduce escapes (only marginally, because most reptiles and amphibians swim strongly). But the construction is more difficult for an amateur, and a moat has no definite advantages over a traditional pond.

Careful consideration must next be given to the reptiliary soil. A heavy clay hinders digging, both when waterlogged and when baked, and prevents the inhabitants from excavating deep, safe winter quarters. Moreover, a soil that retains the rain will cause high winter mortality in snakes and lizards, which require dry, well drained hibernacula. All such soils should be lightened with sand, peat or a good topsoil, until the entire reptiliary is well-drained and the digging easy. It helps to set a six inch layer of gravel a foot below the surface, to improve drainage. If the soil is a dark peat, or chalk, it should be neutralized to a more balanced state, as extremes of acidity and alkalinity are detrimental to certain species.

Hibernating chamber

As an optional extra, some herpetologists sink a 'hibernating-chamber': an underground brick box, packed with straw, drained by tunnels, and entered by gently-sloping pipes to the surface (the pipes opening under the shelter of rocks, away from the rain). Such a chamber is useful in ensuring that inhabitants hibernate below the frost-line (though many will ignore it completely), but most reptiliaries fare quite well without this feature. In a soft soil the animals will dig perfectly adequate hibernacula for themselves, while a poorly-built chamber can easily turn into a flooded death-trap.

Beyond this, interior design is a question of personal aesthetic preference: your taste in rockery, bark, gullies, nooks, mosses, ferns and flowers. Remember only that there should be some exposed and sunny rocks, and an abundance of cool, dark cover. Tall vegetation should not be planted, or permitted, near the perimeter: a clump of rushes or a lofty weed provide a royal road over the overhang and into the outside world. If the reptiliary is large, it is a pleasant idea to set a rustic garden seat by the pool, so that you can relax with a Green lizard on your shoulder, a tortoise gnawing at your sandals, and a pint of beer at your side.

Rockery

It is also practical, as well as pleasing, to set rockery and vegetation around the *outside* of the reptiliary, so that if a lizard does escape it remains nearby, captivated by its charming surroundings, and does not wander off across an austere lawn in search of cover.

A good overhang excludes many terrestrial predators such as hedgehogs, but you may need to hurl a few deterrent stones at the neighbour's tabby. Birds such as magpies and jackdaws pose occasional problems. Some herpetologists set-up anti-bird nets, but these are unsightly and awkward. It is better to dissuade the birds through a display of bad temper and a few mis-aimed pebbles. Reptiles are not cabbages: one wants to admire them, and not just protect them.

Reptiliaries are partially self-supporting. Insects breed inside them, and moths and bluebottles fly in, especially if attracted by a lure. However, the population density of reptiles is usually too high to maintain itself perpetually on these resources, and you will need to add a regular supplement of garden insects, together with delicacies such as mealworms and banana. Because the reptiliary is open, please don't introduce potential pests such as cockroaches or house-crickets, which might escape, and migrate to a neighbour's kitchen.

Hardy species

There are at least thirty species of European reptile and amphibian suitable for an outdoor reptiliary in southern England, plus a handful of species from other parts of the world. The permissable species drop out, one by one, as you move northwards, until only a very small set of very hardy animals are appropriate to a reptiliary in, say, county Durham. In northern England, and in Scotland, the greenhouse is a better option, one that I discuss in a subsequent article. I shall also detail the relative hardiness of different species, and outline some well-balanced communities for outdoor vivaria.

The reptiliary possesses numerous advantages. It costs less to construct, per unit area of ground space, than any other indoor or outdoor vivarium, and hence can be made exceedingly spacious, to house a large and varied community of reptiles. Apart from clipping the vegetation and inspecting the overhang, it requires minimal maintenance. You can leave for three weeks holiday without worry, and without complicated arrangements and precautions over heating and feeding (no need to fear the disastrous, but excusable, *faux pas* of a press-ganged neighbour). There is no need to expend science, thought—or money—on regulating the temperature and humidity. Mother Nature sees to all that, albeit in a somewhat eccentric manner. The inhabitants do not suffer from the diseases of overcrowding: heavy parasite infections, or the stresses of peck-orders or territories compressed into a match-box. Given the natural succession of the seasons, breeding proceeds regularly, without those aberrancies of timing and fertility that plague species in the indoor vivarium. Above all, the reptiliary is a handsome creation, full of rockwork and green plants and cool water, in which to contemplate Eyed lizards sunning on stones or Marsh frogs on water lilies, just as if your garden were a transplanted corner of Tuscany or Aragon.

ON THE ROCKS

AN EXPLORER'S GUIDE TO THE SEA-SHORE

by Huw Collingbourne

MOST OF THE articles dealing with native marine life which appear in the *Aquarist* concern themselves with a discussion of large and mobile creatures such as fishes, starfish or crabs.

In this article I intend to deal with the sedentary and rock-dwelling animals which inhabit the shore. Of course, having chosen this topic, I am aware of the enormous variety of animals which fall into this category and it would be impossible to attempt even the crudest outline of all such creatures in a single article.

Instead, I hope to present a brief description of a few of those which I find, in some way, especially interesting. Many of them are extremely common, some ubiquitous, whilst others are to be found only in restricted areas where they will need to be sought out by the most dedicated of explorers.

The sponge

One creature which is perhaps more common than is generally imagined is the sponge. In fact there are two hundred and fifty indigenous species, thirty of which inhabit the shore. They are generally quite little (unfortunately, none of them is big enough to be of any use at bath time) and often cover a small area of rock. Sponges occur in a variety of colours, green, yellow and orange being common. The "Crumb of Bread" or "Breadcrumb" sponge, *Halichondria panicea*, may normally be found with little difficulty on shores where the water is clear. It is characterised by the "volcanic" craters which pit its surface; in fact, these are the outlets for water and detritus.

The Sea Squirts or Ascidians are the most common type of shore-dwelling tunicate (i.e., belonging to the sub-phylum, Tunicata). They look like rather unpleasant, bulbous tubes of jelly and, of all the "invertebrates" of the sea shore, they are the ones which most closely resemble men (admittedly, some more closely than others!) for they belong to the same phylum: Chordata. Although the Ascidians are not vertebrates they do have an internal support—a sort of rudimentary backbone. In fact, this support (called the "notochord") is composed of cartilage, not bone and, in sea squirts, it may be seen clearly in the larval stage though not in the adult.

The larva, which is free-swimming, much resembles a tiny tadpole; when it is ready to metamorphose into an adult it attaches itself by its head to a rock. The adult form is completely different from the larva; as I have said, it is basically a bag and has two tubular openings through which water is syphoned in and out. When disturbed, the sea squirt will suddenly contract and squirt out some water; hence the name. The interested reader should look for sea squirts at very low tide, on piers, under stones or beneath ledges of rock.

Tunicates

In so doing he may well come across the sea squirt's more beautiful relative, the Golden Star Tunicate, *Botryllus schlosseri*. This is, in fact, not just a single animal but a colony of tiny Ascidians which clings like a sponge to a stone or to the frond of one of the larger seaweeds. It is a dark green and gelatinous thing speckled all over with golden stars. The whole colony may be six to eight inches long and may be composed of one thousand or more individuals, each $\frac{1}{16}$ in. to $\frac{1}{8}$ in. long. These individuals form the "arms" of the stars; there may be between three and a dozen little tunicates in each star. Through the centre of each star a current of water flows, bringing food and oxygen to the animals—each animal has its own individual inlet, though they share a communal outlet at the centre of each star grouping.

The tunicate's sex life is rather interesting. It is hermaphrodite and may be alternately male and female though may not be both at the same time (as certain other animals are) and one individual may not, therefore, breed with itself. They reproduce sexually, producing eggs and sperm which develop into the planktonic tunicate larvae. Eventually the larvae settle and grow into the adult form, developing into colonies as described above. However, having

Dog whelk encrusted with tubeworms and barnacles

developed thus, a colony may reproduce itself asexually by budding. For a colony of individuals to reproduce itself in this way is extraordinary and the process involved is not yet fully understood.

Anemones

Anyone who has kept Beadlet Anemones, *Actinia equina*, will be familiar with the sight of a single creature budding, however. But it is the anemone's *sexual* reproduction which has mystified science until quite recently. Most anemones expel eggs and sperm, into the sea, fertilization taking place in open water. Some, however, retain the eggs in their bodies where they develop, after fertilization, into perfect miniature adults (in aquaria, certain anemones frequently startle or amuse their owners by unexpectedly "spitting out" numerous baby anemones!)

It has always been assumed that the Beadlet Anemone is one of the species which retains its eggs and that there is no planktonic stage in its development. However, it has now been discovered that the young anemones developing in the bodies of adults are not invariably brooded in the bodies of their natural mothers (Chia & Roston, *Journal of the Marine Biological Association*, February, 1970). In fact, baby anemones have been found growing inside male anemones and in sterile anemones; the young must, therefore, have been passed out of the mother's body at some stage, before arriving in the body of the "foster" parent.

The Beadlet is not the only common variety of anemone to be found on the shore, though it is almost certainly the most numerous and may be distinguished by the brilliant blue, light-sensitive "beads" at the bases of the tentacles. The Dahlia Anemone, *Tealia felina*, is quite common and may be identified by its banded tentacles; it often camouflages itself with little stones and pieces of shell which adhere to its body. The Snakeslocks Anemone, *Anemonia sulcata*, is to be found in clear, brightly lit water, especially in the south of Britain. Its tentacles are long and writhe about continuously like snakes.

The Plumose Anemone, *Metridium senile*, is seldom found inshore, though it may occasionally be found at extreme low tide in certain areas. This species is notable for its delicate pastel hues (pink, white, orange) and its crown of feathery tentacles with which it catches planktonic animals.

Hydroids

Hydroids are related to sea anemones. Small hydroids, living in tiny, calcerous, white tubes may be found encrusting stones on the shore. These tubes resemble the tubes of the little fan worm, *Pomatoceros triqueter*, but careful observation will reveal differences. The tube of the hydroid is circular in cross-section, whereas that of the worm is triangular, having a distinct ridge running along the top, ending in a needle-shape, protective spike at its opening. The tube may be one or two inches long.

Having identified the tubes of the fan worm, the observer would be well rewarded to continue observation of a tube-encrusted stone when it is fully submersed in sea water. If left for a minute or two undisturbed, the worms will, one by one, thrust their feathery gills out of the ends of their tubes. The gills are many different colours and resemble, in miniature, the peacock-tail glory of the larger and more spectacular tube worms. However, it needs just one slight disturbance of the water to send all the worms hurrying back into the safety of their tubes.

The worm *Spirorbis*, another common variety, is quite different in apperance—its smooth, white tube is tightly coiled like the shell of a Ramshorn Snail and the whole thing is no more than ¼ in. in diameter. It is often to be found in large numbers on the fronds of brown seaweeds.

There are many interesting molluscs native to rocky shores. One of the first to be seen (in very large

Rock pool life with golden star tunicate on right

numbers in certain areas, though sometimes almost completely absent elsewhere) may be the mussel.

Mussels

The Edible Mussel, *Mytilus edulis*, is the only bivalve to thrive on the rocky shore; (the other varieties, although common, are generally found in deeper water—the clams, scallops and oysters, for example, or buried in the sand like the cockles). It is able to survive in such an environment by virtue of its remarkably strong anchoring threads or *byssus* which hold it firmly to the rocks against all the violence of the varying tides.

There is a far greater variety of univalve or single-shelled molluscs to be found on the shore. One of the most remarkable as regards specific adaptation is the common limpet, *Patella*. Adhering firmly to the rock, its shell flush with the rock surface, the limpet does not relinquish its hold even to the most turbulent of tides. The limpet's flattened, conical shell, indeed, is of such a shape that most of the tidal force is deflected over it instead of against it. Aristotle was the first to observe and record the movement of the limpet in search of food; its food is minute algae which the animal bowses at high tide. No matter how far the limpet travels to feed, it will always return to its point of departure—its "home" base—which, after prolonged occupation, may be marked by a discoloration or, in soft rock, a scar depressed into the rock, into which the shell of the limpet exactly fits.

The more "typical" univalves are those which, we might say, resemble snails and have coiling shells: these include winkles, whelks and topshells. These animals possess a large, muscular foot upon which there is a tough, leathery "lid" or *operculum*. When the tide is out the animal will withdraw its foot into the shell and block off the shell mouth with the *operculum*; this prevents the animal from drying out during prolonged exposure to the air.

Periwinkles are present on most rocky shores. They are small molluscs with shells of many different and beautiful colours. The shells of the Rough Winkle, *Littorina rudis*, a species living high up the shore, may be found in all hues of green, grey, yellow, orange or brown, and some may be almost pure black.

Not all univalve molluscs are herbivores. The Dog-whelk, *Purpura lapillus*, for example, is a fearful predator of mussels and is the greatest enemy of the normally invulnerable Acorn Barnacle.

Barnacles

Barnacles themselves, are not mulluscs but crustaceans. And although certain types may superficially resemble bivalve molluscs (Goose Barnacles, *Lepas anatifera*, for example) they have, in fact, far more in common with crabs and lobsters. The Acorn Barnacle is another creature whose shape is well suited to shore life. Like the limpet, the barnacle's "shell" is of a low, conical shape, over which the tide may flow, most of its force being safely deflected. Moreover, the base of the barnacle is fixed to the rock with a natural glue of extraordinary strength. Look carefully into almost any rock pool and you will see hundreds or thousands of barnacles. Stay there and observe them closely and you will notice the faint flickering as the barnacles continually thrust out and withdraw little, filtering plumes with which they catch the microscopic life upon which they feed.

Externally the barnacle is protected by six, closely fitting, limy plates. In the top there is an opening which may be sealed by another four plates to retain moisture when the tide is out. Inside this armoured chamber is a tiny animal like a shrimp standing on its head, for the barnacle is fixed in position, head downwards. Being thus enclosed, the barnacle is presented with some serious problems, for, as a crustacean, it is obliged periodically to shed its hard outer skin to allow for growth. Somehow the animal manages to do this and to eject the skin through the aperture of its little chamber.

However, as the animal grows it must, of necessity, have a larger chamber, but the chamber is a constructed thing and is not a part of the animal's body so there is no way in which the barnacle may "shed" it; therefore the chamber must be enlarged. Exactly how this is accomplished is not known but it is thought that the inside of the chamber is dissolved by some secretion of the animal while it is added to and strengthened on the outside.

PLANT QUERIES

by Vivian De Thabrew

My query is about Water Hawthorn (*Aponogeton distachyus*). **In the Encyclopaedia of water plants by Dr. Jiri Stodola, it says it is important to allow the tubercles to dry during the winter for a rest period in a temperature of 42°-50° F. This helps the plant to put out flowers in the summer, so I have lifted the pot containing my plant out of the pond and put it on the floor in the greenhouse. Is this correct please?**

Aponogeton distachyus L.f. is a poor aquarium plant but ideal for the garden pool. It was originally an indigene of S. Africa, but it has now naturalised in several European countries. Like many water-lily species of similar metabolism, the tubers of *A. distachyus* should be sorted dry in a container of peat, soil or loam, to induce good flowering. As you suggest, you may certainly lift the pot with the tubers and store in the greenhouse. However, I have observed this species grown in heated aquaria, where it will remain dormant during its resting period of about three months. In Germany and Italy I have seen this plant in pools, where the tubers are left in the water. These very plants were observed flowering in profusion during the following summer. Provided they are well covered with mud and kept sheltered from the adverse effects of frost, they will overwinter in the outdoor pool and put forth new healthy shoots in spring.

Two of the popularly cultivated varieties, *A. distachyus* var. *rosea* (pink flowers) and *A. distachyus* var. *grandiflora* (large white flowers), are available to the aquarist.

I would be grateful for any information you could give me about a plant I have come across in various aquarist shops under a variety of names, 'Potato plant', 'Wheat plant', 'Green and White' and 'Star of India'. Information about the Latin name and water conditions would be most welcome.

The universally accepted common name of the so-called 'Potato plant', 'Wheat plant' or 'Green and white plant' is Star of India. The species is *Pleomela reflexa*. However, there is still uncertainty as to its real nomenclature, and some botanists consider it to be a *Dracaena*. The first three names mentioned above are those given by plant dealers to suit their fancy.

Pleomela reflexa is really a land plant, adapting itself very well to bog conditions. In the Asian tropics this species and all its relatives are land dwellers. In their natural habitat these are grown as bedding plants in a rich soil. There it favours shady conditions. I have seen this plant growing wild in very large clusters in hill country, often by banks of water-courses. In these conditions it reaches a height of over eighteen inches.

There are at least two other varieties, both hybrids, one having a pinkish edging to the green and white leaf, the other with pink, green and white stripes, almost like a Tradescantia.

The Star of India which finds its way to the aquatic market is the young plant, quite often with its creamy white bulbous roots intact. It is capable of surviving in submerged conditions for a short period, provided the temperature is kept between 70°-74° F. The water should have a pH of between 6·5-6·8, and be relatively soft, at around 6DH. It prefers a good muddy bottom or one with plenty of detritus, and good, even light is essential. These are the ideal conditions for its maximum period of survival under water.

I would be gratified if you would supply me with information concerning the species of plant known as *Myriophyllum hippuroides*.

1. **What pH, DH and temperature range best suit this plant?**
2. **Does the species require a particularly nutritious bottom medium? i.e., How well will it survive in fairly clean gravel?**
3. **What are its approximate light requirements?**
4. **With what other readily available plants is** *Myriophyllum* **compatible?**
5. **What is your opinion upon the merit of liquid aquarium plant fertiliser, and do you think that the use of such a product would encourage healthy growth of** *Myriophyllum*?

The genus *Myriophyllum* belongs to the family Hallorrhagaceae. There are many species of *Myriophyllum* (Water Milfoil), among which *Myriophyllum hippuroides* is one. Water Milfoils are generally marsh and aquatic plants which are capable of growing well as aquarium plants. *M. hippuroides* originates from North America. It is a sturdy plant with branching stems bearing green and reddish or brown-red leaves in whorls.

As is expected of Water Milfoils, Cabomba and

Ambulia, a rich tank bottom with some loam or detritus is appreciated. Though it will survive on relatively clean gravel, it will not thrive. It prefers alkaline water, and 10DH will suffice. The temperature is between 74°-77°F. It requires plenty of light, and when this is given, the colour of the leaves deepens to a most attractive brownish-red or wine-red hue.

On ecological terms, it will grow well with *M. scabratum, M. brasiliense, Elodea densa, Sagittaria graminea, S. subulata, S. latifolia, Vallisneria asiatica, Echinodorus tenellus, E. intermedius, Potamogeton qayi, P. crispus, Ludwigia arcuata* and *L. palustris.*

Liquid fertilisers available on the market are generally satisfactory and will benefit plant growth if introduced as recommended by the manufacturer. However, maintenance of a good tank bottom with the natural organic matter is the thing to aim for, then you can use the liquid fertilisers as a supplement.

I have been trying to grow Vallisneria and Cabomba in my fish tank, but for some reason it keeps rotting at the bottom of the plant and they die. Could you please tell me why this is?

This could be due to many reasons. As you do not give me any data concerning water conditions, lighting method and planting medium, I can only give you the factors which favour good growth in the two plant species you have mentioned.

Cabomba ideally requires a water temperature of between 68°-78°F. The water conditions should be slightly acid and soft, with a pH value of 6·5-7·0 and a DH of 7. Vallisneria requires similar conditions to those of Cabomba. While Cabomba requires a coarse sand or gravel planting medium with peat for good growth, Vallisneria does not make any specific demands. *Cabomba caroliniana* is the popularly available species in the U.K. *C. aquatica,* which is rarely available here, needs special attention and has exacting requirements. Both Cabomba and Vallisneria need plenty of light. The more natural light you can give the better. Therefore, if you maintain a tank bottom consisting of coarse sand or fine gravel, mixed with some aquarium peat, you should not only satisfy the conditions for both the above species, but also generally provide a good base for most of the plants available to you from your dealer.

My problem is growing plants. I checked the pH of my tank, this was found to be 7·4, so I added some sodium biphosphate, which brought it down to 6·4. However, after five days it went back to 7·4. I read in one of your books that you put some peat into tap-water to bring down the pH and filtered it diatomically. Could you tell me what this means? I was thinking of putting a layer of fine gravel, some loam or some sub-soil over the undergravel filter to grow plants. Will this set-up be suitable? Once I have got the correct pH, will it remain so?

Your obvious problem of a high pH is a serious one. Sodium biphosphate, as you have rightly observed, will only give a very short-term effect, and dosing the tank at very regular intervals is certainly harmful for the fish. The high build-up of the chemical ions would prove fatal.

As mentioned in one of my previous columns, the immersion of peat wrapped up in a muslin bag or cloth in a tub of water for a period of about a fortnight will produce a peat-impregnated liquid of high acidity This solution mixed with tap-water should be allowed to filter vigorously either through your normal filtration system in your tank, or by using a diatom filter. This sort of filter is a bell-shaped outside unit, which works on the principle of water passing from your tank through the filter chamber, which traps all the particles in the diatomic powder-coated parchment within the filter. The essence of this exercise is that it filters all the fine particles and obtains crystal-clear water. Once this is done, chemicals to change the character of the water should not be added. Ideally, if you could collect some rain-water, filter it and then use it in your tank, you should find a significant pH reading of some acidity.

In setting up the tank bottom, a layer of fine gravel with some clay granules on the bottom layer will provide a conducive planting medium. The clay content of your soil medium will maintain the correct pH. However, from time to time the addition of a pH balancer such as a peat extract, would be beneficial. Under these circumstances, there is no harm in adding tap-water occasionally.

Each time that I put some new plants in my aquarium they grow vigorously for a few weeks and then slowly start to decay. It seems to be caused by a build-up of algae on the leaves. Is there anything I can do? The aquarium is 2 ft. 6 in. × 14 in. × 12 in. and is illuminated by a 40 watt bulb. There is an undergravel filter. The tank does not receive much light from the window in the room.

As you only say that your tank is illuminated by a 40 watt bulb, it is not possible even to surmise what is causing your plants to grow for a few weeks and then die. However, since you say that the growth is vigorous for a few weeks, before decay sets in, and especially after a rapid build-up of algae, it is a good indication that the plants are receiving more intensity of light than is required by the species. What is actually happening is that the growth of the plants is being accelerated by the extra light, and the leaf-pores are being covered by a layer of algae growth, thus causing a breakdown of the photosynthesis process, subsequently weakening the

Continued on page 51

OUR READERS WRITE

QUESTION'S ANSWERED

DEAR SIR,—In all the years of reading the "*Aquarist and Pondkeeper*," and of maintaining tropical marine aquaria, I have just discovered what a first class service Mr. G. F. Cox provides for your readers.

Within a week of me sending a long, detailed and difficult series of questions for him to answer, I received from him a most comprehensive reply. The "document" ran for six pages, and answered my questions in minute detail.

May I, through you, thank Mr. Cox sincerely for a much needed reply; one which must have taken him *at least* one and a half hours to prepare.

With best wishes,
Yours sincerely,
W. JOHN SKILLCORN,

76 Barmston Court,
Columbia Village,
Washington,
Tyne and Wear.

OBITUARY

The South Park Aquatic (Study) Society report with deep regret the sudden death of Mr. Peter Biernacki on Christmas Day. Peter was a long standing member of S.P.A.S.S. and past committee member. He was a G.S.G.B. judge and also an expert on fish diseases, on which subject he had given many lectures at various clubs around the country. He will be sadly missed by the many friends he made, but all who knew him will remember him for his kindness, friendship and dedication to the hobby. The club extend sincere condolences to his wife and family.

MARGUERITE DUDLEY,
Secretary,
S.P.A.S.S.

Freeze-dried food dispenser

May I submit what is virtually an open letter to a hitherto unspecified manufacturer?

As I recall, in the early days of the introduction to freeze-dried fish foods, there accompanied the early purchases a free 'lobster basket' attached to a length of nylon. For many years I found this aid invaluable —particularly as a means of feeding bottom dwelling and middle region fish. The lobster basket was a semi-sphere of perforated plastic—the bottom edge of which being weighted and the *tubifex* etc. were introduced through the hole in the bottom; no doubt many readers will remember the article. As the dried worms swelled in the water they tended to appear through the perforations where they were eagerly seized upon by the catfish, red-tailed sharks, rosy tetras, etc. The feeding procedure is one that is easily recognised by the fish and enables catfish (always good eaters) to be given one of the best foods.

Unfortunately, I gave my 'basket' away some time ago and as far as I am able to determine at the present time, there is no replacement to be had and any feeble attempt to construct a substitute on my part has been doomed to failure, so what about it manufacturers? I am sure there would be a market for this product (I would buy one!) not to say an increased sale of that excellent product, freeze-dried *tubifex*,—convinced? Please forward free test sample to the above adress as due reward for a splendid idea—at least that is my opinion!

JACK ANDREWS,
14 Pannatt Hill,
Millom, Cumbria.

Betta imbellis

In the January 1978 issue, P.S. 421, one of your readers asked where one might obtain a pair of a new Betta species, *B. imbellis*. You advised your reader to contact several of the larger British dealers who may have access to this species.

Interestingly enough, I was also looking for *Betta imbellis* and my search led me to the International Betta Congress. In 1974 or 1975 several IBC members imported *B. imbellis* and *B. smaragdina* into the United States from Germany. While *B. smaragdina* has all but died, due to unbalanced spawns (nearly 100% females), the *B. imbellis* thrived and are now fairly well established within the IBC membership. Periodically, these fish are offered in the "Trading Post" section of the IBC publication "Flare" and the usual price is $10 a pair. If your reader was not successful in locating this fish in the U.K. I would suggest he or she contact the International Betta Congress. Their address is:

International Betta Congress,
c/o Margaret Hood,
242 G St. S.W.,
Washington, D.C. 20024 U.S.A.

Annual membership dues are $8·50 per year.

These fish will ship very well, being airbreaders, and conceivably could be shipped via air mail special delivery from the U.S.A. to England. However, air freight would be less risky for that distance.

I hope this will be of some assistance.

MARTIN CAIN,
855 Woodpark Way S.W.,
Calgary, Alberta,
Canada T2W 2V7.

COLOUR VARIATIONS OF
Aphanius dispar

by William Ross

Aphanius dispar (Ruppel 1828) is a cyprinodontid found around the Arabian peninsula, Iran, Israel, Jordan and Ethiopia. Not only is it found on both sides of the Red Sea it has apparently found it's way through the Suez Canal into the Mediterranean Sea. It is extremely tolerant with respect to salinity and temperature. Found in the cooler sea, brackish water of the estuaries and the fresh water wells of the interior of Saudi Arabia, the water in these wells is very hard and is often at a temperature in the lower 90°'s F.

Over the past two years I have had the pleasure of collecting many Arabian Killifish from their natural habitats in Saudi Arabia's Eastern Province. In the wild their colour varies greatly according to their locality and the surrounding fauna. Fish found in streams with an abundance of green algae and plant life appear much more colourful than those found in wells and streams which have a sand or mud bottom. Having observed this colouration phenomenon on many occasions and studied it for some time, I have come to the conclusion that the more colourful fish are a result of reflected colour on the metalic scales; this has not to be mistaken for the nuptial colours of the breeding males. The dull colouration found on fish in muddy or sandy streams is a very effective form of camouflage.

Female *Aphanius dispar* tend to be of a similar colour, greenish or yellow with numerous narrow dark vertical bars on their flanks. Caudal, anal, pelvic, pectoral and dorsal fins generally are clear or may have faint yellow tinge. It is on the males that we find greater colour variety and basically I have found four different colour patterns on the fish in this area:—

Blue, brilliantly coloured bluish brown with many irridescent bluish white spots on the flanks, young fish may display faint brown transverse bars on the caudal peduncle. Dorsal fin patterned with stripes and spots similar to the body. Anal and pelvic fins yellowish. Caudal fin has 5-6 transverse bars, the terminal bar yellow the remaining bars alternating dark and light blue, often the third bar may be yellowish. Young males may have blue tails but the yellow bars will develop as they mature. Length 3 in.—3½ in., this is the fish I class as a standard *Aphanius dispar*. Marine specimens are generally blue.

Blue tailed, these fish were found in an isolated pool on the coast near the oasis town of Qatif. The caudal fin has alternating dark and light blue transverse bars, the yellow colouration being absent, this has not to be mistaken for the completely blue tails on young male fish. Some two hundred specimens were caught, all these fish lacked the yellow on their tails. These tend to be smaller at 2½ in.—3 in. in length.

Gold, with a rich overall gold colouration, blue irridescent spots on the flanks. Pectoral, pelvic and

Marine *A. dispar* showing blue coloration

Blue Male *A. dispar*

Gold Male *A. dispar*

anal fins yellowish. Orangish gold spots on the gills. These most attractive fish were found amongst large shoals of normal coloured Arabian Killis in a stream at Qatif. Length 3 in.—3½ in. I believe these are "sports" from the normal Aphanius dispar.

Green or Turquoise, very similar to the blue *Aphanius dispar* with green or turquoise irridescent spots replacing the blue. Often the yellow colouration on these fish appears more greenish. Length 3 in.—3½ in. Various shades of green, turquoise and blue are found.

Arabian Killifish are rarely seen for sale; whether this is due to difficulty in obtaining them or lack of demand from the hobby, I just don't know. They may not be as colourful as many of the killis on sale but it would be very interesting to see what would become of this fish if, and when, some of our breeders took an interest and live-bred some of the natural occurring varieties. I am sure with some attention they would produce some really beautiful specimens. All the accompanying photographs were of wild caught fish and I am indebted to Peter Stroud for the help and advice he has given me on the preparation of the slides which accompany this article.

PRODUCT REVIEW

The "Derbert" Garden Pool Filter

THE Derbert filter is designed to operate from the delivery side of the pump and water is pumped through its filtering medium to extract dirt and algae.

The unit will, therefore, be suitable for most pools and can be used for both fountain and waterfall installations.

With fountains the filter will serve as base support for the fountain jet. The fountain jet can be screwed onto the outlet of the filter and the delivery pipe from the pump is then connected to the hose union on the inlet.

The "Minor" filter is supplied with two hose unions for connecting ½ in. (13 mm.) or ¾ in. (19 mm.) plastic tubing to the inlet connection.

The "Major" is supplied with only one ¾ in. (19 mm.) hose union because ½ in. (13 mm.) tubing would be too small for a filter of its size.

For use with fountain jet

Connect plastic tubing from the pump to the inlet of the filter using the appropriate size of hose union and bend provided. The fountain jet can then be attached to the vertical outlet so that it protrudes above the surface of the water. It may be necessary to raise the filter on bricks or similar to bring the fountain jet to the desired height.

For use with a waterfall installation

The filter is incorporated into the delivery pipe and situated in the pool. Connect the pump to the inlet of the filter with a short length of tubing using the hose union and bend provided. Connect the remainder of the tubing to the outlet (for which you will require a socket, hose union and hose clip, obtainable from your supplier) so that the water is pumped through the filter to the head of the waterfall.

In all cases fill the canister with water before making final connections and placing into pool, this will prevent difficulty due to the unit being initially buoyant.

One Minor filter treats up to 1,000 gallons, and for the pools with a greater capacity use the Major.

The time taken to clear the water depends on the size of the pool, and of course the condition of the water. It may be necessary to wash the filter wool several times before the water is perfectly clear, but once this condition is reached, the filter will work for longer periods before it will need cleaning out again.

To remove filter wool for washing unscrew the base cap and withdraw the filter wool. Wash this clean in lukewarm water and allow to dry out before replacing. Spin drying will accelerate the process.

After drying, fluff up the wool and replace into the canister making sure that the plastic gauze is situated in the top end and also the rubber sealing ring is inside the base cap.

Replacement wool may be obtained direct from the distributors at the following address—price on request.

Lotus Water Garden Products Ltd.,
260-300 Berkhamsted Road,
Chesham, Bucks.

Commentary

by Roy Pinks

This hobby has much to offer in contemplation as well as achievement, and the field is as open to the owner of one tank as it is to the possessor of wide resources. Some thinking ahead to the coming year, some swapping of yarns about years gone by, together with a certain sense of thankfulness that we are in a position to enjoy our hobby in such a troubled world may perhaps set the scene for the year ahead. Much happiness in the New Year to all readers!

I suppose that more fish are bought on impulse after a viewing in dealers' tanks than in any other circumstances. For the most part there is nothing much wrong in this, but purchasers often feel let down because the fish fail to perform subsequently in some particular respect. I can well recall disappointment with a tiny saltwater wrasse which cost the earth, and which looked wonderful when I bought it: after transfer to my tank all I ever saw were its eyes or tail just sticking proud of the sand. There are lots of marine fish with habits like this, and one has to be careful. The same sort of things might be said of the Kuhli Loaches, which just go to ground in a well planted tank and reappear weeks later looking much fatter than when they went in.

In particular, the mere basic deportment of individual species can make or mar them, and if a special effect in a tank is required, undiscerning selection will certainly bring disappointment. The buyer who simply adds what he fancies to his community tank probably doesn't worry all that much, so long as there is plenty of colour and movement and compatibility, and he seldom complains. The aquarist, however, who aims for example, at a sedate collection of tiny South American tetras may miscue and add a gorgeous blood red Platy which looked just right in the shop, but whose fussy locomotion and subsequent growth made everything else look out of step. Usually selection will be made on the basis of colour and body shape, but certain groups of fish do possess temperamental qualities which are well worth attempting to establish.

We have already classed the small tetras as staid and jewel-like. The more popular livebearers like the Guppy, the Platy and the Molly are flamboyant and fussy and constantly on the move and they can be something of a fidget if there are too many of them. The Barbs tend to be lively and inquisitive, now standing on their nose ferreting about on the tank bed, and now standing on their nose in mid-water in a form of sex play. The Fighters carry with them an air of splendid, silent and purposeful menace, whereas the Gourami group provide something of a mystic presence coupled with great individual beauty and gracefulness.

Catfish are more of a comic turn, and they are companionable creatures at the same time. Infinite business is the hallmark of the danios, the premier performer, surely, being the cheap and common but incomparable Zebra which, in a small shoal, whips any tank into unbelievable activity, continuously and quite effortlessly. Tracing the path of such a shoal has a decidely soperific effect on the beholder!

When we turn to the larger Cichlids (which, as juveniles look so unremarkable and harmless) we tend to think in terms of solitude and regal splendour and gloomy fastnesses not for the nervous, while the dwarfs play all this in higher key with altogether less drama and much more sparkle. Groups like the Glass Perch are on their own too, and are best not confused with species which would steal their show; rather like putting large coloured beads with diamonds.

If you study the locomotion of the above groups you will find how they tend to separate out. The tetras proceed in graceful flicks of the body and often remain stationary for considerable periods. The Barbs propel themselves similarly, but tend to hover in mid-water with the nose downwards. The livebearers wriggle somewhat and often cluster in imaginary feeding postures even when there is no food there. Catfish will suddenly appear as from nowhere, and, just as suddenly, whisk away behind a plant or rock. The Pencilfish will remain stationary for quite long periods near the surface and perhaps startle you with the sudden appearance of their brilliant and unusual colourings.

Gouramis, like galleons, carry all before them in stately and impressive passage through the water, while the Fighters slide in an oily and insinuating

fashion from one lurking place to another. For those who demand constant colour and movement the Danios as a whole cannot ever disappoint, but it must be remembered that for some their incessant questing can be upsetting and unnecessary. The beginner should carefully study all these characteristics, as they are just as important as compatibility in the community sense. If some of the worst combinations are avoided it will still be found possible to introduce graduations of temperament even within single groups. Some tetras are more quarrelsome or fast moving than others, and again, some strains display their own individual characteristics. Fine tuning in the selection of tank content is a characteristic of maturity in an aquarist, so why not start the process early on!

PLANT QUERIES *Continued from page 46*

plants and causing their decay.

First of all, try to shorten the period of lighting, say up to 8 hours per day, and also check whether you are maintaining a correct temperature. Without knowing the types of plants you are growing, I cannot give specific guidance in this matter, but you would be safe in maintaining a temperature of 70°-74°F. As the plants seem to grow well even for a period of a few weeks, it would seem that the water pH is satisfactory.

I have a 36 in. × 12 in. × 12 in. tank which I am setting up with plants such as *Cryptocoryne nevillii* **(10), 3** *Aponogeton crispus*, **3** *A. undulatus*, **3** *Nymphaea stellata*, **12** *Vallis. spiralis* **plus Hornwort. Lighting is with a 30 watt warm white fluorescent tube lit for 10-12 hours with a pH of about 7·2 and no filtration. Could you please tell me:**

1. **How many more and what kind of plants do you recommend?**
2. **How close together should I plant them?**
3. **Do you recommend the use of plant plugs?**

The amount and types of plants you propose to plant is adequate and should provide you with a lovely tank if they grow well. The *C. nevillii* should be planted at the front of the tank, and especially if you have some rocks, as they are dwarf plants. *A. crispus* and *A. undulatus* being tall plants should be grown as background plants in clusters, and the same thing applies to *V. spiralis*. The corner areas can be well planted with these. *Nymphaea stellata* is most effective when planted centrally, as the beautiful mauve and olive green leaves on long, trailing stems provide a true, natural underwater vista.

As to Hornwort (*Ceratophyllum demersum*), I do not recommend you to plant this in your tank, for it is essentially suited to the cold-water aquarium. Even when it survives in the heated tank, the stalks remain bare, with only the green shoot visible.

If you can maintain an average tank bottom of fine gravel or coarse sand with some plant debris or aquarium peat worked into the medium you should achieve good plant growth, provided of course you have the other conditions, such as water, temperature and lighting compatible with the plants you grow. Therefore plant plugs are not absolutely necessary. However, these can be used for your own luxury of convenience.

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 am soon to be starting a 72 in. × 24 in. × 24 in. marine aquarium and it will contain 24 cubic feet or 150 Imperial gallons which will weigh 1,500 lb and have a surface area of 12² feet. I intend to have U/G filters under 1½ in. of coral (crushed), some coral, a couple of caves and maybe a tree trunk. I intend to have two, 5 foot "Gro-Lux" fluorescent tubes and a powerfilter. I have worked out that I can have 37·5 inches of fish to start with. My questions are as follows:

(1) Are my figures correct?
(2) What fish should I have and what should I feed them?
(3) What type of powerfilter should I have and what turnover rate should it offer?
(4) Can you see anything wrong with my furnishings and if so please could you advise me of any errors?
(5) Can you see anything else I should add to the aquarium?
(6) Can York stone be used?

(1) *Your calculations.* These are all correct *except for* your calculation of the weight of your aquarium. Here you have made the following incorrect assumptions:

(a) *Weight.* You have assumed, correctly, that one gallon of freshwater weighs 10 lbs. wt. However, since your aquarium is filled with much denser *seawater*, the water alone will weigh about 1,540 lbs. wt.

(b) In addition, you should bear in mind the weights of the empty aquarium and the cockle-shell/coral-sand, rocks, corals and shells. Although you haven't given me enough details, experience suggests that an all-up weight of about 1,800 lbs. would be a better allowance figure for a set-up of this size.

(c) *Coral sand/cockle.* You will need about 1 inch depth of coarse, crushed cockle-shells *alone.* On top of this you need a minimum mean depth of oolitic coral sand of 3 in. depth, e.g. 2 in. deep at front of tank sloping to 4 in. depth at the rear.

(d) *Lighting.* Two 5 ft. flourescent tubes will be adequate for a fish-only aquarium. If you later decide to add invertebrates you would need *at least* five more 5 ft. white tubes. I therefore advise that you fit your "Gro-Lux" tubes as close to the front of the aquarium as possible—leaving plenty of reserve space toward the rear of the hood.

(e) *Stocking ratio.* You appear to be estimating your 37½ inches (nose to tailtip) on my long-advised maximum beginner's ratio of "*no more than 1 in. of fish to each 4 Imperial gallons of seawater.*" This is very sensible. I advise that you keep to this very light stocking level and the very light feeding régime that goes with it, for at least the next six months and, in view of your tender years, probably the next 12 months.

If, after this 6-12 months "apprenticeship," your losses have been nil and you have mastered the skills of early diagnosis of fish diseases and prompt usage of the appropriate medication, you could slowly begin to increase this stocking ratio to one inch of fish to each 2 gallons of water PROVIDED that you have pur-

chased a large powerfilter in the interim—see 3 below.

(2) *Choice of fishes.* The enormous scope of this question lies outside my word allowance here. The only advice I can offer is:

(a) Read a well-written, colour-illustrated beginner's book on the sea aquarium and make a list of all those species which you admire and feel may be compatible. PAY PARTICULAR ATTENTION TO THE MAXIMUM SIZE THAT EACH SPECIES REACHES. In a tank as large as yours some fishes will reach adult size in 12-24 months time. Take this list along to your local dealer and use his advice to delete any fishes on your list which are not available/obtainable. Also ask your dealer to re-arrange your species list in an idealised purchasing order; that is to say, that the re-arranged list should have the gentle, shy, retiring species at its head and the more confident forceful and ebullient species at the bottom. This is then the safest order in which to begin stocking the fishes.

(3) *Powerfilter*—this should be any reliable powerfilter having a turnover rate of about 75 Imperial gallons per hour. Ideally it will be arranged to operate the undergravel filter in a reverse-flow filtration way. However, if you restrict your stocking level to 1 in. of fish to each three (3) gallons of seawater (maximum) AND always take the periodic partial seawater changes as an opportunity to wash as much sea-humus from the coral-sand as possible, you do not strictly need a powerfilter at all.

(4) *Furnishings.* The addition of a tree trunk in a sea aquarium would soon have disastrous consequences. The level of dissolved organics in natural healthy seawater is extremely low. As a successful marine aquarist you will soon learn that, to achieve this desirable low level of organics in solution you must employ ultra-high activity charcoal and do regular partial (max 33%) water changes. A decomposing tree trunk would not only look totally incongruous in a sea aquarium—it would be positively dangerous.

(5) *Additional furnishings.* You haven't mentioned any sea shells in your list of aquarium decor materials. They are also useful hiding/sleeping places for coralfishes.

(6) *York Stone* is a non-toxic form of sandstone which is quite safe in a marine aquarium but would look almost as incongruous in a marine environment as a tree trunk. You would do better to stay with calcareous rocks such as living-rock, tufa, limestone, Westmorland stone and very hard chalkstone.

I wish to make a 72 in. × 18 in. × 18 in. all-glass aquarium to contain invertebrates and coralfishes.

Please can you advise me on the following:

(1) What thickness of glass should I use on a tank this size? How many reinforcing bars will be necessary?

(2) What lighting would I need for this tank?

(i) The minimum thickness of glass needed for a tank of 18 in. vertical depth would be $\frac{3}{8}$ in. thick (= 10 mm.). Additionally, unless you are going to support the tank on a stout, welded steel stand which is positioned on a concrete, rather than a wooden floor, I strongly advise that the tank's baseplate be made up of $\frac{1}{2}$ in. thick glass (= 12 mm.).

Irrespective of the nature and strength of the stand, I advise that:

(a) the four vertical faces of the tank be supported against *bowing* (i.e. bending under the pressure of the water once the tank is filled) by glueing strips of 1 in. × $\frac{3}{8}$ in. glass at right angles to the vertical faces, i.e. with the 1 in. dimension in the horizontal plane, around the entire length of the open top of the tank.

If these bars are glued (with normal silicone rubber) some $\frac{1}{2}$ in. down from the top of the tank you will find that they create a convenient ledge on which to support the all-over fitting cover-glasses which all sea aquaria should have.

(b) in addition to the strips described in (a) above which run around the inside upper perimeter of the tank, you should glue three (3) front-to-back strips of 1 in. wide by $\frac{3}{8}$ in. thick glass from the front anti-bow strip to the rear one. These additional three strips should be sited at approximately 18 in. centres.

(c) you *must* interpose a layer of styrofoam at least $\frac{1}{4}$ in. thick between the baseplate of the aquarium and the baseboard ($\frac{3}{4}$ in. thick *plywood* NOT CHIPBOARD) which is placed on top of the stand.

(d) if the stand *must* be placed on a wooden floor, please make sure that the stand's legs (at least six legs needed) are placed on joists, *NOT* on floorboards.

(ii) *Lighting a 72 in. × 18 in. × 18 in. sea aquarium*

If this aquarium is not intended to house invertebrates, and provided that you treat both the solid fishfoods and the seawater regularly with a liquid vitamin supplement, the exact lighting level of your new sea aquarium is of relatively low importance. By this I mean that, provided the in-tank level of ambient lighting is enough to prevent the fishes from assuming their darker, nocturnal colouration patterns.

(*NB:* If your lighting level is so poor as to induce nocturnal or twilight fish colouration patterns the fishes will NOT feed!), then this lighting level is adequate. A fish-only aquarium the size of yours needs at least two, five foot fluorescent tubes—one "GRO-LUX" and the other "NORTHLIGHT." You will find it cheaper and "electrically-tidier" to use a Twin—65 watt. control gear.

Coldwater jottings

by Frank W. Orme

READING *W.Y.O.*, in the December issue of "*The Aquarist*," I noted a letter from Mrs. A. Powell of Glamorgan. In this she asked that some guidance should be given to help a beginner to recognise a goldfish egg. Apparently, in her innocence, she once raised a bunch of young pondskaters in the mistaken belief that they were goldfish fry.

As the daylight hours begin to lengthen, and spring approaches, perhaps now would be an ideal time to fulfil Mrs. Powell's request by outlining the preparations for breeding goldfish in an aquarium.

When the water temperature has warmed sufficiently to encourage the fish into activity, and they have started to seek food, it is a good idea to select the fish which it is hoped to spawn. These should be placed in separate tanks so that the males are apart from the females; at the same time clean and prepare the tank which is to be used for the spawning. The separation of the sexes will often encourage the males to be more vigorous in driving the females during the act of spawning.

Feed the adults with good nourishing foods; earthworms which have been swilled and chopped to a suitable size are an excellent food for helping to bring the fish into breeding condition. Do not give more food than the fish will readily eat within a few minutes, little and often is more successful than offering one large feed.

Good health

Do not be in too great a hurry, be patient, and if the conditions are right and the feeding has been adequate, the fishes will soon exhibit those signs of good health and first class condition which are essential if it is hoped to breed the fish. They will have bright eyes, be alert and swimming actively, their scales will shine and the fins be held stiffly expanded. Soon the females will seem to be slightly plumper than usual, due to the pressure of the developing eggs, which may cause some of the slimmer varieties to appear slightly lop-sided; the males will develop small white pimples, known as tubercles, upon their gill plates and the front of their pectoral fins. These are the signs that the potential breeding fish are in breeding condition.

When the water temperature reaches 60°F (16°C) an attempt can be made to spawn the selected pair of adults. Be sure that the fish is showing its breeding characteristics for, too often, the novice tries to breed fish which are not ready or makes the mistake of using either two males or two females. Ripe adults will often chase each other, however, unless both sexes are present; this will not result in any fertilized eggs; fish which are not in breeding condition will have little interest in spawning because they will lack the sexual instinct to breed.

Spawning tank

Preferably the spawning tank should not be less than 36 inches by 12 inches, and no deeper than 12 inches, although it is possible to use a tank of smaller dimensions. This must be thoroughly cleaned to ensure that no possible pest or infection is likely to be hiding in it and which might attack the young fish. It is also a wise precaution to disinfect the adults prior to placing them into the breeding quarters so that they do not introduce flukes or some other unwanted problem. If it is intended to use plants these should be treated with the same caution. Cleanliness at this stage is essential to the well being of the hoped-for fry. Place the aquarium where the rays of the early morning sun can reach it because the sunlight will often encourage the spawning. Place the spawning medium, which may be either fine-leaved plants or wool mops (made of synthetic wool cut into 12 inch strands and bound together), at both ends of the tank to catch the sticky eggs as they fall through the water. The tank can then be left until it is considered that it is time to introduce the pair of adults; this will allow any excess oxygen or chlorine to dissipate into the air.

When it is thought that the pair have reached a stage of breeding condition that will result in a successful spawning, the male can be caught and gently placed into the prepared breeding tank—make sure that the water temperatures are very similar to each other—and leave the fish to settle down in its new quarters without feeding it. The following day, during the

evening, place the female in the tank. If the male shows interest in her after a short time and begins to follow her around with some nudges and pushes, then it is possible that they may spawn the following morning.

Chasing

During the act of spawning the male will drive the female into the spawning area and there will be a great deal of vigorous chasing during which the fishes seem to be oblivious of everything other than the over-riding instinct to spawn. The female will enter the spawning area, closely followed by her partner, and there the male will quickly place himself along her side and, with a shuddering movement, release sperm-bearing milt to fertilize the eggs released, simultaneously, by the female. The eggs will fall in a shower and adhere to anything with which they come into contact. This procedure will start early in the morning and continue for some hours; at no time should the pair be interfered with; although the fins may become torn it is seldom that any serious or fatal injury will be suffered—and torn fins will heal. The eggs are globular, roughly the size of a pin head, translucent, and may range in colour from almost clear to amberish. They number from only a few up to a thousand, or more, depending upon the size of the female and the condition she had reached at the time of spawning.

Inspect the tank at intervals to make sure that the spawning is still in progress; it may be that the drive may cease sooner than anticipated. If all is well leave the fishes to continue until around mid-day. They can then be removed and placed back into their original tanks—as always, be sure that the water temperatures are compatible. Like many species of fish, goldfish are cannibalistic and, once they have finished spawning, will commence to eat the eggs—they will also eat their own fry if given the chance. Therefore, the adults should not be allowed to occupy any aquarium containing eggs or young fishes that are small enough to be eaten.

Remove adults

Having removed the adults, carefully siphon over the tank bottom to remove any mulm or excreta, then carefully refill with clean water to the original level. In order to reduce the hatching time to about four days, install a heater and thermostat set at 70°F (21°C). The rate of hatching depends upon the water temperature; the lower the temperature the longer it will take for the eggs to hatch. The longer the hatching takes the greater the opportunity for some pest to attack the developing eggs. Now is also the time to ensure that a supply of the essential tiny food is available, ready to feed the small fry when they become free-swimming. This is best attended to by starting a culture of brine shrimps. Details of how to hatch the brine shrimps egg are usually given with the vial in which the eggs are supplied.

Many of the eggs will have failed to be fertilized. These will become opaquely white and develop fungus. However, this need cause no great alarm for many will be viable and few of these are likely to be harmed by the fungused, dead eggs.

After a time it will be possible to perceive the tiny alevin, within the egg, making sudden and vigorous twisting movements. Most noticeable will be the eyes and, possibly, a thin thread-like line running from the head of the embryo to its tail—this is the notochord which will become the backbone of the fish. The movements within the egg is a sure sign that hatching will soon take place.

Alevins

Quite possibly an inspection of the tank on the following day will reveal the tiny alevins, looking like little splinters of glass, hanging from the spawning medium and sides of the tank; be very careful not to disturb them for this is a critical stage. If they are disturbed they are likely to fall to the bottom and have some difficulty in rising against the water pressure. Before long they will begin swimming in jerky, spasmodic movements towards the water surface. This is an essential part of their development and must be completed in order to inflate the swim bladder. When this task has been accomplished the fry will be able to swim freely, and it will be possible to see the silvery sac of the swim bladder. Those which fail to fill the swim bladder will shuffle around on the bottom until eventually they die. This is the reason that the depth of water, in the spawning/hatching tank should not exceed 12 inches, because the greater the depth the greater the effort required to reach the surface. In fact, many breeders of goldfish keep the water depth to between 6-9 inches.

Within twelve hours or so the tiny fish will have recovered from the efforts of filling their swim bladder, and will have become free swimming. They will have used up the food contained in their 'yolk-sac' and will be actively seeking the minute food which forms the diet of fry. It is at this stage that the newly hatched brine shrimp nauplii should be fed to them. Offered in sufficient quantity it will be noticed that the stomachs of the fry will become very distended, and a reddish colour, as they feed to bursting point. Aim to keep the stomachs well filled and the fry will grow quite rapidly. Feed little and often in order to try to keep the youngsters feeding almost continuously. They can consume more than their own weight in a day and their future development depends upon making good growth at this stage. Given sufficient food and space it is not unknown for the fry to grow to a length of half-an-inch within seven days from becoming free swimming.

Second attempt

If the first attempt to spawn the adults is not

successful, do not be disheartened. Return the fish to their conditioning tank and start again. Be patient and, providing they are a true breeding pair, they will eventually present the desired spawning—but they will not spawn until they are ready to do so, and conditions are to their liking.

The wise novice will not attempt to breed and raise fish until he is sure that he can provide the right conditions to ensure a reasonable chance of success. Basically, this means having sufficient tanks of the largest size possible to be able to provide plenty of growing space. In the very early days the fry will not suffer by being crowded, but within a very short time they will need to given much more room. Plenty of food will be another requirement that must be met. Of course, it would be impossible for the average amateur to raise every one of the many fry to maturity it would require a colossal amount of tank space—however, many will be deformed or otherwise unworthy of keeping. These inferior specimens will be removed as part of the programme of culling, and this must be severe to ensure that only the best are kept, and this will ease the problem slightly.

In a future article I will cover the culling of goldfish, and describe the points to look for.

* * *

During the latter part of last year I received a copy of the newsletter issued by the Midland Koi Association. This contained some interesting reading. There was an article giving advice to members about the best methods to adopt in order to give winter protection to their pools and koi. Another, by Tony Walsh, is the first part of a series designed to help newcomers design a garden which will incorporate a pool for koi. A very valid point is made in the statement, "It is not easy to impress on people that constructing anything, be it house, garden, pond, shed or wall, is almost 90% thought and planning and 10% grafting," as he so rightly mentions ". . . careful planning on paper will save a lot of backbreaking work later on."

Unfortunately, nowhere in the magazine type newsletter could I find any mention of the name or address of the secretary.

PHILLIPS VEGETABLE DIET

We have been requested to point out that the price quoted in our December 1979 issue, although correct when the press release was originally issued, has now been adjusted.

The current retail price for Phillips Vegetable Diet is 74p.

THE KEYHOLE CICHLID

by Garry Younger

THE CICHLID FAMILY in general have a bad reputation for aggressiveness, plant destruction and a tendency to dig; indeed anything bad that can be said about any fish can be applied, in a general sense, to the cichlids. Perhaps it is this reputation that makes these fish so popular although I think that their individuality, each seeming to have its own character, is the real reason. The majority of these fish cannot really be kept in a community tank either growing too large or disturbing the other tank mates and plants by their activities.

However, not all members of this family share these traits, *Aequidens maroni*, the keyhole cichlid, being a very good example. Having kept the fish for many years (it was my first cichlid) I have found it a very good fish for the more well planted community tank. By cichlid standards a small fish, maximum size of 4 ins., it is really a dwarf cichlid. A very pleasing yellowy-brown with a dark bar running through the eye, the typical dark blotch on each finak, giving the species its common name. It is by nature a shy fish being prone to mad dashes for cover when disturbed, indeed it is seen more often in a well planted tank as if the plants give it security. It is not fussy about water type or temperature although it seems to do better at 75-80°F. It will take readily all types of flake and dried foods but will do better on a live food diet, essential for bringing these fish into breeding condition.

It is, then, a relatively easy fish to keep but to get this species to breed is a different matter, mainly because of its shyness which extends to its own species. They do tend to avoid each other and are very wary when they do meet. My first attempts at breeding met with failure; being a hard fish to sex, I bought six juveniles and in the time honoured practice, allowed them to mature and to hopefully pair. All six turned out to be females. So many hours were spent touring shops searching for a mature male of similar size. One was eventually procured and introduced to two of the females. The male was determined by its longer anal and dorsal fins, however, it has been my experience that this is not always the case, some females also growing these fins.

After months of conditioning, feeding live foods (white worms, small whole earthworms and *daphnia*) and frequent water changes, none of the fish showed any inclination to breed. Tank conditions were perfect yet the fish would not breed. Remembering their timid nature I put more rocks in the tank and added more plants (overplanting the tank). Almost immediately the fish took note of each other. The male turned a dark brown (a colour only previously seen at night after lights out when the fish rest on the substrate) and began to display to one of the females, raising his fins and following her closely. The female was not slow to respond, mimicking the male and also laying over almost on her side. Both fish were now very dark, almost a deep chocolate brown; at this point the other female had gone into hiding and was not removed for fear of disturbing the courtship. The courtship display appears to vary from fish to fish but involves body movements, colour changes and the raising and lowering of fins. Sometimes pecking occurs and occasionally the fish lock jaws, although never as violently as their larger relatives.

In this particular case the actual spawning was not observed but on other occasions the female lays her eegs in a preselected and precleaned nesting site (usually a stone or piece of wood, although plant leaves have been used). As the female deposits her eggs the male waits in attendance fertilizing the eggs when she has finished. Generally both fish guard and fan the eggs with their fins, although sometimes only the female or more rarely the male does, the other partner losing interest, when it should be removed.

The mated pair now became more aggressive, defending the nesting site against all intruders, the lone female that had been left in the tank was kept

Continued on page 59

SOME OTHER AQUARIUM PESTS

by Dr. Christopher Andrews

LETTERS regarding excessive algal growth, white-spot, fungus, and similar aquarium pests frequently turn up in my mail-bag from worried aquarists. There are, of course, other pests which occur under aquarium conditions, and it is the purpose of this article to discuss one or two of the (perhaps) less frequently encountered examples. As always more detailed advice on these, or any other problems concerning fishkeeping, may be obtained from the Tetra Information Centre.

Marauding Molluscs

Snails are often suggested as an essential part of any aquarium (or pond). However, their value as scavengers is vastly overrated, and they may (by their rapid multiplication), become a problem in their own right. Therefore, snails should not be knowingly introduced into any tank, and all new plants inspected for signs of these molluscs or their jelly-like eggs. Once they gain access to a tank, snails can be very difficult to remove. When all else fails the tank may have to be completely stripped down, cleaned and refurbished. Chemical remedies for snail eradication are available, but these must be used carefully. If large numbers of snails are suddenly killed by such a remedy, they may pollute the tank, and must therefore be rapidly removed. Several other methods of control are feasible. To begin with most snails do not like soft, slightly acid water, which is favoured by many tropical freshwater fish. In addition, certain aquarium fish (e.g. Clown Loaches *Botia macracantha*, Blue Gourami *Trichogaster trichopterus*, Convict Cichlids *Cichlasoma nigrofasciatum*, etc.) will avidly consume snails, although some of the harder shelled molluscs may be a little too tough!

Many Tentacled

Freshwater *Hydra* may suddenly appear in some aquaria, often introduced with contaminated plants or live food. When disturbed, their body will contract hiding their many tentacled, almost tree-like appearance. Some species may reach up to several centimetres in length, although in the aquarium they are usually much smaller than this.

The tentacles of *Hydra* contain tiny stinging cells which are used to stun their prey (e.g. waterfleas, fish fry, etc.), which is then consumed with relish. Although larger fish are not affected by *Hydra*, in some tanks they may be present in such numbers to have a serious effect on the availability of live food, and the survival of fry. Certain snails (e.g. *Lymnaea stagnalis*) feed upon *Hydra*, and thus offer one means of controlling this pest. However, you may be simply replacing one problem with another—snails! Fish (e.g. some Gouramis) will eat *Hydra*, although this is unlikely to be an effective means of control in a badly infested tank. Probably the best way to eliminate *Hydra* from an aquarium is using a six volt battery. Two pieces of copper (insulated) wire are connected one to each end of the battery, the other ends of the wire allowed to hang in the tank. The insulation from these ends of the pieces of wire is stripped away to expose about 2-3 inches of copper. Within a couple of hours the *Hydra* will begin to lose their grip and eventually fall dead to the bottom of the tank. For efficient control the wires should be left in the tank for about 4-6 hours, by which time most of the *Hydra* should be dead. Although it has been suggested that the weak electrical current was responsible for the death of the *Hydra*, it seems more likely that the small amounts of copper dissolving in the water from the wire is the cause. Copper is, of course, very toxic to invertebrates. Although fish in the tank will not be harmed by this treatment, a 25-30% partial water change should be carried out straight afterwards, siphoning excess debris (and dead *Hydra*!) from the tank floor.

Dirty Tanks

Planarians and Bristle-worms are often introduced into fish tanks with live food, and then thrive under unhygienic, dirty conditions. Excessive amounts of mulm and organic debris are a great encouragement to such pests! They swarm over the glass of the tank, making it appear unsightly and (although they do not harm adult fish) they may attack fish eggs and fry.

Planarians are tiny flatworms (often a few millimetres long) that move with a smooth gliding motion. They are rather remarkable invertebrates with incredible powers of regeneration. If a planarian is cut into several pieces, each will regenerate into a complete worm! One species also has a rather unusual method of reproduction: it will literally tear itself into two parts, each which will then grow into a whole animal. Bristle-worms are tiny (a few millimetres long), freeliving nematodes or "roundworms." On close inspection you will see that their eel-like body has numerous small spines or bristles (hence the common name).

Bristle-worms can be controlled quite simply by just cleaning up the tank, and improving your routine maintenance. Every week or ten days, about 25% of the water should be removed along with accumulated debris from the floor of the tank. Avoid overfeeding at all costs, and service the aquarium filters regularly (e.g. every 2-3 weeks). Although this will also help in the control of planarians, these animals are often more difficult to get rid of. Some Gouramis, Siamese Fighting Fish (*Betta splendens*) and Kribensis (*Pelvicachromis pulcher*) will feed on planarians, although there are more effective means of control. Removing resident fish to another tank, and raising the temperature in the infested tank to about 90-100°F (i.e. around 35°C) for several hours will kill planarians. After such a treatment a partial water change is essential, along with a reduction of the temperature, before the fish are reintroduced. An alternative means of controlling these pests involves hanging a piece of raw meat in the aquarium, suspended on a piece of cotton. If left hanging in the tank overnight, the meat will attract the planarians, which can all be removed the next morning. To achieve control, this should be repeated on several consecutive nights, taking care to always remove the meat to prevent tank pollution. However, where all methods of control have failed, it may be necessary (as with snail pests) to completely strip the tank down, and rinse everything (except the plants and fish!) in 2-3% formalin (available from a chemist). Everything must then be well rinsed in clean water to remove the formalin before the fish and plants are returned to the tank. During this operation the fish should be placed in a separate tank, and the plants dipped into cherry-pink solution of potassium permanganate for a few minutes. This will remove any planarians from the plants, although if they are left in the permarganate too long, the plants will be adversely affected. They should be rinsed in clean water before they too are put back into the tank.

Act Fast

The above mentioned pests occur in set-up aquaria from time to time. It is important to recognise their signs early on, and instigate control measures straight away. As with many other aquarium pests, and also fish diseases, "leaving things for a few days" is not a good idea, as it frequently leads to more long-term problems. The Tetra Information Centre is always interested to hear how aquarists deal with the problems they encounter. For advice on any aspect of fish-keeping write to Dr. Christopher Andrews, Tetra Information Centre, 15 Newlay Lane Place, Leeds LS13 2BB.

THE KEYHOLE CICHLID *continued from page 57*

well away from the nesting site being repulsed when crossing the invisible boundary of the spawning area. The eggs hatch after forty-five to sixty hours at 80°F and the fry take food at about three to four days afterwards as the egg sac is used up. Microworm, liquifry and occasional feedings of brine shrimp and *daphnia* (homegrown, therefore no aquatic fish diseases are introduced) bring the fry on. The parents guard the young, moving them to 'safe' areas when threatened. Interestingly the lone female during this first spawning was allowed to take part in shepherding the fry and was accepted as part of the 'family.' As the tank used to hold these fish was a large one (4 ft.) the adults were allowed to stay with the fry for some six months, the fry shoal around the adults looking very impressive. Some sixty fry were hatched in this spawning (although only twenty or so were left after the six months, due to heavy demand from friends, etc.). However, numbers do vary and occasionally the parents eat one or two of their babies as if by accident.

Having bred this fish many times, both with or without the parents attending the eggs, I can recommend it to anyone who would like to keep and breed cichlids, but either has not got the room or doesn't want to upset their community tank. In my opinion it is a very beautiful fish, undemanding and with no real bad habits and once a pair have established themselves and spawned they will continue to do so, if kept properly.

From a Naturalist's Notebook

by Eric Hardy

HAVE YOU noticed how many stream fishes keep to their home range and territories? The submerged pondweed density can be a factor in the wintering haunts of our freshwater fishes. In an aquarium, the link is not so necessary as in the garden pool, and carp can be destructive to aquarium vegetation if they are abundant, especially in early spring. By fencing off pens to keep carp away, these had a third more vegetation at the end of the season. Trout may serve a useful purpose in streams and lakes by feeding on leeches in their early days, as was found in Anglesey's large Llyn Alaw. Many fish, like carp, distribute the seeds of waterside sedges which they eat. Conversely, two leeches are parasitic on fish in Britain. Other fish are hosts to parasites which spend part of their life cycles in birds which prey on fish, like herons, bitterns and kingfishers.

The most up to date survey of this fascinating field of fishlife came from the German publishers Springer-Verlag last year: *Diversity & Adaptation in Fish Behaviour* by M. H. A. Keenleyside, of the University of West Ontario. From group-behaviour to anti-preditor habits and spawning site selection, it reveals much that fascinates the aquarium-watcher. The courting male *Eupomacentros partitus* for instance includes a quaint tilt sequence as it dips down over a conch shell on the bottom then rises again. KMNO: crystals are used to demonstrate fanning currents by the male stickleback fanning eggs at its nest.

One of the great Norfolk haunts of bream, pike, roach and other fish, which has seldom appeared in angling literature because of its privacy, 160 acres of Upton Broad and Fen in the winding Bure valley, have been purchased by Norfolk Naturalists' Trust. It is one of the only 4 major broads which escaped the damaging eutrophication from house-boat effluent. Amongst its rarities are water-plants like holly-leaved naiad and the Norfolk hawker dragonfly *Aeshna isosceles* with its transparent wings and yellow, triangular body-mark. It also has a good population of swallowtail butterflies living on its milk-parsley, while bog-pimpernel, grass-of-parnassus and wintergreen are among the plants of its boggy borders. It is planned to create an otter haven.

Marsh St Johns wort, whose hairy nature keeps it dry in the wet margins of ponds and streams, is mainly a plant of the wetter west of Britain, though localised. The discovery of its only Westmoreland haunt at a little tarn above the Winster Valley was long overdue, for it grows not far away in the Duddon Valley of Cumbria. Among other very localised waterside plants in Lakeland, the elongated sedge thrives among the willows at the north end of Esthwaite, and long-stalked pondweed, *Potamogeton praelongus*, at the Glencoyn end of Ullswater. The only Cumbrian site of hornwort, *Ceratophyllum submersum* is in equal abundance at the Stainton end of the Kendal-Lancaster canal.

The haunts of the small slender, 6-stamened water-wort, *Elatine hexandra* have been extended to Grasmere and Loughrigg Tarn. Ever since Pearsall's discovery in 1914, a multitude of synonyms have long caused confusion between the rare Esthwaite water-weed *Elodea nuttallii* which is also in Coniston Water (SE), Brotherswater, Derwentwater (N) and Bassenthwaite (S), which has 48 chromosomes; tropical *Hydrilla verticillata* which has 16 chromosomes; and

the latter's variety *pomeranica*, the synonym for the first-named.

Chinese Alligators

Many who enjoyed seeing the rare Chinese alligators, bred in Peking Zoo and introduced last year to London Zoo, may like to know that Pergamon Press are publishing one of the largest series of monographs ever produced on crocodiles, by Sydney University and the Parks & Wildlife Commission's joint crocodile research project. Eleven monographs, each with some 25 colour photos, cover in turn all the navigable Northern Territory rivers and their crocodiles, at £7·50 each.

Green Wall-lizards, marked heavily with black and normally continentals, have for 21 years survived near London on 2 railway-bridges near Hampton, south Middlesex, as well as the famous Paignton colony which may now have died out in south Devon, and others in Surrey and the Isle of Wight. In a recent history of the Middlesex colony in the London Natural History Society's journal, D. Stiles, of Hampton showed how they survived the pointing of many of the holes they favoured in one of the bridges. Their yellowish-brown young are first seen in August from eggs laid in May. They are very agile and find sufficient spiders, flies and grasshoppers for food in the warm summer weather, visiting local footpaths and gardens. In winter they dispute for hibernation cracks and holes in the bridge. They could be the Italian race *brueffenanni* or *nigriventris*.

The society also records the North American painted terrapin living in the Long Water at London's Kensington Gardens, and escaped pet garter-snakes in the Startford-Plaistow area of Essex, seen usually in cold weather when forced to move to better hibernaculae. Slow-worms still inhabit Beckenham Place Park and Bookham Common, grass-snakes in Trent Park at Cockfosters, Ashtead Park, Bookham Common and East Hollow Pond (Surrey) and great crested newts in the garden pond at Forest Gate, Essex and old gunpits on Bookham Common. Common lizards live as near as Bookham and Ashtead Commons and Epping Forest. More toads and frogs have been introduced into Wanstead Park, Epping Forest and the Curtis Ecological Park at Southwark.

American Marginals

The discovery by the Grand Union Canal near Greenford in Middlesex in 1977 of the first British record of the American bur-marigold *Bidens connata* has been followed with records along the canal from Herts. (Rickmansworth gravel-pits) and Bucks. (Slough spur of the canal). It has also spread in France and Germany. Another American relative with very similar leaves, *frondosa*, has been colonising the London area since 1964 at Dobb's Weir on the River Lee and the Grand Union Canal in southwest Herts. It grows also in Staffs., Worcestershire and Warwickshire, as well as a canalside in Monmouthshire. These rarer bur-marigolds are best distinguished by their seeds, which probably brought them here shipped with foreign goods. Those of *frondosa* having 2 awns or appendages, those of common native tripartite 2 or 3, and native nodding *cernua* and *connata* 4, the former more domed between the awns, the latter with nearly straight margins, stronger ribs and roundish raised pustules on the surface.

Lobsters

The tank-culture of lobsters still requires several years' research before it becomes commercially economic, according to a recent government feasibility study at their pilot plant on Conway research labs. This is the gist of MAFF's new 33-page illustrated Laboratory Leaflet 47, *Lobster Culture Research* by P. R. Richards and J. F. Wickens. Little is known of the diet or habits of wild juveniles under 10 cm, as they are so rarely found by sea-shore collectors. All stages are nocturnal, and fighting and cannibalism are common where they are kept together with big age-differences in close confinement, unless their claws are banded. Eyed eggs from berried females have hatched in the Conway tanks at 13-15°C. Free-swimming larvae are then netted out for rearing in fibre glass "bins" or tanks with upwelling water from the bottom, for females will feed on newly hatched larvae. Unlike juveniles and adults, larvae can be reared in mass culture. The best food for rearing larvae proved to be deep-frozen mysids, small shrimp-like creatures, but chopped mussel can also be used and the tiny seashore crustacean *Artemia* proved the best of foods elsewhere. After moulting to the 4th stage, the young lobsters were moved for a month in individual tanks of 5 × 5 × 9 cm deep, with overhead sprinklers and biological filters, and fed on mussel with weekly doses of mysid or small pieces of shrimp, removing all uneaten food.

From that stage, moulting times varied, but mortality fell from the former 24% to 3% and the juvenile lobsters fed on mussel and frozen shrimp, were used for experiments on various environmental and nutritional factors. The optimum temperature was found to be 20-21°C, and salinity 28-32‰. The shape of their containers (twice body length) proved not so important as floor-area, a minimum of 100-135 square cm. A shelter encouraged the fastest growth, as its hiding place reduced energy in movement. Constant darkness also favoured their growth, but constant illumination had a higher survival percentage. They could also be grown on a compounded diet of 61·9% dry weight white fish-meal, 12·1% soya bean concentrate, 9·4% skim milk, 6·7% reclaimed haddock-flesh, 5·4% cod-liver oil, 2·7% shrimp-flour, 1·6% vitamin mix and 0·2% choline chloride, the dry ingredients bound with an agar-sea water solution.

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BRINE SHRIMP

SOME COMMON PROBLEMS AND THEIR SOLUTIONS

by S. R. Prescott and J. P. Michotte of New Technology Ltd., Hadlow, Kent.

IN THE TROPICAL FISH hobby today, there are many serious aquarists who are interested in breeding their preferred species.

Often the fish will spawn when the enthusiast is least prepared and without a suitable and easy answer in the form of a dependable live food, the vast majority of the young fry will usually die within 48 hours of hatching.

A live food to be suitable for the sucessful rearing of fry especially egglayers must be:

(1) a suitable size;
(2) easily available;
(3) cultured without difficulty;
(4) not introduce disease to the aquarium.

Artemia (Brine Shrimp) eggs have been used for many years as the answer which most nearly approximates the given criteria, but having said that there have always been certain problems to be resolved.

(1) Origin of eggs

Many Artemia eggs are today heavily polluted with D.D.T., Dieldrin, PCB's (poly Hydrocarbons), and other 'industrial age' contaminants, and at a recent scientific symposium devoted only to the Brine Shrimp at Corpus Christie in Texas, August 1979 ("National Symposium of the brine shrimp")[1] which the author attended, it was shown by five independent laboratories throughout the world, that these contaminants were in the greatest concentration of all the strains examined, in the eggs known to the hobbyist as San Francisco Bay brand. During the seminar it was demonstrated by many lecturers that these toxins in the San Francisco Bay eggs were responsible for the deaths of complete spawnings at metamorphosis. The species examined included, flounder, bass, dungness crab and many others. Although no lecturer reported on Freshwater Tropical species, one contributor who is the largest breeder in the U.S.A. of Tropical Marine fish had also had disastrous results using the same eggs.

The conference examined some 14 strains of Artemia eggs and were unanimous in voting that the eggs from Macau were superior in virtually all qualities to any of the others available. It is interesting that these eggs have recently become available to the hobbyist throughout Europe in a totally new form and have met with tremendous success.

It is therefore imperative for the hobbyist to be certain of the origin of his eggs and never to purchase eggs which come from an industrially contaminated area.

(2) Possibility of introduction of disease

It has now been proved[2] beyond any question that pathogenic bacteria and other harmful organisms can be introduced to the aquarium using conventional cysts. The pathogens are introduced in the porous part of the Chorion. The best way to overcome this problem is to use a decapsulated cyst. In such eggs the membrane has been dissolved and any micro-organisms killed in the process.

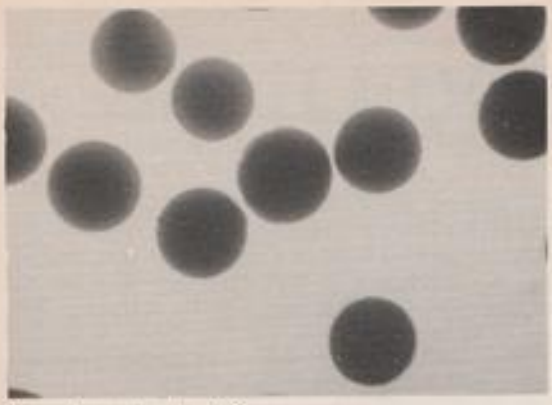
(3) Viability of eggs

Extensive studies have shown tremendous variance in the hatch percentage or viability of cysts. Many eggs sold have also a large amount of debris within the vial or carton. Some cysts will give 1 million nauplii (first stage of hatched Artemia) from 3 grams of eggs while others will require as much as 50 grams to achieve a similar result[3]. Be certain when purchasing cysts to obtain strains with a guaranteed number of viable nauplii per vial or bottle, compare one or two strains for yourself, you'll be amazed at the differences.

(4) Hatching procedures

Even with the very best cysts poor results will be obtained unless the basic requirements of good hatching procedures are followed[4]. These are:

(a) Temperature 28°—30°C (83°—86°F).
(b) Full strength (35 grams/litre) sea water using medium and natural salt or marine salt, only excepting iodised table salt, can be used for hatching, but if you wish to rear the brine shrimp then a good marine aquarium salt must be used. There are several good brands on the market, such as Living Reef salts, Tropicmarin or HW Marin Mix.
(c) Make certain that at the start of the hatching procedure, the eggs are exposed to strong light (artificial or day light) for at least two hours.



Normal (eggs) cysts x 100

Decapsulated (eggs) cysts x 300

Newly hatched *Artemia nauplii* x 100

(d) Aerate the eggs from the bottom of the hatching container and *make certain* that *all* the eggs are in continuous suspension during the hatching period, any eggs that rest on the bottom will not hatch.

(e) Always use the newly hatched nauplii as soon as possible after hatching to obtain the optimum results.[5]

Problems

(1) Conventional methods of selling standard Artemia eggs are to supply them in a small, plastic or glass vial. No matter how successful the first hatch with such eggs then viability will diminish with each subsequent hatch as air and light both act on the eggs in a negative way once the carton or vial is opened. Decapsulated eggs stored in a special solution overcome this problem.

(2) Separation of nauplii from egg shells in conventional eggs. This is a problem that has occupied aquaculturists for more than two decades. Many pieces of equipment have been devised, none absolutely satisfactory, all these devices work on the principle of photo-tropism, i.e., the fact that the nauplii are attracted to light plus the fact sometimes that the shells tend to float. You can no doubt use this principle yourself in one of its variants or you can avoid it altogether by using decapsulated eggs where the shells have been removed.

Using high quality Artemia eggs and following the above guidelines the average aquarist should be able to rear very high percentages of his fry past the critical stage. Certain lavae will need an even smaller live food for the first day or two and this we intend to revert to in a later article.

★ ★ ★

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O.F.I. PRESS RELEASE

Ornamental Fish International Wholesalers Organization

The U.K. representatives of the Ornamental Fish International Wholesalers Council have requested us to print the following press release in order that the true nature and aims of their organization should be more fully understood not only by the trade but also by the many fishkeeping hobbyists throughout Great Britain.

O.F.I. Council cement very firm foundations for Europe

O.F.I. Council met on a brisk cold but bright weekend in Amsterdam. Much hard bargaining and discussion took place on the Interpretation of policy and statute. Although some difficulties arose, hard work patience and understanding between Nations represented, eventually produced workable results. Much credit should go to the Officers of the Board of Directors, for the unyielding determination to resolve the sometime very difficult differences between National Interest and ways of operating.

Such dedication must most certainly establish O.F.I. as a very strong and sound collective European voice, for wholesaler importers of ornamental fish. Something which is completely new and very much needed to meet today's trading climate.

The meeting opened with reports from each country on the progress being made and the general attitude to O.F.I. Most countries in principal accept O.F.I. aims and objectives as a long term defence against adverse Government action, which could result from the uncontrolled situation existing generally at this time. More work must be done by O.F.I. to make the aquarium world aware that its main objective is to ensure continued wide availability of ornamental fish throughout Europe. O.F.I.'s desire to establish a standard of import/wholesale installation is clearly aimed at illustrating to Government that the industry is a responsible one, capable of looking after its own problems and duties to a pre-determined high standard, and not simply trading in livestock with little care for welfare and handling.

The O.F.I. Board of Directors are keeping a watchful eye on Government activities with the European community at large, making themselves available for discussion when the need arises.

A decision was taken that for the present time O.F.I. should concentrate its interest on Europe, closely keeping in contact with the exporting countries.

A request by a major Far Eastern exporter to address the Board of Directors had been received.

It was decided to allow a time at the next meeting for this gentleman to put his case. But strictly on the grounds that it was a policy discussion and not a selling mission.

The meeting then discussed the financial position and membership subscriptions.

Some confusion had arisen due to the final establishment of head office in Bologna Italy, and some incorrect English addresses.

On the question of membership, interested parties and potential members were requested to contact the board member in their own country. U.K. representatives . . . Malcolm Hardy and Keith Barraclough (your own country please). . . .

Mr. Hardy agreed to prepare an introductory leaflet explaining the aims, objectives, and advantages of O.F.I. to wholesaler/importers.

A draft letter is enclosed with this report for open publication, explaining the sincerity and responsibility of O.F.I. membership. Every member should now be in possession of label samples, and a set of negatives free of charge with which to print their own supply of labels.

The meeting then moved on to discuss a common D.O.A. report recommended to be used by O.F.I. members, who are authorised to include the O.F.I. mark on the sheet. This led to further discussion on how to promote greater communication between members in other countries when delays occur at foreign airports.

Members are urged to travel to as many open meetings as possible, although expensive, it brings members together which quickly leads to greater understanding and co-operation.

By regularly attending meetings members can make their trip worthwhile.

It was proposed by Herr Willie Remke, that not more than 2 people from any new member country, should be allowed to sit in by invitation at a Board of Directors meeting, without voice, until the next General Assembly when the country in question could duly elect its representatives. This was unanimously accepted.

At this time a very difficult matter was in the process of being resolved, but it took a further 24 hours before an agreeable answer was found.

Mr. Keith Barraclough proposed, that each board member should be authorised to bring along a maximum of one assistant to the board meeting (which

could be a paid up member or an Interpreter). This proposal was seconded by Mr. Bjarne Manley, and unanimously accepted.

The Selsdon Manor convention at which O.F.I. was founded, has presented some problems due to a mis-understanding about booking. Steps have been taken to settle this item quickly.

Plans for 1980 were briefly discussed, as time was getting close to the open meeting held Sunday afternoon.

The board welcomed 5 guests, all Dutch, with whom several interesting matters were discussed. It is understood that membership is being given serious thought by those attending.

The next Board of Directors meeting will take place in Dusseldorf on 19th-20th January 1980. With the Sunday afternoon being declared an open meeting, when as many members and prospective members as possible are invited to come along and participate.

Advance plans are also in hand for the next General Assembly to take place in Rome over 31st May to 1st June 1980.

The meeting closed at 6.00 p.m.

O.F.I. Press Officer . . . Keith Barraclough

OFF TO A FLYING START

by Charlie Tam

KEEPING a Fighting-fish (*Betta splendens*) in Singapore is no longer a child's hobby. Nowadays adults with more leisure time at hand and better-paid jobs are putting up their prized collections for competitions at Guppy clubs.

Actually these activities are only a small shot in the economic arm. What actually stimulated the industry is the export boom in aquarium fish trade.

From a $2·5 million business in 1965, it has shot up to $25 million in 1977, a ten fold increase in ten years. In 1978 the total domestic export amounted to $32·5 million.

All the business dealings are in private hands. At present there are about 1,000 licensed aquarium fish breeding farms in the country, producing over 200 varieties of fish for export to Western Europe, United States and other countries.

In land-scarce Singapore, the industry is hit by urbanisation which is creeping rapidly into the once rural areas shanties have given way to modern high-rise flats.

Together with this, the Government is aware that this industry is not only viable, but has the potential for growth and further expansion. Through its specialised agency, the Primary Production Department, the entire industry has been given new impetus, by means of technical and marketing know-how.

The industry is to be confined to an area. About 21·8 hectares of land have been set aside for resettling local aquarium fish breeding farms. The area earmarked is on the northern shores, away from the city, factories and refineries. It is intended to be an intensive aquarium fish breeding estate and is divided into lots. A farmer affected by the resettlement scheme is offered 0·6 hectare each.

On the technical side, the Department advises fish breeders on control of outbreak of diseases, diagnosis and treatment of diseases to boost export quality.

The Department also provides more varieties and higher quality fishes to breeders. It experiments with induced breeding of some imported fish which do not spawn in captivity. These varieties include the "Bala Shark," "Red Tailed Black Shark" and the "Red finned Shark" all of which are popular but expensive.

The findings based on the cage-net systems have been successfully adopted by the local aquarium fish breeders. The system provides better management and improves the utilisation of pond space for maximum production.

With the development of the aquarium fish breeding estate, production is expected to soar quickly. This will give exporters the chance to develop existing markets as well as finding new ones in countries like Canada, Middle East and Eastern Europe.

Recently twenty four members of the Singapore Tropical Aquarium Fish Breeders Association left for Taiwan, Hong Kong and Thailand for two weeks in search of the latest fish breeding techniques. And the Japanese discovery of keeping fish alive for longer periods will certainly add more dollars to the country's economy.

Junior Aquarist

AT THE CLUB

by John Loader

YOU MAY not have been to a fish club. If not, my advice is to locate one as soon as possible. Even if you only have one tank as I did, it is well worth while to join. You can probably find the address of the secretary of your nearest club in this edition of the *Aquarist*. If not, you can write to the *Federation of British Aquarist Societies* for this information.

The first day I discovered the local club I was feeling shy and nervous so I crept in and sat at the back. It seemed as if an auction was going on. A man was holding up a jar containing a trio of black mollies and describing them. The highest bid so far was 20p. In my pocket I had 50p, which I had just received for delivering newspapers in the area, so I plucked up my courage and asked the auctioneer if I could have them for 25p as I had not yet joined the club. "Sure son they are all yours," he replied.

Now I was feeling realling happy as I could imagine the picture they would make in my tank of red platies. Then the man in the next seat nudged me and said "you'll need some salt in the water with those, son." After this a heated argument ensued as to whether or not mollies needed salt added to the water. This went on until the chairman called the club to order. A vote was taken by a show of hands and it seemed that about half of the members used salt in the water. The president's advice was asked and his decision was that if the mollies were newly imported some salt should be added, but if home-bred no salt was required. It turned out that mine were home-bred so I didn't bother with the salt!

After the auction, the club was divided into five groups, Livebearers, Labyrinths, Characins, Cichlids and Tooth-carps. Each section was placed in the care of an "expert." There were less people in the labyrinth group so I was placed there. The "expert" in charge of our group was called Jim. It turned out that he had a fish house with more than thirty tanks and he bred Siamese fighting fish.

Jim and I became great friends and he taught me not only how to breed labyrinth fishes, but how to make tanks, how to make fry grow and many other things. He would not take the credit for all the good advice he gave to me and others. He told us his advice had been given to him by an old aquarist called Frank who kept a shop at Waterloo, and the rest he had learned from a book called *Exotic Fishes* by William Innes.

The next week at the club we had a table show and afterwards the judge gave a talk about the fishes on show. It seemed to me that the biggest aquarium fishes I had ever seen were on show in the smallest possible containers! After the talk the judge asked if there were any questions so I plucked up courage again and asked how the contestants' fishes were so much bigger than those I had in my community tank. This raised a few smiles and a discussion evolved in which it appeared that one had to learn to be an aquarist instead of a fishkeeper! At that time I resolved to do my best to be an aquarist.

The following weekend the club arranged a coach outing to a wholesale breeding and importing establishment in the country. This was surely the most wonderful day of my life. There were literally hundreds of tanks full of thousands of all kinds of aquarium fishes. We were allowed to buy any fishes we wanted except breeding stock and what impressed me was the care with which the nets were sterilised.

The manager of the establishment offered to answer any questions we might ask. When I asked him if the fierce aeration he used wouldn't hurt the small fishes, he answered that if the fishes were not strong enough to swim away from the air bubbles they were not strong enough for him to keep anyway!

On the way back home in the coach we all compared the fishes we had bought and came to the conclusion we all had good bargains. Luckily I sat next to the president of the club, dear old Sid, and he explained

to me that although the establishment where we had been took the greatest care of their fishes, it was as well to quarantine them in a small tank for two weeks before placing them with known healthy fishes. He offered to lend me a small tank as he knew I only had one tank.

After a little discussion, during which he invited me home to supper with his charming wife, Olive, we decided to quarantine our fishes together in his quarantine tank. This we did which was a relief to me as I felt my fishes might be getting a little cold after their long journey. The following week at the club he told me all the fishes appeared healthy so we congratulated ourselves on our selection. Only one club member had lost his fishes which I understood were a delicate kind called Chocolate Gouramis.

At the club the following week, much to my joy, we had a lecture about mollies. That evening I learnt a lot and resolved to save up and buy another tank to breed some mollies. On the way home the president advised me to wait until the next meeting of the club when another lecturer was coming to demonstrate how to make our own fish tanks. This was another wonderful evening and I hope you enjoy yourself at your local aquarium club as much as I do at mine.

BOOK REVIEW

A Key to the British Freshwater Leeches. *By J. M. Elliott and K. H. Mann* (£2).

A Guide to Methods for Estimating Microbial Numbers & Biomas in Freshwater. *By J. G. Jones* (£2·50). Freshwater Biological Association, Ferry House, Ambleside LA22 0LP).

Two additions to the FBA's well known Scientific Publications. With a colour-plate of 10 species, Elliott and Mann eschew distribution-maps, (because of their often biased or incomplete pictures) in bringing up to date the latter's original 1954 key to our 16 leeches out of 500 world species. All but the largest are temporarily immobilized for some 15 mins with soda-water from a siphon! Two especially interest aquarists as they parasitize fish. From haunts beneath stones in swift streams or lakesides, like Windermere, *Piscicola geometra* attaches to the bodies, mouths or gills of most native fish from salmon to stone-loach, and may become such a serious pest of fishponds as to require chemical removal. It has two suckers, using the enterior one to attach to passing fish and when insatiated with blood days later it drops off, leaving a red, inflamed patch where its sucker attached.

Another leech, *Hemiclepsis marginata* attacks rudd, perch, tench, bream, pike and roach. It may originate from stagnant, weedy ponds, and may kill small fish in an aquarium. Little is known of this leech's life history, but some are eaten by fish, and the parent tries to find a suitable host as soon as possible after the young have hatched and are attached to her belly. The famous medicinal leech, which is not extinct (except in Ireland), may also attach to small fish and amphibians.

Large deposits of silt reduce the numbers of leeches, and some can host fish-parasites. Most prey on invertebrates. One enters the nostrils of waterfowl. Identification is a matter of eyes, body-colour and segmentation, genital pores, and jaws and this booklet is the best aid to this.

Dr. Jones' booklet is more for the specialist in techniques for counting or estimating micro-organisms (plankton) in freshwater samples, methods to solve different problems. His notes cover the dilution, filtration and concentration of samples, handling of algae, bacteria, fungi and protozoa, preserving and counting by membranes, counting chambers and electron microscopy, with an appendix of statistical and mathematical guidance plus a long reference to literature and manufacturers. It does not include the more sophisticated techniques for viruses and measuring metabolic activity, while several sampling techniques and descriptions of apparatus are excluded because they are readily available in existing literature. Freshwater microbes are not the only populations to be estimated in ecological research and this guide to the methods available will assist more than microbiologists.

ERIC HARDY.

News from AQUARISTS' SOCIETIES

Monthly reports from Secretaries of aquarists societies for inclusion on this page should reach the Editor by 3rd of the month preceding the month of publication.

AT the A.G.M. of **Sheaf Valley A.S.** the new committee elected were: chairman, M. Kemp; vice-chairman, F. Toyne; treasurer, J. Barlow; show secretary, D. Golland; secretary, Mrs. M. Kemp, 167 Buchanan Road, Parson Cross, Sheffield S5 8AS. (Phone: 619562); social secretary, Mrs. C. Toyne; other members, L. Hattersley, Senior; L. Hattersley; D. Silk.

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THE **Medway A.S.** held their annual general meeting at which the following officers were elected: chairman, J. Gay; secretary, K. Grubb; treasurer, P. Brown; show secretary, G. Carpenter. They were told that membership had declined and more of the members were encouraged to show their fish at the table shows. Members were reminded that the open show will be on May 18th and support with entries is a must. More details from K. Grubb, 66 Norman Close, Gillingham, Kent.

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A VERY informative slide and tape show entitled "Keeping Koi" was featured at the December meeting of the **Evesham Fishkeepers Society.** a table show was held for A.V. Egglayers with results: 1, M. Barnett; 2, T. Rixon. Also the first round of the Fish of the Year contest was held, with results as follows: Joint 1st, M. Barnett and F. Hessel (100 points); Joint 3rd, Mrs. E. Thornton and Mrs. J. Hessel (98 points).

The society meets on the 1st Wednesday of every month at 8.00 p.m. at the Hampton Scout Hut, Pershore Road, Hampton, Nr. Evesham, Worcs. New members and visitors are welcomed. Secretary: Mrs. E. Thornton, 41 Crooks Lane, Studley, Warks. (Tel: Studley 7125).

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A CROWDED meeting of members and friends celebrated the end of the Golden Jubilee Year of the **Bristol A.S.** A slide show, a buffet, and a collection for the Xmas Appeal by Radio Bristol were some of the items in a full evening. Mr. J. Day proposed a vote of thanks to the Committee for their work during this past busy year.

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AT the annual general meeting of the **Doncaster and District A.S.** the new committee elected was: chairman, H. Ackroyd; secretary, B. Roberts, 2 Shelley Grove, Sprotborough, Doncaster DN5 8BX; assistant secretary, J. Simmonite; treasurer, S. Copley; assistant treasurer, Mrs. D. Copley; show secretary, G. Flint, 37 Copley Crescent, Scawsby, Doncaster DN5 8QW; assistant show secretary, K. Lancashire.

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THE **Wycombe Marsh A.S.** meet at the Social Club, Railko Ltd., Loudwater, High Wycombe, Bucks. at 8.30 p.m. on alternate Mondays. Visitors, Other Club members and Juniors are welcome at meetings. Future meetings include: 4th Febeuary, Tape/slide pegramme on Native Freshwater fishes; 18th February, D. Hickman on Cichlids. Further details can be obtained from the secretary, Mike Fox, 24 Kelvin Close, High Wycombe, Bucks. (Tel: High Wycombe 38823).

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THE result of the inter-club between **Merthyr A.S.** and **Abertillery A.S.** which were held at four meetings, two at Merthyr and two at Abertillery and ended on 19th November was: Merthyr A.S. 65 points; Abertillery A.S. 15 points. A shield was presented to Merthyr A.S., to be held until our next inter-club with Abertillery A.S. sometime next year. Trophies were also awarded for highest individual points. Winners for Merthy A.S. were: 1, P. Willis; 2, R. Morgan; 3, E. Morgan. Winners for Abertillery: 1, A. Taylor; 2, E. Taylor; 3, A. Winstone.

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THE **Catfish Association** committee for the session 1979/80 are as follows: chairman, Roy Goodson; secretary, Paul Miller, 89 Cedars Avenue, Durrington, Worthing, Sussex (64641); assistant secretary, Gina Sandford; treasurer, Pat Lambourne; P.R.O., John Carpenter; show secretary, Terry Cruickshank; magazine editor, Derek Lambourne; assistant editor, Mike Sandford; floor member, David Allison.

The C.A.G.B. Convention was a great success once again, and the 120 members and friends who attended saw some tremendous slides which backed up lectures from Gordon Howes and Robert Travers (of the British Museum) on Catfish's and collection methods; Derek Lambourne (of the C.A.G.B.) on the Callichthydae family; and David Allison on Keeping Loricaridae. The lectures were split by a film on Breeding Sturisoma Panamense, filmed and shown by Allison Productions (John and David). During the lunch break there was an auction.

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THE December meeting of the **New Forest A.S.** was held at the Community Centre, Lymington. The main item was a fascinating colour-slide lecture about Cichlids of Lake Malawi, produced by the Federation of British Aquarist Societies. During the interval a raffle was held, along with an auction of members' fish. Table show results: Barbs: 1 and 3, T. Kirby; 2, R. Menhennet. Fighters: 1, R. Menhennet; 2, T. Kirby. Platies: 1, R. Menhennet. Mollies: 1, R. Menhennet.

New members are always welcome at meetings which are held on the third Monday of every month at 7.45 p.m.

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MEETINGS of the **Catfish Association of Great Britain** (Northern Area Group): February 15th, table show (Loricaridae, Bagridae and A.O.V.) and discussion on the classes benched. March 21st, table show (Mochokidae, Doradidae and A.O.V.) and discussion on the classes benched. Meetings commence at 8 p.m. and are held at Quarry Bank R.A.O.B. Club, Skelmersdale, Lancs.

Inquiries re., the new Group to: David Sands, 116 Hesketh Lane, Tarleton, near Preston, Lancs.; Steve Hootton, 81 Radnor Drive, Southport, Merseyside; or George Waterhouse, 23 Moss Lane, Southport, Merseyside.

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TEN years ago a handful of dedicated Koi enthusiasts got together and with the most valuable assistance of Ken Fawcett (of T.F.H. Gt. Britain Ltd.) created the **British Koi-Keepers Society.** A small committee was set up and carried on running the business of the ever-growing and thriving Society. In 1972, upon his retirement as chairman, Ken Fawcett was made honorary president. Initially, a news letter was issued but has now developed into a fine magazine which is written by Koi-Keepers for the benefit of Koi-Keepers.

1980 marks the 10th Anniversary of the British Koi-Keepers Society and with a continuing growth, now some 1,200 members, it can be said that interest both in Koi-Keeping and the Society is well and truly established. The Society has several active local sections covering the length and breadth of the country. These sections hold monthly meetings and very friendly inter-section visits which are ever-popular.

On Sunday, 14th September, at the very beautiful Bressingham Gardens and Steam Museum in Norfolk, the B.K.K.S. will hold its 5th Annual National Koi Show, where some of the finest Koi in the country may be seen. The British Koi-Keepers Society extends an invitation to all Koi Keepers and members of the general public to come along to view these beautiful fish.

Prospective Koi-Keepers wishing to join the B.K.K.S. please contact the Society's membership secretary, M. Waumsley, 165 Woodside Road, Amersham, Bucks. HP6 6NR.

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AT the December meeting of the **Mid-Sussex A.S.**, members were shown slides of various club activities which have taken place throughout the past year. The table show for Furnished Aquaria was won by L. Pinney. On Sunday, 18th November members entered their community tanks in the 'Home Aquaria' competition. The results were as follows: 1, L. Pinney; 2, B. Slade; 3, S. Tester; 4, J. Fall. The junior award also went to J. Fall. The monthly '50 club' draw winners for December were: J. Buetles, R. Pinney and Mr. Short.

Meetings are held on the second Thursday of each month at Ockley Lodge, Keymer, from 8 p.m. Further information from the Secretary, John Birch, 11a Sandrocks Way, Haywards Heath (phone: H.H. 50585).

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AT the A.G.M. of **St. Helens A.S.** the Chairman for the last several years, and one of the founder members, had to resign for personal reasons, although he still retains his membership and attends meetings when his job permits. The Society takes this opportunity to thank him for all the work he has done in the past for them.

Robert Jones, the secretary and show secretary remains the same for 1980. The new chairman who is also having to continue his role as treasurer is John Dean.

This year's open show will be on 29th June and will be again held at Rainhill Village Hall. Schedules will be available from the show secretary closer to the time of the show.

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Grangemouth A.S. held their A.G.M. and prize giving on 29th November. President J. Makin and treasurer A. Binnie both wished to retire from office and were thanked by the evening's chairman, Mr. W. Beglin, for their hard work during the past three years. The new office bearers elected: president, Mr. I. Philips; vice-president, Mr. D. Bridges; secretary and P.R.O., Mrs. J. Wardlaw, 15 Portal Road, Grangemouth, Stirlingshire; treasurer, Mr. C. Simmons; show manager, J. Makin; custodian of trophies, I. Young. Committee, R. Tinto, Mrs. E. Tinto, J. McNee, I. Young, I. Millar, W. Beglin. Junior representative, F. Elder.

Shields for highest points gained during the year in table shows: Senior, Mrs. J. Wardlaw; Junior, Gregor Fitzcharles. Cup for highest points (Egglayers), J. Makin; Cup for highest points (Livebearers), Mrs. J. Wardlaw.

Members submitted ideas for future meetings and the Committee will meet at an early date to consider these.

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DUE to circumstances beyond their control, **Osram A.S.** have been forced to change both their premises for meetings and also their name. Osram A.S. will now be known as **Woodside A.S.**, of Altrington, and will now hold meetings every Thursday at Altrington Hall, Altrington, Middleton.

By moving premises, however, the Aquarist Society will now encourage the development of a Junior Section, and although it is early days yet, the number of juniors attending meetings looks very promising indeed.

THE **East Anglian Federated Aquarist** show was held at the Community Centre, Diss on 2nd December. There are now ten East Anglian aquarist societies in the Federation and shows are now to be held at two monthly intervals throughout the year. Societies taking part in the show were Bury St. Edmunds (B), Diss (D), Ely (E), Great Yarmouth (GY), Ipswich (I), Kings Lynn (KL), Thetford (T) and Thorpe & District (TD). There was a total of 217 entries. Results: Barbs: 1, N. Cobb (D); 2, T. Cork (TD); 3, D. Gissing (D); 4, Mrs. D. Cowell (E). Characins: 1, M. Laws (KL); 2, N. Cobb (D); 3, C. Eades (I); 4, B. Illingford (D). Cichlids: 1, J. Illingford (D); 2, Mrs. C. Turnbull (I); 3, Mrs. C. Palmer (D). Dwarf Cichlids: 1, C. Newman; (I); 2, D. Newman (I); 3, T. Cork (TD); 4, Mrs. C. Turnbull (I). Rift Valley Cichlids: 1, M. Laws (KL); 2, A. Kemp (GY); 3, C. Simper (KL); 4, N. Cobb (D). Labyrinths: 1, G. Drewry (GY); 2, N. Cobb (D); 3, C. Eades (I); 4, B. Illingford (D). Toothcarps: 1, D. Newman (I); 2, S. Cowell (E); 3, D. Gissing (D); 4, P. Auffret (I). Catfish: 1, P. Eyles (KL); 2, T. Cork (TD); 3, D. Newman (I); 4, T. Cork (TD). Rasboras: 1, D. Borley (B). Danios: 1, D. Gissing (D); 2, T. Cork (TD). Loaches: 1, D. Knights (GY); 2, L. Durrant (GY); 3, N. Hume (D). AOV Egglayers: 1, 2 and 4, J. Ellingford (D); 3, G. Drewry (GY). Labeos: 1, Mrs. C. Palmer (D); 2, D. Borley (B); 3, N. Cobb (D); 4, Mrs. C. Turnbull (I). Egglayers (Pairs): 1, C. Eades (I); 2, N. Hume (D); 3, J. Ellingford (D); 4, N. Cobb (D). Livebearers (Pairs): 1, T. Cork (TD); 2, J. Ellingford (D); 3, K. Appleton (TD). Guppies: 1, D. Gissing (D); 2, A. Moore (TD); 3, F. Auffret (I); 4, K. Appleton (TD). Swordtails: 1, G. Drewry (GY); 2, D. Knights (GY); 3, A. Thorpe (GY); 4, A. Moore (TD). Platies: 1, A. Knights (GY); 2, N. Cobb (D); 3, R. Gallop (B); 4, L. Durrant (GY). Mollies: 1, K. Appleton (TD); 2 and 3, N. Cobb (D); 4, A. Kemp (GY). AOV Livebearers: 1, T. Cork (TD); 2, D. Turnbull (I); 3, F. Auffret (I); 4, K. Appleton (TD). Singletail Goldfish: 1, 2 and 3, A. Moughton (D); 4, D. Cowell (E). Twintail Goldfish: 1, S. Forrest (B); 2 and 3, E. Wood (T); G. Hume (D). AOV Coldwater: 1, V. Good (T); 2, G. Hume (D); 3 and 4, K. Appleton (TD). Breeders: 1, M. Laws (KL); 2, A. Thorpe (GY); 3, J. Ellingford; 4, B. Ellingford (D). Junior Tropical: 1, A. Moore (TD); 2, J. Nash (D); 3, A. Moore (TD); 4, N. Palmer (D). Junior Coldwater: 1, Miss A. Cobb (D); 2, C. Hume (D); 3, N. Hume (D); 4, V. Wood (T).

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A SEASONAL reminder to any koi keepers in the London and Home Counties area that the London Section of the **British Koi Keepers' Society** is enlarging its membership and increasing its activities with great rapidity. Because of the large membership five or six annual meetings always take place in Conway Hall, Red Lion Square, London, N.W.1, where lectures, demonstrations, slides film-shows and discussions are given. Recently, three further sub-groups have been formed within the Section—North London, South-East London and South-West London—very successfully and house meetings and visits to other members ponds prove very popular in the summer months.

A London Section show is planned for July and reciprocal visits to other Sections of the Society which have proved so popular in the past two years will also be confirmed.

Any koi-keepers in the area who have not already joined are really missing out both in acquiring koi knowledge and making koi friends. Further information regarding the Section may be obtained from Tony Bullock, 60 Edison Avenue, Hornchurch, Essex. Meetings at Conway Hall in 1980 will be held at 2 p.m. on the following Sundays: 3rd February, 30th March, 29th June, 21st September, 30th November.

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CHANGE OF VENUE

MEETINGS of the **Nottingham Home A.S.** are now being held at S.A.T.R.A. Social Club, St. Annes Well Road, Nottingham. First meeting 8 p.m. on Thursday, 7th February, and the first Thursday of the following months. For further details please contact either of the following: Ian Hardwick, chairman (phone: Nottingham 873073); David Galbraith (phone: Nottingham 583722). New members welcome.

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CALENDAR

15th March: The British Aquarists' Study Society First Spring meeting at 2 p.m. in the Meeting Rooms of The Zoological Society of London, Regents Park, London NW1. Marine biologist and diver John Hancock will give illustrated talks on the United Services Expedition to the Chagos Islands in the Indian Ocean where he collected, observed, photographed and kept hundreds of tropical marine specimens from starfish to sharks. The meeting will be followed by a visit to the London Zoo Aquarium by kind permission of the Curator, Dr. H. Gwynne Vevers.

Tickets from W. Goodwin, 14 Dawlish Drive, Devon Park, Bedford.

22nd March: Hendon D.A.S. convention. Guest speakers, Dr. H. R. Axelrod and G. S. Axelrod.

31st March: Nelson A.S. annual open show at the Civic Theatre, Stanley Street, Nelson. Details from show secretary R. McKenna, 52 Bath Street, Nelson, Lancs BB9 0NP.

12th April: Catfish Association of Great Britain open show at Raynes Park Methodist Church Hall, Worple Road, Wimbledon, S.W. Schedules from Terry Cruikshank, 82 Stanley Avenue, Greenford, Middx. (Tel: 01-578 0104).

13th April: Kettering A.S. open show at the McIntay Theatre. Forms available from I. Lloyd, 32 Hawthorn Road, Kettering, Northants. (Tel: 519492).

27th April: Yeovil and District A.S. open show at Parish Hall, Martock, Somerset. Schedules and details from A. Holt, 45 Glenville Road, Yeovil, Somerset BA21 5AF.

27th April: Merseyside A.S. open show at the Rainhill Village Hall, Tainhill, Lancs.

11th May: Throckley A.S. open show at the Grange Welfare Association, Newburn Road, Throckley. Benching 12-2 p.m. Schedules from Mrs. D. Lakey, 51 Hewley Crescent, Throckley, Newcastle on Tyne. (Tel: 0632 677236).

11th May: Bournemouth A.S. open show at Kinson Community Centre, Kinson, Bournemouth. Show secretary, Jack Jeffery, 30 Braemar Avenue, Bournemouth Dorset BH6 4JJ.

17th May: Port Talbot A.S. open show at the Talbach County Youth Centre, Margam Road, Port Talbot, West Glamorgan. Trophies, cards and plaques for all classes. Schedules from early March from Show Secretary, A. E. B. Fouracre, 3 Cross Street, Velindre, Port Talbot, West Glamorgan SA13 1AZ.

18th May: Medway A.S. open show. Details from K. Grubb, 66 Norman Close, Gillingham, Kent.

18th May: Scarborough Fishkeeping Society first annual show. Schedules and details available later.

25th May: Portsmouth A.S. inter-club show at the Portsmouth Community Centre.

June 29: Sherwood A.S. open show at the Lady Margarets Hall, Worksop.

29th June: St. Helens A.S. open show at Rainhill Village Hall.

6th July: South East London A.S. open show at 141 Greenwich High Road, SE10. Information from secretary, W. Hastings (Tel: 8586344 or 6920283).

20th July: Sandgrounders A.S. 10th open show at Meols Cop School, Meols Cop Road, Southport. More than 30 trophies; plaques for each class winner. Inquiries to Mr. B. Baldwin, show secretary, 10 Olive Grove, Southport, Merseyside PR8 6BG. (Tel: 0704 43384).

7th September: Huddersfield Tropical Fish Society open show at Slaithwaite Civic Hall. Show secretary, Mrs. P. Town, 187 Abbey Road, Shepley, Nr. Huddersfield. (Tel: Kirkburton 7640).

21st September: Tonbridge and District A.S. open show at Hadlow Community Centre, Hadlow, Kent. Schedules from Mrs. D. Feast, Show Secretary, c/o 6 Albert Road, Tonbridge, Kent.