

JUNE 1973

20p

# Pet Fish

monthly

*The* PRACTICAL FISHKEEPING MAGAZINE



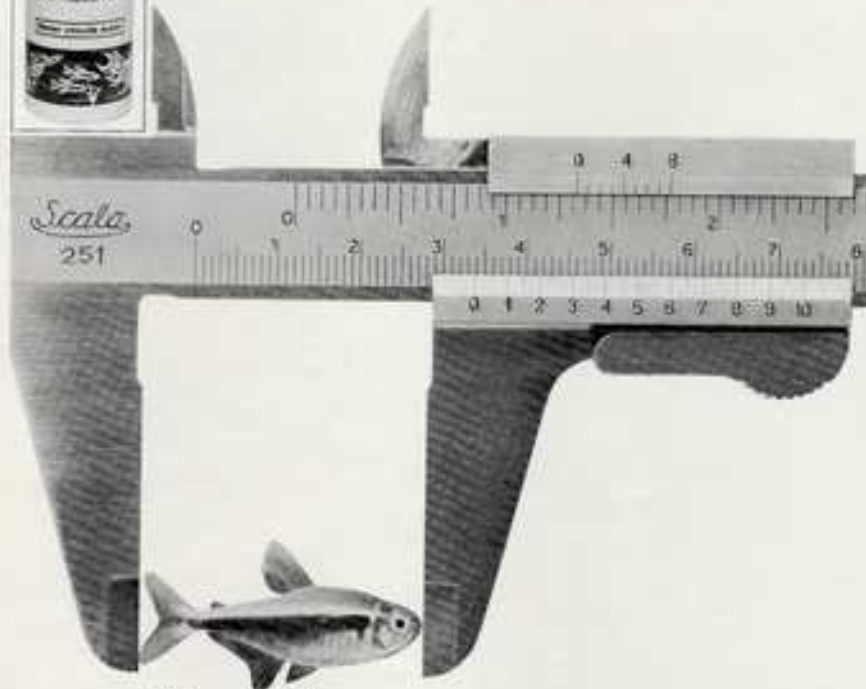
**Contents include:**

The Marbled Hatchet Fish  
Practical Koi-Keeping  
Readers' Queries Answered  
Native Marines

Preparing for Holiday Time  
Aquarium Filtration  
Honey Gouramis  
Coldwater Scene etc.



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## Comments and Quotes

- Crossed lines with lightning?
- Algae sabotage water supplies
- Siliness about plastic bags

### Bad Lines

DO you ever get one of those telephone lines that does nothing but click, crackle and hum? If you have suffered in this way you might know something about the frustration that gymnotid fishes experience in trying to communicate with one another in thunderstorms. At least that is what some recent scientific work could indicate.

Gymnotids, such as the African electric fish *Gymnarchus niloticus* that was the subject of a study by Dr C. D. Hopkins, are known to use an electric communication system at a frequency below about 20 kHz. Lightning also gives rise to a natural noise of electrical origin with the same frequency range. Careful examination of the electrical characteristics of the 'clicks' and noises that were tape-recorded by amplification from electrodes underwater in a freshwater creek in Guyana during lightning flashes showed that these were capable of being detected by electric fish, although in his report in NATURE, Dr Hopkins writes 'the degree to which this noise interferes with communication remains unknown'.

It seems that lightning noise is unlikely to affect some other electric fishes such as the electric eel and some mormyrids, the nature of whose discharges is such that lightning 'clicks' would not be confused with their long-distance calls to one another.

### Big-Scale Algae Problem

THOSE who are gloomily contemplating the ever-greening process taking place in their ponds might derive some comfort from considering the ramifications of the problem of algae that might be facing the local pumping station. When algae clogged

the filter systems at Woking and District Water Company's pumping station at Walton-on-Thames in Surrey recently, the water supply to industry in the area had to be cut off. This created a 2-days' stoppage at the British Aircraft Corporation factory there when seven thousand workers normally busy making parts for the Concorde were sent home. A spokesman at the pumping station explained that the situation had been created by the low water flow in the river, owing to the abnormally low rain fall during the winter, and a bout of early spring sunshine that had created an algal growth which led to clogging of the filter beds. The thought of algae on that scale should lend renewed vigour to the hand that patiently twists the rough stick through the strands of blanket weed at the pond's edge in the accepted manner.

### Floating Plastic Bags

HOW long does it take for a piece of nonsense, put out as a new scientific truth, to find its way into new books or new editions and be presented as if it were Holy Writ? About 5 years, if we can judge from what might be called the 'plastic bag silliness'. This originated in the USA in 1967 as a piece of armchair theorising on the practice of floating plastic bags, with fish therein, in tanks to equalise water temperatures before liberating the fish. Don't do it, said the would-be pundits, it's bad for the fish. At the time we criticised (1971, November 1967) the 'scientific' reasoning that had been put forward to justify the advice not to float plastic bags in aquaria. Alas, in the otherwise commendable new book by Dr Yoshichi Matsui, COLOURFUL AQUARIUM, the author has written: 'At one time, hobbyists were instructed to 'float' the bags in the tank to equalise the temperature. Today, we know that because the

microscopic pores in the bag permit gas exchanges, this practice is harmful.' This does not even correctly present the reasons given

by the original! Watch out, this utter nonsense is now likely to be propagated from one uncritical author to the next, from book to

book, probably becoming more and more distorted on the way. Readers of 1973—you have been warned—here's a bit of advice to ignore!



Your comments and views on all topics of interest to aquarists are welcomed. Address letters to PFM Letters, 554 Garratt Lane, London SW17 0NY

### Techniques With Glass

IN the issue of PFM for April there appears the first article in a series 'Aquarium Techniques with Glass' by Mr Cliff Harrison. Whilst Mr Harrison is doing a first class job in explaining the finer points in what can prove to be a real bugbear and yet show a considerable saving to the hobbyist I must bring a couple of points to the notice of your readers.

When instructing on the finishing of cut edges he does not mention that an abrasive disc used in an electric drill must not be used freehand but mounted on a suitable stand, and in this connection a fixed fence on the base of the drill stand will be found a great help in guiding the glass past the disc.

When finishing glass in this manner, although the user was reminded to protect the eyes and clothing from flying glass dust and splinters, it was not mentioned in the article that harm could be done through breathing the glass dust produced. It is recommended that when doing any kind of grinding where mineral dusts are produced a face mask should be worn. This can be either a piece of surgical wadding with elastic sewn on to go round the head or a mask purchased from chemists, of the type we used to refer to as 'smog masks'.

Whilst Mr Harrison's methods may work every time for him, I use a slightly different method when cutting glass. First, my wheeled cutters are kept at all times in a jam jar with about 1 in. of paraffin to make sure they are always to hand and that the wheels are wet and will run freely as soon as put to use. Secondly, I treat glass much the same as I do wood as regards marking out and cutting, i.e. first choose a perfectly straight edge and finish it with a stone or 100 grade wet or dry paper, then test and if necessary cut an adjacent edge true and finish in the same way. After this your glass can be cut for length and width with a finished edge always towards you; again this is in the interests of preventing accidents when stretching across the work top to check measurements and cut. The final two edges are then finished as required.

This may seem a long way round of getting the pane to a finished size but if you are going to make a square tank you must start with square pieces of glass! I also used this method because I have a different way of making the break: after making the score on the surface, I place my thumbs under the glass on either side of the scored line and press down with the fingers, getting down as low as necessary in order not to raise the glass from the work bench too much.

I can certainly agree with Mr Harrison's last paragraph, having produced over 60 all-glass tanks for Club members, friends and myself as well as glass shelves and sliding doors etc. for friends and neighbours.

I hope that some of what I have written will be of assistance to other hobbyists.

Hoddesdon, Herts.

K. G. RUSSELL

CLIFF HARRISON writes: *Certainly if any quantity of glass is to be finished in the way described the use of a face mask is essential. Generally I have worked only on the top edges of the aquarium and then only out of doors so that no glass dust has accumulated in the air. The main precaution is to ensure that the shower of dust and splinters is directed harmlessly to the ground. On the matter of mounting the drill and abrasive disc on a suitable stand, this might be fine for small pieces of glass. Handling sheets 3 or 4 ft. long is a problem, however, and the freehand use of the disc on the cut edges has always proved satisfactory and is in fact the way suggested by the makers of the disc.*

### Catching a Large 'Cat'

I HAVE tried Mr M. J. Walters' method (PFM, April) of catching a large 'cat' with my 8 inch albino clarias. The large plastic bag was slashed in several places by the clarias' spines as I lifted it out of the tank and it leaked like a sieve afterwards.

Portsmouth, Hants.

N. PERKINS

More letters on page 63

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# LETTERS

*continued from page 54*

## Vitakraft Aquaria

WHEN going through the April issue of PETFISH MONTHLY we came across the article entitled 'An Aquarist's Visit to Belgium and Holland'. One photograph is shown of our ornate hexagonal aquarium on exhibition at the Pet Fair in Antwerp. It should be made clear that these beautiful aquarium cabinets are manufactured by ourselves and exclusively marketed by our company and Vitakraft distributors. It is not correct that this range of aquaria is being marketed by a 'consortium' consisting of two other companies.

Bremen, Germany

H. KNOLLHAIN,  
Vitakraft-Werk

*We are pleased to make it clear that the range of aquarium cabinets mentioned in the article referred to and in our feature 'What's New' (PFSM*

*May) are exclusively Vitakraft products and we regret that the article contained an erroneous statement in this regard.—EDITOR.*

## Which One?

AT the seminar held by Derby Regent AS in January, I was asked by those present to write on their behalf to the magazine WHICH? and this I did. I quote a brief extract:

'... It was proposed that I should suggest that you carry out surveys and publish reviews as you do for other hobbies. Tropical fishkeeping is a fast growing hobby, possibly due to the increase in flat-dwelling, and now involves a large section of the community. Reports could range from proprietary food mixtures, to pumps, filters, heaters and thermostats, pumps being a particular cause for concern...'

A copy of their reply is enclosed. Since I cannot possibly contact all those who attended, I would be obliged if you could give me some space in your magazine.

J. BLAND,  
Secretary, Derby Regent AS

*The copy of the Consumers' Association's communication sent to us by Mr Bland is a standard acknowledgement stating that suggestions from readers of WHICH? are 'welcomed and carefully noted'.—EDITOR.*

## Meetings and Changes of Officers

**AMERSHAM & DAS.** Chairman, Mr K. North; vice-chairman, Mr T. Barber; secretary, Mr S. Thompson (8 Windmill Wood, Amersham); assistant, Mr A. Hall; show secretary, Mr B. Jessup (24 Oakley Lane, Huddersfield Estate, Tring, Herts.); contact, Master P. Daniels; publicity officer, Mr J. Berridge.

**ASHINGTON & DAS.** Chairman, Mr E. Frythurch; secretary, Mr H. Kennard (8 Tansley Place, Ashington, Northumberland); Meetings: new venue Universal Social Club, Woodburn Road, Ashington, every other Wednesday, 7.45 p.m.

**BEDWORTH A & PS.** Chairman, Mr M. Lane; vice-chairman, Mr M. Lee; secretary, Mr R. Todd; treasurer, Mr T. Pugh; show secretary, Mr J. Howson; assistant, Mr J. Salisbury.

**BRITISH MARINE AQUARISTS' ASSOCIATION, New Section.** London & South-Eastern Regional Group, Secretary, Mr Peter J. Inland (24 Newber Road, Waltham Forest, London, E11). First full meeting: 22nd June, 9 p.m., Meeting Room, Zoological Society of London, Regatta Park, London, NW1. 50p admission including film and refreshments.

**CATERHAM NOMADS AS.** Chairman, Mr Keith Noss; secretary, Mr V. Gibson; 723 Park Road, Caterham, Surrey; show secretary, Mr Paul Howard (11 Shirley Avenue, Caterham, Surrey); treasurer, Mr R. Dwyer.

**COVENTRY POOL & AQUARIUM SOCIETY.** President, Mr B. Bromfield;

vice-presidents, Mr B. Mox R. Fox, Mr W. T. Oliver; chairman, Mr T. Shady; treasurer, Mr F. Watts; secretary, Mr D. Eastwood (12 Cardale Court, Coventry; phone Coventry 477551); show secretary, Mr S. Woodbridge (12 Budgeons Avenue, Coventry; phone Coventry 412511); newsletter editor, Mr C. Hinde; assistant, Mr B. Ferguson; Meetings: new venue at Buggy Hall Hotel, Bordesley Road, 2nd Tuesday of month, 7.45 p.m. Visitors always welcome.

**CROYDON AS.** New assistant secretary, Mr A. S. Purvis.

**FEDERATION OF NORTHERN AQUARIUM SOCIETIES.** President, Mr G. W. Cooke; vice-presidents, Mr C. Walsh, Mr B. Taylor; secretary, Mr E. Wood (8 Henge Close, Bury, Lancs.; phone 061-764 8981); treasurer, Mr S. Nicholls (43 Shore Avenue, Bury, Oldham, Lancs.); BAF Organiser, Mr G. W. Cooke (Spinning Grove, Field Hill, Bury, Yorks.); phone Bury 3467; secretary, Judges & Stewards Committee, Mr A. Wilson (44 Harold Street, Archer Park, Middleton, nr Manchester; phone 061-642 7142).

**HARTLEPOOL AS.** Chairman, Mr E. Williams; treasurer, Mr P. Radman; show secretary, Mr J. Wilson 144 Ryelands Road, Hartlepool, Co. Durham, (1728 4897); secretary, Mrs R. Norton (143, Elwick Road, Hartlepool).

**HASTINGS & ST LEONARDS AS.** Chairman, Mr G. Peck; vice-chairman, Mr G. Funnell; secretary, Mr P. Martin (12 Silverlands Road, St Leonards); assistant, Mrs Q. Pollard; treasurer, Mr T. Chakraborty;

show secretary, Mr E. Mowter; P.O., Mrs E. Reed.

**LEAMINGTON & DAS.** Secretary, Mrs P. M. Stoddart. New address: 4 St John Terrace, Leamington Spa, Warwick.

**PONTEFRAC & DAS.** New title, (previously Catford & DAS). Chairman, Mr B. Nock; secretary, Mr Barry Stevens (72 Falcon Drive, Linn Lane, Catford, Yorks.); show secretary, Mrs B. Cobon (20 St Oswalds Avenue, Pontefract, Yorks.); social secretary, Mr Jim Dickinson (6 Holmfield Lane, Newton, Pontefract). Meetings: first Wednesday of month, 7.45 p.m., Willow Park Hotel, Pontefract.

**RUNNYMEDE AS.** Secretary, Mr P. Coote (1 Manser Road, Ashford, Middlesex; phone Ashford 29270). Meetings: 2nd & 4th Tuesday of month, Ashford Community Association, Chestnfield Road, Ashford, Middlesex.

**SMITHWICK & DAS.** President, Mr L. Stokes; chairman, Mr D. Johnson; treasurer, Mr J. Harris; show secretary, Mr P. Troth; assistant, Mr A. Layton; secretary, Mr E. Woodward (12 George Road, Southwick, Warley, Warwick). Meetings: 2nd and 4th Wednesday of month, 9 p.m., Arden School, Arden Road, Southwick, Warley, Warwick. New members welcome.

**TONBRIDGE & DAS.** New Secretary, M. D. R. Poythorpe (8 Albert Road, Tonbridge, Kent, TN11 2SR; phone Tonbridge 52445).

**WALTHAMSTOW & DAS.** Meetings: 2nd and 4th Wednesday of month, Groups Community Centre, Frederick Street, Walthamstow, London, E17. Visitors and prospective members always welcome. For details: Mr A. Chandler, 213 Forest Road, Leytonstone, London, E11.

# The Marbled Hatchet Fish



Photo: BRAZ WALKER

## *Carnegiella strigata*

**S**OUTH AMERICA seems to offer an endless array of fascinating aquarium fishes of almost every imaginable physical concept and adaptation, and by far the largest contributing group is that of the suborder Characoidei, sometimes collectively lumped as 'characins' but more correctly known as characoids. Among the 16 families generally recognized are flesh-eating piranhas, fruit-eating pacus, salmon-like sports fish, cigar- and pencil-shaped fishes and a host of other 'models' in addition to the familiar tetras of the home aquarium. Certainly one of the least convention-following families among them is the family Gasteropelecidae, often known as hatchet fishes because of their hatchet-like body forms.

*Carnegiella strigata*, the marble hatchet fish, is not only an undemanding, easily kept and completely inoffensive aquarium inhabitant, it is the most striking and handsome of the hatchets. The sides of its deep-breasted, keeled body are silvery, ingrained with darkly contrasted and altogether tasteful marbling. The caudal or tail fin is forked, the dorsal is situated unusually sternward and the pectorals or breast fins are large and almost wing-

By BRAZ WALKER

like, all of which features are shared with other gasteropelecids. There is no adipose fin, although other genera of the family possess this appendage.

Hatchet fishes are among the fishes capable of becoming airborne for short distances if the need arises, and are often referred to as 'freshwater flying fishes'. As a matter of fact their entitlement seems in some ways more valid as true aerialistic creatures than the more famous marine flying fishes of the family Exocoetidae, whose 'flights' consist of launching into the air with a final burst of surface speed, unfolding the broad pectorals to catch the wind, and sailing or gliding as long as wind and air speed would permit. Hatchet fishes, however, are not merely gliders, since they are reported actually to beat their pectoral fins up and down, aided by powerful and oversized pectoral or breast muscles, in quite acceptable



mimicry of the powered flight of a bird. At times they 'fly' along just above the surface with their bellies partially submerged, and at other times they leave the water completely. There are even substantial reports of a buzzing noise produced by the wing-beats of *Carnegiella strigata tenca* as it passed near the ear of a qualified observer.

*Carnegiella* and other gasteropelecids (Gasteropelecidae: *gastero*—belly, *pelec*—hatchet, axe) have good aerodynamic design for the short form that their flight takes. Lengthy aerial excursions would obviously be as detrimental to the gills, skin and fins of a fish as the overly prolonged flight of Icarus was to his own equipment. Surprisingly, flight can be sustained for as much as 60 feet, often well above the water's surface, which one could consider an Olympian feat for a 1½ in. fish!

From a frontal view, the hatchet fish has a sort of V-shape, which is helpful in cutting through the water's surface as the creature either taxis for take-off or simply skims along the surface, as is often the case. In profile, the deep breast turns up sharply at the front end of the fish, and it tapers more gradually toward the tail. This distributes the weight unevenly forward, which combined with the forward position of the 'wings' or pectoral fins gives the fish good 'balance'. The value of this will be recognised by anyone who ever folded paper airplanes or constructed balsa wood gliders. By having a bit of extra weight to the front, momentum is kept forward, which results in a more stabilised and controllable flight pattern. The wing-like pectoral fins are long and strong, actually forming quite a good air-foil design with a convex surface above and a concave surface below. The rearward position of the dorsal adds further stability to the design.

The marble (or marbled) hatchet fish is found from Guyana to the Amazon Basin and is fortunately among the most hardy of the group. Hatchet fishes have a largely undeserved reputation for being touchy and delicate, and although they may be more sensitive than certain other tropicals the fact is that they are so often kept under unsuitable circumstances or with unsuitable tankmates that their potential longevity suffers for it.

An aquarium for hatchet fishes should be roomy, with some floating vegetation as well as the rooted kind. The floating plants should not be so dense as to be impenetrable. Since the hatchets, especially marble hatchets, often come from forest brooks, with sunlight being somewhat filtered or partially shaded, the floating plants give them not only a refuge from more predaceous fishes but protection from overlighting of the surface waters where they spend their time under normal conditions. The marbled shading of the marble hatchet blends very effectively with either true floating plants or rooted

plants whose tops have reached the surface. Open areas should certainly be available at the surface of the aquarium, but it is important that hatchet fishes have access to the refuge provided by surface vegetation if they are to appear at their best and if they are to lose their shyness, especially in an aquarium containing other fishes. Although their aquarium should always remain covered, to contain their periodic attempts at 'flight', planting of this type also helps reduce the number of flying excursions resulting from fright.

In Nature, hatchet fishes are insectivores, concentrating on the myriads of small insects which swarm just above the surface and are often found on the surface itself. The hatchet's flight is thought to be used in catching their prey, and their mouths are equipped with teeth for securing the insects either on or above the surface. Certainly there could be no more ideal food for them in an aquarium than *Drosophila*, the well-known fruit fly, which is so often bred for feeding to aquarium fishes. These are rather easily raised in bottles containing a medium in which the adults lay their eggs. The larvae feed and grow on the contained medium, and there are soon enough adults for feeding and starting new cultures. Fortunately, the laboratory strain of fruit fly used by aquarists is a wingless mutation incapable of flight. The adult flies are simply shaken out of the bottle on to the water surface, where they are greedily attacked by the hatchets. In the occasional spawning accounts which come about, fruit flies have been mentioned as the food on which the fish were conditioned.

The aquarium hobby has seen many advances in the past few years, not the least of which have been in nutrition. For the aquarist who has neither time nor facilities for live food there are a number of excellent alternatives available in freeze-dried, flake and frozen foods, which are entirely capable of bringing many aquarium fishes into spawning condition, species that previously would have been thought to have required living foods. Marble hatchet fish have spawned in my own aquaria where they had received nothing but a high-quality conditioning flake food and loose-pack freeze-dried brine shrimp. Unfortunately there were other fishes in the tank and the eggs were lost. This has occurred on several occasions, indicating that spawning condition is achieved without too much difficulty.

Properly housed in a reasonably roomy aquarium with other inoffensive and small fishes which frequent other levels of the aquarium, marble hatchet fish, either *Carnegiella strigata* from Brazil or *Carnegiella strigata tenca* from Guyana, which is sometimes considered a distinct species, soon lose their shyness and become among the most enthusiastic and interesting of small aquarium





fishes. Well cared-for hatchet fishes, including the marble hatchets, will live for several years. In feeding, it should be kept in mind that they are strictly surface feeders, and should be thus provided for.

As for differentiating between the two subspecies mentioned, according to A. Fraser-Brunner, in *C. strigata vesca* the second dark oblique band is double for most of its length, reaching the ventral edge near the middle of the keel, with the dark

band along the base of the anal reaching well forward on to the keel. He states that *Carnegiella strigata* differs in having the second oblique band single for at least its lower half, meeting the ventral edge well posterior to the middle of the keel, with the dark band along the anal fin hardly extending on to the keel.

For those who like small and handsome fishes which are a bit 'different', either subspecies is sure to be a favourite.

#### PFM REVIEW OF

## Aquarium Filtration

**T**HERE is probably no item of aquatic equipment that is available in such a diversity of styles and range of models as the once-humble aquarium filter. Beginners to the hobby are taught that this is an indispensable piece of equipment for any home aquarium, yet probably the cost of a good air pump and filter would be generally better spent on a larger tank *initially*, and these other items added a month or two later when their selection can be made with care and consideration. Very rarely indeed will the aquarium be so heavily stocked from the outset that the fishes should be in dire need of aeration. Anyway, a couple of months later the price will be a far less important factor in the choice of equipment.

For simplicity, filters may be divided into two categories—biological and mechanical—according to the way they work.

### Biological Filtration

Bacteria are to be found in any body of water in Nature, with a function to play in a chain of events that permit all forms of life that we know to exist on this planet. In the context of the home aquarium, bacteria rely for nourishment on substances dissolved in the water, primarily the waste matter produced by fishes, breaking these down into nitrates and other soluble salts which, in turn, provide nutriment for the aquarium plants. In the wild, where there are relatively few fish per square yard, plenty of plants and, most important of all, a generally constant flow of water, the system works well. To achieve this notional 'balance' at home would mean perhaps having no more than two or three small fish in a heavily planted 2 ft. aquarium. In any case, a far more important balance

for the aquarist is between the states of fish not getting enough food for proper growth and development and their getting so much that not all can be consumed. Whilst we cannot greatly speed the rate at which plants use the nitrates produced by bacterial action, we certainly can encourage the action of the bacteria. Although the main concern of the aquarist contemplating the use of filtration will naturally be to eliminate the unsightly sediment that collects on the surface of the gravel, the waste matter invisible to the eye (i.e. dissolved in the aquarium water) is in the long term likely to be more harmful to the fishes if it is ignored, than detritus which is visible.

Two types of bacteria—*aerobic* and *anaerobic*—are involved in aquarium chemistry: the former will be dominant in water highly charged with oxygen, whereas the latter will increase where there is a serious deficiency of oxygen. Given that there is a plentiful supply of waste matter from the fish, we can support the activity of aerobic bacteria (the sort compatible with the conditions required by fish), by ensuring that the oxygen content of the water is maintained—in other words, by using artificial aeration. Thus with an airstone alone we can keep an aquarium clear and clean almost indefinitely provided it is stocked with fish to a fairly low level—perhaps ten zebra-size fish in a 2-ft. aquarium, and provided that they are not fed too heavily. However, there comes a stage at which additional aeration alone will not give the bacteria the best conditions in which to work for us.

Here we can turn for guidance on procedure to commercial water-purification methods. The method used at sewage works is for the impure water to flow slowly through a thick layer of coarse clinker; this clinker soon becomes covered with a jelly-like zoological film, composed of colonies of bacteria. It

is this thriving mass of aerobic bacteria that converts the impurities into simple salts as mentioned earlier.

We can duplicate this method in the home aquarium by using the tank's gravel as the host medium for the bacteria; circulation of water through the gravel is the job of the biological filter. Biological filters are available either in the form of a series of perforated tubes or as perforated plates, connected at one corner to an air-lift, and are placed under the gravel with a covering at least  $\frac{1}{2}$  in. deep. Fine gravel and sand are not suitable for this purpose, and the system works best with gravel of approx.  $\frac{3}{8}$  in. grade, though coarser material may be used in a rather deeper layer.

Undergravel filters can be used in unfurnished aquaria and even transferred from tank to tank if the arrangement pictured here is used. Photographed in a dealer's tank, this unit consists of a deep plastic tray that holds the gravel serving as filter medium and biological purification system together with the undergravel filter equipment (only the vertical air-lift tube is visible).



Photo: CLIFF HARRISON

These biological or 'under-gravel' filters work best when the air-lift is working fairly slowly—just 2 or 3 bubbles per second being produced. Overloading or deaths of water plants are the most common causes of breakdown of the system. Such rich sources of nourishment will rapidly increase the numbers of aerobic bacteria, with a consequent shortage of oxygen for themselves and the fish too. Depletion of oxygen will cause the ascendancy of the anaerobic bacteria, whose presence can be associated with the unpleasant odour of the 'polluted' aquarium familiar to us all.

Incidentally, some people run the air pump for just a few hours a day to circulate the water: this is no good for the biological filter, since the bacteria need a constant flow of oxygen-rich water to survive—switch off the pump for a few hours and the colonies will be diminished, necessitating a wait of a week or so before the colonies have built up to their former activity.

Slowly the concentration of dissolved salts not utilized by the plants will build up in the water with this method of filtration, and a partial change

of water every 2 or 3 months will prevent any ill-effects from this (it works wonders for the fish!). Provided that you exercise moderation with feeding and do not stock the aquarium too heavily with fish, biological filters can keep your display crystal-clear and since the filter medium is alive it is self-maintaining and does not require to be changed regularly.

### Mechanical Filtration

This method involves passing aquarium water through a suitable filter medium—nylon floss or spun glass are the most common—which traps and retains any suspended solid matter in the inter-

stices present in it. Dependent on the speed of the water flow and the amount of solid waste present (or produced) in an aquarium, and of course the size of the filter box, the medium may have to be washed out or replaced at intervals of between 5 and 10 days. If cleaning is not done at least this often, a bacterial film will form on the surface of the filter medium, blocking and decreasing the flow of water severely.

For this review, it is proposed to divide mechanical filters into three categories: inside filters, external filters and power filters—the first two relying on an independent supply of air for their operation, the third being a self-contained motorised unit.

Inside filters are probably the most popular types, thanks to their cheapness; they are reasonably foolproof, fairly easy to clean out and very economical with air, but they do have to be sited inside the aquarium and may therefore interfere with the artistic arrangement of the display. The commonest type in this category is the bottom filter, which, as its name implies, rests on the gravel. It is generally a small box, about 3 in. square and a little higher,

with a removable perforated lid that enables the interior to be lightly packed with nylon floss. Two upright tubes protrude beyond the top of the box: the small one is fitted with an air-line connected to a pump, and the large one is the air-lift from which a steady stream of bubbles rises.

A bottom filter is very light, and a marble or pebble put on top of the nylon floss will keep it stable on the bottom of the aquarium. By carefully planning the layout of the aquarium, the filter can be hidden behind a rock or screen of plants, and its regular removal for cleaning should not affect the permanency of the display. However, they are probably most popular for tanks not set up solely for display purposes, and here their cheapness, ease of cleaning and economical use of air have made them extremely popular.

Two other internal filters may be occasionally seen. The corner filter comprises a triangular box which is fitted to the inside top corner of the aquarium, and water carried up by an air-lift flows through the floss and back into the tank via the holes in the base of the filter box. The other type is commonly known as a 'polyfilter', and is quite simply a tube of synthetic sponge fitted over the bottom of a specially-designed J-shaped air-lift. These are very easy to clean—by squeezing the sponge a few times under a running tap—and have the added advantage that they may be used safely in a tank with very young fry.

Outside filters are often preferred for display aquaria, since the only indication of their presence is normally just one or two transparent plastic siphon tubes of around  $\frac{1}{2}$  in. diameter placed unobtrusively at the back of the tank: these tubes are used to supply water to the filter box, suspended from the top frame of the aquarium, as the air-lift returns filtered water to the tank. They generally require a large amount of air to operate efficiently since the water has to be lifted from its own level in the filter box, over the top frame of the aquarium and back into the tank. An interesting and effective variation of this system, and ideal for larger aquaria, is where the lower end of the air-lift is connected to the bottom of the filter box by a length (around 3 ft.) of soft, plastic tube: the air is introduced part of the way along this tube so as to form a powerful air-lift of around 18-21 in. in height.

All the filters powered by air are likely to produce a 'bubbling' or 'gurgling' sound, which, although not loud, might intrude upon the quieter moments spent with your fish. If you feel these quieter moments are worth something upwards of £7, or if you have a particularly large aquarium, you will no doubt be tempted to splash out on a power filter, where a small impeller pump provides the motive power and increased rate of water circulation. There are basically two designs: one is

similar in design to a normal outside filter, employing siphon tubes, with the impeller motor mounted on the open-top filter box. The other type is a sealed watertight box with the pump unit attached, and transparent plastic tubing carries the water to and from the aquarium. This means that the filter unit can be located several feet away from the aquarium in some convenient spot, if necessary even underneath the tank. An American development of this self-contained design uses diatomaceous earth as the filter medium rather than nylon floss, and this is fine enough to trap the most minute particles, even protozoa and other aquatic life invisible to the human eye. However, this does mean that for use with a normal display tank it requires very frequent cleaning out to maintain an adequate flow of water, and perhaps its greatest asset is the ability to reduce the numbers of free-swimming parasites in aquaria used for quarantine purposes.

It was stated above that mechanical filtration traps and retains solid matter present in the water being filtered. This is its sole activity, for (unlike biological filtration) the filter medium described cannot in itself remove or convert any of the dissolved waste matter in the water. To partly rectify this shortcoming, some hobbyists pack their filters with a layer of activated carbon or charcoal to absorb these noxious substances. Carbon will do this, primarily for dissolved ammonia, but a problem occurs in that there is no indication of when the carbon can absorb no more—the time this takes is dependent on a number of factors which cannot be assessed by the average fishkeeper. The small quantities of carbon that are generally used, together with the infrequency of replacement (you can't just wash it clean), suggest that its contribution is more likely to be mistaken peace of mind for the owner than radically improved conditions for the fishes. If the aquarist relies on the absorptive action of carbon he must be prepared to use it generously for it to prove effective.

There are so many types and makes of filter on the market that it is not easy to choose which one will suit your specific needs. Try to work out your priorities first, then go down to your local aquatic shop and see what is available.

Among the factors (other than price limitations) that will influence the choice of type of filter are these: size of the aquarium or number of aquaria to be served; purpose of the tank, i.e. display, breeding, quarantine; type, size and number of the fish population kept; capacity of your existing aerator; availability of time for filter maintenance.

Since there is no such thing as a 'best' aquarium filter for everyone's particular needs, your dealer's guidance in this matter should be sought—the chances are he has tried all of the types himself at some time.





by  
ARPEE

## Personal COMMENT

THOSE fortunate aquarists with virtually unlimited space for their hobby seldom appreciate the difficulties confronting the individual whose resources limit him to a single tank of perhaps 18 or 24 in. The long-term value of tanks of these dimensions depends very largely on what you decide to put in them, and as community containers they cannot be rated very highly. The main reason for this is that a mixed tank is automatically rated by its owner as a potential receptacle for almost anything, cichlids apart, which might appear in the retailer's list, and as a result it gets filled to capacity—and frequently beyond this point—very early on. This leads either to failure or disappointment as well as unnecessary loss of life and avoidable exits from the hobby. In fact, for the owners of the small tank the community concept is probably one of the worst on which he could be weaned.

I have always urged that beginners should leave some reserve in their holdings for the 'irresistible' chance purchase or for the temporarily unattainable object of their desires. This reserve, of course, can be in the time dimension as well as that purely of space. In other words a small tank can be restricted to just one species or just one or two species. Within this constraint as many specimens may be kept as will mature satisfactorily, and some fishkeepers even overstock somewhat in order to 'dwarf' immature initial purchases. This technique can be quite successful, though whether it can be recommended unreservedly is another matter.

By exercising similar limitation as regards plants it is possible to determine, over a period, what species both of fishes and plants will do best in your locality, and if you record your findings the information can prove extremely useful if, at a later date, you decide to set up a larger tank or expand your activities some other way—for example, by setting up a fish house.

The 'restricted species' tank owner will find that he has rather more scope than the 'community' owner when it comes to changing décor. A lot of aquarists are rediscovering the possibilities of ringing the changes on coloured gravel, which is a

good investment provided that one resists the temptation to mix one colour with another—they are terribly difficult to separate if the desired effect fails! However, a selection of the colours which most appeal will provide a succession of alternative settings for your fish whenever you decide on a change of scenery. The gravel which is 'resting' should, of course, be tightly bagged in polythene containers and kept away from likely sources of pollution until required. Other features like rock-work and wood or cork bark can be brought into play as the whim takes you, though little rearrangement should be attempted once a major change has been effected.

The choice of fish is a highly subjective matter, but once you have decided on a 'restricted' tank the claims for the single species is very great indeed. The single shoal of cardinals or glass fish is such a compelling sight that one wonders why we bother with jostling and clashing mixed collections at all. Nonetheless two species of contrasting characteristic can be just as good, and I suppose it would be difficult to surpass the cardinal associated with the platinum tetra. The pygmy catfish and the botia (*B. sidhimunkhi*) might provide variety of body shape, as would also, to a lesser extent, the tiny green-eyed rasbora. Others will certainly suggest themselves, but these are some of the smaller and finer of the jewels we have at our disposal, with the outstanding virtue that they remain small, good natured, live long and retain their lustre till a ripe old age.

To have accepted the principle propounded above will be something of an admission that the aquarist is thirsty for change. It is better to admit this at the outset—most of us dabble with one species after another in the course of our hobby, and perhaps it is as well that we do. But if we are to remain aquarists it is far preferable to change from tetras to catfish than from freshwater to marines: relatively, of course, since we may ask what comes after marines. One need have no fear that the 'restricted' tank will not pay its way either. If you have a tankful of nice adult harlequins, for example, you will probably get a much better 'per unit' price for them from your dealer than for the relics of a failed community collection. The former—because they will probably look better than a direct importation will sell readily to the public at a healthy price: the latter, because they are survivors rather than the sole population, will be something of a nuisance and a potential menace to any dealer, as, unless he has an 'odds and ends' tank, they may have to be sorted into several different tanks in his shop. In these, their size disparity will make them stick out like sore thumbs, and you will deserve to be regarded with equal unwelcome by your dealer if you choose to tread this path.

## NATIVE MARINES IN THE AQUARIUM

# A Selection of Temperate Aquarium Marines

By GRAHAM ROBERTSON and GRAEME ROSS B.Sc.

**I**N this month's article the suitability of a selection of native marine animals for home aquaria is discussed under the main phyla or groups in which they are classified.

**Phylum Porifera.** In this phylum are the sponges. You will not find anything like a bath sponge round our coast, however; British sponges tend to be found covering the surface of rocks and are usually flat with many volcano-like projections. As they are filter feeders (i.e. they filter plankton from the sea) they are not recommended for the aquarium as it is unlikely they would obtain sufficient food there to sustain themselves.

**Phylum Coelenterata.** This phylum contains the sea anemones, jellyfish and corals. Sea anemones do well in the aquarium and are extremely interesting to keep. They possess 'stinging cells' in their tentacles, with which they catch their prey, which generally consists of small living creatures. In the aquarium they can be fed on bits of meat or fish.

The plumose anemone *Metridium senile* should be fed with only very fine food. The only coral likely to be found on our coast is the soft coral 'dead man's fingers', *Acyonium digitatum*, but as it is a filter feeder it should be treated with caution. Jellyfish do not make good aquarium inhabitants so it is advisable not to include these when stocking the aquarium. Also, they are not likely to be found in sizes suitable for home aquaria.

**Phyla Nematoda, Platyhelminthes, Annelida.** These marine worms are all mostly found in a sandy or muddy environment, in which they bury themselves. As such they do not make very interesting aquarium inhabitants but they are quite useful as a live food for fish.

**Phylum Arthropoda.** Most arthropods found on the shore belong to the Class Crustacea. Included in this Class are such diverse forms as barnacles, crabs, lobsters, shrimps and prawns. Most crustaceans make good scavengers, except barnacles.



A group of plumose anemones (*Metridium senile*), from a little off the Aberdeen coast. They are attached to an overhanging rock and hang downwards. This position is a typical one for this species, and the anemones seem to have insufficient strength to expand fully in an upright form.

Photo: GRAHAM ROBERTSON

which are filter feeders. Many crabs and lobsters are quite destructive when large and only small specimens should be kept. The edible crab *Cancer pagurus*, the shore crab *Carcinus maenas*, and the common lobster *Homarus vulgaris* are included in this group. The last-named will, however, seldom be found in sizes suitable for the average aquarium. The Norway lobster *Nephrops norvegicus* in its smaller sizes makes quite a good inhabitant, as does the hermit crab *Pagurus bernhardus*.

One of the most attractive crustaceans suitable for the aquarium is the spiny squat lobster *Galathea strigosa*, which with its bright red and blue striped body rivals many tropical invertebrates for colour. Shrimps and prawns also make interesting inhabitants and are relatively peaceful.

Phylum Mollusca. The molluscs can generally be divided into two main groups: univalves such as whelks, periwinkles etc., and bivalves such as mussels, oysters, scallops etc. Bivalves are mostly filter feeders and so should be restricted in number if used but univalves are generally good scavengers and can be used for this purpose.

Phylum Echinodermata. Echinoderms commonly found on the shore include starfish, brittlestars and sea urchins. Starfish are carnivorous and normally eat shellfish but will eat meat if this is placed beneath them. Brittlestars and sea urchins are mostly omnivorous and will eat almost anything, but can be fed on meat and fish like starfish. If echinoderms are collected, ensure they do not come into contact with the air, particularly starfish as these can get air trapped within themselves and soon die. If starfish are kept, always check regularly to see if they are still alive; a dead starfish can easily pollute the aquarium water.

When starfish are unwell they become flaccid and often shed an arm. Should this occur they must be removed immediately.

Phylum Chordata, Class Pisces. Finally we come to the fishes. There are a great many species of fishes to be found around our coastline, most of which will live happily in the aquarium. Some, however, do not take well to high temperatures or take a while to become acclimatised to temperatures of about 58-68°F.

Few native marine fishes will learn to take dried foods and so fresh protein must be provided for them. This can be in the form of meat, fish, tubifex, whiteworms, earthworms etc., the normal type of fresh protein foods that are fed to tropical marine or freshwater fishes. It may be advisable to include foods of a marine origin in order to supply certain elements not normally found in food from non-marine sources.

Many fishes caught in the wild suffer from parasites. It is therefore advisable to quarantine specimens in a separate tank before adding them to your main display. Copper sulphate solution (available commercially) can be used in this quarantine period. Do not use any copper treatment in your display tank, though, as copper kills most invertebrates at low concentrations. Larger parasites can be picked off the fish with tweezers.

In the above list we have done no more than give a rough idea of the types of life likely to be encountered on any pollution-free coastline. Finally, therefore, we would urge you to visit your local library or purchase a book on seashore life to help you identify specimens and ascertain their habits and suitability for living in a community with other specimens.

## MARINIST'S Notebook

ONE of the things I was most intrigued about when beginning marine fishkeeping was the seasoning process of newly set-up tanks, in particular those housing semi-natural systems and employing undergravel filters. The injunction was to run them in for anything up to 7 or 8 weeks, using one or two hardy 'starter' fish like damselfish, whose waste products would feed the bacteria which gradually multiplied in the gravel. These bacteria would, as part of their metabolism, overcome the harmful amounts of nitrites which arise from the presence of animal wastes—or, at least, decrease the nitrites to an amount safe even for species of fishes most sensitive to these salts.

It is widely held that once a tank has achieved a safe concentration, and this is quite easily determined by a Nitrite Test Kit, considerable liberties

By ROY PINKS

can be taken with its contents before free nitrites overcome the ability of the bacteria to cope with them.

Whilst this is true in the main I have come to the conclusion that one must be constantly watchful that the situation does not in fact slip out of control, because if it does, even temporarily, such valuable fishes as butterflies will either die or sustain gill damage, which will permanently cripple them. It is emphatically not good enough to wait until the fishes show signs of discomfort, as by that time much of the insidious damage will have been done, and it cannot be put into reverse.

By far the most likely cause of temporary pollution is the introduction of new pieces of dead coral, of sea trees, shells and similar items. Despite the most rigorous treatments, I have, on several occasions, sustained losses of fish that could have been avoided. As a result of this I have developed a practice which gives some measure of early warning, but even this is not infallible. Thus, I first soak the pieces in a polythene bucket containing a mixture of water and household bleach (about a teacupful of the latter, per bucket), and this is left for 2 or 3 days. After several days' further soaking and washing in plain water the material is boiled for several hours, involving numerous changes of water. The thin 'fish soup' which results is distinctly unappetising, but so long as it continues to build up, the boiling process should be extended. The coral, for example, is then put in a plastic bag containing enough salt water to cover it completely, the top is secured and the whole thing is left for about a week, after which a nitrite test is applied to the water. The boiling is repeated until there is no nitrite reaction.

When you find that there is a persistent reading, it is wise to seek the source of the trouble, and it pays to pick around in any softness of the coral foot to establish whether there is any remaining animal matter, and this is usually manifested by a black or brown discoloration. All of this must be removed with the end of a screwdriver or a penknife. Large 'feet' with dark interiors may need smashing

open with a hammer—don't hesitate to do this in cases of doubt. Coral is comparatively cheap, as compared with marine fishes, and small pieces may have to be sacrificed for the common good.

It is not safe to assume that a clear nitrite reading even at this stage is an unqualified green light, as I found recently to my cost. For this reason I now route all coral etc., additions to my butterfly tank through a smaller tank which contains the hardier species, such as damselfish and chromis. The water is tested after the newly treated coral has been in it for a few days, and if, after a week, there has been no reaction, the new addition is allowed to go forward.

It is interesting to note that a piece of coral which I subjected to this routine within the last few weeks caused the tank water to give a quite strong nitrite reaction after 5 days. The tank had been set up for over 18 months and is not overcrowded, nor do the occupants get overfed. The incident was a considerable surprise to me, from what I had been given to understand on the subject, but I have always doubted an over-elastic tolerance on the part of the bacteria: there must be a point at which they cannot cope. For this reason amongst others I find myself reaching out constantly for the Nitrite Test Kit. They are expensive, so divide the measuring tube into a number of equal segments by little marks with a file and reduce the quantities of reagent accordingly. By this means the kits will last several times as long as they otherwise would.

## Book Review

COLLENS GUIDE TO AQUARIUM FISHES AND PLANTS. A. Schiøtz and P. Dahlström. 223 pages, 70 colour plates, about 170 illustrations in the text. William Collins Sons & Co., London, 1972. £4.50.

THIS book aims to present a popular sketch of the main fresh- and salt-water fishes usually met with by the aquarium keeper, together with details of available plant life. There are no photographs, but the illustrations by Preben Dahlström are most successful and lifelike, almost without exception. The few falls from grace, such as drawings of the beacon and *Heterostichus marginatus* are not of great consequence.

Visually, the whole publication is a pleasant experience, and a high degree of artistic craftsmanship has been achieved. One must applaud

the almost total suppression of artistic licence which so often bedevils books of this sort: in this case the approach has been very objective indeed so far as the fishes are concerned. I am less happy about the decision to integrate plants with some of the colour plates, because many of them are seen only in part, which detracts considerably from their value as aids to recognition. The text is somewhat variable and patchy, and although the facts as presented are accurate enough, the desirable range of information applying to each species is often too limited. More careful planning of this content would pay handsome dividends in future editions of this book, and it would be of greatly enhanced authenticity as a consequence. An example of the unbalance is the detail about the White Cloud Mountain minnow, which, though interesting, is quite unhelpful in determining the essential visible differences between *T. albosulcus* and *A. pooni*, whose resemblance is very much less,

particularly in habits, than the text suggests.

The inclusion of data on invertebrates is helpful only as regards identification, but compatibility as between species, and as between the species and fish, is not dealt with, possibly owing to lack of information. Closer guidance about this—or a mention of the many real dangers which actually exist—would enable readers to minimise their losses of aquarium stock through unexpected predatory activity. The sections on plants, pests, food and tank maintenance cover the essential details for the beginner, and the introductory section about the structure of fish is especially relevant to his understanding of what makes them tick.

I found only two spelling errors in the whole of this excellent production, whose size and paper quality put it into the 'practical' class. Despite the omission of *PET FISH MONTHLY* from the bibliography, this can be recommended with very few reservations. R.P.



# What's New?

## Accessories

AN Automatic Aquarium Siphon from Hykro (distributed by Petorama Ltd.) has a self-starting device attached to 8 ft. of plastic tubing. On lowering the self-starter into the tank and releasing it, the siphon action commences and the tube can either be left to float beneath the water surface or can be snoved over the gravel surface for use as an aquarium cleaner.

The **MillionAire** is a new kind of air diffuser that releases air from a cylindrical tube along its 8 inches length. Not only is this diffuser bendable to fit into any desired position but similar diffuser units can be joined end-to-end to form extended diffuser outlets. By slipping off the ends of the tube the fibre material of the diffuser can be floated under a running tap to maintain free air flow. Distributed by King British Ltd., retail price is 60p (tax extra).

Another extendable air diffuser in which units can be joined together end-to-end is the **Hobby Mini-Long Diffuser** (price 48p), made of carbonadium specially treated, and suitable for the marine tank. It is in fact an addition to the Hobby range that already includes the Hobby Long Diffuser (Hilside Aquatics Ltd.).

A handy comparator unit for checking aquarium water reaction is the **Wardley Dial-A-pH**, in which the colour of the water sample treated with the indicator dye, bromothymol blue, is used to assess pH by fitting the sample tube into the unit and holding it up to the light. Fantasy Pet Products Ltd. distribute this kit, which includes the rectifiers sodium dihydrogen phosphate and sodium

This month **What's New?** presents some of the recently introduced items for aquarists that were on show at this year's Pet Trade Fair at Harrogate

bicarbonate (price complete £1.89, tax extra).

For the garden pond owner wishing to keep a surface area free from ice in winter, Singleton Bros. (Electronics) Ltd. (Tresor Hill, Penryn, Cornwall) have introduced the **Es-Es Pond Heater**. This is a 100-watt glass-encased heater with an expanded plastic float at the top end and three more floats on the heater's cable to ensure that the heater is kept away from the pond edge. Price is 90p (tax extra).

## Aerators

NEW features of the latest **Rena 101**, based on the Rena 100, are a new moulded Cycrolon case with a redesigned coil that is completely impervious to water and which will slide out from its niche in the case without removal of screws after the case is opened. The air control is now threaded through the side of the case, and the aerator generally conforms with electrical standards requirements throughout the world. Price of the Rena 101 is £1.80 (tax extra) and all replacement parts are available (Imperial Ltd., 80-80A Park Street, Slough, Bucks.).

Following on the success of the Orion Night & Day Twin Pump, Interpet (Curtis Road, Dorking, Surrey) are now distributing the same manufacturer's pumps for the aquarist whose air requirements are to supply three or four tanks. The **PoPo I** (£1.44 including tax) will give sufficient air for two tanks and **PoPo II** for up to about four aquaria (£1.88 including tax). The pumps are attractively styled and are stated to be of high performance and reliability.

New to the Hykro range (Petorama Ltd.) are the **Jetstar I** and the **Jetstar II** (twin) pumps. Both pumps have adjustable air outlets (the Jetstar II outlets being independently adjustable) and both have an on/off switch incorporated into them.

## Filters

IT is quite some time since the **Dynafluo Motor Filter** (Metaframe) was available on the UK market but this useful aquarium filter is now being distributed with a complete range of accessories and spare parts by the UK sole agents, King British Aquarium Accessories Co. Ltd. (Cannon Mills, Union Road, Bradford, BD7 3HW). A pleasant surprise is that the old retail price of £10.50 (tax extra) has been kept. A new Metaframe accessory to the Motor Filter is the **Dynafluo Instamatic Siphon Starter** (52p, tax extra), a bellows-type self-starter for the filter siphons. Also available is an **Air Injector** for the return stem of the Dynafluo, which draws in air and disperses it as a cloud of minute bubbles.

Since the fish bowl seems to be permanently with us, the next best thing to its total disappearance must be to improve the conditions inside it and the **Hykro Fish Bowl Undergravel Filter** aims to achieve this. Two sizes, 4 in. and 6 in. in diameter, are available and both carry a charcoal cartridge filter. (Distributed by Petorama Ltd., The Elms Estate, Harold Wood, Romford, Essex.)

## Fish Foods

LIKELY to be of special interest for the mariculturist in particular but a floating food that will excite most tropical fishes is the **Metaframe Brine Shrimp Flakes**, now being distributed by King British Ltd. (42p for 1-ounce can). The analysis shows the food's content of San Francisco Bay brine shrimp to be 95.6% and it is claimed to be free from any water-clouding effects.

**Owarafu** is the name of a Japanese 'fish cake' now available from T.F.H. (Great Britain) Ltd., Reigate, Surrey. Packed in sticks from which pieces can be broken off for feeding pond fishes, this food swells on contact with water and

floats at the surface. Analysis shows '27% protein, 56.4% sugar'. Price is 30p (tax extra).

The old well-known brand name and formula of **Elite Fish Food**, made by Derhams Products, is now being distributed again, by Hillside Aquatics (price 20p for pond and coldwater fishes, 15-40p for tropical fishes).

## Remedies

FOR inhibiting growth of algae and for destroying established algal growths, Hilena have introduced **Algizit-FB**. This is a tablet preparation, each tablet being used to treat 250 litres (55 gallons) initially, and the dose can be repeated after 1 week. Treatment at the rate of one tablet to 110 gallons is suggested to inhibit growth of algae. The preparation is packed in tubes of 12 tablets,

price £1.32 (including tax), distributed in the U.K. by Shirley Aquatics Ltd. (Stratford Road, Monkspath, Shirley, Solihull, Warks.).

Remedies for various aquarium ills and fish diseases by the German firm **Frickhinger** are being distributed in the UK by Hillside Aquatics (29 Dixons Hill Road, Welham Green, nr. Hatfield, Herts.). The preparations include Algo-stop and Poolcoryn algae killers, Gyrotex remedy for fish flukes, Hexa-ex for hexamitiasis ('holes-in-cichlid disease'), Dynoplant and Dynophyll plant fertilisers and Exrapid, general disease remedy.

Available for the first time this month will be **TetraWerke's Aqua-Safe** for making a new aquarium immediately safe for fish and for use after every water change. The manufacturers explain that AquaSafe functions by containing a powerful colloid to protect a fish's sensitive

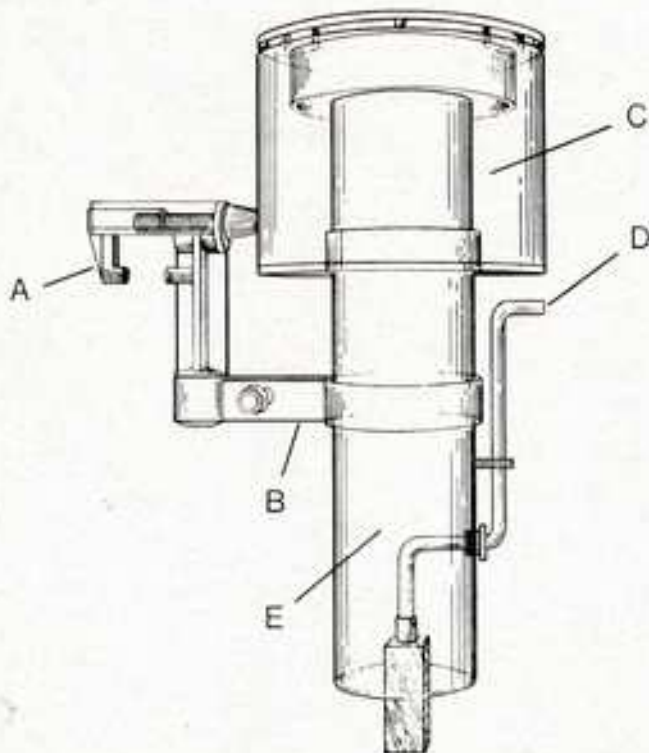
gills and mucous membranes, by binding dangerous metal ions through a chelator into a harmless salt complex and, because it contains an effective pH buffer, by preventing the large or sudden changes in alkalinity that can be harmful (Tetramin U.K. Ltd., Colley Lane Estate, Bridgwater, Somerset).

## Protein Skimmer

FOAM fractionation is a procedure used industrially for a variety of purposes involving separations of materials, and it is the process described by this name that is utilised by aquarium 'protein skimmers'. Like a number of other substances, proteins in water become concentrated at the surface of the liquid with air, where their presence decreases the 'surface tension' so that the water readily forms a lasting froth when shaken in air. By passing fine bubbles of air through water, any substances like proteins that are present collect around the dispersed air and are carried upwards with the stream. As most of the air bubbles break at the surface the substances carried by them remain there and accumulate as a foam. Obviously if this foam is removed or 'skimmed' from the water surface the substances originally in the water are removed at the same time. The design of the aquarium protein skimmer is such that after a vigorous mixing of air and water in a 'reaction chamber' the formed foam accumulates in a 'foam collector', which can be removed for the foam to be disposed of by washing it away.

This action takes place either in freshwater or in seawater, although it is generally said to be more efficient in the marine system, where there is, of course, greater application for it.

**An Aquarium Protein Skimmer** has just been introduced into the Hykro range of equipment (Peterama Ltd., The Elms Estate, Church Road, Harold Wood, Romford, Essex). The Skimmer is made of clear, tough (2 mm.) plastic, the reaction chamber being a tube 17 cm. (6½ in.) long and 5 cm. (2 in.)



The Hykro Aquarium Protein Skimmer. A, Adjustable clamp for securing to the top edge of the tank; B, adjustable collar for the skimmer; C, foam collector; D, air inlet; E, reactor tube

*Continued on page 76*

somewhat similar fashion to the human finger nail. Under the dermis is a layer of fat and muscle. It should perhaps be mentioned that as a fish grows the individual scales enlarge, but the number of scales does not increase.

Fish scales are transparent. However, within the thin layer of the epidermis and the dermis sub-layer, there are a large number of pigment cells, called chromatophores, each being yellow, orange, or black. The density of colour will vary according to the depth of the pigment cell in the fish's tissue. In other words, if black cells are near the surface the fish will appear black. Should the black cells be deeper in the tissue then the fish will appear blue.

In addition to the chromatophores the dermis contains a substance called guanine, which in the form of minute crystals has the ability to reflect light. Cells with these reflective crystals are known as iridocytes.

With this knowledge it is now possible to explain the three different scale groups in goldfish. In the metallic type an abundance of iridocytes occurs together with orange or yellow pigment, but little black. This combination produces the burnished gold appearance, whereas the blackmoor variety of goldfish has iridocytes combined with black chromatophores, near the surface, so that the fish has a velvety black look.

With the matt group the exact opposite applies. A lack of guanine results in there being no reflective iridocytes; additionally an absence of colour pigment occurs. In the absence of these two factors the pink flesh can be seen through the transparent scales. Occasionally it is possible even to discern the internal

# AquaGLOSSARY

No. 10

A PFM guide to the meanings and accepted pronunciation of the scientific names of aquarium subjects, arranged by word-roots in alphabetical order

**Quinque** (Latin): five. Pronounced 'kwin-kwee'. For example, the scientific name of the tropical wrasse *Thalassoma quinquevittatus* ('thal-las-som-ah kwin-kwee-vis-tah-tuss') refers in its trivial part to the five stripes of this fish (*vitta*, Latin: decorative fillet).

**Xeno** (Greek): strange, different. Pronounced 'zen-no'. For example, the generic names *Xenocara* ('zen-no-kar-rah') and *Xenomystus* ('zen-no-miss-tuss'). The genus of the totally aquatic African clawed toads *Xenopus* ('zen-no-puss') refers to the unusual feet of these amphibians (*pod, pu*, Greek: foot).

organs of this type of fish.

The nacreous group has been left until last as it is an intermediate type. Amongst the fancy varieties of goldfish this group is usually the most colourful and therefore the most popular.

Nacreous fish do not possess reflective tissue to the same degree as the metallic. What they do have normally appears as a mother-of-pearl shine. This group may also carry one or more of the three colour pigments at varying depths in its tissue.

When only one chromatophore is carried, resulting in the fish having only a single colour, it is also called a

'self'-coloured fish.

If two or three colours are carried these may overlap at different depths; thus the colours of the fish may be yellow, orange, black, violet, brown or blue in varying degrees of combination, shade and intensity.

Any of the three groups is capable of cross-breeding with any other. Only the metallic and matt groups will breed true, if bred to their own type. When a nacreous is crossed with another nacreous a percentage of each group will be evidenced in the resulting young.

The following list of crosses, with the percentage of young in each group, will illustrate the point.

Nacreous	×	nacreous	=	50% nacreous, 25% metallic, 25% matt
Metallic	×	matt	=	100% nacreous
Matt	×	matt	=	100% matt
Metallic	×	metallic	=	100% metallic
Metallic	×	nacreous	=	50% metallic, 50% nacreous
Matt	×	nacreous	=	50% matt, 50% nacreous

## What's New?

continued from page 74

in diameter. Slide-fitting to the top of this is the circular foam collector, 10 cm. (4 in.) in outer diameter and 7.5 cm. (3 in.) deep with its collecting trough 2.5 cm. (1 in.) wide. Air is delivered into the reaction tube by a length of air-line passing through the wall of the reaction tube to a wooden diffuser block,

which gives the necessary finely divided air release.

A neat adjustable holder and clamp secures the Protein Skimmer to the tank side, the adjustment providing for use with all types of framed or unframed aquaria.

## Pondkeepers' Booklet

SO many are the services offered by the water gardening nursery today that their trade brochures can

take the form of the complete guide to pond-making and pond maintenance. This applies to the well-illustrated **Stapeley Water Gardens booklet** produced by Davies Enterprises. Some care to give a wide range of hints and information on how to make and keep a pond has been shown in the course of describing the ponds, plants, fish, pumps, lighting and accessories that they have to offer. The booklet can be obtained free from Stapeley Water Gardens, Dept. PFG, 92 London Road, Stapeley, Nantwich, Cheshire.

# A Practical Introduction to Keeping Koi

By E. A. ALLEN

Vice-chairman, The British Koi-Keepers' Society

Photographs by the author

Koi are well known for their tameness in ponds. Here a golden ohgon is seen taking food from a baby's bottle held over the water.



IN recent years, a great deal has been written about this fancy variety of carp, which in the basic forms of black, blue, red, white and yellow fish, are first recorded as existing in China. These simple-coloured varieties are known to have been later bred by the Japanese as pond fish and, during the last 1000 years or so, developed only slowly until early this century. Then, after the arrival of a few European mirror and scaleless carp in Japan, plus the work of some dedicated breeders, a colourful range of koi was exhibited in Tokyo as little as 60 years ago. The true golden koi and metallic varieties, generally referred to as ohgon, all appeared within the last 25 years, and developments are still continuing by selective breeding to produce koi of other patterns and predominant colours, including green.

From personal experience in visiting Japan several times since 1964, I would say that koi keeping only really boomed from the 1968 Tokyo Show, to be closely followed by a rapidly increasing interest in this country.

Large, well-patterned and first-class koi have always been expensive, even in Japan, and the problem is that air-freightage to the U.K. immediately doubles the initial cost, plus also the ever-changing value of currency not in our favour. One answer could be the availability of koi bred in this country now that many spawnings have occurred.

Unfortunately we do not enjoy a sufficiently long or warm summer period for adequate growth of the young fish during their first year, and this means the expense of artificially heated conditions at least for the several weeks of fry stage and again the following winter for the smaller fish. It remains to be proved whether there can be bred good quality and highly coloured koi to compare with Japanese varieties; at the moment, there does seem to be some reversion to the more common types, which is probably due to the lack of good breeding stock.

It is interesting to record that an experienced amateur breeder in Japan estimates that, even by an expert, only 5000 koi may be raised from more than 200,000 eggs, and, in his case, he may successfully raise only 1000 fish. This is presumably the result at the end of 1 year, as other data available also confirm a similar low rate of survival. The reasons why so many fish die is not made clear, but it can be expected that about one-third of the eggs will not be fertile, quite a high percentage will have external or internal deformities and many will become diseased, to die in Japan or to be freely exported to those countries having no health regulations.

Experience shows that subsequent losses with koi after arrival are relatively high. These losses can be attributed partly to the conditions of travel, change in water, often a rapid temperature differ-

ence and some lack of care by importers and koi keepers. Equal to all these is the incidence of disease, over which there is no control or governing health regulations whatsoever on any variety of fish entering the U.K. for aquaria and ornamental waters. However, a good selection of fish are imported from the better suppliers and there is no doubt that once the ever-attractive koi have been seen, the beholder is 'hooked' by their impressive appearance and the spectacular range of patterns and colours.

The situation, especially for a newcomer to koi keeping, can be most confusing and in this connection The British Koi-Keepers' Society was formed in 1970 to further interest about these beautiful fish for the mutual benefit of members. This is achieved by the regular issue of Newsletters and, to supplement the nation-wide membership, local discussion groups are already being formed. An amount of hard-earned knowledge has been gained and as the Society grows more definite facts are emerging about the fish and their requirements in ponds and aquaria.

The high price of large koi frequently produces in purchasers a severe state of shock, but recovery usually takes place and having decided not to sell your car or mortgage your house, it is some comfort to know that a start can be made with small koi. Losses are likely to occur for the various reasons previously given, although if absolute purity of water is maintained, with a minimum of suspended algae and adequate aeration at the times when this is necessary, some of the so-called mysterious losses may be avoided.

Reasonably priced small koi of 4-5 in. length can be a proposition if purchased during late spring or early summer in the hope they will grow to 6-8 in. for survival through the following winter. It is doubted whether very small koi of 2-3 in. would grow enough, and similarly, it is not wise to buy small koi in the autumn unless complete protection against freezing conditions can be given or the fish can be safely wintered indoors until the following spring. Koi over 8 in. length can be expected to survive an average winter in a pond having sufficient depth (2 ft. to 3 ft.) and preferably with some protection over the deep end, which can be kept clear of ice for poisonous gases to escape and life-giving oxygen to be absorbed into the water.

Healthy koi in a well-maintained pond will take a little food of the sinking type through most of the winter and a high proportion of live food such as earthworms is required at all times. Otherwise, koi will eat almost anything and a varied diet is essential, as like most large fishes they cannot be expected to thrive solely on pellets and similar dry foods.

Some consideration must be given to an existing

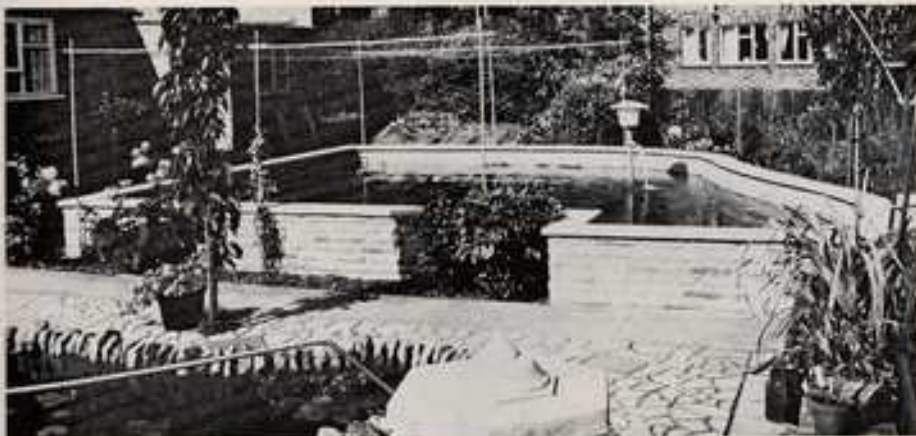
pond, and if less than a 10 ft. 'swim', there will come a time when the growing koi are too confined and expansion in size and depth is desirable in fairness to the fish. Do not forget that koi often leap out of the water and many a good fish has been lost in this way. A pond with raised sides will prevent such losses and act as a deterrent to predators.

When stocking a pond, the requirements of even small koi should not be compared with those of other coldwater fishes as koi need much more food; also their waste products are much more and can create problems of pollution. The common rule of 2 in. of fish per sq. ft. of the pond surface area is an absolute minimum for small koi and for fish, say, 10 in. in length, then a safer rule would be 1 in. of fish per ft.<sup>2</sup>. This would only apply with a natural balance between the fish, plants and water, but with the larger koi this is unlikely to exist for any length of time as they can literally turn an established pond upside down and will constantly stir and sift through normally settled mulm that other fishes would not disturb.

On reaching this stage, the chance of maintaining a balance is slight and a water-changing or filtration system, or both, can play an important part in the successful keeping of koi. For example toxic conditions or a shortage of dissolved oxygen can occur when least expected, with or without an excessive build-up of algae; something can be learned from anglers who well know that fish suffer badly in the rivers during long periods without rain. In the confines of a pond, the same danger situation is reached much quicker and, if neglected, will have a disastrous effect on the health and life of its unfortunate occupants.

To deal with the subject of buying koi is extremely difficult and the intending purchaser is advised to obtain one of the books available that describe and illustrate some of the varieties, although as may be expected many of the photographs are of specimen fish rather than the average patterned and coloured koi normally exported. Do not worry too much about trying to classify koi, as even an expert can have difficulty and, in any case, choice is entirely a personal matter. An initial purchase may be of the metallic ohgon types, but otherwise patterns and colours should be well defined. It will be soon realised how much the different koi complement each other in a pond and to have just one variety is not so interesting.

The body shape will be found to vary somewhat and mirror-scaled or scaleless koi, referred to as Doitsu (meaning German), can often have a slim appearance when small and may not be so deep bodied as koi completely covered with scales. Viewed from above, the fish should have a nice flowing outline and any koi that are wasted, to give the impression of a large head, or in which



The author's pond built specially for koi. It has a water-changing system with top overflow and bottom drain and also has an undergravel filter. Water pumped through the filter is returned above the surface through a pipe fitted with a lantern (the white object right of centre)

the body is pinched-in along the back, are not recommended. The scales must always lay flat on the body and the skin should appear shiny, as patches or dullness in the natural mucous coating indicate trouble. Fish with any wounds should be avoided even if fungus has not already developed as a secondary infection, and swellings, lumps, pimples or spots, no matter how small, are all bad signs.

Condition of the eyes is important, and these should appear bright. Dull or sunken eyes are danger signs and, in conjunction with the large head or hollow back appearance, such a koi probably has fish tuberculosis or a similar incurable wasting disease, is certain to have a limited life and may infect other fish in the meantime.

Deformities of the mouth sometimes occur and these are difficult to notice. The mouth should be of protrusible type and this capability of extending the jaws forward can best be seen when the fish is feeding. There are two pairs of barbels, but only the larger pair can be easily seen on small koi.

Fins are generally rounded on their extremities and a healthy koi will swim with all fins well extended. Split fins are quite common, owing to the conditions of handling and travel, but given time the fins will heal. In a pond, this can take a few months with small koi and the larger the fish the longer the time, with up to 2 years for major damage to repair. Blood congestion in the fins may be from poor keeping or the first signs of disease. Make sure that any splits have not developed fungus or fin rot; the tail is usually first affected.

In general terms, koi are very active fish but it is

difficult always to judge the effect of life in a display tank. If the fins are held close to the body, or the fish cannot maintain an even balance or is sluggish and tends to stay away by itself from others, then sickness can be suspected. Any fish that appears to have difficulty in opening or closing its mouth, or in which the gills are not working properly, may have flukes and should not be purchased.

It is also wise to look for the presence of any external parasites such as white spot, anchor worms or fish lice. The 'white spot' is about pin-head size and shows up most easily on the fins, although it can infest the whole fish in serious cases. Anchor worms grow to about  $\frac{1}{2}$  to  $\frac{3}{4}$  in. in length and as the name implies they will be firmly anchored in the fish, and positive identification is from the two egg sacs formed at the free end of the thin body. Fish lice are more difficult to see as they are very pale flattened creatures about  $\frac{1}{4}$  to  $\frac{1}{2}$  in., rounded in shape.

The introduction of any disease or parasite into a pond will create enormous problems thereafter and despite having purchased what is considered to be a good healthy koi, the rule applying to all new fish must be strictly adhered to. It is a constant source of amazement that so many aquarists ignore the vital need of quarantine and gaily put new purchases directly into a pond or tank and then wonder why their whole stock becomes sick.

Apart from disease, koi are frequently upset by being moved and can be affected by changes in water, so that if kept separate for only a few weeks, this will give some guide to their health, allow

observation and easy access if trouble occurs. One of the best methods of quarantining a fish is to keep it in methylene blue at the prescribed strength. It has the distinct advantage over any other chemical in that it is non-toxic and cannot harm the fish, it is useful in dealing with many diseases and parasites, it will assist the fish to absorb oxygen through the gills and generally provide a resting action because the water is darkened.

Assuming it is the time of year when the weather is more settled, say from April to May onwards, and koi can be safely put outside, it is important to consider the temperature difference between the

bag of fish and the pond. A great change or rapid drop in temperature must be avoided, and if there is a difference of more than 2°F (1°C), the bag should be floated in the pond until the temperatures are about equal; then open the bag carefully and allow the fish to swim out. It is never advisable to lift fish completely out of water in a net and it is always better to give support in a bowl of water. The net must be as fine as possible to avoid damage to the fins. Finally, never handle fish with dry hands as this will remove the protective mucous coating from its skin and allow fungus or other troubles to develop.

#### HOLIDAY TIME MAINTENANCE HINTS

## Getting All Set to Go

By CLIFF HARRISON

THE holiday season is with us once again, and a problem even greater than deciding where to go looms over the horizon—what to do with the pets while you are sunning yourself in glorious Torremolinos? Dogs, hamsters and the like can usually be farmed out with various relatives or friends, but fish are another matter if your interest extends beyond a solitary goldfish in a bowl. Equipment, such as heaters, thermostats and air pumps, will be left unattended for a considerable time, so the failure of any part must be avoided; feeding, too, may present a problem, but a much less troublesome one than many people seem to think.

At least a couple of weeks before you are due to leave, you should give all your electrical equipment a thorough check-over and replace any parts that are defective or showing signs of wear. Remove the heater(s) and thermostat from each tank, and check that the connections are still sound and well protected with plastic insulation tape. Carefully remove the layer of stone-like minerals that often builds up on the glass heater tubes—failure to do this regularly will cause it to overheat the element and shorten its working life. If you have more than one heater in a tank (as recommended for aquaria 24 in. length and over), plug the heating circuit in for just a few seconds only with the heaters removed from the tank to ensure that all the heaters are working; the failure of just one of them can easily go unnoticed until one really cold night, or until the other one fails, too!

While the heater is quite cold, check for any signs of condensation on the inside of its glass tube: this generally indicates that there is a leak

around the rubber bung, and the heater should therefore be discarded—on a count of safety as well as reliability. Internal thermostats of the glass-tube variety should also be checked for signs of dampness, since not all of them are completely watertight—many require the control head and temperature-setting dial to be kept well clear of the water level in the aquarium, and failure to observe this could make your tank a death-trap. Remember—water and electricity do not mix, so do not take chances with suspect equipment.

The thermostat should also be examined for signs of pitting of the contact points, or 'sooting' around them; these changes are indicative either of the instrument being overloaded i.e. used with heaters of a greater wattage than it was designed for, or alternatively a faulty 'make and break' mechanism. Either way, the only sure way to avoid trouble in the very near future is to buy new equipment.

If the temperature setting on the thermostat can be easily adjusted, it is often wise to lower the temperature well in advance to around 70-72°F for the duration of the holiday; this lowers the metabolism of the fish, reduces the energy they use, and so minimises their requirements for food and oxygen. And with the exception of a few rare and delicate species they will be all the healthier for it.

The next major item to be examined is the air pump, a piece of equipment that most people only think about when it goes wrong—yet a 5 minute check once a month will prevent 99% of failures. The main parts of the pump we should

concern ourselves with are the air filter, the diaphragm and the valves.

The air filter, where fitted, should be cleaned or renewed regularly, otherwise the dirt, dust and grease in the atmosphere will quickly clog up the working parts. These filters are generally small discs of felt, which can be replaced in a few seconds at negligible cost.

The diaphragm is the very heart of the pump, being alternately stretched and compressed, with several million pulsations a day. Two types are in general use—the moulded diaphragm, which is a shallow, bell-like rubber moulding and fits tightly over the top of the valve block, and the flat-disc type, which is held in place with a metal or plastic ring. In time, the continual movement, combined with the heat generated by the coil in the pump, weakens the rubber sufficiently to cause it to split or distort; whilst this may not happen for a year or two, it can usually be detected before complete failure occurs. Again, replacement is quite straightforward, and cost is likely to be well under 20p.

Finally, we must look at the valves, which tend in time to accumulate sufficient dust on the seatings to prevent a complete seal being achieved. Unfortunately this is a very gradual process, and the almost imperceptible loss in the pump's performance is often put down to the air-stones becoming blocked or the pump itself 'wearing out'. A small pointed matchstick may be used gently to remove the deposits—never use metal, though, which could damage the delicate seating. Some air pumps—such as the Rena models—simplify this by having valves that may be very quickly removed and replaced.

A lot of strain on the working parts of a pump can be avoided by reducing 'back-pressure' in the air-distribution circuit. This back-pressure generally results from the use of a powerful pump in a situation that calls for only a small volume of air: if the excess of output is controlled by airline valves or clamps, the build-up of pressure will



A typical medium-priced diaphragm-type aerator with the base removed to show the arrangement of the vibrator arm, diaphragm and valve block. The arrow indicates the position of the air control.

soon distort and damage the diaphragm and valves—and the diaphragm will often be blown off the top of the valve block altogether. Where a volume control screw is fitted to the pump this problem can be easily avoided, but if this is not the case an extra valve should be used in the circuit to 'bleed' the surplus air into the atmosphere.

After attention to all these matters your equipment should be in as reliable a state as can be achieved, and there remain just two functions that you normally control yourself but for which other arrangements must be made during your absence. One is lighting, the other is feeding.

If the tank is situated in a living room which receives some daylight, however indirect, a period of 2 or 3 weeks without additional artificial lighting will do your plants no harm at all—they will soon regain their previous growth rate after your return. If you are using a cellar as a 'fish house', however, a lengthy spell without any light at all could cause some of the plant leaves to disintegrate. In this instance, if a neighbour cannot be entrusted to switch the lights on for a few hours two or three times a week, a time-switch could prove to be an excellent long-term investment. Whatever you decide, don't be tempted to leave the lights on for the whole time you are away, even with the substitution of low-wattage bulbs. Fitting new bulbs for the purpose of your holiday without worries is worthwhile to avoid failures of old lamps.

Finally, we come to what many people regard as an insurmountable obstacle to an enjoyable holiday—the feeding of the fish. So let us first of all establish that, provided your fishes are in good condition and not overcrowded, they will suffer no harm by going without food for 2-3 weeks



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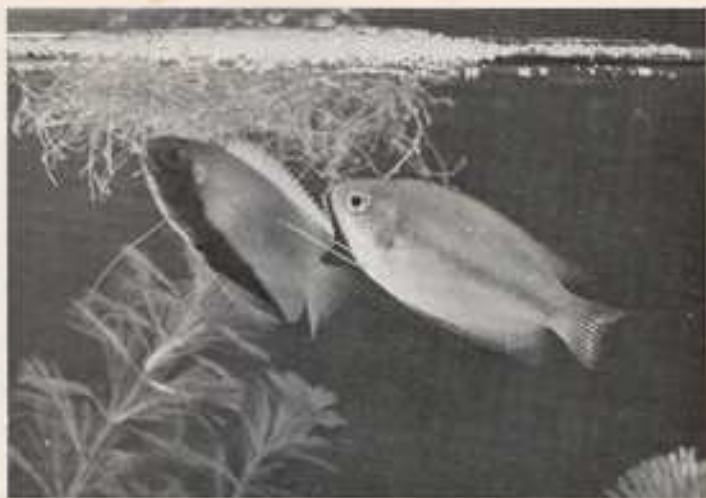
CLIFF HARRISON

Air filter pad in the base of a Rena air pump. This disc should be replaced when clogged with dirt.

Continued on page 84



In this picture and in the one on the opposite page the male honey gourami is distinguished by his darker hue. The spread dorsal fin of the male, waiting beneath the bubble nest, is part of his nuptial display to the female.



can take place in the community tank and the male is then beautifully and gaily coloured.

As I wanted to photograph the spawning I prepared an all-glass tank holding about 2½ gallons (12 litres). At the back I planted Cabomba and put *Sambor calerandis* in the foreground. On the surface I lay a bunch of floating plant. The temperature of the tank water was raised to 82-86°F (28-30°C). As I always do with

labyrinths, I put the female into the tank the day before the male so that she could settle in and be prepared to defend and hide herself. Early the following day the male joined her.

Immediately the 'greeting' ceremony typical of this species began. The male hung almost perpendicularly in the water with his head turned towards the surface and the side of his body turned to the female. The male soon builds the



The approach of the female, followed by a nudge from her, causes the male to arch his body in preparation for the embrace. Photographs overpage show the pair in the embrace during spawning.

you should have no worries—though it would be wise to indicate any tanks that are completely empty of fish so as to distinguish them from those containing specimens of a shy disposition. If the friend has no aquatic experience (goldfish-and-bowl types included here, I'm afraid), then prepare small twists of aluminium cooking foil, each containing sufficient food for one sparing meal for a particular tank. If these 'food parcels' are placed alongside or on top of the appropriate tank—one twist for each 4 days you are to be away—then it is a simple and foolproof matter (one hopes) for the friend to come in and tip the contents into the tank. And make sure all the drums of food are hidden safely away.

Automatic fish feeders are available, but they are expensive and not much help to the enthusiast

with row upon row of tanks. Holiday feeding 'blocks'—dried food encased in a soluble mineral that slowly disintegrates over a period of several weeks—do not suit all fishes and may cause problems with the change in chemical content of the water in the aquarium if used to excess.

If you follow the tips given here, your return will be greeted with the sight of a tank of crystal clarity, of plant leaves shining and clean, and the fishes alert and lively: it seems such a pity we cannot achieve this the rest of the year with the expenditure of so much time and effort!

For a detailed account of the working of aquarium electrical equipment you should see **ELECTRICITY IN YOUR AQUARIUM** by L. Warburton (13p post free from PFM).

## Readers' Queries Answered



### When to Use Aeration

*I have just built a fish house, and have got to the stage where I have to decide what (if anything) I am going to do about aeration. I like to think I could run my fish house without using an air pump, so could you advise me on the benefit or necessity of having one?*

First, perhaps the reason not to use an air pump should be established—where aeration is used solely to enable more fish to be kept in a tank than could be kept without it. In these circumstances a failure of the pump or a breakdown in the supply of electricity would result in the death of all the fish in a short space of time, probably minutes rather than hours if the over-riding were severe. Furthermore, in the longer term, the growth of the fish would tend to be stunted, and they would not develop the special attractiveness that is indication of healthy, mature specimens in a favourable environment.

Air pumps are particularly useful to the hobbyist as a means of keeping the water circulating around the tank, and additionally as the power

source to operate filters. Moving water itself is something that most fish seem to enjoy: swimming against a flow of water is a valuable form of exercise for those species that come from flowing rivers rather than still pools. It is a way of increasing the oxygen content of the aquarium, by drawing the oxygen-rich surface water down to the lower levels; this in turn promotes the breakdown of unsightly waste matter from the fish by aerobic bacterial action, keeping a lightly stocked aquarium clear and clean without the need for additional filtration. Circulation prevents uneven heating effects. And it is also valuable for dispersing the harmless film that tends to form on the surface of still water, particularly where paraffin is used for heating the fish house.

Water circulation is best achieved by means of a stream of fairly coarse bubbles produced from an air stone: fine bubbles may look more attractive, but they do not rise to the surface with sufficient speed to create a good flow of water. The deeper the tank, the better the water flows in a circular motion and,

for very large or shallow aquaria, a second air stone may be used if needed.

Filters powered by air will generally create a good flow of water, whilst at the same time keeping the more heavily stocked tanks clean. For fish house use, two types are particularly worthy of consideration: undergravel filters, which are moderately expensive but require virtually no attention, and the box-style bottom filters, which are cheap, simple to clean out, but can be a little obtrusive in a properly furnished display aquarium. They are both fairly economical with their requirements of air, and are thus ideal for the more modest fish house.

The means of providing the supply of air can entail a very difficult choice, not only between the various models of aerators but also with the air pump versus compressor controversy. A compressor will provide an enormous quantity of air, sufficient even for a small commercial establishment; yet the initial price—well upwards of £30—and the not insignificant running costs of a fractional horsepower motor, can deter most of those who decide they do not need anything like the full output of the unit. A single high-output air pump is unlikely to be sufficient for more than a dozen or so tanks, yet at a cost between £3 and £5 each the purchase of two or three can still make good sense: furthermore, if one pump is out of service for any reason, you are not left completely air-less. Before you finally commit yourself, make sure that

spares are readily available should the need of replacements arise (as it most certainly will one day).

### Bad Eggs

*I have a pair of angel fish which I've had 6 months. These angels have spawned on the leaf of a Malayan sword plant. The following day I noticed that some of the eggs had become a chalky white. I understand they have gone off. Will these bad eggs affect the others and what steps could I take to prevent this?*

It is quite usual for a number of the eggs in a spawning to be infertile. When the eggs are left in with the parents the adult fish will quickly pick out and discard any eggs that become white. If the eggs are to be hatched in a separate container the water in which they are placed should be coloured a fairly deep blue with methylene blue to prevent the dead eggs from developing fungus. In any case the presence of infertile eggs should not affect the others deleteriously.

### Carp in Tanks

*In my coldwater tank (22 gallons) I have a black and yellow hi-wei which is now about 3 inches and appears to be very healthy, feeding on pond pellets and lettuce. There are otherwise only three small veiltails in the tank. Will the carp outgrow the tank?*

The hi-wei will not outgrow the tank. It will just fail to attain its maximum possible size, though without ill effect to the fish. In a couple of years' time, however, the growth of the three small veiltails (although the same diminished-growth principle will also apply) may be sufficient to present a problem of slight overcrowding in this tank.

### Lighting for Depth

*In an article in 1970 by a Dutch author (February) it was stated that 'the basis of 1 watt per centimetre depth of water' could be used to work out how to get best results with plants when using fluorescent lighting. How is this suggested figure related to the length of an aquarium?*

The author mentioned that aquaria in Holland are now being built to the standard lengths of fluorescent tubes, so that in his suggested lighting allowance the length of the aquarium and the length and therefore wattage of a single tube are

directly related. Take as an example a U.K. aquarium 36 inches (90 cm.) long, and 15 inches deep (about 31 cm. water depth above the gravel), the cover of which could be fitted with a 24 inch fluorescent tube (20 watts); from the above recommendation this tube's wattage would be adequate for only 20 cm (about 8 inches) depth of water, so that one other tube would be needed to make up the deficient wattage (in practice two 20 watt tubes could be used). The recommendation gives somewhat greater wattages than we are accustomed to using in the U.K. but it is one that is used as a guide to lighting for best plant growth in large deep tanks. The duration of lighting is taken to be 10 hours daily on average.



### FBAS Basic Show Class Letters:

A, furnished aquaria and aquascapes; B, Barb; C, characin; D, cichlid; E, labyrinth; F, egg-laying tooth-carp; G, tropical catfish; H, Corydoras and Brochis; J, rasbora; K, danio and W.C.M.M.; L, loach; M, a.o.s. tropical egg-layer; N, pairs of fish; O, guppy male; P, guppy female; Q, swordtail; R, platy; S, mollie; T, a.o.s. livebearer; U, single-tailed goldfish; V, veiltailed goldfish; W, a.o.s. coldwater; X, breeders classes; Y, marine fish; Z, plants.

ISLE OF WIGHT AS have announced their Cup Awards for 1973 and these are as follows: Points Challenge Cup, Mr E. T. Davison; Best Tropical, Mr E. Ford; Best Coldwater, Mr K. Willis; Guppy Cup, Mr F. Scovell; Characin Cup, Mr R. Woodruff; Novice Tropical, Mr F. Scovell; Cichlid, Mr G. Ford; Ladies Cup, Mr O. Davison & Mr E. Ford; Plant Cup, Mr F. Scovell; Hora shield, Mr E. Davison. Medals for three or more 1st cards, Mr R. Woodruff, Mr E. Davison. The

**THE BRITISH MARINE AQUARISTS' ASSOCIATION** announce the first full meeting of the LONDON AND SOUTH-EASTERN REGIONAL GROUP. This will be held on 27th June in the Meeting Room of the Zoological Society of London, Regents Park, London, NW1 and starts at 1 p.m. There will be films and refreshments and the admission charge will be 50p per head. Prospective and non-members are most welcome. For further details please contact the Group Secretary, Mr P. J. Ireland, 1 Sinclair Road, Waltham Forest, London, E7.

highlight of the announcements, which were made at the April meeting, was the nomination of the Champion of Champions for the Society's coveted top award. This year it went to the secretary, Mr E. Davison, who was thanked by the Committee for the tremendous effort he had made over the last year to keep the interest in the club at its peak.

INDEPENDENT AS are pleased to announce that their third Open Show was very successful and wish to thank the members of the many clubs who entered. The prizes were presented by the Mayor of Islington, Mrs Paty Beadbury. The best fish in show award was won by Mr J. Batts of Ealing AS for a *Tilapia mariae*. Results were:

Ag: 1, Mr K. S. Lewis (Rushampton); 2 & 3, Mrs J. Salisbury (Uxbridge); B: 1, Mr R. Coyle (Independent); 2, Mr T. R. Adams (Hampstead); 3, Mr B. Bissom (Barnet); C: 1, Mr D. Durr (Independent); 2, Mr & Mrs Hudson (Ealing); 3, Mrs S. Fordham (Uxbridge); Co: 1, Mr D. Durr; 2, Mr P. Coyle (Independent); 3, Mr R. Bowers (Independent); D: 1, Mr J. Batts; 2, Mr Keeble; 3, Mr K. Greaves (Southern); Dr: 1, Mrs S. Mason (Independent); 2, Mr J. Batts; 3, Mr F. Pinn (Chingford); Dbs: 1, Mr R. P. Ramsey (Mid-Herts); 2 & 3, Mr L. Brauer (Sudbury); E: 1, Mr Seward (Rushampton); 2, Mrs S. Hodges (Dulwich Green); 3, Mr W. D. Wright (E. Dulwich); Es: 1, Mr Giles (Rushampton); 2 & 3, Mr L. Brauer; F: 1, Mr D. Durr; 2, Mrs G. Wain (Hendon); 3, Mr K. Usher (Sudbury); G: 1, Mrs S. Fordham; 2, Mrs P. Lambourn (Rushampton); 3, Mr D. Lambourn (Rushampton); H: 1, Mr W. D. Wright (E. Dulwich); 2, Mrs S. Hodges; 3, Mr V. E. Vasily (Haringey); I: Mr P. Coyle; 2, Mrs S. Mason; 3, Mr R. Kelly; K: 1, Mr K. S. Lewis; 2, Mr A. R. Chandler (Waltham); 3, Mr P. Mace (Blanchley); L: 1, Mr A. Lamb (Mid-Herts); Mr K. S. Lewis; 2, Mr P. Coyle; M: 1, Mrs S. Hodges; 2, Mr A. P. Taylor (Sudbury); 3, Mr B. Butler; N: 1, Mrs P. Lambourn; 2, Mr L. Brauer; 3, Mr A. Heath (Lewisham); O: 1, Mr A. Worth (Mid-Herts); 2, Mr A. P. Taylor; 3, Mrs J. Salisbury; P: 1, Mr P. Coyle; 2, Mr R. Wain (Hendon); 3, Mr K. S. Lewis; Q: 1, Mr F. Pinn (Chingford); 2, Mr D. Kelly; 3, Mr K. Usher; R: 1, Mr M. G. Smith (Waltham); 2, Mr R. J. Watstead (E. Dulwich); 3, Mr Wooley (Uxbridge); S: 1, Mrs R. Home (Horn); 2, Mr A. R. Chand-

ASK YOUR DEALER  
FOR

**Brosiam**  
FUNGUS CURE

1st, Mr S. Mason, T. 1, Mr A. Heath; 2, Mr A. B. Chandler; 3, Mr D. Day, U. 1, B. 1, Mrs S. Hodges; 1, Mr P. Rich (Sharncliffe), W. 1, Mrs S. Hodges; 2, Mr D. F. Goodbody (Walthamstow); 3, Mrs T. Hodges (Bethnal Green); X-ray, 1 & 2, Mr T. B. Adams (Hastings); 3, Mr W. Jones (Hastings); 2, Mrs J. Boulton (Walthamstow); 3, Mr A. Heath; 3, Mr H. Watts (Hendon).

WREXHAM TFS have been enjoying a number of interesting lectures. A talk by Mr T. Pound on the raising of white worms and micro worms gave many members a new insight into the subject. Mr C. Fritchard lectured on the methods of fish judging and went into great detail with the aid of diagrams. After their questions were answered, members of the audience were given judging sheets to assess four fishes themselves and Mr R. Mathers achieved a result corresponding exactly with Mr Fritchard's own pre-judged assessment. Table show results were: Anabantids: 1, Miss V. Jones; 2, Mr R. Mathers; 3, Mr T. Pound. Furnished jars: 1, Mr E. Jones; 2, Master S. Lewis; 3, R. Mathers. Fighters: 1, Master B. Roberts; 2, Mr E. Jones; 3, Mr R. Mathers. Special congratulations were called for by Master B. Roberts' win in the fighter class as this was the first time he had shown fish. Master S. Lewis was also congratulated in coming second in the furnished jar class.

AT Fulwell Cross Library at their recent meeting, ILFORD & DISTRICT AQUARIST & POND-KEEPERS' SOCIETY were presented by Mr H. Gove of the South Essex Water Board with an interesting programme on the subject of 'Water'. Mr Gove dealt with the development of the water supply in Essex since the early 19th century. The lecture was illustrated by some excellent film that included some fine shots of wild life on the Abberton and Hanningfield reservoirs. Accompanying Mr Gove were his projectivist, Mr G. Davies, and a chemist from the Board, Mr J. C. Burrage, who answered questions put to him by members of the Society.

The table show was for a.v. Johnson, platy or singletailed goldfish and the award for the best fish in show was won by Mrs Pat Reade who exhibited a cardinal tetra. Anyone interested in tropical and saltwater fishkeeping is welcome to attend meetings in the Library (Hainsall Room) and Mr Roe Ruth (177 Heath Road, Chadwell Heath, Romford) will be delighted to supply further details.

THE presentation of the annual awards to members of HASTINGS & ST LEONARDS AS was made at the Society's recent Annual General

ASK YOUR DEALER FOR  
**Brosiam**  
PERFUMED COLD WATER  
FISH FOOD

Meeting by chairman Mr G. Fryke. Mr H. Casey was nominated the Member of the Year, and received the award for the Home Aquarium competition. The Chissell Challenge Cup went to Mr T. Adams, and the award for aw to Mr H. Livings. Mr A. Reed received the Christine Reed trophy and the Singapore Bowl was presented to Mr J. Grigg. At the second meeting in the month members enjoyed a slide and tape show on killifish, presented by Mr Barry Funnell with a taped recording by Mr Armstrong of the BKA. An inter-club competition with BETH-HILL also took place, judged by Mr Sloper, and results were:

Loaches: 1, Mrs Sherr (Bethell, best fish in show, 81 pts); 2 & 3, Mr T. Adams (Hastings). Platys: 1, Mr Chalcraft (H); 2, Mrs Sherr; 3, Mr Platt (H). Mollies: 1, Mr G. Joyce (H); 2, Mr C. Dalenberry (H); 3, Mr D. Hazz (H). Pencil fish: 1 & 2, Mr T. A. Adams; 3, Mr Dalenberry. Danios: 1 & 2, Mrs Sherr; 3, Mr T. MacCormick (H). Fighters: 1, 2 & 3, Mr T. Adams.

COVENTRY P & AS members have been delighted by the success of their Open Show, 779 fish entries were received (compared with 640 last year) and, what is more important, the standard of fish was very high with 8 MAAS Gold Stars being awarded for fish marked 80 points or over. Some of the classes attracted a really large number of entries—Corydoras, 55 entries; anabantids, 40; small characins, 41 and 909 cichlids 40. Special awards were won as follows: Best fish in show, Society Cup, Mr L. Poole of Banbury (79); best coldwater fish, the Betty Easingwood Cup, Mr Feed Watts of Coventry (78); best decorative aquarium, Elizabeth Hirst trophy, Mr Austin Simmons & Mr J. McIntyre, Coventry; best egg-

## FEDERATION



NEWS

## The Season's Championship Class Shows

### Forthcoming Championship Class Shows

9th June	Havant & DAS	Ma	
9th June	Vauxhall AS	Ea	Siamese fighters
17th June	Bishops Cleeve AS	P	Guppy, female
23rd June	Dunroam AS	T	Livebearers
30th June	Basingstoke & DAS	No-t	Egglayer pairs
1st July	Exeter AS	Xo-p	Breeders
4th-11th August	Portsmouth AS	Ba	
5th August	Tonbridge AS	Ca	Hypessobrycon etc.
10th August	Northampton AS	Cx	
2nd September	Bethnal Green AS	O	Guppy, male
2nd September	Wellingborough AS	K	Danios & minnows
8th September	Reading-Difoot-Bracknell	Q	Swordtails
9th September	Harlow AS	Rz	
9th September	Newbury AS	H	Platys
15th September	Hounslow & DAS	W	Native & foreign
23rd September	Torbay AS	Xb-m	Breeders
23rd September	North Kent AS	S	Mollies
6th October	E. London A & PA		
7th October	Ealing AS		
28th October	Newcastle Guppy & LBS		

\*Winners of Federation Championship Trophies in classes for single fish automatically become eligible for the Supreme Championship Trophy Competition (to be staged at The AQUARIUM SHOW '73 at the Royal Horticultural Society's Old Hall, London, S.W.1, 2nd-4th November). Six awards are made at this Competition.

layer brood, Rosedale shield, Mr R. North, Pelsall, 78 pts; best Siamese fighter, S.O. Memorial trophy, Mr J. Salisbury, Bedworth (73); best angel fish, K. B. trophy, Mr G. Noble, CAS, 76, J. & F. Mayle of Chelmsley Wood had most individual entries with 30 entries. The MTA Birmingham were the Society gaining most points and with the most entries (57) and Mr E. T. Cobhill of this club achieved the highest number of points at the show.

#### Detailed results were:

Large aquariums: 1, Mr A. Simson (Coventry, 66); 2, Mr P. Hinde (Coventry, 65); 3, Mr D. Eastwood (Coventry). Small aquariums: 1, Mr M. Brainbridge (Leic, 55); 2, Mr A. Troth (Tamworth); 3, Mrs Kitchell (Coventry). Guppy, av male: 1, Mr P. Underwood (Spa, 74); 2, Mr J. L. Smith (72); 3, Mr S. Trovans (CAS, 72). Guppy, av female: 1 & 2, Mr Hancock (Spa, 74); 3, Mr P. Starnon (Bagby, 75). A.v. male: 1, Mr G. Turner (Pelsall, 68); 2, Mr R. Peers (Coventry, 66); 3, Mr W. Mason (Rochampton, 66). av Livebearers: 1, Mr L. Poole (Banbury, 74); 2, Mr Moore (Bedworth, 72); 3, Mr E. Holmes (Banbury, 69).

Danos & minnows: 1, Mr T. Sanders (GKN, 78); 2, Mr T. Hughes (SAS, 76); 3, Mr E. T. Cobhill (MTA, 76). Barbs, common etc: 1 & 2, Mr R. Clarke (Pelsall, 81); 3, Mr D. Wilson (Lower Gossall, 73). Barbs, gelus etc: 1, Mr A. Williams (Wobury, 71); 2, Mr I. Hickman (Dudley, 74); 3, Mr K. Dose (Pelsall, 71). av Barbs: 1, Mr J. F. Marle (Chelmsley Wood, 81); 2, Mr A. Nash (Coventry, 76); 3, Mr T. King (Rochampton, 72). av Rainbow: 1, Mr W. Hickman (Dudley, 76); 2, Mr G. Noble (CAS, 74); 3, Mr H. Richardson (Lozborough, 71).

av Angels: 1, Mr G. Noble (CAS, 76); 2, Mr D. A. Roberts (Luton, 75); 3, Mr Eastwood (Spa, 73). av Cichlid: 1, Mr T. King (74); 2, Mr R. Trappan (MTA, 74); 3, Mr K. Dose (Pelsall, 74). Fighting fish: 1, Mr J. Salisbury (Bedworth, 74); 2, Mr P. Hickey (Pelsall, 71); 3, Mr A. Clarke (Hincley, 72). av Anabantid: 1 & 2, Mr T. Sanders (74, 73); 3, Mr E. T. Cobhill (MTA, 74). Characins, *Hypoclinemus* etc: 1, Mr D. Pennington (GKN, 76); 2, Mr S. Wood (Dillon Aston, 77); 3, Mr E. Baxter (Hincley, 75). Characins, *Aphyocharax* etc: 1 & 2, Mr E. T. Cobhill (MTA, 78, 77); 3, Mr B. F. Hirst (Coventry, 75). av Osteocin: 1, Mr & Mrs Hind (Spa, 74); 2, Mr Nemoyscott (Coventry, 76); 3, Mr L. B. Grogan (N. Wicks, 74). av Egg-laying tetra: 1, Mr E. T. Cobhill (72); 2, Mr G. Turner (Pelsall, 74); 3, Mr J. Ward (Banbury, 74).

Corydoras & Beak: 1, Mr L. Poole (Banbury, 76); 2, Mr J. Turner (Pelsall, 77); 3, Mrs M. Neithard (Riverside, 75). av Catfish: 1, Mr Hind (Spa, 78); 2, Whitfield & Massey (Ribeby, 77); 3, Mr & Mrs D. Lambourne (Rochampton, 72). av Loach: 1, Mr G. Turner (Pelsall, 81); 2, Mr K. Thomas (Luton, 82); 3, Mr D. A. Roberts (Luton, 82). Pairs, egg-layers: 1, Mr D. Lambourne (74); 2, Mr R. Clarke (74); 3, Mr C. Williams (CAS, 85). Pairs, livebearers: 1, Mr T. Allen (Bedworth, 72); 2, Mr E. Holmes (84); 3, Mr R. Marshall (Northampton, 64). Breeders, egg-layers: 1, Mr B. North (Pelsall, 78); 2, Mr J. Salisbury (77); 3, Mr B. F. Hirst (Coventry, 74). Breeders, livebearers: 1 & 2, Mr D. White (Bedworth, 78, 74); 3, Mr E. Holmes (84). Labors, sharks etc: 1, Mr Bird (76); 2, Mr J. Hughes (SAS, 78); 3, Mr Shipman (Grantham, 76). av Tropical: 1 & 2, Mr C. Pratt (Bedworth, 76); 3, Mr J. Wood (Dillon Aston, 75).

Singletail goldfish: 1, Mr F. Watts (Coventry, 74); 2, Mr R. Shakespear (Bedworth, 73); 3, Mr B. Bradford (Coventry, 72). Tuxid goldfish: 1,

**MEMBERS of SUDBURY AQUATIC CLUB, which was formed in September 1972, wish it to be known that they are not associated with, or have any connections with, any other club or society in the tropical fish world. A cordial welcome is extended to all aquatic societies at their first Open Show on 3rd June (see Dates for Your Diary).**

Whitfield & Massey: 1, Mr J. Salisbury; 2, Mr F. Underwood, av Non-peduncle goldfish: 1, Arwood & Williams (71); 2, Mr C. Pratt (67); 3, Mr R. Shakespear (84). av Coldwater: 1 & 2, Mr F. Watts (78, 78); 3, Mr J. Williams (76). av Coldwater pairs: 1, Mr B. F. Hirst (Coventry, 74); 2, Mr R. Broadbill (70).

**THERE were 67 entries in the MIXENDEN TPS bi-annual table show and the best fish in show award was made to a *Betta macracanthus* entered by Mr B. Turner. Detailed results were:**

Livebearers: 1, Mrs Hodgson (Bardin trophy); 2 & 3, Mr S. Ludlum, Barbs; Mr Poole (livebearer trophy); Characins: 1 & 2, Mr Poole (B. Winner trophy); 3, Mr Elstah. Cichlids: 1, Master Steven Poole (B. Winner trophy); 2 & 3, Mrs Hodgson, Anabantid; 1, Mr Turner; 2, Mr R. Marsh, Rainbow & Danos: 1, Mr Elstah, 2, Mr Poole, 3, Mr Ludlum, Catfish & loaches: 1, Mr Turner (B. Turner trophy); 2 & 3, Mr Poole, *Trichoptera*; 1, Mr Elstah, Barbs: 1, Mr Turner; 2, Mr Poole; 3, Mr Deacon. Breeders: 1, Mr Ludlum (G. Pool trophy); 2, Mr Poole, av: 1, Mr D. Hike; 2 & 3, Mr Poole, Janors: Miss L. Hodgson (B. Hirst trophy); 2 & 3, Miss L. Poole. Coldwater: 1, 2 & 3, Miss L. Poole.

**RUNNYMEDE AS wish to thank all those who supported their successful second Open Show and those without whose assistance the show would not have been possible. 430 entries were received in the 29 fish classes and there were classes for plants and individual aquascapes. The best fish in show was a *Tilapia mariae* entered by Mr J. Batts of Ealing, Hounslow & DAS was the Society Points trophy. Other major award winners were: Mr B. Bisson (Basingstoke), a.v. barbs and characins; Mr J. Batts, a.v. cichlids; Mrs P. Lambourne (Rochampton), tropical pairs; Mr J. H. Jackson (Basingstoke), a.o.x. cats; Rift Valley cichlids, Mr V. E. Valley (Ealing); Mr J. W. F. Hughes (Rochampton), plants.**

Individual show results were: Aquascapes: 1, Mr J. Batts (Ealing, 28); 2, Mr J. M. Shepherd (Basingstoke, 74); 3, Mr P. Carr (Basingstoke, 71). Bt. barbs: 1, 2 & 3, Mr K. C. Smith (Basingstoke, 77, 76, 74). B. barbs: 1, Mr B. Bisson (81); 2 & 3, Mr

**PLEASE note! The date of the BILLINGHAM AS Open Show has been amended from 23rd June. It is now to be held on 15th July.**

R. Leslie (H. Wycombe, 76, 28). C: 1, Mr B. Bisson (81); 2, Mrs D. Crouchank (Ealing, 81); 3, Mr R. G. Cox (H. Wycombe, 81). C: 1, Mr R. M. Jackson (Basingstoke, 85); 2, Mr J. H. Jackson (Basingstoke, 79); 3, Mr D. M. Kelly (85). C: 1, Mr M. Strouse (Basingstoke, 84); 2, Mr G. J. Moore (Kingston, 85); 3, Mr A. P. Taylor (Sudbury, 81). Angels: 1, Mr & Mrs P. Stapley (Hastings & St. Leonards, 80); 2, Mr J. Batts (80); 3, Mrs S. Mason (Independent, 79). B: 1, Mr B. Bisson (80); 2, Mr M. A. Alexander (Hounslow, 79); 3, Mr B. Pratt (Hounslow, 79). Rift Valley cichlids: 1, Mr V. E. Valley (Ealing, 81); 2, Mr T. A. Butler (Basingstoke, 81); 3, Mr W. H. A. Bradford (81). Dr: 1, Mr J. Batts (81); 2, Mr P. Harbert (Basingstoke, 80); 3, Mr & Mrs P. Stapley (Hastings, 76). Fighters: 1, Mr C. J. Moore (73); 2, Mr Taylor (Basingstoke, 72); 3, Mr A. P. Taylor (72). Livebearers: 1, Mr A. P. Taylor (79); 2, Mr R. Post (79); 3, Mr J. W. F. Hughes (Rochampton, 78). *Trichoptera* Fish: 1, Mr R. G. Cox (78); 2, Mr K. Usher (Sudbury, 77); 3, Mrs J. Gerrard (Basingstoke, 76). Fo: 1, Mrs J. Gerrard (75); 2, Mr J. H. Jackson (78); 3, Mr A. A. Houghton (Gosport, 75).

Tropical catfish: 1, Mr J. H. Jackson (78); 2, Mr C. J. Moore (77); 3, Mr N. Sawford (Rochampton, 77). *Corydoras* & *Betta*: 1, Mr D. M. Kelly (81); 2, Mr V. E. Valley (81); 3, Mr S. Freeman (Gosport, 81). Rainbow: 1, Mr D. M. Kelly (81); 2, Mr H. M. Jackson (78); 3, Mr N. Newman (Uxbridge, 78). Danos & minnows: 1, Mrs S. Mason (79); 2, Mr A. P. Taylor (81); 3, Mr J. Smith (77). Loaches: 1, Mr D. Stoddard (Kingston, 80); 2, Mr D. Roberts (Uxbridge, 79); 3, Mr R. Leslie (74). av Tropical egg-layers: 1, Mr R. Goodson (Rochampton, 82); 2, Mr D. Lambourne (Rochampton, 81); 3, Mr T. Le Calvez (Rochampton, 77). Pairs, egg-layers: 1, Mrs P. Lambourne (84); 2, Mr C. J. Moore (74); 3, Mr R. Leslie (78). Pairs, livebearers: 1, Mr R. Newman (Uxbridge, 79); 2, Mr B. Bisson (78); 3, Mr T. A. Crouchank (Ealing, 78).

Guppy, male: 1, Mr R. Rodgers (Sudbury, 78); 2, Mrs K. Murphy (Greenford, 74); 3, Mr A. P. Taylor (77). Guppy, female: 1, Mrs S. Orlove (Basingstoke, 78); 2, Mr A. C. Tuffin (Southend, 78); 3, Mr T. Le Calvez (77). *Stenotilapia*: 1, Mr T. A. Crouchank (76); 2, Mrs R. Marshall (71); 3, Mr R. Hart (Hounslow, 74). Plants: 1, Mr A. P. Comstock (Hounslow, 77); 2, Mr F. Hooper (Hounslow, 76); 3, Mr K. M. Soller (Bracknell, 74). Mollies: 1, Mr D. Lyle (H. Wycombe, 74); 2, Mr B. Robinson (Luton, 77); 3, Mr A. C. Tuffin (Southend, 77). av tropical livebearers: 1, Mr M. A. Alexander (79); 2, Mr A. Heath (Luton, 78); 3, Mr R. Newman (72).

Breeders, tropical egg-layers: 1, Mr W. R. A. Bradford (82); 2, Mr B. Pratt (Hounslow, 81); 3, Mrs P. Lambourne (86). Breeders, livebearers: 1, Mr R. Newman (78); 2, Mr A. J. Smith (Hounslow, 77); 3, Mr K. Usher (Sudbury, 78). Plants: 1, 2 & 3, Mr J. W. F. Hughes (Rochampton, 78, 77, 76).

**MEDWAY AS Open Show was a great success at its new venue and attracted 480 entries. Mrs R. Coyle of Independent entered the best fish in show, an *Epiplatysichthys holopterus* (83 pts) for which she received the Barracough trophy. Mr T. Addams of Hastings & St Leonards won the Ray Mayne trophy for barbs; Mrs Bellingham of Tonbridge the Strand Aquaria trophy for cichlids; Mr J. Marshall of Medway the Fighter trophy; Mr B. C. Fry (Erith) the Marilyn Simpson Memorial trophy; Mr G. J. Coe (SLADAS) the Swordtail Plaque; Mr & Mrs Burtles (Mid-**

Sussex) the Breeders trophy; Mr P. O'Bryan (Thurrock) the Plant Shield. The Medway trophy for the highest number of winning points, Mr A. C. Tuffin (SLADAS). Detailed results were:

- B:** 1, Mrs B. Coyle (B. chala, 82, Independent); 2, Mr & Mrs Heston (B. schwaneri, 80, SLADAS); 3, Mr J. Marshall (B. bluntonia, 79, Medway). **Br:** 1, Mr T. Adders (B. gulos, 79, Hants); 2, Mrs B. Scane (B. ruber, 78, Kent); 3, Mr J. Bellingham (Daphnia barbata, 77, Thurrock). **C:** 1, Mr B. Biscoe (Hemigrammus juliae, 80, Basingstoke); 2, Mr T. Taylor (H. juliae, 80, Basingstoke); 3, Mrs B. Scane (Hemigrammus callianus variegatus, 79, C). **D:** 1, Mr D. Duce (Dutchman's fish, 84, Independent); 2, Mr P. Coyle (Tetraodon lineatus, 82, Independent); 3, Mr A. Kinner (A. gulos, 81, Independent). **De:** 1, Mrs Bellingham (D. callianus, 84, Thurrock); 2, Mr A. Kinner (D. gulos, 81, Independent); 3, Mr & Mrs Bartles (Pseudorasbora parva, Mid-Sussex). **Do:** 1, Mr B. Biscoe (P. parva, 79); 2, Mr C. Marsh (P. parva, 78, Medway); 3, Mr P. Jarvis (P. parva, 77, Lewisham). **E:** 1, Mr J. Marshall (red light, 78, Medway); 2, Mr D. C. M. Durrant (blue, 77, SLADAS); 3, Mr T. Taylor (red, 76). **F:** 1, Mr P. Coyle (C. carolinensis, 81, Independent); 2, Mr C. P. Marsh (D. callianus, 80, Medway); 3, Mr T. B. Adams (C. carolinensis, 79). **F:** 1, Mr R. Apperard (P. amabilis, 79, Thurrock); 2, Mr D. Duce (P. amabilis, 78); 3, Mr J. London (P. amabilis, 77, Thurrock). **G:** 1, Mr R. A. Biddle (Heterostichus rostratus, 80, Kent); 2, Mr A. Kinner (P. rostratus, 78, Independent); 3, Mr J. London (Heterostichus rostratus, 77, Thurrock). **H:** 1, Mr J. Connolly (C. species, 80, Bethnal Green); 2, Mr T. Craichank (C. species, 79, Edin); 3, Mr A. C. Tuffin (C. species, 78, SLADAS). **I:** 1, Mr R. George (B. jaculum, 78, Mid-Kent); 2, Mr P. Coyle (B. jaculum, 77, Independent); 3, Mr T. King (B. jaculum, 76, Kent). **K:** 1, Mr J. Connolly (B. albino, 78, Green); 2, Mr D. R. Puchard (B. albino, 77, Thurrock); 3, Mrs B. Heston (B. albino, 76, Kent). **L:** 1, Mr E. Parker (L. gulos, 80, Kent); 2, Mr T. King (L. gulos, 79, Kent); 3, Mr T. Craichank (L. gulos, 78, Edin). **M:** 1, Mrs B. Coyle (L. gulos, 81, Independent); 2, Mr J. London (L. gulos, 79, Thurrock); 3, Mr P. Coyle (L. gulos, 78, Kent). **N:** 1, Mr A. Heston (G. varians, 77, Lewisham); 2, Mr J. London (G. varians, 76); 3, Mr B. Biscoe (G. varians, 75). **O:** 1, Mr C. Fry (O. varians, 79, Kent); 2, Mr B. Biscoe (O. varians, 78, Thurrock); 3, Mr A. C. Tuffin (O. varians, 77, Kent). **P:** 1, 2 & 3, Mr A. C. Tuffin (P. varians, 79, Kent); 2, Mr R. Sashby (P. varians, 78, Kent); 3, Mr K. Adders (P. varians, 77, Kent). **Q:** 1 & 2, Mr B. Biscoe (P. varians, 78, Thurrock); 3, Mr A. C. Tuffin (P. varians, 77, Kent). **R:** 1, Mr P. O'Bryan (P. varians, 79); 2, Mr R. Sashby (P. varians, 78, Kent); 3, Mr K. Adders (P. varians, 77, Kent). **S:** 1 & 2, Mr B. Biscoe (P. varians, 78, Thurrock); 3, Mr A. C. Tuffin (P. varians, 77, Kent). **T:** 1, Mr A. Heston (P. varians, 78, Lewisham); 2, Mr C. Elliott (P. varians, 77, Medway); 3, Mr B. Biscoe (P. varians, 76). **U:** 1, Mr & Mrs Bartles (P. varians, 78, Mid-Sussex); 2, Mr D. Adders (P. varians, 77, Kent); 3, Mr J. London (P. varians, 76). **V:** 1, Mr M. T. Wall (C. species, 77, Thurrock). **W:** 1 & 2, Mr R. Usher (P. varians, 78, Kent); 3, Mr R. Apperard (P. varians, 77, Thurrock). **X:** 1, Mr P. O'Bryan (P. varians, 79, Kent); 2, Mr D. C. M. Durrant (P. varians, 78, Kent); 3, Mr J. Marshall (P. varians, 77, Medway).

CASTLEFORD & DAS have had much difficulty finding suitable accommodation in Castleford that it has been decided to discard this title. The new title is to be the PONTEFRACT & DISTRICT AQUARIST SOCIETY. Meetings will be held at 7.15 p.m. on the first Wednesday of the month at the Willow Park Hotel, Pontefract. Secretary, Mr Barry Stevens of 77 Falcon Drive, Love Lane, Castleford, Yorks, would

be very pleased to receive show schedules from secretaries. Social secretary, Mr Jim Dickinson (6 Hainfield Lane, Noston, Pontefract) would welcome information on lectures, slide shows, etc. or other material for society meetings. Mrs B. Cohen (75 St Oswalds Avenue, Pontefract), the show secretary, would be glad if winners of last year's Castleford Open Show would kindly return trophies to her.

**In Brief . . .**

... RECENTLY some 45 aquarists from several societies attended HENDON & DAS Spring Mini-Convention. The speaker was Mr M. J. Hardy, and his interesting talk concerned his recent tour of the Far East. Slides were shown not only of actual fish-collecting locations and the fish themselves, but also of the Hong Kong fish farms, Japanese koi carp farms and marine exporters' establishments.

... MR R. J. Baker (FRAS) was the judge at the table show for tropical catfish held by BRIGHTON & SOUTHERN AS. Results were: Class G: 1, Mr & Mrs Corbin; 2, Mr H. Maddison; 3, Mr V. Aldis. Class H: 1 & 2, Mr V. Aldis; 3, Mr H. Maddison. While judging was in progress, Mr Dick Mills gave an interesting talk on the different types of filters and their uses.

... THERE was a very good attendance of GAINSBOROUGH AS members when Mr John Blizard of Sheffield & DAS presented a tape and slide lecture on "The Breeding and Rearing of Killifish". Mr Blizard also judged the table show and results were: Platys: 1, Mr & Mrs W. Gilding; 2, Mr & Mrs K. Cowan; 3, Mr & Mrs R. Harris. Anabantids, small: 1 & 2, Mr & Mrs W. D. Gilding; 3, Mr & Mrs R. Harris. Large: 1, Mrs A. Robinson; 2 & 3, Mr & Mrs Harris. Juniors. Platys: 1, G. Gilding; 2, N. Cowan. Anabantids, small: 1, 2 & 3, G. Gilding; Large: 1, N. Cowan; 2, D. Thorpe; 3, M. Brumby.

... 45 members of WEYMOUTH AS attended the talk on Judging by FBAS judge Mr J. Stillwell. In his talk Mr Stillwell recalled seeing a 10 in. black mollie. The table show results were: Rasboras: 1, Mr K. Forrester; 2, Mr T. Edwards; 3, Mr M. Medway. Danios and minnows: 1, Mrs V. Worth; 2, Mr G. Fitzgerald; 3, Mr K. Forrester. Visitors and new members are welcome at meetings at the Assembly Rooms, Waverley Hotel, Abbotbury Road, Weymouth.

... FUTURE events planned by AMERSHAM & DAS include a Bring-and-Buy Sale and 12-0-6-6 match with HIGH WYCOMBE AS on 6th June, a coach outing for club members on 17th June, a talk on filters on 26th June and a talk on coldwater fish on 4th July. For details contact secretary Mr S. Thompson, 8 Windmill Wood, Amersham.

... THOSE members of BRISTOL AS whose interest lies in the tropical side of the hobby were particularly well catered for at a recent meeting when two well-known members of ROLLS ROYCE AS were the experts answering questions at a Questions-and-Answers session. The experts were impressed at the knowledge revealed by the questions and the evening proved most enjoyable.

... AT the BEDWORTH AQUARIST & POOL SOCIETY'S April meeting there was an MAL eliminator, judged by Mr K. M. Wright. Results were: Egglayer pairs: 1 & 2, Mr D. White; 3, Mr & Mrs M. Lee. Livebearers: 1, Master C. Pratt; 2, Mr T. Allen; 3, Mr J. Salisbury. Rasboras: 1, Mr D. White; 2 & 3, Mr R. Shakespeare. Catfish: 1, Master C. Pratt; 2, Mr J. Salisbury; 3, Mr J. Houndon.

... THE best fish in show award at the April table show of KIDDERMINSTER & DAS went to a bescon tetra entered by Mr G. Lawrence. Results were: Livebearers: 1, Mr P. Allen; 2, Mr G. Lawrence; 3, Mr L. Edwards. Characins: 1, Mr G. Lawrence; 2, Miss W. Jones;

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FISH FOOD

3, Mr P. Allen, Danios; 4, Mr G. Lawrence; 5, Mr J. Barefoot; 6, Mr B. McKenzie.

... HOBBYISTS who are holidaying in Great Yarmouth over the Sunday of 26th August will be able to enjoy the Tropical Fish Exhibition being staged by **GREAT YARMOUTH & DAS**. As a relatively new society, this will be the club's first major venture. Assured of strong support from fellow members of the East Anglian Federation of Aquarists, the Society hope to attract many holiday visitors as well as local hobbyists and thereby put this corner of East Anglia on the aquarist map.

... POSITIONS in the 1973-4 Points Cup trophy of the **BIRMINGHAM SECTION** of the FGA after the first two table shows are: 1, Mr & Mrs Phillimore (63); 2, Mr K. Lee (44); 3, Mr G. Steadman (40); 4, Mrs Steadman, Mr H. Baldwin (24); 5, Mr M. Delingpole, Mr & Mrs Nicholson, Mr J. Esketh & Mr W. J. Ewart (10); 6, Mr Fewles & Mr Vinall (16).

... A warm welcome awaits all newcomers at **CATERHAM NOMADS AS**. Secretary Mr V. Gibson writes: 'If there are any people who would like to join or just visit, don't hesitate to drop a line to 71 Park Road, Caterham, Surrey or phone me at 02-584 1263. We have a good programme of forthcoming events that we hope will satisfy all aspects of the hobby.'

*Mr Ian Wood, secretary of the FEDERATION OF NORTHERN AQUARIUM SOCIETIES, reported on an eventful year at the Federation's Annual General Meeting. The membership list had recently been received and there were now 55 member societies. The newly set-up Management Committee was working well through its regular monthly meetings and the system would soon be showing effective results. Mr Wilkes, secretary of the Judges and Standards Committee, reported that the first priority of the Committee was to produce a new set of Judging Methods and Show Rules. The Federation's decision to produce the new methods with the co-operation of the Scottish Federation meant that uniform standards would in future be operative over a much larger area but inevitably created some delay and it was unlikely that the new booklets would be available before January 1974.*

## Dates for Your Diary

22nd June, **FRAS Assembly**, Curlew Hall, Red Lion Square, London, WC1, 2.30 p.m.

22nd June, **BREISTOL AERO AS** Open Show, Wesleyan Church Hall, Brunton Hill, St George, Bristol. Schedules: Mr G. A. Sprake, 234 New Tree Drive, Kingswood, Bristol, BS15 4UF (phone: 623995).

23rd June, **ACCRINGTON AS** Open Show, St John Ambulance Drill Hall, Bell Bridge, Accrington. Schedules: Mr S. Walsh, 233 Lammack Road, Blackburn, Lancs.

23rd June, **LOUGHBOROUGH & DAS** Open Show, The Sports Centre, Grassy Street, Loughborough. Schedules: Mr I. Parry, 10 Cleveland Road, Loughborough, LE13 2SP; phone Loughborough 57714.

23rd June, **BOURNEMOUTH AS** Open Show, Kinross Community Centre, Feltham Park, Bournemouth. Details: Mr J. V. Jeffrey, 30 Brunar Avenue, Southbourne, Bournemouth, BH16 4JF.

23rd June, **SUDBURY AQUATIC CLUB** First Open Show, St Andrews Church Hall, Harrow Road, Woudley, Middles. Schedules: Mr L. Brazier, 66 Overby Way, Kinson, Middles.

24th June, **HAVANT & DAS 2nd** Open Show, St George's Hall, Waterlooville. Details: Mr V. B. Hunt, Caughle, 120 London Road, Witley, 10, Portsmouth, Hants.

24th June, **VAUXHALL MOTORS AS** Open Show. Details: Mr A. Philip, 14 Hollybush Road, Luton, Beds.

24th June, **LLANTWIT MAJOR AS** Open Show. Show secretary: Mr J. Edwards, Glanston Mill Park, Llanllanham, Cambridge, Glas.

24th June, **GEN POND & AS** Open Show, GKN Centre, Salisbury Street, Darlington, Staffs. Details: Mr Ken Bowler, 125 Walsinghampton Street, Darlington, Staffs.

24th June, **LINCOLN & DAS** Open Show, Frell Hall, Broadgate, Lincoln. Details: Mr H. Kibb, 44 Scarer Street, Lincoln (phone: 521113).

27th June, **CHELMSLEY AS** Open Show. Details: Mr R. J. Hesley, 2 Levensdale Close, Colchill, Birmingham B46 1BS.

17th June, **BISHOPS CLEEVE AS** Open Show, T.A. Centre, Arle Road, Cheltenham, Glas. Schedules: Mrs J. Hawkins, 44 Barton Street, Cheltenham, Glas.

17th June, **SALISBURY & DAS** Open Show, The City Hall, Fisherton Street, Salisbury.

17th June, **NORTHWICH & DAS** Open Show, Harford Secondary, Berr School, Chester Road, Harford, Northwich. Details: Mrs D. J. Thorne, 68 Whitgate Road, Winford, Cheshire; phone Winford 5280.

17th June, **FANCY GLUPPY ASSOCIATION, LANCASTER SECTION** Open Show, Gregson Institute, Moor Lane, Lancaster. Details: Mr J. F. Peck, 3 Ridge Street, Birk, Lancashire.

17th June, **FREELANCE AS** Open Show, Annetwain Community Centre, Theolow Street, London, S.E.17. Details: Mr J. Stamp, 74 Redmond House, Last Street, Birmngh, K.E.1.

17th June, **SWILLINGTON AS** Open Show, John Swainson School, off Barwick

Road, Leeds 14. Show secretary: Mr K. Scolding, 38 Goodwood Avenue, Kippax, 10 Leeds, Yorks.

22nd June, **DUNMOW & DAS** Open Show, Fakes Memorial Hall, Great Dunmow, Essex. Details: Mr D. McMoran, 37 Chapel Road, Rayne, 10 Dunmow, Essex.

24th June, **DUDLEY & DAS** First Open Show, Blind Institute, Walsinghampton Road East, Sedgeley, Dudley. Judging in FRAS Rules. Schedules etc.: Mr W. A. Hilderson, Crad-Lea, 29 Ludbrook Grove, Lower Gornal, Dudley, DY3 2UP, Woon.

24th June, **GOSPORT & DAS 7th** Open Show, Stubbington Community Centre, Stubbington, Hants. FRAS Rules. Details: Mr K. L. Ayling, 32 Founders Way, Bridgemary, Gosport, Hants, PO13 4LR.

24th June, **ALFRETON & DAS** Open Show, Adult Education Centre, Alfreton Hall, Alfreton. Details: Mr R. Hocking, Parkview, 13 Coppice Drive, Eastwood, NG16 1PA (phone: Langley Mill 2104).

28th-30th June, **BREISTOL, TFC** Open Show, Congregational Hall, Stapleford Road, Bristol. Schedules: Mr T. A. Coppins, 35 Loughton Road, Southville, Bristol.

28th June, **BASINGSTOKE & DAS** Open Show, Carnival Hall, Basingstoke. Schedules: Mr R. Bush, 63 Pinkerton Road, Basingstoke, Hants.

1st July, **GLOSSOP AS** Open Show. Details: Mrs P. Turner, 28 Newlands Drive, Hatfield, via Hyde, Chester.

1st July, **LYTHAM AS** Open Show, Lovelock Gardens Pavilion, Lytham, Lancs. Schedules: Mr E. Willett, 64 Avenham Place, Newton, 10 Kirkham, Lancs, PR4 3RQ.

1st July, **CHELMSLEY AS** Open Show. Details: Mr B. J. Hesley, 2 Levensdale Close, Colchill, Birmingham B46 1BS.

1st July, **EXETER & DAS** Open Show, Kenford, Village Hall, Kenford, 10 Exeter. Details: Mr A. J. Wainwright, 28 May Street, Exeter, EX4 4LL.

7th July, **BOREHAMWOOD & DAS 1st** Aquascap and Pseudoed Aquarist Festival and Open Show. Schedules: Mr D. J. Crowder, 64 Milton Drive, Borehamwood, Hants, WD6 1BB.

7th July, **GGB** Quarterly Meeting, Curlew Hall, Red Lion Square, London, 2.30 p.m.

7th-8th July, **BOMFORD & BEACONTHREE AS** Open Show, Dagenham Town Open Show, Central Park, Dagenham, Essex. Details: Mr B. G. Kent, 74 Lywood Drive, Collier Row, Romford, Essex, RM3 2QT; phone Romford 67804.

22nd July, **BELLINGHAM AS** Open Show, Amended show, Billingham Community Centre, Billingham Town Centre. Schedules (mid-May): Mr J. Arwell, 24 Hatfield Place, Penrith, Co. Durham (phone 4183) or Mr A. Crowler, 32 Midwick Road, Billingham.

22nd July, **OLDHAM & DAS** Open Show, Warrath Park, Oldham. Schedules (when available): Mr E. Rushwood, 20 Inverness Avenue, Blackley, Manchester 9.

24th-25th August, **PORTSMOUTH AS** Open Show, St Patrick's Hall, Winter Road, Southsea, Portsmouth. Setting up Saturday 24th August; Judging, etc. open to the public, Monday, 26th to Saturday, 31st. Schedules: Mr J. Stidwell, 34 Salcombe Avenue, Copnor, Portsmouth, Hants, PO3 6LD.

26th August, **TONBRIDGE & DAS** Open Show, Tunbridge School, Tunbridge, Kent. Schedules: Mr I. T. Matheson, 33 Noronia Way, Five-Oak Green, Tunbridge, Kent.

14th August. **BLACKPOOL & FYLDE AS** Open Show. The Northwick Castle Hotel, Northwick, nr. Blackpool.

14th August. **NORTH STAFFS AS** Open Show. Colridge Drill Hall, Waterloo Road, Coalville. Sokes-on-Trent. FNAS Rules. Details: Mr R. Ashern, 4 Castle Street, Chatterton, phone 720 254490, or Mr J. S. Booth, 215 Beverley Drive, Berrislee, Sokes-on-Trent, Staffs.

14th-16th August. **MIDLAND OPEN SHOW (MAPS)**. Hagley Hall, Broad Street, Birmingham. Details: Mr T. Greig, 45 Perrett Street, Wotton Green, Birmingham, 15. phone 021-254 9064.

14th-17th August. **HARWICH & DAS** Open Show. The Queens Hotel, Dovercourt, High Street, Harwich. Details: Mr A. Green, 21 The Ridgeway, Dunmooton, Essex, CO11 4AU.

14th August. **BEDWORTH A & PS** Open Show. Nicholas Chamberlain School, Buckingham Lane, Bedworth. Schedules: Mr J. Hemmick, 7 Tansar Road, Bellington, Warwick.

14th August. **STROUD & DAS** Open Show. Technical College, Stroud Road, Stroud. Schedules: Mrs D. Cole, Avonham, The Hill, Ratwick, Stroud, Glos. GL4 6JH (phone: Stroud 4324).

14th August. **MIDDERSFIELD TFS** Open Show. Details to follow.

14th-17th August. **RIVERSIDE AS** Furnished Aquarists Open Show (open, individual and club class). Schedules: Mr M. Goss, 19 St Hugh, White Lion Road, Ammanham, Bucks: phone 01-970 8874.

14th August. **GREAT YARMOUTH & DAS** Tropicana Fish Exhibition, North Drive International High School, GC, Yarmouth. Details: Mr P. G. Watson, 21 Common Road, Hornby, Gr Yarmouth, Norfolk.

14th August. **FLEETWOOD AS** Free Open Show. Fleetwood Grammar School. Details: Mr N. West, 40th Mowberry Road, Fleetwood: phone FWD 2072.

14 September. **FRAS Assembly**. Conway Hall, Red Lion Square, London, WC1, 2.30 p.m.

14 September. **WELLINGBOROUGH & DAS** Open Show. Queensway Centre, Colchester Road, Wellingborough. Schedules: Mr J. S. Birchmore, 1A George Street, Wellingborough, Northants. phone Wellingboro 2741.

14th September. **THORNE AS** Open Show. Details: Mr B. Backs, 49 Warren Road, South Common, Thorne, Doncaster.

14th September. **BETHNAL GREEN AS** Open Show. Bethnal Green Institute, 220 Bethnal Green Road, London, E.2. FRAS Supreme Championship Trophy Class C (open character). Schedules: Mrs Sybil Briggs, 190 Ashburton Avenue, Seven Kings, Essex. Essex RG2 9E (phone: 01-960 1116).

14th September. **LUCAS AQUARIUM & POOL SOCIETY** Open Show. Spring Hill, Birmingham. Schedules: Mr K. Thomas, 11 Alms Road, Solihull, Warwick.

14th September. **COMBINED BRACKNELL AS, DECCOT AS & BRADING & DAS** Open Show. White Knights, Sheffeld Road, Reading. Details: Mr John Houser, 4 Rickmers Close, Woodley, Berks. (phone: Reading 856427).

14th September. **HOYLAKE AS** Open Show. The YMCA, Hoilake. Details: Mr E. Rowlands, 3 Hag Avenue, Moreton, Wirral, Cheshire.

14th September. **HARLOW AS** Open Show. East House, Harlow. Schedules: Mr S. Jordan, 48 Whitewain, Harlow, Essex.

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9th September. **NEWBURY & DAS** Open Show. Details later.

9th September. **NUNEATON AS** Open Show. Details later.

14th-16th September. **BRISTOL AQUARISTS SOCIETY** Open Show. Details: Mr E. N. Burdett, 12 Stanleigh Walk, Knowle, Bristol, BS4 1BL.

14th September. **MID-HERTS AS** Open Show. Details later.

14th September. **WESTON-SUPER-MARE & D TFC** Open Show. St Johns Hall, Oxford Street, Weston-super-Mare. Details: Mr J. Clarke, St Johns, North Street, Cheddar.

14th September. **HOUNSLOW & DAS** Open Show. The Youth Centre, Cecil Road, Hounslow, Middlesex. Schedules: Mr H. Pratt, 43 Woodlawn Drive, Feltham, Middlesex (phone: 81-984 0012).

14th September. **HASTINGS & ST LEONARDS AS** 1st Open Show. Concordia Hall, Hastings. Schedules: Mr St. J. Hunt, 230 Mt Pleasant Road, Hastings, Sussex.

14th September. **STONE AS** Open Show. Full details later.

14th September. **BUXTON & DAS** Open Show. The Pavilion Gardens, Buxton. Schedules: Mr A. Holland, 8 Midland Terrace, New Mills, via Stockport, Cheshire.

14th September. **GSGB 25th Anniversary** Show.

14th September. **TORBAY AS** Open Show. Torquay Town Hall. Details to follow.

14th September. **HUCKNALL & BULWELL AS** Open Show. Bulwell Youth Club, Coventry Road, Bulwell, Nottingham. Booking: 11.00am-1.00pm. Schedules: Mr J. Sutcliffe, 273 Winkler Court, Bulford, Nottingham.

14th September. **CHESTERFIELD & DAS** Open Show. Clay Cross Social Centre, Chesterfield Road, Clay Cross, nr. Chesterfield, Derby. Exit 29 off M1, follow signs a mile to show. Spacious venue on M1. Booking 11.00am-1.00 p.m. Schedules: Mr D. Stone, 257 North Wingfield Road, Gossington, Chesterfield, Derby. S44 4EB (phone: Burley 47715).

14th September. **NORTHAMPTON & DAS** Open Show. The Drill Hall, Northampton. Schedules: Mr G. Alton, 20 Childrens Avenue, Northampton.

6th October. **EAST LONDON A & FA** Open Breeders Show. Schedules: Mr E. Vicker, 12 Irons Way, Collier Row, Boreford, Essex.

7th October. **HENCKLEY & DAS** Open Show. Heathfield High School, Belle Vue Road, East Shilton, Leicestershire. Details: Mr T. Saunders, 29 Brewham Drive, Leics.

14th-16th October. **FNAS BRITISH AQUARISTS FESTIVAL** at Belle Vue Gardens, Manchester.

28th October. **DONCASTER & DAS** Open Show. Bradenorth Miners Welfare Hall, Welfare Road, Woodlands, nr. Doncaster.

2nd-4th November. London's Sixth Annual Exhibition of Fishkeeping: **The AQUARIUM SHOW '73** at the Royal Horticultural Society's Old Hall, Vincent Square, London SW1. Enquiries to Show Organiser, PFM, 554 Garratt Lane, London SW17 0NY.

1st November. **GSGB Quarterly Meeting**. Conway Hall, Red Lion Square, Holborn, London, WC1, 2.30 p.m.

4th November. **MIXENDEN TFS** Open Show. Venue and details later.

11th November. **HARTLEPOOL AS** Open Show. Longear Hall, Beaton Curve. Details: Mr J. Watson, 42 Rydham Road, Hartlepool, Co. Durham, TS26 9HW.

11th November. **WALTHAMSTOW & DAS** Open Show. Details to be announced.

17th November. **1973 HENDON CONGRESS** (provisional date).

17th November. **KINGSTON & DAS/ SOUTH PARK AQUATIC STUDY SOCIETY** combined Open Show. T.A. Centre, Surlingham Road, Kingston, Surrey. Schedules: Mr D. J. Mackay, c/o 31 Mount Road, New Malden, Surrey (phone: day, 01-372 0612; night, 01-948 0015).

17th November. **GSGB 25th Anniversary Dinner Dance**. Details: Mr A. Lewman, 48 Gordon Road, Enfield, Middlesex.

1st December. **FRAS Assembly**. Conway Hall, Red Lion Square London WC1, 2.30 p.m.



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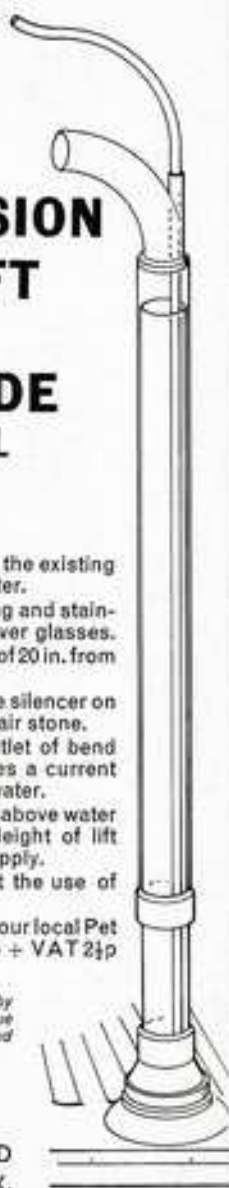
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