

MAY, 1967

2s 6d

Pet Fish

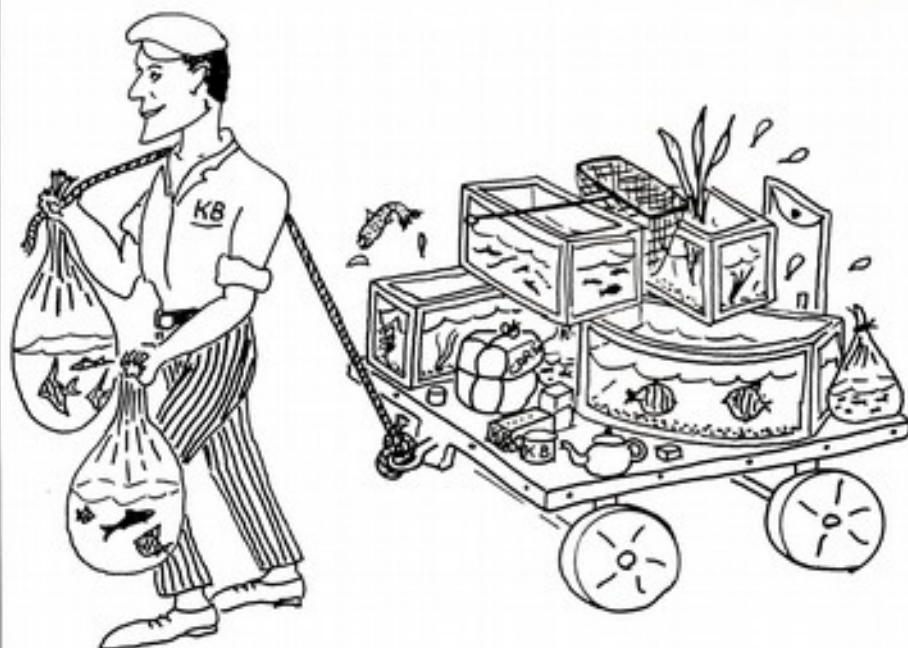
monthly



KB TROPICAL FISH KB
AND
AQUARIUM SUPPLIES

SEND NOW FOR 1967 CATALOGUE (6d. stamp)

Please note **WE ARE MOVING** (only 200 yards)



As from Mid-May all Aquatic Business will
be carried out at 568 Great Horton Road

KEITH BARRACLOUGH
568 & 215 GREAT HORTON ROAD BRADFORD 7 YORKS
Tel. 73372

Half day closing Wednesday 1 p.m.

Open until 8 p.m. Friday evenings

Please mention PFM when writing to advertisers

PetFish

Monthly 2s 6d

Vol. 2 No. 2

May, 1967

Subscription rates: £3 15s for 12 issues; 17s 6d for 6 issues (U.S.A. and Canada \$5.00)

Editor: Anthony Evans

In This Issue

	Page
Comments and Quotes	41
Letters	45
Show Time	46
Breeding Neons and Cardinals	47
Skimmers in the Marine Aquarium	48
Queries	52
Guppy Comment	53
Simple Biological Filters	54
Marineland of Florida	56
Catfish	59
Mainly for the Pondkeeper	60
Advantages of Hand-Spawning	61
Personal Comment	63
Crabs and Lobsters	65
Club News	68
In Brief	71
Dates for Your Diary	73
Centre Supplement	
Index to Volume 1	(i)-(iv)

© 1967

PetFish Publications

554 Garratt Lane,
London, S.W.17

Telephone 01-947 2805

Advertisement Offices
47 Gresham Street,
London, E.C.2

Telephone MONarch 7644

Comments and Quotes

- Settling differences ● Water conditioning
- Spawning rudd and parasites ● Russian aquarists ● Mollies help out ● Sea water pollution

Getting Togetherness

IS 1967 going to be the year for the mending of splits and resolving past differences in the organised side of the aquarium world? On the tropical side the two major guppy organisations have met and made first advances towards more co-operation between them. In the coldwater section the Goldfish Society of Great Britain and the Federation of British Aquatic Societies are exchanging views about their two sets of standards for goldfish.

It is never easy to get two separate sections representing bodies of different opinions together and to resolve the differences to the satisfaction of all concerned. Someone has to yield a little; individual interests may suffer. In our particular sphere, the aquarium hobby, it should surely be possible to ensure that no-one is treated too hardly? Is it not possible, for example, within the broad framework of a set of standards to give recognition to types that are on the aquarium scene already and which have been the objects of many years of devoted selective breeding efforts by their fanciers? Is it not within the faith of such specialist breeders in their chosen variety to be prepared to work with fellow aquarists who hold different views?

Let's keep the differences in mind, by all means, but let's divide, if dividing there must be, with curtains of lace and not of iron.

Water Conditioning

ALTHOUGH some aquarists de-

scribe the way in which they treat and prepare water for aquarium use as 'conditioning the water', there is growing up a use of the phrase by biologists that indicates a rather different process. Living aquatic animals, including fishes, do their own 'conditioning', according to observations made with a number of species. The conditioning is usually a change making the water less suitable for species other than the one that has brought about the change, apparently by addition of substances formed and released into its surroundings by the animal. Their presence is often shown by a slowing effect on the growth of the young of other species in the conditioned water.

A report from the University of Madras by Dr R. T. Srinivassagam published in NATURE has given some observations on this matter in connection with the development of a marine tube worm. Sea water in which the worms had been kept for only a few hours caused slightly faster development of larvae arising from fertilised eggs of the worms when these were placed in it. The comparison of development rates was made with similar eggs placed in 'unconditioned' sea water.

When sea water that had been 'conditioned' by keeping a species of mussel in it (again only for a few hours) was used to hatch the worm eggs their development was slowed. A further and different effect of conditioning processes was indicated when the worm eggs were placed in sea water 'conditioned' by barnacles. Development was in fact accelerated by this water but to an extent that caused abnormalities to appear in the larvae. This effect could still result in an advantage for the barnacles, because abnormal tube-worm larvae

would be unlikely to settle and build their tubes on surfaces with barnacles already in residence.

With animals like these, that are fixed to one spot and do not move far from it, it seems likely that their success in making conditions locally entirely favourable for their own kind could be in part responsible for the large and dense masses of them to be seen in definite areas.

Parasites Prevent Spawning

WATER-conditioning substances which affect growth, such as those mentioned in the previous note, are one kind of fish-produced material known to influence other fishes, but there are further products. 'Fright substances', changing the behaviour of fish coming into contact with water that has held some excited fish previously, have been postulated and there are also 'sterohormones'—poured into the water by the male fish to stimulate the female to spawn. 'Copulin' is the name given to such a sterohormone, and an interesting research report from Dr T. S. C. Orr of Glasgow University suggests that the presence of parasites which cause a state of castration in rudd can also interfere with the production of copulin and thereby change the behaviour of the fish.

When rudd were netted from a Northants. reservoir in the breeding season those adults caught at random throughout the reservoir were frequently found to be parasitised, whereas those caught from the shoals exhibiting spawning behaviour were free from parasites. The particular parasite here concerned is *Ligula intestinalis*, developing inside the fish, a type of worm which infests a number of cyprinid species.

Russian Aquarists

LIKE many factories, the Hammer and Sickle Works in Moscow runs its own magazine. What distinguishes this one, however, is a regular tropical fish feature, contributed by the workers and their children.

They also run the Neptune Club

Marine Aquarium Magazine

ARRANGEMENTS we have made with the publishers in the U.S.A. of SALT WATER AQUARIUM MAGAZINE will enable readers of PETFISH MONTHLY to obtain this specialist journal for the marine fishkeeper direct from us. SALT WATER AQUARIUM MAGAZINE, edited by R. P. L. Straughan, appears six times a year and this year's first number will be posted to you if you send 4s 3d (to include postage) to PFM, 554 Garratt Lane, London S.W.17.

at the factory, much frequented after school hours.

Here are fish of every shape and hue—among them superb discus, a pretty little fellow from the Celebes who rejoices in the name of *Telmatherina ladigei*, and tiny turtles from Vietnam.

All told the club has 130 different species, in a hundred tanks of various sizes.

The club enjoys the patronage of the noted zoologist, Boris Obratsov.

Members keep in touch with many other clubs both in the U.S.S.R. and abroad.

Tallinn Zoo gave them six of its expensive discus fish from the Amazon.

Neptune gave Tallinn some of its own specimens in exchange.

There's a practical side to the club, too. The Research Institute of Pond Fisheries asked it to study the effect of various drugs on diseased fish.

And the club sent the Severtsev Institute of Animal Morphology some observations on the blind fish which exist in nature in complete darkness, together with some specimens the members had bred themselves.—SOVIET WEEKLY.

Mollies Help Out

IF the black molly is your favourite it may be that you won't like the NEW SCIENTIST's recent description of it as an 'elongated black-body absorber' (of heat). Apparently this

fact has caused difficulties for laser scientists who have had hopes of putting mollies to work for them. The water jackets of their machines, some with tubes over 50 feet long, were becoming choked by algae and mollies in the tubes appeared to provide a cheap way of keeping down the green growths. The absorption of the black fish has, however, proved to be a disadvantage, and experiments are now going on to see if an albino strain of mollies will serve the purpose.

Sea Water Pollution

THE disastrous wreck of the oil tanker *Torrey Canyon* and the threat to British holiday beaches and marine life proved to be an item of major public interest. We found ourselves wondering, however, whether the concern would have been as great if the wreck had occurred, for instance, off the coast of the north of Scotland or that of western Ireland; how much interest would have been aroused here, we wonder, if it had happened in South America? The harm done to marine life would have been just as serious in any of these areas.

We were also astonished by the apparent lack of information about the effect of the detergents, used to treat the oily beaches, on the sea animals. Lack of agreement in the statements made by various 'authorities', about possible effects, was perhaps even more astonishing. Some said no harmful effect would occur, others said the detergents would kill all life in the area and quoted, as an instance, what happened at Milford Haven after such treatment a few years back.

We thought we detected a lack of public comment from people who should have had the information, but this could perhaps be explained by the understandable reticence of scientists to make generalised statements. Sea-shore conditions are complex, and what can be shown in the static conditions of a laboratory test might not apply to the constantly shifting state of the littoral zone. In any event, the affair was disturbing to anyone with the interests of wild life at heart and it must surely be the aim of authority to make it difficult for the same thing to happen again.

TWO BOOKS NO AQUARIST SHOULD BE WITHOUT

BY

GUNTHER STERBA. Dr. RER. NAT. HABIL

Director of the Zoological Institute, Karl Marx University of Leipzig

"FRESHWATER FISHES OF THE WORLD"

A practical guide for all seriously concerned with aquarium fishes; the recognised work of reference, it deals with the identification, biology and care of no fewer than 1,300 species, the vast majority of which are illustrated, including species and genera, even whole families and orders not mentioned elsewhere. Thus it easily exceeds in comprehensiveness the scope of any comparable English language work.

This edition, translated and revised by D. W. Tucker, late Asst. Keeper (Fish Section), British Museum (Natural History). Lavishly illustrated throughout with black and white photographs, line drawings and full colour plates.

"The best authoritative text on the subject ever written for the aquarist . . . This splendid book is destined to become the standard work of reference for the aquarist."—*Times Educational Supplement*.

84/-

"AQUARIUM CARE"

Professor Sterba's complementary volume to his classic "Freshwater Fishes of the World". Translated from 'Aquarienkunde' (2 vols.) it has become Europe's foremost guide for aquarists. In this edition the two volumes have been compressed into one volume divided into three parts. The first explains all the technical points which an aquarist must know before he can correctly manage his tanks. It also provides an introduction to basic biology. The second part deals with fish diseases, the causes, how to recognise them, and measures to take to avoid them. The final part is a systematic account of all the Marsh and Aquatic Plants introduced into the aquarium world, and describes the conditions necessary for their cultivation. Fully illustrated throughout with black and white photographs, line drawings, and full colour plates.

70/-

BOTH VOLUMES AVAILABLE FROM GOOD AQUARIST SHOPS NOW

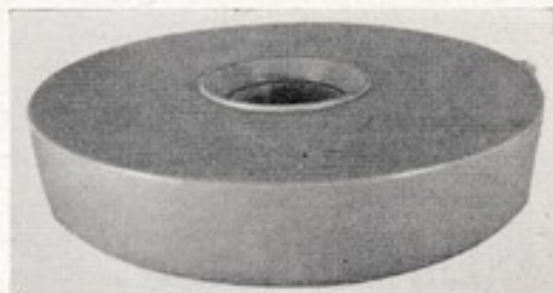


Sole distributors to the Pet Trade

**S.C.A.N. LTD., OLD BATH RD., COLNBROOK,
SLOUGH, BUCKS.**

"I saw your advertisement in PFM"

**Let Your Fish Go to Work
on the
Shrimp—not
the Shells!**



with HYKRO'S new Brine Shrimp Hatcher

Designed to give maximum hatching of brine shrimps and perfect separation of live shrimps from the egg-shells. Complete with one loading of shrimp eggs (500,000) and special salt mix

Only 9s.—From all stockists of HYKRO Products

Other New Accessories from Denmark

Hykro Water pH Indicator Reveals exact degree of acidity or alkalinity instantaneously—over 100 tests per roll, 5s. 6d.

Hykro Variety Food The Perfect Food for all fish. One trial will convince you—3s. per large drum. Hykro Flakes: Breeder's Pack (1 kilo, over 2 lbs.), 32s. 6d. Hykro Vacation Food, only 1s.

Hykro Ganged Valves Hykro Clamps, Tees and 4-Ways. Also 2-way, 3-way and 4-way ganged valves. All are reasonably priced, as strong as metal and cannot rust.

Ask for the large packs of Hykro Shrimp Eggs (*Artemia salina*) and Hykro Prepared Salt Mixture.

HYKRO lines are obtainable at all good Aquarists and Pet Shops.

JOE GRASSBY Sole Importer
THE GLEN FISHERIES MOBBERLEY CHESHIRE

Please mention PFM when writing to advertisers



Foods for Marines

I SHOULD like to repair an omission from my article on marine foods (PET FISH MONTHLY, February). I refer, of course, to the use of live fishes as food. Any fish of a suitable size may be used, with the obvious exception of poisonous species such as *Cottus*, *Trachinus*, *Tetraodon*, *Pterois* and *Scorpaena* types. Bony-plated creatures like pipe-fish and sea horses are also useless.

Naturally, the most suitable fishes for use as live food are the cheap, prolific and ill-fated freshwater live-bearers. Guppies and mollies may be used with great success and are, indeed, virtually essential for the maintenance of purely predatory fishes such as *Pterois*. Mollies are readily adaptable to marine water (where they may be found in the wild), and may be kept with the smaller varieties of tropical marines to provide live food actually born in the tank.

Guppies may be adapted to water of a comparatively high salinity (density 1.010-1.012), but not so readily to truly marine conditions (1.020-1.030). However, both mollies and guppies may be raised in fresh water and thrown straight into sea water, where they will live for up to half-an-hour. Our native marine fishes are also very keen on this form of food, and provided that the temperature is not too low, guppies and mollies will live in cold sea water until eaten.

TERRY HALL

Marine Study Aquatic Society of Great Britain

It Depends on the Shop!

I RATHER fancy that a number of dealers would take umbrage at Bill Armitage's remark that a pet shop 'is hardly the place' one would go to to buy a good strain of guppies (Guppy Comment, PET FISH MONTHLY, April). Pet shops, perhaps, but the pukka fish establishments?

High Hurstwood, Sussex

J. H. ESKIN

Aquaculturists (Live Foods) Ltd.

Standards and Judging

THE president of the Goldfish Society (PET FISH MONTHLY, March) knows too well that we of the tropical hobby will unfortunately never have a Dr Affleck to come along to the Standard Committee with live fish representing all that is best in the hobby at shows in the previous 3 years. The tropical hobby is many-sided and, as a one-time illustrator of Standards, with ichthyological pretensions, may I say that I would have been delighted to have seen one fish to accept and illustrate. No—I had to attempt to draw the imagined conception of perfection, and it fluctuated with the boundary of the hallucinations of the beholder.

However, I always tried to remember after 20 years one lesson I learned from Captain Betts himself, when

things were getting a bit warm around the collar, at meetings of the early F.B.A.S. He would point to his fantail shubunkins, which would have probably been a Bristol in Bristol or a nacreous nymph or a scaleless twintail raspberry etc., and say 'Don't forget chaps—we're here for the sake of this fellow, not for our arguments'.

Delighted I am to hear he is happy with the Standards after 18 years, but is it progress? Or are we old hands trenching in with 'what was good enough for me will have to be good enough for you'?

B. CALROW

Hendon Aquatic Society

Sulphadimidine and White Spot

IN a new edition of one of the popular aquarium books it is suggested that sulphadimidine sodium may be effective in the treatment of *Ichthyophthirius* ('white spot'). Recently I had an opportunity to test this.

The disease was introduced into two tanks with some newly purchased plants, despite washing of these in a Dettol solution. Spots were seen initially on a blue acara and within a few days had spread to some *Monodactylus argenteus* and red-tailed tetras. No spots appeared on the firemouths and *Aplochelichthys lineatus* that share the tanks. In the other infected tank only cardinals were affected.

One c.c. of 33% sulphadimidine sodium was added to every 7 gallons of water as soon as spots appeared, and repeated in 2 days as the disease was spreading. This seemed to halt the disease, but no improvement took place. On the sixth day, therefore, the tank temperature was raised from 75°F to 85°F, and 1 c.c. of 10% formal saline was added for every gallon of water, and repeated three times on alternate days. The spots disappeared from most fish in 3 days, but one *Monodactylus* took 5 days to be cured.

I conclude that the use of sulphadimidine sodium as described is inferior to established methods of curing white spot.

R. W. SCHOLES, B.V.M.S., M.R.C.V.S.

Cottery, Warwick.

Coastal Survey

THIS year, our Society intends to run a series of coastal surveys to determine the densities of population of some of the commoner species of littoral fauna. To enable us to undertake even the first phase of this operation we require all the assistance possible from the aquatic societies around our south and south-eastern coastline, with regards to details concerning tides, geology etc. We would be grateful if these societies could contact our P.R.O.—Mr A. S. Metzger (112 Brooke Drive, London, S.E.11) for further details.

Our outings are generally most enjoyable occasions as well as being an excuse for aquarists to meet friends and have a day by the sea.

GERALD JENNINGS

Marine Study Aquatic Society, G.B.

Thanks to Hounslow

MAY I, through the medium of your magazine, thank the Hounslow A.S., on behalf of Kingston & D. A.S. members who attended, for a most enjoyable evening at their first Convention on Saturday, 25th

February. The speaker for the evening, Mr Jim Kelly, not only made it an interesting evening. He also made it an entertaining one as well. If the club intend to run a Convention annually with speakers of Mr Kelly's calibre this will be a date to remember and could in a very short time be on par with the Hendon A.S. Conventions—the quality of which are of the highest standard, as all that have been to them know.

I, for one, hope that the Hounslow club will be having more Conventions. A lot more people will go now they know how good the last one was.

D. W. ELLIS
Chairman, Kingston & D. A.S.

Deeper Tanks

WE agree with Arpee in his 'Personal Comment' (PETFISH MONTHLY, March) recommending the greater use of deeper aquaria. The so-called standard tank depths of 12 in. and 15 in. do not do justice to plant life and restrict potential artistic layout.

We are perturbed by his experience of long delivery of non-standard aquaria. We can always supply quality aquaria of any size to our customers within 14 days and we extend this same service to any of your readers who are prepared to collect their order, it being impracticable to despatch glazed tanks.

Sutton-in-Ashfield,
Notts.

D. PEPPER AND J. BARRON
Aquapets

Good Home for Large Tropicals

THE EASTBOURNE A.S. are looking for any large tropical fishes to stock the local public aquarium they have taken over, so if any readers have tropicals which are outgrowing their tanks, and are at a loss to find a

Prize Letters

TO the writer of the letter judged by the Editor to be specially worthy among readers' letters published in each month's issue, PETFISH MONTHLY will award a prize of a well-known make of aquarium aerator (as pictured here).



PETFISH MONTHLY will be glad to have your experiences, comments, suggestions etc. in letters on any matter associated with fish-keeping. Write to the Editor, PETFISH MONTHLY, 554 Garratt Lane, London, S.W.17.

home for them, we should be pleased to accept. All offers greatly appreciated! We will collect within a sixty miles' radius. Please write to me at 6 Hurst Road, Eastbourne, Sussex.

C. GEORGE
Secretary, Eastbourne A.S.

Show Time

AT this time of the year schedules for the various shows held by aquarists' societies and clubs commence to be distributed, and with a view to 'clearing the air' so to speak, as far as the newcomer to the hobby of tropical fishkeeping is concerned, I submit these comments in the hope that they may assist in the understanding of some of the points on shows in general.

Mainly, shows can be divided into two categories: (1) 'one-day' or, as they are sometimes called, 'jar shows', and (2) shows of a duration exceeding one day. In both cases they can be 'open', i.e. those in which all comers can exhibit, or 'closed', which limit the exhibitors to certain clubs, areas or even to a particular club.

For the 'one-day' show equipment

required is minimal and therefore it can be staged with comparatively little expense. The staging on which the entries are displayed normally consists of wooden tables or benches, and no heating for the exhibits is provided. Lighting is generally that normally used in the hall in which the show is held.

By L. LITTLETON

Treasurer, Bristol Tropical Fish Club

To stage a show exceeding one day means that the organisers must own or have access to equipment costing a considerable sum of money, be it owned by an association of clubs or an individual club, and the use of a hall suitable for the purpose throughout the period of the show.

It will be appreciated that a combination of these circumstances

is not common, and therefore this class of show is not so frequently met with. From the experience of my own club, however, it has been found that, once the necessary equipment has been obtained, the advantages resulting from a two-day or longer show amply compensate for the additional effort involved.

In a 'one-day' show, the benching, judging, distribution of awards etc. all take place on the one day, usually Saturday or Sunday, depending upon which day a suitable venue is available. Entries are brought to the show by the exhibitors in the morning in square-faced glass containers, usually screw-top storage or sweet jars, and the fish remain in them throughout the show (hence the name 'jar show').

Entries on arrival at the show are booked in by the show secretary and

Continued on page 52

A course
for the
would-be
breeder of
tropicals

Part II

Breeding Neons and Cardinals

THIS topic has been left to the end of this series of articles for two special reasons, the first being that those aquarists who took the trouble to prepare the peat water, mentioned in my first article a year ago, should now have a supply of very soft acid water that is essential in breeding either of these beauties. The second reason is that breeding neons in captivity has, for years, been regarded as extremely difficult if not almost impossible.

Let me start by exploding this myth; once you have the right conditions, neons are easier to breed and raise than zebra danios or any other species regarded as simple, even to beginners.

Let me qualify this statement: to breed any species of fish the water conditions have to approximate to those found in Nature where the species abounds, because the eggs are accustomed to that water and have been so for millions of years. If a certain fish inhabits soft, acid water the egg membrane is constructed to withstand these conditions. But place these eggs in hard alkaline water containing calcium carbonate and magnesium salts, and the egg membrane which is not equipped to cope with these will break down, allow water and bacteria to enter and the embryo will be killed.

Such species as zebra danios, black line tetras etc. produce eggs that can survive in water with a medium but fairly wide range of pH and hardness. Rainwater is within this range, and since rainwater is readily procurable in this country the eggs of such fishes are unharmed and hatch and the species is considered easy to breed.

Neon and cardinal eggs are not used to such conditions and require much softer water—this is not so easy to obtain in this country and aquarists kept on trying to use the readily procurable wrong water, always failing, and these species earned the reputation of being unbreedable.

Fish eggs cannot protect themselves from salts in the water, bacteria which may puncture them, snails which may devour them and many other hazards. Thus one can say that the spawned egg is probably in its most vulnerable stage until it is hatched. Zebra danio eggs take from 5 to 8 days to hatch, neon eggs take from 5 to 30 hours. Thus the highly vulnerable time for neon eggs is much shorter than that for zebra danio eggs, hence my statement that given the right conditions neons are easier to hatch and raise than zebra danios.

By **D. B. McINERNY**
(McLynn's Aquarium)



pH is difficult to stabilise. At night there is more carbon dioxide in the water—plants during darkness absorb oxygen and give off carbon dioxide and down will go the pH. During the hours of light plants absorb carbon dioxide and give off oxygen and up goes the pH. This happens just the same in Nature as in your tank, and realising this I did not bother too much about pH. But what about hardness? This does not jump up and down each day and night and though it may change very slightly over a period of months, when rain falls upon the surrounding land, swamps, mountains, be whatever they are, the water seeping through into pools or rivers will always be much the same.

So, finding that neon eggs would not hatch in hard water, I decided to experiment with softer water. The first thing to spring to mind was distilled water and so I used it. My fears were confirmed: it was too pure, too dead to be anything like natural and so I had to start with natural rainwater and reduce the hardness bit by bit.

I purchased a hardness testing kit and by titration tested the rainwater taken from a roof tiled with asbestos sheeting; the total hardness reading was 65 p.p.m. More rainwater was collected from a glass roof and here the reading was only 15 p.p.m. The neons spawned in this, as they had done in much harder water, but not a single egg hatched.

A bath full of this water was collected and into this was tipped buckets of broken-up peat. The peat floated on the water but after several months it became waterlogged and sank. Now the water turned a pale amber colour, and some was siphoned off and neons were placed in it. They spawned but again not one egg hatched; the reading taken showed the water now had

Continued on page 64

Skimmers in the Marine Aquarium

Skimmers

By ERWIN SANDER

Aquarium skimmers are not filters. The skimmer plays a supporting role to the filter and is not intended to be used instead of a filter. However, protein and other substances which occur as a 'colloidal solution' in sea water containing fish and other animals and which are not removed by filter media can be caused to aggregate and be eliminated by the use of a skimmer. Such substances are likely sources of pollution in the marine aquarium if they accumulate in the water. The oxidizing effect of ozone can be put to use advantageously with a protein-skimmer. Although the production of skimmers on a large scale has not yet been undertaken by manufacturers it should be pointed out that some of the models described here are protected by patents.

THE protein-skimmer is a device for the purification of sea water and works on the principle of flotation, a process which also has industrial applications. Skimmers are not the invention of any one individual, who, following an initial impulse, developed the exact idea overnight, but are the product of minor findings over a period of years by aquarium experts who in addition to finding pleasure in aquarium-keeping also found pleasure in research.

For example, firstly Guido Hückstedt in his book *AQUARIENTECHNIK* described under the name *Kontaktrohr* a skimmer that is still much used today in a somewhat modified form by aquarists. Several members of scientific circles which meet in Wuppertal, Germany, together with Herr Eynöthen, have concerned themselves intensively with the phenomenon of protein-skimming in sea water. At first prototypes were passed on from one friend to another, and the name 'protein-skimmer' still did not exist. Some producers hit upon very interesting designs whose functions and method of construction will be described below.

All protein-skimmers have in common that they, by means of a stream of fine bubbles of air or an air/ozone mixture, skim off the protein colloids which are present in sea water and accordingly eliminate from the water substances that would not be removed by the usual filters and which, if left, would take part in the process of putrefaction.

Three different principles of construction can be distinguished in the various skimmers described up to the present time: (1) protein-skimming by the direct current principle; (2) protein-skimming by the counter-current principle; (3) protein-skimming by the rotation principle.

These protein-skimmers differ in their motive power and their efficiency, and the efficiency is related to motive power. This statement can be regarded as a precept. Efficiency of skimming cannot be higher than the energy introduced into the skimming process. Whoever would convince himself of this, I ask him to put all three types

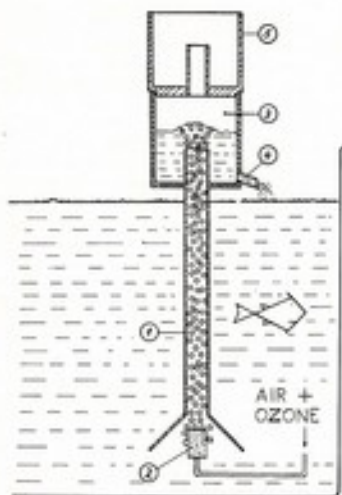


Figure 1. Protein-skimming by the direct current principle. The numbers are identified in the text

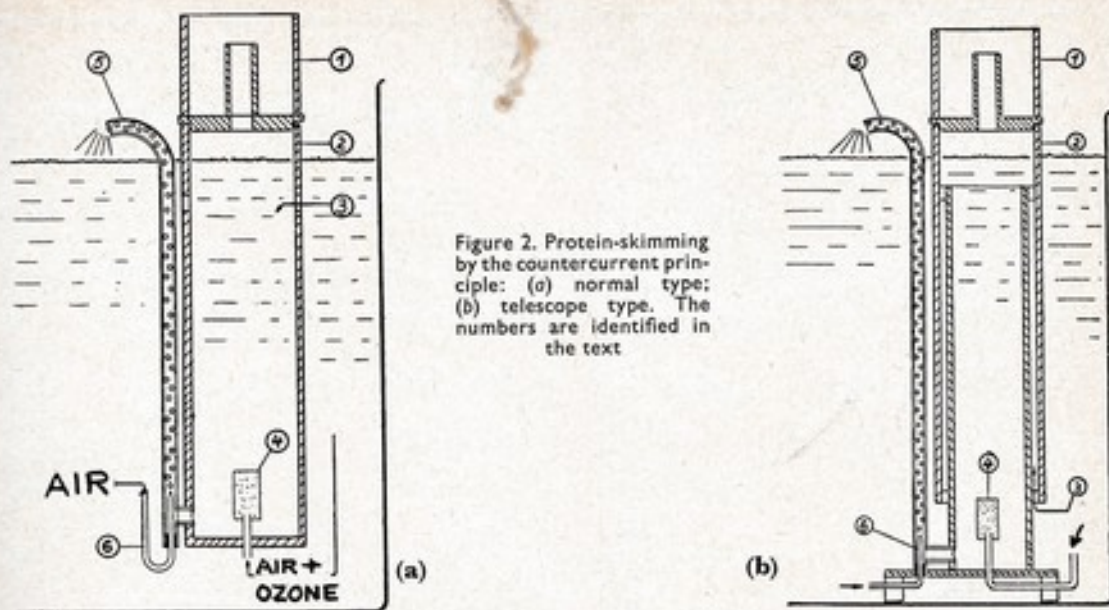


Figure 2. Protein-skimming by the countercurrent principle: (a) normal type; (b) telescope type. The numbers are identified in the text.

of protein-skimmers to work in one and the same water at the same time and he will prove thereby that only the machine which is propelled by the highest energy output will yield skimmings.

Skimming by Direct Current

In protein-skimmers using this principle of operation the skimming effect is provided simultaneously with an upward current of water achieved by the well-known air-lift method. In Figure 1 the water is seen to be lifted through a vertical tube (1) by the stream of air or air plus ozone bubbles from a diffuser (2). The protein colloids are caught in the separation chamber (3) as a frothy scum which separates from the clean water and slowly builds up in the scum beaker (5). The clean water returns to the aquarium through the outlet pipe (4). The advantages of this apparatus are apparent: there is little operating equipment, only a small aquarium air pump connected to the diffuser being required.

Unfortunately this apparatus has a very high emptying effect; also, only a very small part of the protein colloids found in water are skimmed off, and the rest fed back into the aquarium water. The time of contact between the water and the air is all too short, and this disadvantage also applies when the protein-skimmer is run additionally with ozone. The time simply does not suffice to coagulate the loose particles and to bring about the skimming phase.

Skimming by Countercurrent

This model is a further development of the contact cylinder described by G. Hückstedt. It was an essential feature of this design to move the water in countercurrent from the air plus ozone mixture and thus increase the contact time.

Figure 2 shows the operation of this type of skimmer. The scum beaker (1) fits at the top of the wide contact

tube (2). Water enters this tube at (3), either through a ring of holes in its wall close to the top or, in a 'telescope' modification of the apparatus (Figure 2b), through the gap between the wall of the tube and an inner tube of slightly smaller diameter. Water leaves the contact tube, in which it meets the air plus ozone stream from the diffuser (4), near the base of the tube, to be returned to the tank through the return pipe (5). It is caused to move up this pipe by the air stream from a simple nozzle (6).

It is evident that with the large diameter of the contact tube the mixture of air and ozone streaming out of the diffuser (4) can have an effect on the individual protein colloids for a relatively long period. This effect is added to by the fact that the water flows in opposition to the rising air plus ozone.

In the operation of this model, the following must without fail be observed: the cross section of the reaction tube (2) must be filled completely and wholly with the air plus ozone bubbles or else the skimming effect does not take place; the smaller the air plus ozone bubbles streaming out of the diffuser (4) the greater is the skimming effect.

A countercurrent protein-skimmer should, to attain a particularly high efficiency, be as long as the aquarium is high. The longer the tube the greater the time the air plus ozone takes to get from the diffuser (4) to the separation chamber between the water level and the scum beaker (1). Some aquarium specialists have applied this to advantage by placing the protein-skimmer by the side of the aquarium, and consequently have an effective height of 4 to 5 feet at their disposal.

The advantages of this model are quite obvious: the contact time of the water, protein, air and ozone molecules which take part in this process is increased and at the same time the efficiency. One can clearly see a decrease in formation of scum after the ozone apparatus has been switched off. These advantages are obtained

Aquarium-Skimmers of the Rotation Type

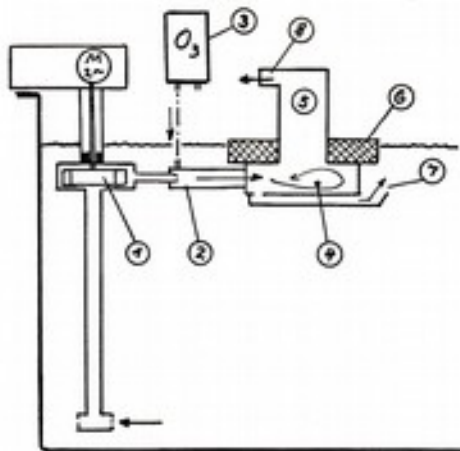


Figure 3. Protein-skimming by the rotation principle. (1) Immersion centrifugal pump. (2) Injector tube. (3) Ozonizer. (4) Separation chamber. (5) Scum beaker. (6) Float. (7) Clean water. (8) Exit for scum.

Figure 4 (right). Cross-section of the separation chamber shown in Figure 3 (plan view).

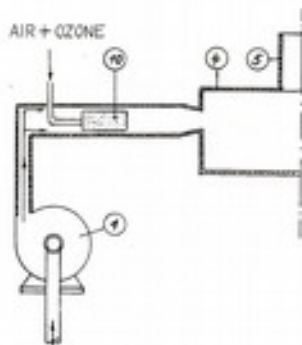
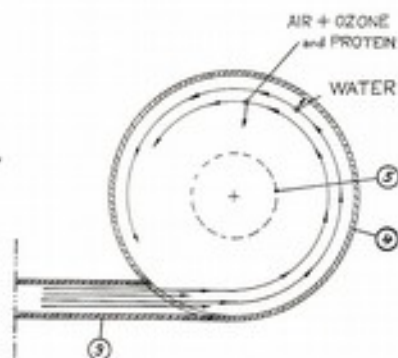


Figure 5. Use of a diffuser stone (10) to blend air, ozone and water before passage into the separation chamber (4) in protein-skimming by the rotation principle.

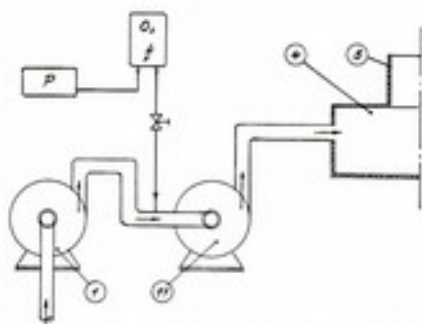


Figure 6. Use of a second centrifugal pump (11) to blend water, air from an aerator (P) and ozone from an ozonizer (O₃) in protein-skimming by the rotation principle.

by the particularly good construction, but there is also a drawback: the energy requirement is high. So the rule mentioned at the beginning becomes evident. No result without expenditure of energy. For a counter-current skimmer with an internal diameter of about $\frac{1}{4}$ inch at least 200 litres of air/hour will be needed.

Skimming by Rotation

The rotation skimmer (Figure 3) works fundamentally with a centrifugal pump (1) which takes in the air plus ozone mixture over the injector (2), mixes it up with the water and introduces it into the separation chamber (4).

The function of the separation chamber is shown in Figure 4. The water plus air plus ozone mixture is directed at a tangent through the connexion (3) into the separation chamber (4). By this means a circular motion is produced in the separation chamber which develops the necessary centrifugal forces and the opposing forces associated with them. As the water is heavier than air, ozone and protein particles, a separation now sets in very quickly, and this is necessarily hastened through the frothy air plus ozone mixture which has been made. Owing to the relatively high energy involved here, the whole scum will be forced to the middle and conveyed into the scum beaker (5). The efficacy is astonishing.

The equipment is foolproof in operation. Only almost dry skimmings will be produced. Over-running of the skimming phase is as good as out of the question. Also here one can perceive very clearly the coagulating effect of ozone. One needs only to turn off the ozonizer for a short while and at once the scum in the scum beaker (5) sinks down to half.

One problem was the admittance of the air plus ozone mixture over the injector. The bubbles were relatively large and because the efficiency of the protein-skimmer is influenced by the size of the bubbles one ingenious manufacturer substituted a diffuser for the injector, over which the water coming out of the centrifugal pump (1) was directed (Figure 5). The relatively large air plus ozone bubbles flowing out of the stone (10) are dispersed by the water stream, i.e. each bubble is divided into 20 small bubbles. Because of this the scum-formation is enormous and not surpassed by any of the systems described before.

For the sake of completeness yet a further system for the production of the finest air bubbles should be described. With this no diffuser stone, which necessarily sooner or later will become stopped up, is used. For this two centrifugal pumps are needed (Figure 6).

The first pump (1), as in each of the previously described cases, takes the water from the aquarium. On the way from this pump (1) to the second pump (11) an air plus ozone mixture is introduced into the water, that will in pump (11) be broken up into the finest bubbles. The chemical reaction accordingly begins in the second pump (11), so that in the separation chamber (4) only a separation of the particles that have already reacted results.

General Principles of Protein-Skimmers

A protein-skimmer is not a filter. Particles which are heavier than water pass through the protein-skimmer without being removed by the flotation process. Even

suspended particles such as floating algae will only partly be taken up by this process. In other words a protein-skimmer should support the action of a filter and does not take its place. Since the ozone introduced into the protein-skimmer should have only the action of a catalyst, over-dosage with ozone should be avoided; in fact, with too high a dose of ozone the scum gets less. One can accept as a rough formula that with a circulation of about 20 gallons/hour about 4 milligrams of ozone/hour should be introduced.

A protein-skimmer can also be made to work as an ozone-reactor. For example, when as the result of death of a sea anemone a suspended green algae formation appeared in one of my tanks, I fed 200 milligrams of ozone/hour into the protein-skimmer and in this way all the floating algae were destroyed and transported to the scum beaker as dry crystalline scum. If one wishes to imitate this experiment, it is absolutely essential that the water emitting from the protein-skimmer is additionally filtered through carbon to absorb the ozone which remains in the water. If this precaution is not taken, after a few hours all the fish will be dead. Strangely, sea anemones survive even the highest concentrations of ozone.

There are too few sea water aquarium-keepers for the production of protein-skimmers on a big scale to be worth while. It can only therefore be the business of an idealist to concern himself with this type of equipment. It would be a good thing if other aquarium specialists were to present their experiences of protein-skimmers and ideas for improvement of these in PETFISH MONTHLY for us all to perfect our common ideal.



Show Time

Continued from page 46

placed on the show bench in their respective classes to await judging, which generally takes place from 12.30 onwards. At the conclusion of the judging the general public are admitted to view the exhibits, and awards are presented from 4.0 p.m. onwards.

It will be appreciated that whilst fish can be contained in a small container with reasonable safety for the period required by a 'one-day' show, water and temperature requirements demand other more permanent arrangements for a show of longer duration.

We therefore find that in the longer shows separate tanks about 12 in. by 8 in. by 8 in. are provided for each exhibit, with adequate staging on which to display them to advantage, and a system of heating beneath the tanks maintains the water in them at a comfortable temperature. Instead of remaining in the container in which they are brought to the show, the entries are transferred to these tanks by the exhibitor when bringing them for benching on the evening before the opening.

The benching and heating facilities used by the Bristol Tropical Fish Club at their 'three-day' show in June, 1966, proved entirely successful. Temperature of the entries throughout the show remained between 75° and 80°F (24-27°C) and not one fish was lost whilst on show. The hall lighting was reinforced by additional lights suspended above the exhibits, resulting in all the fish being seen to the best advantage, a fact greatly appreciated by the judges and visitors to the show.

Doubts were expressed in some instances about whether the fish would stand up to the three days without distress. I am happy to say that the general opinion at the conclusion of the show was that the fish looked very content and in fact appeared in better condition than when first benched. This year we are repeating our Show on 22nd, 23rd and 24th June and we are hoping that those who had doubts last year will, in the light of the results shown in 1966, be satisfied



Rocks

What decorative rocks, apart from Westmorland, would you recommend for the tropical aquarium?

Other suitable rocks are all types of granite, red white-veined Mendip mountain rock, grey and red sandstone, Devon black rock, Somerset stone, Cornish stone, Welsh stone.

Water Movement

Will fish in an uncrowded, un-aerated tank be smaller than those in a tank with aeration/filtration?

It is possible that fish in a tank with aeration/filtration will be larger than those in an un-aerated tank, even though this may not be overcrowded, as the water movement created by the aeration does seem to stimulate the growth of the fishes swimming against the current.

Overfeeding

I have about 20 guppy fry in a small

task which I cannot keep clear of a thick dark-green slime. I have twice cleaned the tank out but after a week the gravel is covered again. The fry are fed with only a few drops of soluble fry food daily so it would not seem to be due to overfeeding.

This slime is, in fact, a particularly persistent and strong-growing algae, and its growth is almost certainly being encouraged by excess of food. Since you feed it very sparingly it would seem that the fry have grown beyond the stage at which they will take such tiny particles as those in the suspension and are not eating it because it is too small. Guppy young particularly will take fine-particle dried food from soon after birth.

It is much easier to keep a fry tank clean if it contains no gravel and only floating plants. If gravel is to be put in the tank, then the tank must also be well planted.

More queries are answered on page 58

that three-day shows are quite practicable.

Sent with the schedule for these longer shows will be an entry form, in duplicate, which would-be exhibitors are requested to return to the show secretary by a certain date, usually about one week before the first day of the show. On it the exhibitor is asked to state details of intended entries. It cannot be stressed how important it is that these entry forms are returned, correctly completed, by the closing date stipulated.

The organisers of the show cannot set out the tanks in their respective classes correctly, allocate staging space and calculate the heating requirements or install them unless they know how many entries are forthcoming before the show commences. Neither can they, if they do not know who is exhibiting or what

fish are being entered, be expected to produce a satisfactory programme giving all these details and others in time for it to be available to competitors and visitors as soon as the show opens. Printing requirements are such that a week is necessary for production of the programme.

For the mutual benefit of exhibitors and organisers at all shows can I ask aquarists to make a special effort to comply with closing date requirements. It is not much to ask but it does make show life so much easier.

I hope all those having had the patience to read these notes may be a little wiser, and may I, in conclusion, wish them every success in their showing, be they 'old hands' or 'newcomers' to our wonderful hobby. Believe me it can be great fun and the cause of considerable satisfaction.



Guppy Comment

By
BILL ARMITAGE

SOME guppy breeders are of the opinion that the problem of split fins cannot be solved, and are content to leave matters as they are. This attitude is altogether wrong, and not in keeping with the true traditions of the guppy cult. While fin splitting is not a very serious threat at present it could become a menace in the near future. As the pioneer breeders thought that rough rocks and sharp-leaved plants etc. were the cause, it is quite understandable why it is only in the last few years that the heredity factor has even been considered.

If the fault does lie in the breeding, as it has been suggested, it will most certainly take an enormous amount of research to find a solution. As far as it is known very little has been done collectively in this direction. The late W. G. Phillips carried out a considerable amount of research with negative results. But one would imagine individual effort to be totally inadequate when dealing with a matter that is so complex. If interested readers will co-operate by letting me have their views, together with the results of any experiments they may have undertaken, it could be a step towards solving this knotty problem.

It is an astounding fact that although the specialist guppy clubs should always be looking for new members little or nothing is being done to encourage recruitment. The various sections of these clubs hold table shows at regular intervals—shows that should be the shop windows of the fancy. At present the only incentive to exhibit at these shows are prize cards. While a card may be considered sufficient reward for winning in a class for a dedicated breeder it is probably considered by the prospective mem-

ber a paltry award when compared with the prizes offered by other livestock hobbies.

We are all aware that when showing livestock it is very unlikely that one will even clear expenses such as entry fees, transport etc. but with a card as the only return it is not only improbable but a sheer impossibility. If the section committees are satisfied with the income from the present entry fee why not increase it and distribute the increases as prize money?

In this there would be satisfaction all round: the successful exhibitor would receive not only a card but a prize as well, the quality of the exhibits would be greatly increased, the prospective member would be induced to join by the extra attractions, and the sections would accordingly have an increased membership. This is admittedly a revolutionary idea, but guppy breeders will no doubt agree it is constructive and progressive. I will be pleased to hear from readers who may have similar ideas.

There are tens of thousands of aquarists in Britain today without any particular inclination or affiliation. If only one in a hundred could be persuaded to join the ranks of the guppy breeder who knows what could be achieved.

A date to remember is Sunday, 4th June 1967, the date fixed for the second International Guppy Show. The venue is The Drill Hall, Ardwick Green, Manchester, the same as last year. It is easily accessible from all parts and has plenty of parking space. This show is the most important fixture of the year for members of the F.G.A. The extended classification of 24 classes, with classes for non-members, will attract entries from all over Britain

and provide a most interesting spectacle not only for the guppy breeder, but all aquarists. For non-members wishing to try out their guppies, this is the show. They will be judged by some of the best guppy judges in the world.

As announced in April's issue of PETFISH MONTHLY a meeting has been held jointly between the Federation of Guppy Breeders Societies and the Fancy Guppy Association. Here is a summary of the report that has been issued since the meeting.

The chairman of the F.G.B.S., Mr Ken Pearce, laid the framework of the meeting in his opening address, when he said that aquarists throughout the country and indeed throughout the world were reluctant to accept that there was room for two sets of standards and it would seem that it was time for the two specialist organisations to cease travelling along parallel roads with a high wall between them. Mr Jim Kelly, for the F.G.A., stressed that, while it might be much too early to talk about an amalgamation of the two bodies, the production of one set of standards would, in itself, be a triumph.

A very full and frank discussion then took place in which views were exchanged on a great variety of subjects, including guppy varieties such as roundtail males, pin tails, spear tails, delta tails and, more dangerously perhaps, the veil tail; and members of both organisations were found to be putting forward views that had formerly been attributed exclusively to the other! In fact, any division of opinion seemed to be more along the lines of

Continued on page 55

What is Biological Filtration? — 2

Simple Biological Filters

By Capt. L. C. BETTS

As explained in the first article of this series, the underlying principle of an aquarium biological filter is the development of a zoogeal film, on a hard insoluble medium, which will feed on the impurities that accrue with time in any aquarium water containing fishes. This sort of film will form anyway on the sides and bottom of the aquarium and the object is to provide additional surface areas in which the film will grow.

To increase the filtering action, it is obvious that the efficiency will be improved upon if the water is moving and not still. A high degree of efficiency, however, is not necessary as the load of impurities in aquarium water is low when compared with, say, that in sewage. Because of this, satisfactory results are obtained with the medium submerged, so that the filter can be inside the aquarium, thus reducing or rather obviating the risk of flooding. If, however, the water from the aquarium is sprayed over the medium with the filter placed externally a much higher efficiency will result. But for average conditions then, an internal filter is adequate.

The simplicity of an elementary type of biological filter is its worst advocate, and many aquarists are strangely unwilling to try it. Each breeding season the writer installs one for no more than the cost of a 6 inch plastic funnel and a length of $\frac{1}{2}$ in. plastic air line, and the installation takes less than 10 minutes to fix up. Fry newly hatched, in a matter of 48 hours, are soon at the surface layers of the water asking for relief which an ordinary air diffuser never really satisfies.

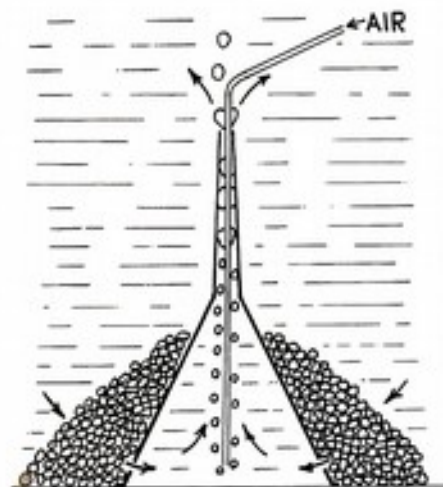
The funnel, which has been perforated with a leather punch to give $\frac{1}{4}$ in. holes round the outer lip, is placed upside down on the aquarium bottom and six large handfuls of washed $\frac{1}{2}$ in. shingle are placed on and around it. Previously the air line has been inserted into the neck of the funnel and connected to an air pump. Once the air starts to run the water is drawn through the shingle, through the punched holes and water and air is drawn through the neck of the funnel out and up to the surface. This simple but expedient filter will successfully maintain 200 goldfish fry in a 36 in. by 18 in. by 18 in. tank for 4 to 6 weeks until they are ready to be sorted for size and quality.

Semi-permanent types of filter employ the shingle covering the bottom of the tank as the filter medium. By building a false bottom to the tank of perforated sheet plastic, the shingle is suspended above this to permit the water to pass through it and be lifted by air line to the surface. Another method uses perforated plastic tubing

buried in the aquarium shingle, but the mechanics involved is the same. Provided that the passage of the water is uniformly distributed over the whole of the shingle bed, the water must receive the maximum purification. This type of filter can be worked satisfactorily with a cheap diaphragm A.C. air pump and the reliability and efficiency is directly related to that of the air pump.

Since air is used to lift the water it is obvious that not only is the water purified by biological action but it is also aerated at the same time, and perhaps a little discourse on the functioning of an air-lift would not be amiss.

Despite advocates who make big claims for good results by producing high concentrations of dissolved



Simple type of biological filter made from a plastic funnel surrounded by gravel, as described in the text. The air line can be sealed into a hole made in the side of the funnel and the shingle can be contained in a shallow bowl

oxygen in water by blowing air into it, unfortunately the results do not justify the claims.

Air released into water quickly reaches the surface and dissipates itself before the full (saturation) amount of oxygen can be dissolved. Oxygen is only a constituent part of air (nitrogen 80%, oxygen 20%) and the second or so that the air is in contact with the water is not long enough to have very much effect. Under aquarium conditions maybe 5% is utilised. It follows therefore that the slower the air reaches the water surface, the greater the uptake will be. A much more reliable source is where the bubble breaks the surface, for here the area can be extended as far as the four sides of the aquarium and the full effect of aeration at the interface of air and water is obtained.

Air-lift Essentials

An air-lift, to be really functional therefore, requires two essentials to be satisfied: a design to slow up the release of the air and a point of delivery that will give the maximum agitation to the water surface. A simple way to slow up the air/water flow is to insert an expansion chamber in the delivery tube.

This can be done by taking, say, 3 in. of 1 in. plastic tubing and inserting it just above the point of entry of the air line. The 1 in. tubing can be squeezed over the 1/2 in. delivery line by using a rubber grommet, and another rubber grommet will secure the 1/2 in. tubing for final delivery just below the surface of the water. In operation the air bubbles will bounce around inside the enlarged area of the delivery tube before forcing themselves out through the restricted delivery tube.

The maximum agitation of the water surface will be obtained by placing the delivery tube to one corner of the aquarium and bending the end of the delivery tube to induce the flow of air/water along the surface of the water instead of just bubbling out of an open ended tube. A filter so made and installed will set up a cycle in which the water ejected from the air-lift will pass in a wave motion across the tank, down through the bulk of water, through the clinker bottom to be purified and up through the

air-lift to be finally aerated at the surface.

Approximate figures for oxygen content for a filtered water against a non-filtered water are 5 to 6 parts per million and 2 to 3 p.p.m. respectively, or put another way 55% and 25% saturation. Readers may be wondering how fishes can live on so low a percentage saturation and why 100% saturation with oxygen is not required. Fishes in the trout category cannot live in water with less than 80% saturation, but members of the carp family are much more amenable to a range of 30 to 80%.

However, carp are susceptible to sudden fluctuation in the percentage saturation. It follows then that goldfish maintained at around 60% saturation, which is a normal one for filtered water, become debilitated when placed in unfiltered water, and aquarists committed to filtration must continue this without cessation or the fish will lose condition.

This is not an argument against filtration, for no aquarium should be operated without a filter, but rather a clear statement of policy that should have been laid down years ago, thus saving the hundreds of thousands of people who have entered the hobby and left it because they were unable to keep their fishes alive.

A biological filter will work without attention for at least 6 months. During this time all that will be needed is a topping up to maintain the water level. The water itself will have deteriorated slightly in that the concentration of nitrates will have risen and reached a point where the digestion of the fishes may become affected. Slight patches of congestion in the fins would be an indication of this, and the excreta would be thin and loose instead of firm and slightly stringy.

A simple remedy is to dismantle the filter and lightly wash the clinker under the tap. This will remove the sloughings from the zoogeal film and other accumulated debris, and once re-set the aquarium is ready for another 6 months. If, however, the filter is self-contained as opposed to a bottom medium type then the wash and change of water should not exceed 3-monthly intervals.

Next time we will discuss a similar system of filtration for the aquarist with more than one tank and how it is possible to link up the tanks employing only one pump yet giving each tank a separate filter.

Guppy Comment

Continued from page 53

individual disagreement than between official thinking within the two organisations, and the motion put forward by Mr Pearce that the Judges and Standards Committees of both the F.G.B.S. and the F.G.A. should meet and seize the opportunity to try to find a common denominator was carried unanimously.

On the subject of open shows, the

discussion centred round a search for a means whereby common standards to be used by both organisations could be found as a basis for holding a joint show. A suggestion that a combined show using both the present sets of standards might be held did not find favour on the ground that this might well cause further division. It was decided that the resolving of details of show procedure (items such as open classes, award of trophies, numbers of judges) could only usefully be undertaken after the societies had got together on the question of standards. Differences in provincial organisation were also

discussed freely.

Altogether it was a most fruitful meeting, best summed up in the official words: 'Whatever should come about as a result of this afternoon's work, it is quite obvious that things can never be quite the same again. A mistrust of each other's motives and aspirations had been dissolved, and it has now been revealed that here we have two bodies interested in but one object—the propagation and dissemination of good guppies that can be enjoyed by all; and it is our most fervent hope that the seeds that have been germinated may grow, flourish and bear fruit'.

Marineland of Florida



By JIM KELLY

Cruising past remnants of a sunken ship, the sandbar shark is only one of the many large and small specimens of saltwater fishes exhibited at Marineland of Florida. About 3,000 live specimens of 125 species of marine life are displayed. Oceanarium is a word originally coined by the marine attraction to describe its exhibit of marine specimens living together much as in the open sea. . . unlike conventional aquariums, where various species are separated.

Photographs by Marineland of Florida

A film about jungle life deep in the wilds of Indo-China seems far removed from keeping fish in captivity but it was such an expedition that set off the chain of events that culminated in the building of **MARINELAND OF FLORIDA**

ON 23rd June, 1938, whilst we in Europe were experiencing the 'phony war', W. Douglas Burden and Ilya Tolstoy (grandson of the famous Russian writer) were preparing for a battle of their own, that of trying to successfully keep large fish and marine animals in captivity.

When attempting to film animals in the jungle, these two experts had found their efforts thwarted because the creatures would soon dash out of focus, and it wasn't until they built a large enclosure to keep the animals within camera range that their efforts were successful.

If these animals could be corralled, they thought, why not the elusive and, then, seldom-photographed, creatures of the sea? All one needs is to contain the fish.

After a long search for a suitable site to build their huge tank 'corrals', they settled on a strip of beach on the Atlantic coastline of Florida, sandwiched between St Augustine and Daytona Beach; the strip of sand between inland waterway and ocean had ample clear water and easy availability for collecting the desired marine specimens.

Like all pioneers, they had their difficulties and setbacks. They hoped their 'fish set-up' would attract large crowds to the area, and when they detailed a young negro boy to sit by the A1A Highway nearby and count the cars that passed, the fact that the most he counted in any single day was only six didn't put them off one iota! But on the day it was opened to the public, more than 30,000 visitors poured in to see this new venture to aid man's understanding of nature.

From its modest beginning, Marine Studios (as it was then called) has now grown into Marineland of Florida, and on those shores one discovers a world more wonderful than any words can convey, the sort of magic that cannot, like a specimen, be pinned down on a board for meticulous dissection, the place where beauty and the beast are found together.

As it is approached Marineland looks like some monster vehicle designed to visit the moon, more in keeping with a space project or oil installation, but the sense of space continues as we see our first tank, the circular Oceanarium, 75 feet in diameter, 12 feet deep and holding some 400,000 gallons of freshly pumped and filtered sea water.

Here is the home of the permanent colony of porpoises. Derived from the French, *porc poisson*, porpoise simply means pig fish; European fishermen, fearing that these huge creatures would eat up all the fish, christened it with this abusive tag.

Yet this talk that porpoises are insatiable eaters (consuming 'their own weight in food in a day'), is unfounded. Tests and inquiries carried out have proved that the average creature eats only between 15 and 20 pounds, and for their huge bulk, this isn't much; to act according to their accusers they would have to increase that poundage to around the 500 mark!

A porpoise, though fish-like, is a member of the whale family, an air-breathing mammal that has to rise to the surface regularly to take in air through the blow hole in the top of the head. They have been recorded as staying

submerged for as long as 7 minutes but only in an emergency.

Though possessing from 60 to 100 teeth (shaped like pegs), porpoises swallow their fish diet whole; how long they live has not been fully verified but it is believed to be as long as 40 years.

The occupants of this great circular tank can be viewed through 100 large viewing ports below decks, made from Tuflex glass, so strong that a 14 feet sheet will support a full grown elephant. These windows are double thickness to withstand the tremendous pressures from the water. Through the windows the human divers going about their work on the tank bed can also be seen and one cannot help a twinge of envy.

Keeping this large amount of water clean is a problem, and it has been solved by having a regular flow of ocean water pouring through at the rate of 2,500 gallons a minute.

As well as the porpoises mentioned this circular oceanarium houses turtles, groupers and a host of smaller fishes, the last-named always ready to dash for cover when the big inhabitants approach.

The show staged for visitors begins here and we start by climbing back into the Florida sunshine up to the circular walk round the top of the pool. After seeing the smaller fishes feed below we can now start our pulses racing as the larger occupants leap out of the water to take fish from the hand of the attendant.

This part of the show over we go down the stone staircase into the Wonders of the Deep exhibit, where in a familiar setting to aquarists are to be found the jewels of the sea.

In showcase type aquaria are shown over 3,000 specimens covering 150 species, and though their shape may be familiar their names often are not.

Collected in and around the coral reefs of the Florida Keys and Bahama Islands, here are the beautiful and deadly, large and small, fishes swimming against the simulated reef decor background.

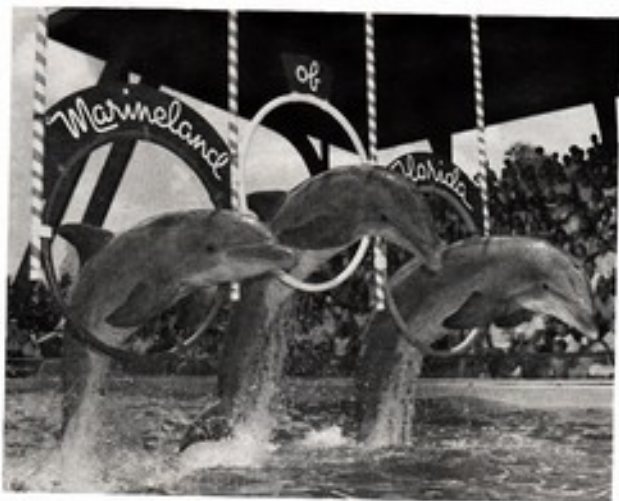
Next we move on to the rectangular Oceanarium, 100 feet long, 40 feet wide and 18 feet deep in the centre. Here are to be found the villains of the piece: huge sharks, barracuda, sting rays and moray eels, the last-named noted for their great length, short dispositions and painful bites.

Seeing the sharks reminded me that it was from the closure of the studios during World War 2 and the researches of many people, including Marineland's Douglas Burden and Stewart Springer, that a shark repellent was discovered. Just how many shipwrecked seamen or shot-down fliers this repellent saved we don't know, but we do know that Marineland played its part in this life-saving piece of research.

Whoosh! It was unnerving to see that 12-foot tiger shark turn within a few inches of our faces and comforting to think we had the porthole and its safety between us; as we watch him swim leisurely away he disappears into the interior of the old sunken shipwreck, a novel and authentic touch to the whole scene.

For refreshments after such excitement there is the

A trio of aquabats perform a difficult triple-hoop jump at Marineland of Florida in a demonstration of perfect synchronization. Marineland of Florida was first to successfully maintain a colony of porpoises in captivity over a prolonged period. Now in its 28th year of exhibition, Marineland has become synonymous with trained bottlenosed porpoises. Six times daily, after Oceanarium feedings, these amazing animals perform before audiences in the Porpoise Stadium



Dolphin Restaurant, in which we have the choice of the Sea Horse Lunch Room or Moby Dick Lounge; the latter features a whaling decor and a ship's bar that actually rocks. I felt a little out of place asking for my usual plate of scampi in such surroundings!

Suitably refreshed, we move on and take our places in the 1,000-seater stadium for the 'trademark' of Marineland, the Porpoise Display (six complete shows daily).

Here we really see just how intelligent these mammals are as they play football and basketball, leap through hoops: one leaps 16 feet in the air to recover a baton from the end of a pole and then returns it to the trainer! But if there ever was a show-stopper, and in my opinion, the whole show is in that category, it is the sight of a dolphin in harness pulling a dog round the tank on a surfboard.

All this developed from experiments started in 1949, when members of the Marineland team decided to

assess the ability of these animals to learn. Today, delving into what surely must have been yesterday's science fiction, these scientists have found that porpoises 'talk', and are finding from the mammals about their system of communication.

Marineland has a well-established Research Laboratory. Here the staffs work diligently to solve the many biological and chemical problems that arise from keeping fishes in captivity; their published findings over three decades have thrown new 'light' on the darkened deep. Qualified investigators wishing to undertake serious scientific work are always welcome and the use of the laboratory and facilities is quite free.

With the applause for the porpoises' latest trick still ringing in my ears my day at Marineland of Florida was over. A day I shall remember.

I wish to acknowledge the help and advice of Richard W. Edgerton, resident Director of Marineland of Florida.

Readers' Queries Answered

Hormones

I wish to obtain some 'anterior pituitary waste' to feed to my velifera mollies. I do not intend to show the mollies, but wish to grow them to a really good size.

Hormone preparations for use by fishkeepers appear to be readily available in the U.S.A. but here their distribution is regulated by issue on

prescription only. Many of them are, of course, potentially harmful to humans or are liable to be mis-used. Your local veterinary surgeon would probably be prepared to co-operate with you, but it would almost certainly involve buying the rather expensive purified preparation on the market, since the material you mention would be obtainable only from the manufacturer's laboratories in the U.S.A.

Acara Breeding

Two of my four blue acaras have paired up and laid eggs. Should I remove the other two fish from the tank?

If the tank is less than 36 in. in length, the presence of the breeding pair will certainly lead to battles and possible damage to some of the fish. In a large tank they might be content to keep one end for their own use, but they will fight other fish approaching their area and there is the risk that they will want the whole of the tank. It is always advisable to give the breeders a tank to themselves.

Catfish of the genus *Corydoras*

Corydoras aeneus

aeneus schultzei
agassizii
ambiacus
arcuatus
arcuatus
australe
axelrodi
barbatus
bondi
brevirostris
caquetiae
cervinus
cochui
elegans
elliae
equis
evolvinae
foveoli
funnelii
garbei
grafi
griseus
guapore
habrosus
hastatus
hastatus australe
harold-schultzei
julii
latus
leopardus
longirostris
macropterus
melaniticus
metae arcuatus
metae auratus
metae australe
metae myersi
metae
multimaculatus
multipunctatus
myersi
nattereri
paleatus
polystictus
pestai
punctatus
punctatus julii
punctatus acutus
rabauti
reticulatus
schultzei
schwartzi
spilurus
sterbai
tychri
treitlii
trilineatus
undulatus

CATFISH

By LEN McCOURT

Secretary, International Catfish Society

DURING the period of growing interest in the past year or so, catfish have become very popular on the show bench in the northern area. Large numbers are entered in the catfish classes and a good number of times there are more entries in the catfish class than in any other. But the soery point is that a large percentage of these fish are unknown to the judges and even to the owners, with the result that a good deal of 'kidology' goes on with remarks like 'Oh, that's a *Piractesaurus macropocilopterus* and it should be 4 ft. long'. The bystanders, not knowing themselves, accept this, and the owner goes home with his charge, pondering on the fact that he will have to get a 10 ft. tank and feed the blasted thing on rabbits or some such creature to obtain the 4 ft. size before he shows it again!

It is true that a large number of the sub-order Siluroidea grow to a good size (in excess of 20 in.). In fact, the largest freshwater fish in the world is a catfish, *Brachyplatystoma filamentosum*—a South American catfish that attains a size of 15 ft. even exceeding the legendary *Arapaima gigas*. But at the other end of the scale one of the smallest fish is also reported to be a catfish and could be either *Corydoras cochui* ($\frac{1}{8}$ in.) or *Vandellia cirrhosa* ($\frac{1}{8}$ in.), the parasite catfish that lives in the gill chambers of the large armoured catfishes, all coming from South America.

The *Corydoras* genus is greatly abused by people claiming that they know what species this is, what species that is. This again is wool-pulling. I am sure that to know this genus properly would take a lifetime of study without even considering any other fish.

It is possible that the *Corydoras* species could exceed 100, but I also

wonder how many that have been discovered in later years are only local varieties and colour variations of already existing classifications. I have made a list of some 60 *Corydoras* species. But I wonder myself how many of these are duplicated. I for one do not know the difference between such fish as: *arcuatus* and *arcuatus*, *australe* and *metae australe*, *Harold-Schultzei* and *schultzei* and a few others. Nor could I recognise the best part of this list without using references.

How do you point for deportment the catfish that is nocturnal and whose natural position during the day is to lie in one position on its back, or stood on its head, that when it is crammed into a toffee jar looks neither one thing nor the other, yet in a very dimly lit tank, in a quiet place, is one of the most graceful movers you have ever seen?

So a good deal more swotting up should be done by our judges. To know all the species of catfish is, of course, impossible, as it is with all other groups, but to know and be able to recognise a few must be desirable. For more and more species are being imported and a number of these will find their way to the show bench. It would be better to know that 'that's a *Heteropneustes fossilis* and should be 28 in. long', and then put it to the back with confidence.

As it is widely believed that very few tropicals make any sound, I would like to point out that a great number of fishes collectively known as catfish make a good variety of noises.

For example, in the family Callichthyidae, a number of these fish utter guttural sounds. *Hoplosternum thovacatum*, *H. littorale* and *Callichthys callichthys* are three who

make different pitched noises uttered from the throat that can be very plainly heard during mating. In the family Pimelodidae, *Microglanis paraguayae* makes very audible noises (more so when removed from the water) by rapidly moving the serrated pectoral spines causing the joint at the base to make a loud clicking noise. This is more pro-

nounced in the Doradid catfishes, *Acanthodoras*. In the family Aucheniperidae, *Trachycorytes striatus* carry on a long throaty conversation during courtship as do some members of the *Clarias* group.

In general, nearly all catfish that have an internal breathing organ—that is, take gulps of air, also utter some kind of noise emitted from the

throat. Some make this noise a lot louder than others. I do believe that *Corydoras* make this kind of noise but that it is too soft to be detected. I have observed them during quiet moments moving their mouths in what I describe as 'chunnering'. When this occurs in larger members of this group (Callichthyidae), the throaty noise can be heard.

Mainly for the Pondkeeper

MEDITATING in a profound sort of way on the life of a tropical fish as I relaxed in a hot bath, I heard the telephone ring. Dripping with water and imprecations, I sweetly asked if I could be of service. Apparently I could, for the caller had a large golden orfe on his hands that had died precipitately for no apparent reason. There were no signs of disease and each had passed over with that sad but calm look that comes over golden orfe struck down in the prime of life as if by an act of God. Had the caller 'tried to improve their lot?' I enquired, by some procedure such as dropping 5 lbs of rock salt in the water or 4 ounces of permanganate crystals or some other chemical that is supposed to make up for Mother Nature's careless deficiencies? No, I was assured, nothing unusual had been done. Ten minutes later and with my teeth chattering like castanets, the truth was finally elicited. As a safeguard against frost, a wood frame had been constructed over the pond and over the frame had been stretched a number of sacks. The whole arrangement worked perfectly but, what a pity, the sacks had been used to transport fertiliser.

It is a curious commentary on the present scene that as the numbers of organised hobbyists drop, the aquarium trade gets better and better. As the regulations governing flats

gets tighter and tighter with regard to four-legged pets, more and more tropical aquaria are appearing in lounges and drawing rooms. Similarly, more and more householders buying their house for the first time are enamoured with the prospect of building a pond. Not without reason, for where in this noise-ridden community in which we live can so much activity be observed in such utter silence? Is everything being done by the hobbyist to see that newcomers to aquatic life are getting the information they need and generally to encourage outsiders to take part in what must be the most fascinating of hobbies? This combination of horticulture and pisciculture is surely the least exacting and time-demanding of any similar activity. A well-constructed pond will give years of faithful service with the absolute minimum of attention. What part of the garden on a pouring wet day will look half as attractive as the pond area? What pet such as the goldfish or other ornamental fish can be left for the summer holiday without cruelty? No, a well designed and executed pond can be a joy for ever although it has to be said that this is not always so.

A pond is not only a servant but a master for there is a time in the order of things when action has to be taken and delay will only make matters worse. One such situation is

the loss of water level. A leaking pond never improves and the time to effect repairs is the late winter before the plants get active. A leak can be due to several causes, and due allowance should be made for the loss of water by evaporation. In the hot days of summer a fall of an inch a month is normal, but in the winter a search should be made for cracks in the concrete, as an inch loss is too much.

There are several reasons for cracks developing in the sides or bottom of a concrete pond. But generally it is as the result of haste in mixing the cement. However, a pond full of water is a very heavy thing and a poorly constituted base on which it rests is another common fault. Time spent with a rammer and roller compounding the earth to receive the concrete is time well spent. A pond 6 ft by 6 ft by 2 ft and with 3 inch walls will weigh at least 2 tons for the water and another ton for the concrete. More important still is the mixing of the ingredients, especially in the dry state. No water should be added until the whole mix is of a grey colour, showing that the cement is in intimate contact with each grain of sand. The addition of the water and the constant turning over of the mix must be carried on without heed to the pain in the small of the back, and if there is a choice between being too 'dry' and being too 'wet' the latter is the lesser of the two faults.

Inattention to complete mixing will result in the concrete being porous in texture and later developing cracks. The materials are also important. Builder's sand, which is admirable enough for general work, contains too much loam to give the necessary strength although it 'works' nicely enough. Sharp sand should

Continued on page 46



Index to Volume I

monthly

April, 1966 — March, 1967

<i>Issue</i>	<i>Pages</i>	<i>Issue</i>	<i>Pages</i>
April	1-32	October	197-232
May	33-64	November	233-268
June	65-96	December	269-308
July	97-132	January	309-340
August	133-164	February	341-376
September	165-196	March	377-416

Club News

- Aberdeen 186
 Accrington 86, 119
 Aireborough 55, 185, 222, 295, 331, 363, 403, 404, 405
 Alfreton 55
 Amersham 222
 Association of South London Aquarist Societies 25
 Association of Yorkshire Aquarist Societies 253, 363
 Atherstone 294
 Barry 56
 Basildon 84, 186, 401
 Basingstoke 23, 328, 404
 Belle Vue 291, 401
 Bethnal Green 159
 Blackpool & Fylde 156, 291, 366, 405
 Boston 59
 Beacknell 85
 Bradford 90, 159, 291, 296, 363, 401
 Brighton & Southern 86, 88, 158
 Bristol A.S. 256
 Bristol Tropical Fish Club 159, 363, 367
 British Ichthyological Society 24
 British Killifish Association 26, 297
 Bury 291
 Bury St. Edmunds 297
 Cambridge 119, 294
 Canterbury 55
 Catford 159
 Chapeltown 291, 405
 Chelsea 121, 187
 Cheltenham 123, 402
 City of Salford 291
 Clapham 159, 363
 Colchester 365
 Corby 23, 56, 221
 Coventry 120
 Crawley College 123
 Creswell 291, 295
 Deal 186
 Derby Regent 23
 Derwent 58
 Dewsbury 291
 Didcot 157, 297
 Dudley 328, 405
 Dundee 90, 156, 296, 404
 East Dulwich 58, 85
 East London 55
 Eastbourne 55
 Enfield 90
 Erith 365
 Fancy Guppy Association 87, 162, 404
 Edmonton 295
 Liverpool 87, 220, 254, 405
 Radlett 188, 295
 South London 156
 Federation of British Aquatic Societies 23, 57, 155, 364
 Federation of Northern Aquarium Societies 290
 Federation of Guppy Breeders Societies 187
 Federation of South Wales Aquarists Societies 58
 Freelance 253
 Garforth 84, 119, 291
 Glossop 162
 Goldfish Society of Great Britain 189, 329, 402
 Gorton & Openshaw, 156, 256, 291
 Gosport 120, 188, 224, 297, 402
 Hampstead 224, 253, 364
 Hendon 58, 159, 365, 366
 Heywood 123, 330

- High Wycombe, 156, 256, 328, 406
 Hounslow, 85, 297, 329, 363
 Huddersfield 162, 295, 365
 Hutton Grammar School 406
 Ilford 56, 87, 220, 330, 406
 International Catfish 405
 Isle of Wight 90, 162, 290
 Keighley 56
 Kingston 294, 403
 Knutsford 365
 Lanarkshire 404
 Leamington 58, 187, 254, 331, 402
 Leeds 403
 Leigh 86
 Llanswit Major 187, 294, 401
 Long Beach 330
 Lytham 291, 294, 331, 365
 Mansfield 296, 401
 Marine Study Aquatic Society of Great Britain 24, 57, 86, 186, 224, 291, 406
 Medway 23, 57
 Merseyside 122, 251, 296, 331, 364
 Middlesbrough 88, 402
 Mid-Herts 296
 Midland Aquarist League 185
 Midland Aquarium & Pool Society 123, 218
 Midland Association of Aquarists' Societies 120
 Mixenden 221
 Moray 23, 257
 New Forest 404
 Newport 58, 120, 155, 221, 254, 331
 North London 58
 North of Scotland 23, 253, 296
 North Warwickshire 291
 North West London Group of Aquarist Societies 56, 364
 Northern Goldfish & Pondkeepers 291
 Nottingham 23, 55, 87, 90, 123, 186, 255, 328, 402
 Ostram 224
 Portsmouth 23, 85, 119, 155, 222, 403
 Prestwich & Bury 119
 Rainworth 365
 Reading 86, 159, 328
 Reigate & Redhill 185, 294, 402
 Rochdale Tropical Breeders 402
 Roehampton 86, 330
 Romford & Beacontree 330
 Rowntree 185
 Rugby 55, 59, 120, 189, 221, 331, 402, 404
 Runnymede 365, 402
 Scunthorpe 23
 Sheffield 291
 South Wales Tropical Fish Study Group 162
 Southampton 188
 Southend, Leigh & D. 23, 57, 85, 155, 328
 Stevenage 155
 Stockport 85, 187
 Stockton-on-Tees 404
 Stone 158, 221, 364
 Stroud 155
 Swillington 86
 Tamworth 253, 328
 Taunton 120
 Thorne 58
 Three Counties Group 58
 Thurrock 330, 367, 403
 Tottenham 188, 295, 363
 Tropical Aquarium Breeders 88, 253, 291, 402
 Uxbridge 55, 85, 119, 187, 297, 329, 405
 Valley 402
 Walthamstow 55, 402
 Warrington 88, 365
 Wednesbury 295, 364
 Weston-super-Mare 365
 Wigan 297
 Willesden 257, 401
 Wimbledon & Merton 122, 295
 Worcester 56, 86, 157
 Worthing 367, 401
 Yeovil 120, 186, 328
 York 90, 120, 189, 254, 402

Coldwater Fish

- A Coldwater Community Tank 357
 Bitterling 388
 Colour, Shine and Shape 112
 Deep-bodied Goldfish 143
 Environmental Conditions Best Suited to Goldfish 152
 Goldfish without Dorsal Fins 178
 Orfe 287
 Peacock-eyed bass 287
 Planning to Breed Goldfish This Year? 351
 Popular Goldfish Types 205
 Standardisation of Goldfish Varieties 78
 Water Temperatures and Goldfish 71
 Whither Coldwater Fishkeeping? 386

Comments and Quotes

- Another Little Drink 198
 Aquarium Fish Booms 269
 Ban on Piranhas 197
 Battery Fish-keeping 2
 Beneath the Gulf Stream 328
 Big 'uns and Little 'uns 97
 Blue for Goldfish 310
 Bright Colours and Aggressive Behaviour 65
 Camouflage by Reflection 309

- Can there be Immunity to White Spot? 133
 Catchers cannot Sell 98
 Cichlids in the Lake 309
 Cleaner Thames 378
 Control of Water Snails 34
 Cost of Living Food 134
 Dangers in the Rivers 134
 Discus Milk 33
 Drinking Water from Sewage 65
 Drugs from Fish 234
 Eels and Blood Pressure 2
 Fish-breeding in the Desert 198
 Gigantic Canadian Aquarium 165
 Glass Bowl for Whales 341
 How Long to Make a Fish? 233
 Is the Plankton Disappearing? 377
 It's in the Scales 2
 Judges—'Ware Forgers! 378
 Metals in Aquarium Water 197
 Mod. Cod at Aquarium 378
 'Nifty' Breeding Sites 234
 Oral Nurseries 33
 Pests get Pests 377
 Problems of Fish Culturists 233
 Progress Report 98
 Proportional Representation 377
 'Rare Fish' on Display 165
 River in the Laboratory 133
 Roof-top Heating 198
 Saved by a Fish Tank 65
 Saving a Coral Reef 97
 Some Pet Fish! 234
 Sounds like Feeding Time 378
 Standards and Judging 269
 Through the Tap 2
 Too Hot in Liverpool 341
 Tours beneath the Sea 134
 Tracing the Culprit 1
 Water Plants from Chemicals 134
 World's Largest Aquarium 341

Features

- Personal Comment 7, 68, 146, 175, 217, 244, 283, 327, 356, 382
 Transatlantic Topics 182, 223, 286, 321, 359, 392
 Course for Tropical Fish Breeders 52, 74, 107, 147, 169, 203, 239, 274, 319
 Readers' Queries 100, 134, 173, 209, 241, 287, 350, 360, 388

Letters

- A Criticism Answered 166
 Aeration 98, 166
 Angel Breeding 344
 Anything New about White Spot? 99, 137

Aquarium Ornamentation 166
 As Black as You'd Like 34
 Bark and Aquaria 273
 Blue Fins Galore 313
 Breeder of Sharks 273
 Cabomba v. Riccia 382
 Can Fish Think? 201, 238
 Catching Your Own Fish 237
 Colour Preference by Sharks? 313
 Comfort at Shows 201
 Concerted Breeders' Action 270
 Confusing Nomenclature 98
 Congratulations for the North 313
 Co-ordination between Federations 99, 238
 Dealing with Snails 270
 Distribute Your Good Guppies! 273
 Dormancy of White Spot 35
 Earthworms Galore 343
 Effects of Inbreeding 381
 Evaporated Milk for Fry 137, 203
 Extermination of Hydra 237
 F.B.A.S. Defended 237
 Fighter Specialists 270
 Forthcoming Society Handbook 259
 From Small Beginnings 166
 Fry Food is Egg-shaped 166
 Goodwill Messages 6
 Guppies are Tough 344
 Hara-Kiri? 198
 Have the Sharks bred in Aquaria? 201
 Hendon's Convention 343
 Hobbyist and Trader Relations 270, 344, 381
 Information Required 66
 Interesting but too Elaborate 137
 Keep the Flag Flying 168
 Leadership Required 138
 Lecturers Wanted 170
 Living Space for Goldfish 66
 More Co-ordination Required? 34
 New to the Hobby 238
 Not as Black as it Might be? 6
 Our First Issue 35
 Persevere with the Sharks 137
 Red-tailed Black Sharks 66, 201
 School Aquarium Project 313
 Should Judges be Graded? 310
 Shrimps without Shells 270
 Simplified Brine Shrimp Hatching 138
 Specimens Wanted 138
 Split Fins of Guppies 310
 Standards and Judging 378
 Stone A.S. Summer Show 344
 Thanks to the Tubifex Men 6
 The Milky Way 66
 Those Marine Classes 34, 100
 Water and Low-Voltage Electricity 342
 Watch those Sales! 343
 Which Hormones? 166, 238
 Who Wants a Helicopter? 381

Marine Aquaria

A Decorative Marine Aquarium 282
 Birth of a Cuttlefish 114
 British Marine Fish Surveys 186
 British Marines in the Window 51
 Foods for Use with Marine Fishes 361
 Living Corals in the Aquarium 20
 Making of Artificial Sea Water 72
 Marine Forum 350
 Marine Hobbyist's Dreamland 80
 New Marine Society 24
 Spawning the Cloudy Damsel 362
 Tell it to the Marines! 326

Miscellaneous

A Decorative Large Aquarium with Fitted Rockwork 345
 A Look Back in Admiration 105
 A New Look at White Spot 247
 A Trip to the Far East 117
 A Visit to Wingate of Winchester 116
 And now—the Mini-Tank 172
 Aquarium America through the Looking Glass 15
 Aquarium Filtration 18
 Bacterial and Virus Infections 76
 Big Tank, Big Fish? 5
 Casboy Aquarium 395
 'Casino Royale's' Kitchen Aquarium 293
 Constitutional Aspects and the Rule Book 250
 Curing White Spot without Drugs 391
 Decorative Aquaria for the Home 314
 Diseases of Aquarium Fishes 11
 F.B.A.S. Standards Under Discussion 240
 Film Show Suggestion 234
 Fish Parasites in the Natural Environment 174
 Fish Parasites in Pond and Tank 207
 Fungus and Ill-Health 110
 Have you Thought of Using Wood for Making Aquaria? 141
 How to Take a Fish Show to the Public 82
 How to Make Your Own Power Filter 212
 Inter-Pet's Fish Section at Newdigate 60
 Keeping Up the Interest 277
 Life Cycles of Fish Parasites 284
 Low Cost of Fish House Heating 280
 Low-Voltage Electricity for Control of Pests 245

Making Aquarium Rockwork 359
 Middle Western Welcome 48
 Modern Treatment of Disease 39
 Mr B. Bell at Home 44
 Mr T. W. Glass at Home 180
 Mr W. Richardson at Home 275
 Ozone 9
 PetFish Guide to Aquarium Filters 210
 PetFish Photo Competition 22, 288, 318
 Profile of a Professional Aquarist 214
 Quarantine 14
 Shipment of Fishes from South America 36
 So—You Would Like to Start an Aquarist's Society? 213
 Swimbladders are Versatile Organs 108
 Tape Lectures and Slide Shows 318
 Training for the Aquatic Trade in Germany 148
 Vet's Congress Discusses Health of Aquarium Fishes 79
 Why Do Glowlights Glow? 145
 Your Fish Can't Shop for Themselves 249

Ponds

Give Your Pond that Well-Planted Look this Year 396
 Green Pond 287
 Lilies around the Pool 103
 Moving Water 400
 Plastic or Concrete? 46
 Pond Fish 360
 Pond Plants to Try Out This Year 43
 Prefabricated Ponds 394
 Schedule for a Garden Pond 399
 Success with Water Lilies 75
 Water at the Flower Show 111

Tropical Fish

Albino sailfin mollies 19
Ambassis lala 101
 Anabantids 239
 Angel fish 173, 319
Aphyocypris pooki 139, 356
Aphyosemion cinnamomeum 322
 Arowana 42
Austrofundulus transilis 323
Barbus species 203
Barilius species 41
Bedotia geayi 169
Betta splendens 274
 Bleeding-heart tetra 183
 Blue gourami 240
Brachydanio species 203

(iv)

Brazilian darters 19
Calamocichthys calabaricus 69
Cardinal tetra 142, 279
Catfish 3, 67, 324
Chalceus macrolepidotus 398
Chanda ranga 101
Characidium fasciatum 19
Cheirodon axelrodi 142, 279
Cichlasoma ocellaris 42
Colia chumae 240
Corydoras species 3, 67
Discus fish 33, 183
Emperor tetra 393
Eyed spot cichlid 42
Fighting fish 274
Gara tamiata 216
Glass bass 101
Golden pencil fish 170
Guppy 242, 278, 355, 390
Gyrinocheilus aymonieri 349
Honey gourami 240
Hoplosternum thoracatum 324
Hypheobrycon ionesi 354
Hypheobrycon rubrostigma 183
Killifish 322, 384
Kissing gourami 118
Lace gourami 241
Lake Nyassa cichlid 353
Leopard catfish 66
Livebearers 74
Macropodus opercularis 240
Mastomembela 216
Melanotaenia maccullochi 107
Nannostomus anomalus 170
Nematobrycon palmeri 393
Neon tetra 354
Osteoglossum bicirrhosum 42
Paradise fish 240
Penguin fish 246
Pigmy rasbora 252
Procatopus nototania 323
Prochilodus insignis 19

Pseudotropheus trencosanus 353
Pterolebias zosterus 384
Rasbora maculata 252
Red-tailed chalcus 398
Reed fish 69
Siamese fire eel 216
Sparkling gourami 239
Stonelapper 216
Sucking loach 349
Symphysodon discus 33, 183
Tauchthys albonuber 139
Teimatherina ladigeni 169
Thayeria obliqua 246
Tinfoil barb 100
Trichogaster leeri 241
Trichogaster trichopterus 240
Trichopsis pumilus 239
White Cloud Mountain minnow 139

Water Plants

Amazon swords 100
Aquatic Ferns 177
Armoqacia aquatica 54
Bladderwort 173
Blyxa japonica 77
Bolbitis headfatti 177
Ceratopteris thalictroides 40, 177
Cryptocoryne Beckettii 359
Disinfection of water plants 173
Elocharis vivipara 251
Hair grass 251
Indian fern 40, 177
Lake water cress 54
Microsorium pteropus 177
Myriophyllum 360
Planting Photo Tip 38
Pond Plants 43, 396
Rotala indica 153
Rotala rotundifolia 153

Spiranthes cernua 317
Water lilies 75
Water orchid 317
Water Plants and Special Compost 184

What's New?

AquatopFlatpak 104
Books
ALL ABOUT TROPICAL FISH 286
AQUARIUM TECHNIQUES 43
A SIMPLE GUIDE TO FRESHWATER INVERTEBRATES 248
DISEASES OF AQUARIUM FISH 387
DISEASES OF FISHES 348
FOOD FOR THE AQUARIUM AND VIVARIUM 348
FRESHWATER TROPICAL AQUARIUM FISHES 348
PLANNING AND DECORATING THE AQUARIUM 348
THE LIFE OF FISHES 4
THE MARINE AQUARIUM 387
Convert-A-Lite 286
Dynaflow Motor Filter 13, 387
Filter Cleaning Brushes 388
Freeze-dried Foods 276
Halvin Filterfast 202
Hykro Brine Shrimp Hatcher 387
Hykro pH Tester 104, 348
Kingfish Nutrition Flakes 202, 348
Lazy Susan Automatic Fish-Feeder 104
Lotus Garden Illumination System 104
Lotus Pond Heater 202
PetFish Aquarist's Diary 202
PetFish Binder 388
Wooden Diffuser Blocks 104

AUTHORS

ALEXANDER, R. McN. 108
ARMITAGE, B. 355, 390
ARPE 7, 68, 146, 175, 217, 244, 283, 327, 356, 382
BEHNE, T. 80, 148
BENNETT, N. H. 46
BETTS, L. C. 71, 152
BRESER, J. 72
BOWLER, E. 36
BUTCHER, G. 247
CICCH, J. C. 174, 207, 284
CLUSE, M. D. 78, 112, 143, 178, 205
COOPER, J. 353

ESSON, R. D. 351
EVANS, A. 14, 43, 44, 116, 180, 275
FENTON, E. R. 117
FRASER-BRUNNER, A. 5, 41, 67, 101, 145
GHADIMLY, F. N. 314, 345, 389
GLOVER, K. 301
HALL, T. R. 361
HARRISON, C. 212
HAYNES, J. 3
JENNINGS, G. H. 69, 213, 250, 277, 362
KELLY, J. 15, 48, 82, 105, 182, 223, 242, 286, 297, 321, 326, 359, 392
KIPPER, H. 114
KLAUSEWITZ, W. 20

LEE, J. 142, 183, 252, 254, 393
MCCOURT, L. 324
MCINERNEY, D. B. 52, 74, 107, 147, 169, 202, 239, 274, 319
READ, D. A. 141
ROE, C. D. 12, 54, 77, 153, 177, 251, 317, 359
ROLAN, T. 184, 249, 357
SANDELL, E. 9
SHEWELL-COOPER, W. E. 43, 75, 103
STILL, I. 395
STOKES, P. R. 280, 322, 384
STOKES, W. M. 11, 39, 76, 110
STONE, F. 51
THOMPSON, H. E. R. 139
VOSPER, H. J. 214
WHITTON, W. L. 171
WHITTINGTON, R. M. 386

GOLDFISH BREEDING

Advantages of Hand-Spawning

By R. D. ESSON

THE hand-spawning method of breeding goldfish is now widely used by goldfish breeders. It has many advantages over pond or tank spawning. It gives a very high fertility yield: up to 99%, with 80% being quite common. The females do not suffer the damage that can occur in natural spawnings and both males and females are not fully spent so therefore they make a quick recovery. There are, of course, a few disadvantages but these are under the control of the breeder.

Once a female goldfish has spawned it is possible to obtain eggs from her at almost any time by hand-spawning, but to do so would result in ruining the fish. So the golden rule is never hand-spawn fish unless they have started to spawn naturally. Hand-spawning offers the temptation to use a male which is a poor chaser, as this seems an ideal way of solving the problem of getting such a fish to breed. Resist this at all costs. All you will achieve is to introduce the tendency for the strain of fish to produce poor breeders, which unfortunately is as much a hereditary feature as colour, finnage or body shape.

Prepare for a hand-spawning in the same way as for a tank spawning. Put the fish into the tank in the evening for a spawning the following morning. Allow things to proceed as normal. In the mean time prepare a dish or container to strip the fish into.

I have several dishes 6 in. by 9 in. by 1½ in. deep and I have cut some sheets of glass to fit into the bottoms of them. Into the dish I put enough water to cover the glass. Now I am ready for the fish. At this point I must stress that no attempt should be made to strip the fish until they are ready and they are only ready when the female sheds her first eggs naturally in the tank. The moment this happens, take the female and the males you wish to use and place them in a bowl. A dark one is better than the white enamel type as you do not want to shock them out of the breeding urge.

Take the male and hold in the left hand (if you are right-handed) with its head towards you and its back in your palm, the vent just in the water in the dish. With the thumb and forefinger of your right hand placed either side of the abdomen just before the vent, stroke lightly together and towards the tail. A stream of milt will be seen to come from the vent. It is a white liquid like thin milk. In this one stream there are millions of sperm.

Put the male back in the bowl and take the female. Holding her in the same way lightly stroke out some eggs into the dish. Whereas it was necessary to stroke the male only once to obtain enough milt, it may be necessary to stroke the female three or four times to relieve her of all the eggs she will expel at one pass. Remember that the eggs must flow easily. The moment they don't, replace her in the bowl. With her tail, spread the eggs in the area you are using to make the pass.

With a 6 in. by 9 in. dish I make six passes by mentally dividing the dish into six squares and making a pass into each square. I obtain the milt first each time and then the eggs, so that the sperms are already in the water



Holding a twintail goldfish ready for hand-spawning



Left: milt is first expressed from the male fish into the hatching tray



Right: eggs from the female are pressed out and dispersed in the water already containing the male's sperms

ready to fertilise them. Continue to use the female until she will no longer expel any eggs. Note that she is rested in the bowl in between each pass in the same way as if she was spawning naturally.

This resting her in the bowl for a few seconds is equivalent to her swimming out into the clear water of the tank or pond after spawning on plants. In a moment or two she will return to the plants to shed more eggs. So with hand-spawning the fish is rested between each pass until either you have sufficient eggs or they cease to flow easily. After spawning the males and females are returned to separate containers, as you do not wish the males to chase any more.

Being adhesive, the eggs will stick to the glass in the dish and remain secure. Remove the glass, tip away the water and wash both the glass and dish under the tap, ridding them of any spent milt and also any flukes or parasites that could have been on the parents. It is essential to wash the eggs and put them into clean water within 10 minutes of stripping.

To the clean water I add enough acriflavine to tint it green. This inhibits any fungus forming on the eggs. The glass is left in the dish with a $\frac{1}{2}$ in. covering of water, and this is changed each day when I wash the eggs under the tap. A violent fall in temperature does not harm them. I hold the glass up to the light so that any infertile eggs can be seen and removed. With each change of water fresh acriflavine should be added. Cover the dish with paper, as the eggs should be protected from sunlight.

I believe that the best temperature to hatch goldfish eggs is about 70°F (21°C). At this temperature they take 3 to 4 days. Leave the glass in the dish while the eggs develop. Stand the dish on a shelf in the fish house if the weather is warm enough (if it is not, I float the dish in a tank in which the water is heated to the required temperature).

Have a rearing tank cleaned and ready to take the sheet of glass just before the eggs hatch. Place the glass in an upright position against the side of the tank,

which has water heated to 70°F (21°C). Put the aquarium heater in a milk bottle laid on its side so that the newly hatched alevins cannot settle on the heater and be killed. In 24 hours the eggs will hatch. Remove the sheet of glass, raise the temperature of the water to 75°F (24°C), and start light aeration. Within 2 days the alevins will have absorbed their yolk sac and become free-swimming. They will now require feeding.

One final advantage that hand-spawning offers. I have often obtained large numbers of eggs from a



Magnified views of goldfish eggs at (left) about the half-way stage to hatching and (right) just before hatching. Glass sheets bearing the eggs are moved into the hatching tanks at the time this pre-hatching appearance is seen. (From original drawings by Dr R. Affleck, reproduced by kind permission of Mrs R. Affleck)

female and had the problem of raising all the fry at once. This problem can be overcome by splitting up the spawning into two or three hatchings, by retarding the progress of the eggs. This is possible by keeping them in the refrigerator. I have retarded eggs for 17 weeks and it did not seem to make any difference to them at all. Whilst in the refrigerator, the water in the dishes was changed every other day, and never allowed to freeze.



by ARPEE

IN the queries column of the February issue of PETFISH MONTHLY there was reference to the use of *Myriophyllum* in breeding tanks, and the enquirer bemoaned the fact that he had had little success with it, and that all the leaves tended to fall off. The reply, although cautious, held out some hope to those really determined to utilise this plant, but I cannot help thinking that it might have been wiser to advise the would-be breeder to give it the go-by and use nylon mops instead.

Pretty clearly the aquarist was having trouble in growing *Myriophyllum* anyway, and in my experience if you can't get a plant to grow in your local water, there's very little that you can do about it. I am always buying bits of this or that variety of this particularly attractive plant, and *Cabomba*, too, but success is always short-lived. It is quite true that you may suddenly strike lucky in one particular tank, for a reason which you cannot fathom, but it is generally safer and altogether more satisfactory to stick to the plants which your conditions particularly favour.

I can quite understand the desire of the enquirer to get some fish to spawn in a *Myriophyllum*-filled tank. Under the right conditions, nothing is more beautiful to watch, particularly if the fish are such as the flame; in cases like this it seems almost indecent to suggest that bundles of wool are the slightest bit in keeping with the process, but undoubtedly they are trouble-free, cheap and reusable, which is more than one can say for most of the fine-leaved plants on the market nowadays.



It is rather sobering to think back to the thirties and forties, before mops were much used, when *Myriophyllum* and the like were the only spawning media normally available to the fishkeeper. I'm not sure how the big breeders managed, but the amateurs used little else, and they certainly got by. It makes one wonder whether, over the years, this plant has changed its habits by becoming less amenable to aquarium conditions. I can remember throwing away handfuls and handfuls of it, and *Cabomba* and *Ambulia* too. This was when *Anacharis* was choking out all our ponds and there were those who said it would become a serious menace. They have grown silent, and the Canadian pondweed is a reformed character.

The *Cryptocoryne* was then fetching tremendous prices at the local shop, but now seems to have adjusted itself to our pockets as well as our conditions. I admit this is something of a sweeping statement, but I note it as a tendency. I certainly don't attribute the high price of *Cryptocoryne* to few imports in the thirties, as they seemed to be freely available. It was getting them to proliferate that took some doing.

My first spawning attempt with the venus fish or pooni (*Aphyocypris pooni*) was not very successful. Only half a dozen or so fry were observed, so I rapidly set up a fresh tank and tried again. The first attempt had been made in rainwater, for which I now substituted 100% tapwater which had been left to stand for a few days. The temperature was about 70-72°F (21-22°C) and the tank was littered with nylon mops. I put five fish in, let them drive around, as before, and removed them when spawning had taken place.

They began egg-laying as readily as the White Cloud does after a change of water. I expected to see some fry after about 3 days, but at this stage there were very few in evidence and I thought things had gone wrong again. Not so. After about 7 days there were many more fry about, and at the tenth day mark there were 60 or 70 of wildly differing size, most of them free-swimming. I cannot remember seeing such disparity of size in a hatching of any fish before, and I shall watch for this feature in future attempts. Liquifry no. 1 gave the youngsters a very good start, and they are now taking micro worms and dry fry food. I could not distinguish them from young White Clouds at this age, but shall continue to look for the first real differences.

The obvious ease of breeding these fish—and at comparatively low temperatures, too—should combine with its other attractions to make it a best-seller as soon as supplies allow. Like the White Cloud, I doubt whether it would be happy in a community tank maintained too near the 80°F (27°C) mark, but as a shoal fish in a collection of small fishes which will tolerate the mid and lower seventies, it will take a long time to find an equal.



Rogue fish are sometimes a serious problem in a community tank, and can cause a lot of damage and discontent. For those who have not met rogues, I will explain that they are apparently normal but rather good-looking specimens, but are the most bad-tempered things imaginable once they are given the freedom of a tank. They usually nip tails and indulge in more serious fisticuffs with any fish in range, but often single out certain fish for particularly severe treatment. As these are sometimes many sizes larger than the rogue the situation becomes absurd—and not a little entertaining at times—were bodily damage not so often involved.

At present I have a trio of *Hemigrammus nanus* (the silver-tipped tetra), and the male is absolutely superb. This miniature of a little over an inch simply terrifies the other members of the community tank, and I resolve about seven times a week to take him back to the shop! Somehow I always let things slide because I have a sneaking admiration for this little terror, but it is comforting to know that if I did get rid of him I should get a very fair price, as rogues usually make excellent breeders and should throw good fry. Larger rogues should be watched carefully, and if they show really nasty traits, should be exchanged for more docile specimens.

Breeding Neons and Cardinals

Continued from page 47

a total hardness of 12 p.p.m. The hardness was less but obviously the water was not yet soft enough.

More experiments were carried out and some weeks later three or four neon eggs hatched. Again the hardness reading was taken and was now down to 10 p.p.m.

We have now bred over 35,000 neons. This was by no means our limit and could well have been double that number, but when one is trying to breed commercially it is unwise to have only one species in stock. Moreover, there were other allegedly unbreedable fish to experiment on and so we did not attempt to produce only neons. Even so I think that 35,000 justifies my statement that neons can be easily bred.

Since publishing my findings in my book as long ago as 1958, various other people have come forward to say that neons will breed in soft water; right as these people are, such information is quite useless without quoting the hardness figures. In a hard water district collected rainwater with 60 p.p.m. would be considered very soft, but it is still over six times too hard for neons.

As the months wore on the hardness of the peat water in our bath continued to drop and the lower it became the greater the number of eggs that hatched in each succeeding spawning. We now know that in water of hardness over 10 p.p.m. neon eggs will not hatch; at 10 p.p.m. four or five in the spawn may hatch; at 8 p.p.m. the number will rise to 20 to 40, at 6 p.p.m. 60 to 80; at 4 p.p.m. 80 to 120, and at 2 p.p.m. 120 to 200 or more.

The essential requirements for breeding neons then are: (1) A good healthy pair of neons, at least 12 weeks old, the female to be round, deep and bulging with ova. (2) A small bare tank, one 24 in. by 8 in. by 8 in. that can be divided across the middle by a sheet of slate wedged with channel rubber to make two compartments 12 in. by 8 in. by 8 in. can be used to spawn two pairs of neons (if you have them) simultaneously, one pair in each compartment (thus showing that a tank as small as 12 in. by 8 in. by 8 in. is quite large enough for one pair).

Of course, if you are dividing your tank you should have a heater in each compartment, unless space heating is supplied. The tank can be of angle iron, glazed on all four sides and its base with clear glass. It should be stood where it will receive some light and upon a stand which does not obstruct one from getting under the tank and looking upwards through the bottom, for it is here that most of the neon eggs will be seen.

(3) Two gallons of soft, amber coloured peaty water with a total hardness reading not above 10 p.p.m.; if you draw this water from a bath outside it is likely to be very cold, so with a piece of rubber tubing carefully siphon off (without stirring up the water-logged peat) sufficient water to fill a 2 gallon enamel bucket. When it is full you should still be able to see the inside of the bottom of the bucket through the amber coloured water; do not use peat water so strong and dark brown that you cannot see the bottom of the bucket. Warm this water on a gas ring till it reaches 80°F (27°C) and pour this into your bare tank (if it measures 24 in. by 8 in. by 8 in. the water will be about 4 in. deep). Now place in each compartment a clean nylon mop attached by a rubber band to a small piece of slate so that it sinks.

The breeders will have to be transferred to the breeding tank in a way that will not change the water hardness, and how to do this and details of the spawning and rearing will be given in next month's article.

Mainly for the Pondkeeper

Continued from page 60

be the type used in conjunction with clean ballast up to 2-inch riddle size.

What can be done if a crack appears? Assuming that the concrete has been properly mixed and there are no evident signs of settlement the best way is to run along the line of the crack with an iron spike and grout out a furrow an inch wide and an inch deep. Mix three parts of sharp sand to one of cement into a paste the consistency of thick cream and work the whole into the furrow, allowing an overlap of 2 inches either side and half an inch proud of the general level. Allow four days for it

to harden and then paint over liberally with two coats of Snowcem. In point of fact the whole pond would benefit by two coats of this, for this particular form of waterproofing does not in my experience contain toxic constituents. If a patch job such as outlined fails to prove a remedy then the best thing is to render the inside of the pond again to a thickness of 1 inch with a mix of four parts of pebbledash, two parts of sharp sand and one part of cement.

Looking into my pond I can see that it is time to break up the lily rhizomes as they are now so congested that the blooms will only become smaller with each season. This is best done with a sharp-edged spade. Lay the mass of lily roots on the lawn, and follow the line of the fleshy rhizome. Plan to make each severance across the mass with the

spade to leave two crowns in each section. Towards the end of the rhizome it is better to leave the smaller crowns together so that there is enough rhizome for the crowns to draw on for nourishment to push out roots.

To replant them I shall cut a grass turf roughly 12 inches square and trim the grass back to the roots. Having made a hole in the centre of the turf, the crowns of the lily will be pushed through the hole so that when the whole is lowered in the water the upper side of the turf will be facing downwards. Lilies so planted quickly acclimatise themselves, for the turf acts as an anchor as well as a planting medium, and by the time the turf disintegrates the lily is fully established and staked down. This method is much better than covering the floor of the pond with earth, which will only putrefy with time.

BRITISH CRUSTACEANS FOR THE MARINE AQUARIUM

Crabs and Lobsters

By H. J. VOSPER

Their identification and care in the aquarium



Common lobster (*Homarus vulgaris*). The rubber bands encircling the pincers readily hold these massive weapons closed. This animal can be considered the most dangerous of our marine Crustacea.



Masked crab (*Corystes coissivelounus*). The strangely elongated pincer limbs of this sand-burrowing crab indicate that it is a male, for the pincer legs of the female are only as long as the body.

Photographs by the author

ALL the really big crustaceans for marine aquaria are members of the group known as the walking decapods (the Reptantia). The swimmers among the decapods (Natantia), as represented by the shrimps and prawns, were discussed in my article last month.

For convenience the animals of the Reptantia now to be mentioned are considered as the lobster kinds, the intermediate kinds and the true crab kinds. Although the species here described are not the sole members of the group that could be found on our shores, the others are far less likely to be encountered. Even some of those named are not well represented in some areas, apart from the ubiquitous common shore crab, whose occurrence is aptly described by its name.

Lobster Kinds

The common lobster (*Homarus vulgaris*) needs no description, only a word of warning. They can move very fast, both backwards and forwards; the writer came close to losing a finger when a 9 inch specimen swept forward along a narrow 5 ft. long tank during the time it took to dip a jar into the water—some 2 seconds.

Their pincers are very powerful and are asymmetrical in that, apart from aberrations that may occur after their loss and regeneration, they consist of one crusher and one cutter. Somewhat fortunately these have but little power when opening, so that once closed they can be kept in that position quite easily, as shown in the photograph of a good-sized specimen with its pincers kept closed by rubber bands.

The spiny lobster, rock lobster or crawfish (*Palinurus vulgaris*) is somewhat slower in action and less dangerous to handle. It is very similar to the lobster in general form except that it has numerous spikes on the body and lacks the heavy pincers, and the colour is brownish in opposition to the lobster's blue.

Burrowing shrimps (*Callinassa* and *Upogebia* spp.) are very like miniature crawfish, growing to but 2 inches in length, but they lack the long antennae and their pincers are not always alike. The colour is red or yellowish.

Intermediates

In comparison with the lobster kind, the intermediate group members have somewhat reduced abdomens, which are carried either more or less permanently under the body or else are spirally coiled. The former are the galatheans and the latter are the hermit crabs, but



Edible crab (*Cancer pagurus*). The stumps of two lost legs are visible (arrows) in the illustration right of a male of the species. These missing limbs will be regenerated during the course of successive moultings.

Velvet swimming crab (*Portunus puber*). This species (above) is our most actively aggressive crustacean and the most colourful of British crabs. This young male savagely faced the lens as its photograph was taken, the brilliant red eyes enhancing its dangerous appearance



another group is also present which rather resembles a stage between the galatheans and the true crabs, these being the porcellans.

Galatheans, better known as squat or flat lobsters, are very like crawfish apart from the manner in which the flexible abdomen is held under the body. This possesses a large tail fan and the rapid sweeping of the whole abdomen provides the propulsion. The three species likely to be encountered are very readily distinguished one from another.

Galathea strigosa: red, with blue transverse lines and dots; the rostrum has three spines each side; legs paler or brownish; body length 6 in.

G. dipera: reddish or brownish, may be palely patterned; rostrum is bristled and possesses a central spine with four more on each side; body 2 in.

G. squamifera: greenish or greenish-brown, with red marks; rostrum with nine spines of which final pair are smallest; body 3 in.; the most common of the group.

Porcellain crabs look very like true crabs in general appearance for they have a short but broad carapace and the abdomen is tucked below, yet this organ is larger than that of true crabs and carries a wide tail fan. They are small animals, readily distinguished one from the other, living tight against the undersides of rocks.

Porcellana platycheles (hairy porcellain crab): greyish or brownish; extremely hairy; the pincers flattened; $\frac{1}{2}$ in. across carapace. This animal is sometimes hard to see owing to the muddy debris which accumulates in the "hair".

P. longicornis (smooth porcellain crab): brownish or yellow; very clean and smooth; very long pincer legs; not flattened.

Hermit crabs are easily recognised as such but we have two species, not readily distinguished owing to wear and damage that may have occurred.

Pagurus bernhardus (common hermit crab): largest

pincer has a granulated decoration, of which two rows of larger spots are present; end joint of second and third pairs of legs carry spines.

E. pilsbani: largest pincer has only a fine-grained decoration; second and third pairs of legs lack spines but possess grooves.

True Crabs

In this group the abbreviated abdomen is almost continually bent under the body. Of the various forms to be mentioned, the spider crabs are the most readily separated from the remainder by virtue of the long and slender legs plus the generally somewhat triangular carapace.

Maia squinado (thornback spider crab): reddish or brownish; two large spines between the eyes and numerous spines and knobs all over the body; pincers small and weak but can reach most parts of the shell; often heavily camouflaged by seaweed; about 7 in. across the carapace.

Macropodia rostrata (crab spider): reddish or yellowish; eight definite spines on the body; legs hairy; very spidery in appearance; $\frac{1}{2}$ in.

Inachus spp.: yellowish-brown; many knobs and excrescences across front of shell and one large knob further back. Often covered by seaweed; 1 in. across shell.

Miscellaneous crabs, lacking any special attribute in common, may best be treated as a group:

Xantho incisus (black-clawed crab): reddish-brown, but pincers black; margin of shell has four blunt teeth on each side and an indentation between the eyes; $\frac{1}{2}$ in. across the shell.

Other xanthids are present but can be considered quite rare. All have a "lumpy" carapace, clearly divided.

Pinnotheres pisum (pea crab): yellow or yellow-brown; carapace almost round; inhabits living molluscs

(mainly mussels) and occasionally sea urchins; male $\frac{1}{2}$ in. and female $\frac{1}{4}$ in.

Pilumnus hirtellus (hairy crab): brownish-red; pincers unequal in size; extremely hairy; 1 in. across shell.

Corystes canaliculatus (masked crab): sandy or yellowish; rostrum with two points plus three spines on each side of carapace; pincer legs of male twice as long as the body, itself longer than broad; long bristly antennae conjoined as tube (may be broken); 1 in. across shell but female smaller.

Cancer pagurus (edible crab): pinky-brown, but pincers darker; three blunt teeth between the eyes and numerous indentations around edge of carapace, giving typical 'pie-crust' look; surface of the carapace is granulated; 10 in. across shell.

Swimming crabs are differentiated from the foregoing true crabs by their modification of the typical walking legs, which end in pointed tips, for the Portunidae have the paddle (illustrated in last month's article). In the common shore crab this paddle is less easily noticed, for while the limb is flattened it nevertheless ends in a point (thereby representing a species which having regained its lost swimming powers has again discarded them).

Carcinus maenas (common or green shore crab): dark green, brownish or reddish, being often palely patterned (especially in the young) with symmetrical markings; three teeth between the eyes and five on the edge of the carapace; readily adopts a fighting stance; 4 in. across the shell.

Portunus puber (velvet swimming crab): brownish, with blue joints and lines on the legs; very red eyes; carapace covered by a pile of fine 'hair'; several small teeth between the eyes and five larger ones on the edge of the carapace; extremely fierce and aggressive; 5 in. across the shell.

P. depurator (swimming crab): yellowish, occasionally reddish; three teeth between the eyes and five on the anterior edge of the shell; may have symmetrical markings on the back but these are hidden in lighter coloured specimens; not as aggressive as *P. puber*; 2½ in. across shell.

Handling

Lobsters, larger edible crabs and the more mature members of the swimming crab section can give very painful and even dangerous pinches, so it is wise to treat the animals with some respect. All can be handled provided they are grasped firmly from the rear and with the fingers placed on either side of the carapace (as indicated in several of the illustrations), with some care to avoid the fingers being trapped between the back of the animals' legs and the sometimes toothed edge of the shell. The Portunidae are very agile and can quickly change position to bring the pincers into action, the velvet swimming crab being perhaps the most active in this respect and also being completely fearless.

Although the thornback spider crabs can give a fairly painful nip, and can reach most parts of their bodies, their movements are somewhat lethargic and they always prove easy to handle even when fully adult.

When catching crabs it may prove best to hold them still initially by pressing firmly downward on the carapace, so that they are held against the ground while a proper grip is obtained.

Larger specimens, particularly lobsters and edible

crabs, should not be removed from narrow crevices by hand, for as well as the real danger presented by their pincers it is possible that the hand could be trapped between carapace and roof of the crevice as the animal extends its legs in an endeavour to maintain its position.

If crustaceans are held by one leg or pincer they might escape as the joint parts, for these are comparatively fragile and are designed to permit of the animal's escape should it be grasped by a predator or trapped under a rock etc. A mechanism at the joint rapidly seals the break and the lost limb is gradually regenerated as moults occur.

Aquarium Conditions

The Portunidae, edible and thornback spider crabs, lobsters, shrimps and prawns are easy to maintain in aquaria if kept at low room temperatures, nor will they object to longish periods out of water provided the atmosphere is reasonably damp. They readily take pieces of meat, fish, worms etc., and will also devour each other if given the opportunity. They may be fed about once every 2 or 3 days but food must not be left in the tank more than an hour or so.

Galatheans appear to suffer readily from shock, and I have known *Galathea squamifera* to pull off their own legs—perhaps as an offering to possible predators while the animal itself escapes.

Porcellanid and pea crabs require extremely minute foods, it being wise to feed these creatures in smaller separate containers rather than in the main tank, to avoid pollution.

Masked crabs like to remain hidden below sand and also will take minute foods in preference to larger particles.

Hermit crabs suffer from shock and are apt to lose limbs readily, yet they are worth taking some trouble over because if supplied with spare mollusc shells and large pebbles can give endless amusement with their activities.

Any tank containing several crabs should have a number of rocks among which they can clamber and hide away from one another; if such are not provided then serious fights may take place and the percentage of deaths rises rapidly.

Some individuals will excavate burrows under the larger rocks, where they will wait in ambush. These should naturally be watched carefully in case hidden deaths occur.

Galatheans, shrimps and prawns can leap from the water surface, so their quarters should be covered. Common shore crabs are most ingenious at escaping—the writer has had them escape from bare tanks by digging their leg-points into the corners and slowly working their way to the top by this means (one then fell into a freshwater tank, but they normally end up covered with dust in some obscure corner of the fish room!).

Bibliography

- GUIDE TO THE SEASHORE, Barrett & Young (Collins, 1958).
GUIDE TO THE CRUSTACEA, Calman, W. T. (B.M. Nat. Hist., 1927).
BIOLOGY OF THE CRUSTACEA, Green, J. (Witherby, 1961).
THE BRITISH SEASHORE, Vevens, H. G. (Routledge & Kegan Paul, 1954).



JUNIOR members were to the fore at the first meeting in February of **BLACKPOOL & FYLDE A.S.** when the president, Mr Clifford Cross, presented the cups awarded to juniors in the annual club competitions. These were: Willmin trophy, David Taylor; Junior fish of the year Cup, Keith Guise; Singleton trophy, David Taylor; Belgrave trophy, Chris Harriman; Hammond trophy, David Clarke; Simmons trophy, David Taylor. The second meeting of the month took the form of a North Blackpool v. South Blackpool quiz. This produced some interesting questions and some even more interesting answers, some of which, we are told, were right! The South emerged victorious but only by one point.

The newly elected show committee are: chairman, Mr B. R. Simmons; show secretary, Mr J. Cross (14 Rose Avenue, Blackpool) to whom all enquiries about shows should be directed; committee members: Mr E. Crowther, Mr C. Jones, Mr B. Littler, Mr A. Mather, Mr J. E. Taylor, Mr B. Turner and Mr F. C. Willmin. All other enquiries should be addressed to the club publicity officer, Mr B. Turner, 3 Kent Road, Blackpool (phone 22524).

WINNERS of the a.v. table show at **STOCKTON-ON-TEES A.S.** were to compete in the inter-club show against **DURHAM CITY A.S.** These winners were: egg-layers: 1, Mr W. Bowman (blind cave fish); 2, Mr and Mrs F. Patterson (tiger barb); 3, Mr and Mrs F. Patterson (nigger barb); 4, Mr and Mrs K. Clennett (giant gourami); 5, Mr and Mrs F. Patterson (*Cichlasoma severum*); 6, Mr and Mrs F. Patterson (*Clarias* catfish). Livebearers: 1, Mr W. Payer (velifera mollie); 2, Mr J. Chamberlaine (velifera mollie); 3, Mr L. Collins (black lyretail mollie); 4, Mr L. Collins (red sword); 5, Mr L. Toulmin (victail guppy); 6, Mr K. Pearson (victory platy). At this meeting also a very interesting talk and demonstration was given by Mr W. Bowman on tank glazing.

"SEA ANGLING" was the title of the interesting talk given by guest speaker Mr T. Tremblett, illustrated by coloured films, to **PORTSMOUTH A.S.** at their March meeting. The table show for livebearers at this meeting was very well

supported and the judge, Mr J. Smith, commended members on the high standard of fish. Best in the show was awarded to Mr P. Wyllie with a platy. Other results were: male guppy: 1, Mr P. Carlyon. Female guppies: 1, 2 and 3, Mr A. Smith; 4, Mr E. Binstead. Platys: 1, 2 and 3, Mr P. Wyllie; 4, Mr P. Carlyon. Mollies: 1, Mr E. Bowyer; 2, Mr G. Marks; 3, Mr E. Binstead; 4, Mr E. Bowyer. Swordtails: 1, Mr G. Marks; 2, Mr P. Carlyon; 3 and 4, Mr E. Binstead. Limias: 1, Mr G. Marks; 2 and 3, Mr P. Carlyon; 4, Mr E. Bowyer.

The club also announce that their inter-club table show will be held again this year, on 28th May. Full details from Mr W. Ryder, 493 Commercial Road, Portsmouth.

AT the **MIDLAND ASSOCIATION OF AQUARISTS' SOCIETIES' annual Convention and Open Show at Leamington Spa on 14th May, the principal speaker will be Mr Leif Christensen from Denmark and there will be other demonstrations and lectures from members of the Marine Study Aquatic Society, the Federation of Guppy Breeders' Societies and the British Killifish Association. There is also an interesting new class called 'Aquarists' Project' for individual or society entry. Competitors are asked to lay out on a table top 3 ft. by 3 ft. a demonstration of any technique associated with fish-keeping, i.e. breeding set-ups, white worm or any live food cultures, filtration, fish-house construction plans etc.**

CHAIRMAN Mr A. G. Jessopp opened the General Assembly of the **FEDERATION OF BRITISH AQUATIC SOCIETIES** on 11th March with the news that, in spite of its being the first assembly of the year, some 39 societies had already remembered to send in their affiliation fees for 1967—an improvement on the situation at the same time last year.

Most of the discussion period was devoted to the series of suggestions that had been proposed by the **THREE COUNTIES GROUP OF AQUARISTS' SOCIETIES**. These were discussed at length and in summing up, Mr Jessopp thanked that group for the man-hours and background work that had gone into their material.

There was a very large number of delegates attending the meeting, including one, Mr M. J. Parry of **NEWPORT A.S.**, who had travelled from Cardiff for the occasion.

THE FEDERATION OF GUPPY

BREEDERS' SOCIETIES held their A.G.M. in March and the following officers were elected: president, Mr K. G. Pearce; immediate past president, Mr R. Forest-Jones; vice-president, Mr G. Smith; vice-presidents: Mr R. Smith, Professor O. Wings, Mr H. S. White, Mr A. Littlewood; general secretary and newsletter editor, Mr M. H. DeLingpole (Willowcroft, Tibberton, nr Droitwich, Worcs.); treasurer, Mr A. Lindley; provincial secretary and press/public relations officer, Mr F. D. Hall (Fernham Road, Shellingford, Faringdon, Berks.); overseas secretary, Mrs D. Court; librarian Mr W. Myers; journal editor, Mr S. Croft; show secretary, Mr P. W. Jinks; management committee: Mr N. Court, Mr P. W. Jinks, Mr A. F. Wilkinson; judges and standard committee: chairman, Dr C. W. D. Cole; secretary, Mr G. Smith; members, Mr B. Myers, Mr A. Lindley, Mr G. M. Davies, Mr A. F. Wilkinson, Mrs I. D. Smith.

Names and addresses of section secretaries are: Eastern counties Mr D. Crane, 59 Wingate Road Ilford, Essex. South Wales: Mr D. R. Bowers, 136 Highway, Panteg Mon. West Midlands: Mr G. M. Davies, 120 The Broadway, Walsall Staffs. Bristol and Bath: Mr H. C. B. Thomas, 2 Grove Park, Bristol 2 North Midlands: Mr A. Lindley 65 Sedgewick Road, Jacksdale, Notts Three Counties: Mr T. M. W. Errey, 34 Oakridge Road, Basingstoke, Hants. South Midlands, Mr M. H. Delingpole, Willowcroft Tibberton, Nr. Droitwich, Worcs Cheltenham: Mr N. E. Binding 4 Turkestan Road, Benhall, Cheltenham, Glos. Overseas: Mrs D. Court 118 Fouracre Crescent, Downend Bristol.

RESULTS of the **BELLE VUE A.S.** open show, held at Switchgear 3 Cowan's Social Club in March, and judged by Mr C. Walker and Mr A. Lindley, F.N.A.S. judges, were:

Guppy: 1, Mr D. Johnson (Stockport 74); 2, Mr C. Bydgos (Belle Vue, 73); 3, Mr J. Allen (T.A.B., 70). Platy: 1, Mr B. Prescott (Belle Vue, 73); 2, Mr Kernho (Heywood, 71); 3, Mr G. Hodgkinson (Gorton, 69). Mollie: 1, Mr M. Fiddle (Glossop, 72); 2, Mr Woodward (Blackpool 70); 3, Mr Wilde (Stretford, 68). Swordtail: 1, Mr Beesing (Stockport, 74); 2, Mr Kilne (Heywood, 70); 3, Mr Slater (Macclesfield 68).

Small barb: 1 and 2, Mr Gregor (Ossett, 76 and 75); 3, Mr Tinsdine (Glossop, 71). Large barb: 1, Mr K. Parke (Merserside, 60); 2, Mr Parke (T.A.B., 71); 3, Mr Jackson (Belle Vue, 70). Smau characina: 1, Mr Hill (Alfreton, 70); 2, Mr Newall (Glossop, 74); 3, Mr Booth (T.A.B., 69). Large characina: 1, Mr Parke (T.A.B. 77); 2, Mr Wilkie (Stretford, 70); 3, Mr Price (Gorton and Openshaw, 72).

Killifish: 1, Mr Hodgkinson (Gorton, 74); 2, Mr Jackson (Belle Vue, 73); 3, Mr Hill (Alfreton, 70). Minnow and darter: 1, Mr Ingham (Glossop, 70); 2, Mr Hayes (Hay

wood, 65); 3, Mr Beasley (Oram, 66).
 Sharks and fishes: 1, Mr Kenshaw (Heywood, 72); 2, Mr Mulla (Merseyside, 72); 3, Mr Woodward (Blackpool, 70). Rishoras: 1 and 2, Mr Gregory (Oram, 74 and 70); 3, Mr Pywell (T.A.B., 69).

Small cichlids: 1, Mr McCourt (Gorton, 78); 2, Mr Taylor (Oram, 72); 3, Mr Jackson (Belle Vue, 74). Large cichlids: 1, Mr Mulla (Merseyside, 75); 2, Mr Allen (T.A.B., 72); 3, Mrs Lomas (Glossop, 74). Angels: 1 and 2, Mr Woodward (Blackpool, 70 and 65); 3, Mr Tomkinson (Glossop, 70).

Catfish: 1, Mr Booth (T.A.B., 77); 2, Mr Parkin (T.A.B., 74); 3, Mr Roberts (Cumbria, 74). Loaches: 1, Mr Wilkie (Stretford, 76); 2, Mr Taylor (Oram, 73); 3, Mr Hodgkinson (Gorton, 72).

Fighters: 1, Mr Wilkerson (Oram, 74); 2, Mr Beasley (Oram, 71); 3, Mr Booth (T.A.B., 69). Anabantids: 1, Mr Pywell (T.A.B., 73); 2, Mr Mulla (Merseyside, 75); 3, Mr Parkin (T.A.B., 72). A.O.V. tropical: 1, Mr Moorhouse (Bradford, 82); 2, Mr Wilkie (Stretford, 80); 3, Mr Hodgkinson (Gorton, 75). Coldwater: 1, Mr Greenwood (Stretford, 71); 2, Mr Roberts (Cumbria, 70); 3, Mr Birch (Heywood, 69).

Juniors, Livebearers, Master Slater (Macclesfield, 72); 2, Master Middleton (Gorton, 70); 3, Miss Birch (Heywood, 66). Egg-layers: Master Hodgkinson (Gorton, 74); 2, Master Middleton (Gorton, 74); 3, Master Slater (Macclesfield, 69).

NOTTINGHAM & D. A.S. have recently enjoyed a most interesting illustrated talk by one of their members, Mr David Holland, on the effect water pollution has on fish and plant life. Mr Holland is on the staff of the Trent River Authority and was able to speak with great experience on his chosen subject. At this meeting, the table show for guppies was judged by Mr Bruce Inman, and results were: Male: 1, Mrs B. Goodlife; 2, Mr K. Binns; 3, Mr E. Gee. Female: 1, Mr K. Binns; 2, Mr F. Saunders; 3, Mr K. Binns.

The club's Appreciation Cup for 1966-67 was awarded to Mr and Mrs N. H. Goodlife as a token of appreciation for the vast amount of time and energy put into the Society since the last A.G.M.'.

NEWS reaches us of a new Association of clubs in the Manchester area. Twelve local clubs (Belle Vue A.S., Glossop A.S., Gorton & Openshaw A.S., Heywood A.S., International Catfish, Knutsford A.S., Macclesfield A.S., Oram A.S., Rochdale Breeders, Salford A.S., Stockport A.S. and Tropical Aquarium Breeders) have recently formed the ASSOCIATION OF MANCHESTER DISTRICT AQUARIST SOCIETIES. Officers are: chairman, Mr M. Fiddler (Glossop); secretary, Mr L. McCourt (Int. Catfish); treasurer, Mr H. Haslam (Belle Vue); show secretary, Mr T. E. Davis (Heywood). The Association are promoters of the newly formed NORTHERN SHOW LEAGUE.

Huddersfield Open Show

FORTY MEMBERS and guests of **Huddersfield Tropical Fish Society** attended the A.G.M. and dinner in March. The presentation of club awards took place after the dinner, by Mr Philip Kaye, Huddersfield's channel swimmer, to the following: Trophy for the overall points winner, Mr F. Ledger. Trophy for the most successful member in open shows, Mr L. Kaye. Trophies for anabantids, Mr L. Kaye; cichlids, Mr L. Kaye; catfish and loaches, Mr L. Kaye; characins, Mr F. Ledger; a.o.v., Mr F. Ledger; livebearers, Mr D. Woodhead; barbs, Mr J. Pratt; breeders, Mr J. Boswell; coldwater, Mr P. Bone; ladies, Mrs C. Kaye; juniors, Master N. Kaye.

Officers elected for the coming year are: chairman, Mr F. Ledger; vice-chairman, Mr J. Wike; secretary, Mr L. Kaye (6 Totties, Holmfirth, Huddersfield); treasurer, Mr J. Boswell; show secretary, Mr P. Bone.

The society has also held its fourth open show. This was most successful, with 427 entries. Mr K. Parkes, Merseyside, won the best fish in the show award. Other results were:

Livebearers. Section winner, Mr F. Ledger (Huddersfield). Sweetfish: 1, Mr F. Ledger (Huddersfield); 2, J. and H. Derris (Workoop); 3, Mrs Cohen (Pontefract). Guppies: 1, Mr F. Reynolds (Swillington); 2, Mr L. Anon (Chapelton); 3, Mr J. Popen (Oram). Mollies: 1, Master D. Lacey (Aireborough); 2, Mr I. Anon (Chapelton); 3, Mr Whitlock (Tadcaster). Platy: 1, J. and H. Derris (Workoop); 2, W. Bralford (Sheffield); 3, Mr F. Ledger (Huddersfield).

Barbs. Section winner, Mr K. Parkes (Merseyside). Small barbs: 1 and 2, Mr W. Bishard (Sheffield); 3, Mr F. E. Gregory (Oram). Large barbs: 1, Mr K. Parkes (Merseyside); 2, Mr K. Gower (Swillington); 3, Mr R. Wilkinson (Halifax).

Characins. Section winner, Mr J. Robinson (Merseyside). Under 3 in.: 1, Mrs Cohen (Pontefract); 2, Mr F. E. Gregory (Oram); 3, Mr T. Grimshaw (Gorton). Over 3 in.: 1, Mr J. Robinson (Merseyside); 2, Mr R. Wilkinson (Halifax); 3, Mr F. Mulla (Merseyside).

Carp and minnows. Section winner, Mrs Cohen (Pontefract). Class 1: 1, Mrs Cohen (Pontefract); 2, Mr K. Smailes (Swillington); 3, Mr F. E. Gregory (Oram). Class J: 1, Mr F. Mulla (Merseyside); 2, Mr M. Gray (Mansfield); 3, Mr Robertson (Tyneside).

Fighters. 1, Mr A. Mason (Workoop); 2, Mr Whitlock (Tadcaster); 3, Mr A. Beasley (Oram).

Anabantids. 1, Mr A. Mason (Workoop); 2, Mr C. Woodhead (Huddersfield); 3, Mr Whitlock (Tadcaster).

Cichlids. Section winner, Mr A. Mabby (Rochdale Breeders). Dwarf cichlids: 1, Mr A. Mabby (Rochdale); 2, Mr F. Mulla (Merseyside); 3, J. and H. Derris (Workoop). Large cichlids: 1, Mr F. Mulla (Merseyside); 2, Mr J. Tunny (Chapelton); 3, Mr F. Ledger (Huddersfield). Angels: 1, Mr J. Longbottom (Mansfield); 2, Mr A. Hudson (Huddersfield); 3, Mrs Bone (Huddersfield).

Toothcarps. 1, Mr C. Holdsworth (Bradford); 2, Mr J. Hodgkinson (Bradford); 3, Mr G. Bulleyment (Notts.).

Catfish and loaches. Section winner, Mr D. Sides (Chapelton). Large: 1, Mr D. Sides (Chapelton); 2, Mr W. Parkin (T.A.B.); 3, Mr E. Price (Gorton). Small: 1, Mr J. Tunny (Chapelton); 2, Mr C. Holdsworth (Bradford); 3, Mr J. Robinson (Merseyside).

Breeders. Livebearers: 1, Mr A. Mabby (Rochdale Breeders); 2, Mr A. Beasley (Oram); 3, Mr R. Boothwood (Leigh). Egg-layers: 1, Mr L. McCourt (Gorton); 2, Mr Cohen (Pontefract); 3, J. and H. Derris (Workoop).

Pairs. Section winner, Mr J. Tunny (Chapelton). Livebearers: 1, Mr J. Tunny (Chapelton); 2, Mr L. Bulleyment (Notts.); 3, Mr F. McCourt (White Rose). Egg-layers: 1, Mr Whitlock (Tadcaster); 2, Mr J. H. Brown (Mansfield); 3, Miss Lindley (Alfreton).

A.O.V. 1, Mr P. Moorhouse (Bradford); 2, Mr E. Piper (S. Kirby); 3, Mr P. Reynolds (Swillington). Coldwater: 1, Mr Booth (Bradford); 2, Mr R. Birch (Heywood); 3, Mr J. Wiggins (White Rose). Juniors: 1, Mr D. Bond (Leigh); 2, Mr A. Kaye (Huddersfield); 3, Master Wilkinson (Clitheroe). Ladies: 1, Mrs Gregory (Oram); 2, Mrs C. Boothwood (Leigh); 3, Mrs Hodgkinson (Gorton).

LATEST results received from **DUNDEE A.S.** Scott trophy and Junior trophy competitions are: Scott trophy platys: 1, Mr W. Carstairs; 2, Mr D. Perrie; 3, Mr S. D. Gauld; 4, Mr D. Perrie. Scott trophy sharks: 1, Mr D. Towns; 2, Mr G. Reid; 3, Mr R. N. Crabb; 4, Mr S. D. Gauld. Junior trophy platys: 1, Mr D. Perrie; 2, Mr S. D. Gauld; 3, Mr D. Perrie; 4, Mr S. D. Gauld. Sharks: 1, Mr S. D. Gauld.

THE novices classes received a very good entry at the March table show of **LEAMINGTON & D. A.S.** Results were: Novices, a.v. egg-

layers: 1, Mr M. Layton (C. Jull); 2, Mr M. Smith (golden barb); 3, Mrs S. Underwood (three-spot gourami); 4, Mr J. Barlow (golden barb). Novices, a.v. livebearers: 1, Mr P. N. Thomas (lemon wag platy); 2, Mr P. N. Thomas (festival platy); 3, Mrs S. Underwood (Berlin sword); 4, Mrs S. Underwood (red sword). Open, true pairs of egg-layers: 1, Mrs J. K. Smith (half-banded barbs); 2, Mr F. Underwood (bleeding-heart tetras); 3, Mrs J. K. Smith (harlequins); 4, Mr F. Underwood (silver tetras). At this meeting, Mr Bob Sharp gave a most instructive talk on native marines, illustrated with some very good slides.

The Haringey Tropical Show

ALL the hard work of show secretary, Mr A. E. Salter, and members of the **TOTTENHAM & D. A.S.**, was well repaid by the success of their open show (THE HARINGEY TROPICAL FISH SHOW) held in March. The show is sponsored by the Borough of Haringey and the club paid tribute to the good offices of Mr F. Smith and his colleagues in the Borough Entertainments Department and were especially grateful to the Deputy Mayor of Haringey, Councillor A. T. Protheroe, who presented the prizes. There were some fine entries out of the 400 and over that were submitted. The best fish in show award went to Mr L. Bromley's magnificent Siamese fire eel, and the George Bundle Memorial Rose Bowl, a new award for barbs presented by the parents of the late Mr George Bundle who had been an active member of the society for a number of years, was won by Mr G. S. Green with a nigger barb. Over 1,000 people visited the show during the afternoon. Trophy winners were as follows (points in parentheses):

Club furnished aquaria (11 entries): 1, London Transport A.S. (78); 2, Walthamstow & D. A.S. (76); 3, High Wycombe A.S.

(77); 4, Chingford & D. A.S. (74). Individual furnished aquaria (9 entries): 1, Mr D. Valverde (T.D.A.S., 76); 2, Miss M. Hanna (T.D.A.S., 75); 3, Miss I. Nutt (T.D.A.S., 73); 4, Mr B. Thornton (T.D.A.S., 72). Guppy (17 entries): 1, Mr G. H. Goodhall (87); 2, Mrs L. Thorne (84); 3, Mr W. Wren (84); 4, Mr T. Smith (83). Fighter (17 entries): 1, Mr D. C. M. Durrant (Winner of F.B.A.S. Championship Trophy with red fighter, 79); 2 and 3, Mr R. Nutt (77 and 74); 4, Mr D. C. M. Durrant (71). Engulfing toothcarp (13 entries): 1, Mr R. Johnston (blue galera, 85, also winner of Class trophy sponsored by Marshalls Aquaria); 2, Mr B. Cooper (Zigzagly nufasciata, 84); 3, Mr R. Oliver (Panchax lineatus, 83); 4, Mr K. Nutt (Aphyosemion calabaricum, 82). Platy (17 entries): 1, Mr T. Gillman (red platy, 87); 2, Mr W. Wren (blue platy, 84); 3 and 4, Mr F. E. T. Smith (red platy, 83 and 81). A.v. rosalia (20 entries): 1, Mr F. E. T. Smith (M. trilineata, 86); 2, Mr A. W. Collins (M. trilineata, 84); 3, T. J. Hennessy (M. splendens, 81); 4, Mr J. Stuart, black rosette, 81). A.v. swordtail (18 entries): 1, L. Bromley (green sword, 82); 2, Mr T. J. Hennessy (red sword, 82); 3, Mrs P. Brown (red sword, 77); 4, Mr W. Barker (red wagaal sword, 75). A.v. dario, rasbora and white cloud minnows (15 entries): 1, Mr W. Collins (Danio detarrio, 81); 2, Mr R. Knock (D. detarrio, 84); 3, Mr G. Aylard (Rasbora elegans, 70); 4, Mr K. G. Clark (fretted rasbora, 78). A.v. Corydoras catfish (16 entries): 1, Mr S. Mooney (C. serena, 83); 2, Mr R. Martin (C. julis, 84); 3, Mr A. V. Pike (C. julis, 82); 4, Mr R. J. Thorne (C. julis, 84). A.v. dwarf cichlid (13 entries): 1, Mr A. W. Collins (A. roseus, 84); 2, Mr W. Barker (A. roseus, 83); 3, Mr E. C. Lidge (Dumetia cichlid, 82); 4, Mr R. Oliver (P. ardensis,

81). A.v. lybrintha (17 entries): 1, Mr F. E. T. Smith (moonlight goarum, 85); 2, Mr P. T. Burton (combat paradise, 84); 3, Mr S. Mooney (combat paradise, 79); 4, Mr P. J. Harwood (thicklip goarum, 78). A.v. characin (13 entries): 1, Mr P. A. Purn (black widow, 84); 2, Mr T. Gillman (A. anomala, 80); 3, Mr G. Owen (N. nufasciata, 79); 4, Mr A. Millhouse (piranha Sorrasimura nattereri, 79). A.v. barb (41 entries): 1, Mr G. S. Green (nigger barb, 85, also winner of George Bundle Memorial Rose Bowl, sponsored by Mr and Mrs Bundle); 2, Mr R. Smith (E. akaboni, 83); 3, Mr T. Mason (tiger barb, 84); 4, Mr T. Mason (roxy barb, 86). A.v. catfish and loach (20 entries): 1, Mr G. E. Greenhall (Clarias platycephalus, 84); 2, Mr G. E. Greenhall (Psectrogonia rufocincta, 84); 3, Mr D. Nutt (Clarias catfish, 83); 4, Mr B. Stewart (Clarias catfish, 82). A.v. cichlid (14 entries): 1, Mr L. Bromley (Jack Dempsey, 86); 2, Mr T. Asquith (Tilapia mossambica, 85); 3, Mr L. Bromley (C. nigrofasciata, 84); 4, Mr D. Nolan (Jack Dempsey, 81). A.v. tropical (19 entries): 1, Mr L. Bromley (Siamese fire eel, 87, also winner of Best Fish in Show trophy sponsored by Lansbury Aquatics); 2, Mr L. Bromley (silver shark, 86); 3, Mr R. Nutt (Duroside microloph, 83); 4, Mr B. Stewart (reed fish, 84). Egglayer breeders team (24 entries): 1, Mr D. C. M. Durrant (lighter, 83, also winner of class trophy sponsored by Strlings Aquaria); 2, Mr S. Mooney (Dolomieu aposta, 86); 3, Mrs Biggs (thicklip goarum, 70); 4, Mr J. L. Cooper (Labeotropheus trewavasae, 78). Livebearer breeders team (13 in class): 1, Mr G. H. Goodhall (guppies, 86, also winner of class trophy sponsored by Lansbury Aquatics); 2, Mr A. S. Green (red sword, 83); 3, Mr E. T. Mather (red-eyed sword, 86); 4, Mr R. Cooper (stray widow, 79). A.v. native marines (8 entries): 1, 2 and 3, Mr L. Clements; 4, Mr T. R. Hall. A.v. tropical marines (8 entries): 1 and 2, Mr G. Jennings; 3 and 4, Mr L. Clements.

Mr P. R. Stokes Mr H. Williams

It is with regret that we record the deaths of Mr Paul R. Stokes, chairman of the British Killifish Association, and Mr Harry Williams, treasurer of the British Killifish Association, who both died in a road accident in the early hours of 21st March. These tributes have been received.

Mr D. W. Ellis writes:

With a heavy heart I pass on sad news of the sudden and tragic deaths of Mr Paul Stokes and Mr Harry Williams. These two aquarists will be missed not only by aquarists in the Midlands, but the world over, owing to their ties of friendship with the B.K.A.

Paul was chairman of the British Killifish Association and chairman of the B.K.A. New Species Committee, stabilising and distributing new species as they came into the country.

Most of the information pamphlets were from Paul's pen, sent out every month to members. He was also on the committee of the M.A.A.S. and a class judge. With Harry he ran training courses for judges as well as being chairman of the Tipton & D. A.S.

Harry was the treasurer of the B.K.A. and did all the duplicating and mailing of the monthly news letters etc., no mean task in itself. He was also a member of the New Species Committee, and a class judge, also being a member of the Tipton Society.

Both of them would travel miles to judge or give a talk. The void that both of them have left will be very hard to fill.

As an outsider from London (Smoke) I have lost friends of short-standing, but they had become close friends in the world of fish, that can cross the barrier of dialect or language. I speak for all members of the B.K.A. when I say, may they rest in peace—but not be forgotten.

Mr M. Packwood writes:

As chairman of the British Killie-

fish Association, London Group, and as a close contact and friend, it is with a sad heart I write this letter as a tribute to Paul Stokes, B.K.A. chairman, and Harry Williams, B.K.A. treasurer. Paul and Harry were recently widely known for their work on behalf of the B.K.A., but they had been known as lecturers, judges and as tropical fish-keepers for very much longer. They were certainly the foremost in the field of killifish breeders in this country. Paul was also well known for his excellent articles on killifish that were published in tropical fish magazines.

They will both be sadly missed by the B.K.A., Paul for his leadership and articles and Harry for his work in keeping our accounts and producing our monthly newsletter. On behalf of the London Group, I would like to express our deepest sympathy to Mrs Pat Stokes and her baby girl, to Mrs Williams and her children, whose husbands will be remembered for a long time by tropical fish hobbyists all over the country and in particular by B.K.A. members all over the world.

In Brief . . .

...NEW officers elected at the A.G.M. of the **WORKSHOP AQUARIST & ZOOLOGICAL SOCIETY** are: president, Mr W. Kirk; chairman, Mr G. Sibson; secretary, Mrs J. Dornie (89 Sparken Hill, Workshop, phone 2975); treasurer, Mr J. Dornie; show secretary, Mr S Knowles. Results of the March table show were: A.O.V.: 1 and 2, Mr A. Mawson; 3, Mr and Mrs J. Dornie. Catfish & loach: 1 and 2, Mr A. Mawson; 3, Mr Bennett. Large cichlids: 1, Mr and Mrs J. Dornie; 2, Mr Bennett; 3, Mr and Mrs Maycock. Fighters: 1, Mr A. Mawson.

...NEW address for the show secretary of **REIGATE & REDHILL A.S.** is: Mr G. Bass, Yew Trees, Westcott Road, Dorking, Surrey ('phone Dorking 3327).

...Mr. A. LINDLEY of Nottingham lectured to a very well-attended meeting of the **CHAPELTOWN & D. A.S.** at which the results of the table show judged by Mr A. Abdy were: Egg-layer pairs: 1, Mr E. Fernough; 2, Mr J. Tunney; 3, Master I. Anson. The start of the interchangeable fish-growing contest between club members also got off to a good start.

...ONE of the few clubs holding weekly meetings, **HENDON & D. A.S.** warmly welcome all prospective members to their Thursday evening gatherings—8.0 p.m. at the Brotherhood Hall, Edgware Road, West Hendon, London, N.W.9, or details from secretary Mr Keith Parbrick, 3 Holme Way, Stanmore, Middlesex. At the club's Open Show on 13th May, an outside lecturer will entertain visitors whilst the judging is in progress with a talk on reptiles, illustrated with live specimens.

...THE new committee of **STOCKPORT A.C.** is: chairman, Mr J. L. Johnson; secretary, Mr M. C. Healy (18 Kinder Street, Edgeley, Stockport); show secretary, Mr W. Barning. New members will be most welcome at the club's fortnightly meetings held on the first and third Tuesday each month at 8.0 p.m. at the British Railway Club, Cheadle Old Road, Stockport.

...MEMBERSHIP of the **MARINE STUDY A.S.** has now reached its highest ever with 97 members and several affiliated societies.

... 'FISHY Topics' was the title of the talk given by Mr Milne of Dunecht in March to a very interested audience of **NORTH OF SCOTLAND A.S.** members. The

talk covered a wide range of subjects and included recollections of bygone days in the original club. The enthusiasm of the new committee and officebearers who were elected

at the A.G.M. in February has encouraged a steady increase in membership, which, if it continues, will put the club once more in a very strong position.



Mr Collinge (left) being presented with his award for best fish in the show by Mr W. H. Smith (president, right) and Mr R. A. Wilde (chairman) of Stretford & D. A.S.

STRETFORD & D. A.S. held their open show on Sunday, 5th March and attracted a large number of competitors and visitors from Lancashire and surrounding counties. Stretford A.S. members, with six first prizes, ten seconds and three thirds, gained twice as many awards as their nearest rivals. Best fish in the show was a dwarf cichlid owned by Mr Collinge of the T.A.B.S. and the award for this was a magnificent aqualamp worth £20 and donated by K.H. Aquaria, Chester Road, Old Trafford, Manchester. Full details of awards (points in parentheses) are:

Guppies: Mr Beasley (Oxam, 74); 2, Mr Allen (T.A.B., 73); 3, Mr Murray (Belle Vue, 70). Platy: 1, Mr Moorcroft (Merseyside, 74); 2, Mr Beasley (Oxam, 73); 3, Mr Prescott (Belle Vue, 69). Mollies: 1, Mr Matthews (Lytham, 73); 2, Mrs Wilde (Stretford, 71); 3, Mr Woodward (Blackpool, 70). Swordtails: 1, Mr Mulla (Merseyside, 71); 2, Mrs Wilde (Stretford, 71); 3, Mr Jones (Blackpool, 69). Small barbs: 1, Mr Gregory (Oxam, 78); 2, Mr Prescott (Belle Vue, 70); 3, Mr Hodgkinson (Gorton, 74). Large barbs: 1, Mr Parkin (T.A.B., 72); 2, Mr Wilkie (Stretford, 71); 3, Mr Prescott (Belle Vue, 70). Small characins: 1, Mr Gregory (Oxam, 73); 2, Mr Greenwood (Stretford, 71); 3, Mr Booth (T.A.B., 70). Large characins: 1, Mr Wilkie (Stretford, 71); 2, Mr Moorcroft (Merseyside, 71); 3, Mr Parkin (T.A.B., 70). Killifish: 1, Mr Ouden (Urmston, 70); 2, Mr Beasley (Oxam, 69); 3, Mr Hodgkinson (Gorton, 68). Minnows and danios: 1, Mr Gussy (Cumbrook, 71); 2, Mr Prescott (Belle Vue, 70); 3, Mr Jones

(Blackpool, 69). Sharks and foxes: 1, Mr Mulla (Merseyside, 70); 2, Mr Jackson (Belle Vue, 70); 3, Mr Jones (Blackpool, 71). Rasboras: 1 and 2, Mr Gregory (Oxam, 73 and 71); 3, Mr Bebbington (Stretford, 67). Dwarf cichlids: 1, Mr Collinge (T.A.B., 81); 2, Mr Maltby (Rochdale, 78); 3, Mr Mulla (Merseyside, 70). Large cichlids: 1 and 2, Mr Guildford (Stretford, 78); 3, Mr Allen (T.A.B., 70). Angels: 1, Mr Woodward (Blackpool, 77); 2, Mr Jones (Blackpool, 75); 3, Mr Hodgkinson (Gorton, 74). Catfish: 1, Mr Parkin (T.A.B., 78); 2, Mr Price (Gorton, 74); 3, Mr Booth (T.A.B., 71). Loaches: 1, Mr Wilkie (Stretford, 71); 2, Mr Guildford (Stretford, 71); 3, Mr Hodgkinson (Gorton, 74). Fighters: 1, Mr Booth (T.A.B., 71); 2, Mr Sutton (Oxam, 70); 3, Mr Beasley (Oxam, 69). Anabantids: 1, Mr Matthews (Lytham, 73); 2, Mr Mulla (Merseyside, 69); 3, Mr Willett (Lytham, 68). A.O.V.: 1, Mr Crook (Stretford, 73); 2, Mr Phillips (Ashton, 71); 3, Mr Collinge (T.A.B., 69). Pavia livebearers: 1, Mr Hodgkinson (Gorton, 70); 2, Mrs Wilde (Stretford, 71); 3, Mr Smith (Stretford, 71). Pairs egg-layers: 1, Mr Charlton (Stockport, 71); 2, Mr Barning (Stockport, 71); 3, Mr McCourt (Gorton, 71). Brooder livebearers: 1, Mr McClelland (Stretford, 72); 2, Mr Maltby (Rochdale, 71); 3, Mr Jones (Blackpool, 70). Brooder egg-layers: 1, Mr Mulla (Merseyside, 70); 2, Mr Wilde (Stretford, 74); 3, Mr Crook (Stretford, 70). Plants: 1, Mr Madden (Stretford, 70); 2, Mr Bebbington (Stretford, 71); 3, Mr Jones (Stockport, 70). Juniors livebearers: 1, Miss Birch (Heywood, 71); 2, Master Hodgkinson (Gorton, 68). Juniors egg-layers: 1, Miss Matthews (Lytham, 74); 2, Master Middleton (Gorton, 71); 3, Master Hodgkinson (Gorton, 70). Cold-water: 1, Miss Birch (Heywood, 70); 2, Mr Greenwood (Stretford, 74); 3, Miss Birch (Heywood, 71).

DO you reside in the North of England? Are you interested in rearing and showing tropical or coldwater marine fishes and invertebrates and willing to attend one meeting each month? If you answer yes please contact Mr C. Walker, 95 Springwood Hall Road, Fitton Hill, Oldham, Lancs. A number of fishkeepers wish to form a society for this purpose and the following people have been approached to act as officers: chairman, Mr C. Walker; secretary, Mr P. Moorhouse; treasurer, Mr A. Harper. The first meeting will be held in the vicinity of Manchester, and Mr Walker will provide details of this.

... THE MANCHESTER SECTION of the **FANCY GUPPY ASSOCIATION** greatly enjoyed the lecture given by Mr R. B. Beresford on Fish Photography which was very well demonstrated by the slides shown. Interested guppy breeders will be most welcome at any of the regular meetings held on the first Sunday in the month at 2.30 p.m. at the Longsight Hotel, Belle Vue, Manchester.

... AT the slide lecture on the maintenance of tropical and native marine aquaria given by Mr Gerald Jennings (Marine Study A.S.G.B.) to members of **NORTHAMPTON A.S.** and guests from surrounding Midland aquatic societies, a useful point was made concerning the availability of the black non-setting mastic mentioned in the lecture that many members had been unable to obtain locally. Mr Jennings said that the best source of supply was a car-repair workshop as it was used for bedding the windscreens of vehicles.

... NEW secretary of **CLITHEROE & D. A.S.** is Mr T. N. Hallett (68 St Huberts Street, Gt Harwood, Nr Blackburn, Lancs.) replacing Mr H. Baldwin, retiring, in his own words 'to make way for new blood'. Other officers elected at the A.G.M. are: chairman, Mr E. Wilkinson and treasurer, Mr K. Carden. The financial position of the club was reported to be 'as sound as ever' and with the many ideas put forward for future lectures, competitions, etc., new members will be assured of an interesting time at the monthly meetings held on the second Wednesday of the month at the Deg & Partridge Hotel, Wellgate, Clitheroe.

... **BRISTOL TROPICAL FISH CLUB** give the following results for their March table show. Livebearers. Open section: 1, Mr J. B. Powell;

2 and 3, Mr F. Brown. Novice: 1 and 2, Mr J. B. Powell; 3, Mr S. Allaway. At this meeting a slide show was given by Mr G. Stone, for Mr V. Capaldi, of various shows in past years, which proved a most enjoyable entertainment.

... A REALLY full and exciting agenda has been prepared for **ELLSMERE PORT & D. A.S.** members this year. Meetings are held at the Woodlands Hotel, Whitby, on the first and third Monday of each month and new members will be most welcome. Further information from secretary, Mr P. Peers, 32 Brownlow Road, New Ferry, Wirral.

... **NUNEATON A.S.** first table show at the end of March attracted 32 entries covering all the popular types of livebearers. The high standard of the entries made the judge's task (Mr G. Rowe) more difficult and awards eventually went to Mr P. Beasley (first and second), to Mr G. Gibbs (third) and to Mrs S. L. Leigh (fourth, with a highly commended entry). At an earlier meeting, Mr B. Eddon from Leamington described some of the finer characteristics of different types of fish, and then illustrated his talk by giving members some fish to judge.

... THE SUBJECT of the talk given by Mr Bateman to members of **BRADFORD & D. A.S.** recently was 'Water'. The many quotes and samples of chemicals with which he illustrated the lecture all helped to add up to a most interesting and educational evening. Table show results at this meeting were: Characins: 1, Mr G. Orchard; 2, Mr C. Holdsworth; 3, Mr P. Moorhouse. A.o.v. results: 1, Mr B. Lightowler; 2, Mr G. Orchard; 3, Mrs J. Creep. Judges were Mr Hooper and Mr Carr.

... MEMBERS of **RUGBY & D. A.S.** should have acquired a wide knowledge of things aquatic as a result of talks at recent meetings. They have enjoyed a discussion on setting up an aquarium and have gone fully into problems of pH and DH, lighting and types of heating, insulation of fishhouses and plants. Mrs Pearson spoke on showing fish and the many points to look for when showing. Mr D. Emery gave a talk on the keeping and breeding of cichlids and Mrs Pearson spoke on the African clawed toad (*Xenopus*), illustrated with live specimens from the young tadpole stage to the fully developed young toad.

... SECRETARY Mr John Ingram of **GLOSSOP A.S.** has asked us to

record his thanks to **GORTON & OPENSHAW A.S.** for their whole-hearted support of the inter-society show on 23rd March. There was a record entry of 133 fish, and Mr Ingram suggests that this may be a record for two not very large societies. Any rival claims from other club secretaries? The evening was a 'roaring success' with Mr Jim Kelly entertaining and edifying in one room whilst the judging was going on in another room. There was also a celebration of the birthday of Mr Eric Price (chairman of Gorton & Openshaw), with the whole meeting singing 'Happy Birthday'.

... **SWILLINGTON A.S.** members had a very entertaining evening when Mr Ray Hampson of Aireborough presented slides and tapes exchanged by him with the American Society of Iowa. This gave a new approach to American fishkeeping and is thoroughly recommended to all clubs. Table show results were: catfish: 1, Mr K. Smales; 2, Master P. Reynolds; 3, Mrs A. Gawthorne.

... **NOTTINGHAM & D. A.S.** pay a sincere tribute to retiring president, Mr Harold Lynn, who has recently suffered a severe illness. Over 21 years, Mr Lynn's devotion to the Society, the immeasurable assistance he has given to it and the work he has carried out on its behalf have won the thanks and admiration of all.

... **MID-HERTS A.S.** announce a comprehensive programme for the next 6 months including a table show at Paton Books, Holywell Hill, St Albans, every third Tuesday of the month and a lecture, slide show or, as on 2nd June, a film show at Roe Hill House, Bishops Rose, Hatfield, every first Friday of the month. New members are very welcome and novices are given all the help they require. Results of February's table show are: cichlids: 1, Mr G. Ralph; 2, Mr J. L. Cooper; 3, Mr P. Thatcher; 4, Mr T. Mahoney. Dwarf cichlids: 1 and 2, Mr D. Lelliott; 3, Mr W. Holmes; 4, Mr A. Withers. Mini aquaria: 1, Mr C. Withers; 2, Mr A. Withers; 3, Mr W. Holmes; 4, Mr W. Davison. Mini aquaria, juniors: 1, C. Lelliott; 2 and 3, A. Withers.

... THREE new B class judges are announced by the **FANCY GUPPY ASSOCIATION**. These are Mr L. Peet (Manchester), Mr D. Curry (Erfield) and Dr J. Atkins (Radlett).

... **MERSEYSIDE A.S.** announce two new competitions for their members. These are for an original article for the Mersey Beacon and for a photograph of a furnished tank. Recent club meetings have included

a lecture by guest speaker Mr Alan Bland on his new fish house and a meeting when members judged the fish taken along by committee members and were pleasantly surprised to find how near their opinions were to those of experts Mr Fred Mulla and Mr Ken Parkes.

... RESULTS of the first round in the 1967 Club championship contest for **CRAWLEY COLLEGE A.S.** were: 1, Mr T. Goggin (75 pts); 2, Mr West (74 pts); 3, Mr Songhund (73 pts). Mr D. Ellis, A.S.L.A.S., was the judge.

... THE talk given by Mr G. W. Cooke, well known as show secretary

of the F.N.A.S., on fishkeeping and fish breeding won the delighted thanks of **HALTON & D. A.S.** for a most informative and entertaining evening. Table show results at this meeting were: fighters: 1 and 2, Mr A. McCulloch; 3, Mr F. Senior. Rasboras: 1 and 2, Mr A. McCulloch; 3, Mrs O. Taylor.

... TABLE show awards for the early March meeting of **AIREBOROUGH & D. A.S.** were: specified class (barbs): 1 and 3, Mr P. Iveson; 2, Mr Emma. A.O.V.: 1 and 2, Mr R. Lister; 3, Mr P. Iveson. Novice (barbs): 1 and 3, Mrs

P. Iveson; 2, Mrs J. Whiteley. Junior: 1, Master K. Lister.

... THE last year, 1966-1967, has been a very exciting and informative period in the growth and activities of **WARRINGTON A.S.** and now, under the editorship of secretary, Mr Ron Tench, a detailed month by month record of club activities and of show successes is recorded in the 40-page Annual Review and Year Book. The Review also contains articles by club members on general aspects of fishkeeping and the results provide a really excellent permanent memento of a memorable year for the club.

Dates for Your Diary

10th April. **ASSOCIATION OF YORKSHIRE AQUARIST SOCIETIES** Open Show (please note change of date from that reported in FFM, January issue). The Railway Institute, Ardsley Road, Hall. Bunching 1-2.15 p.m. Judging 3.30 p.m.

6th May. **TROWBRIDGE & D. A. & P.S.** Open Show, Nelson Haden School. Details from Mrs P. Pearce, 69 Alfred Street, Westbury, Wils.

7th May. **OSRAM A.S.** Open Table Show.

13th May. **FREELANCE A.S.** second Open Show at the London College of Printing, Elephant and Castle, London, S.E.1. Show schedules from Mr A. Howes, 26 Rubens Street, Catford, London, S.E.6.

13th May. **KEYNSHAM & D. A.S.** Open Show, British Legion Hall, Charlton Road, Keynsham, Nr Bristol. Details from show secretary Mr J. D. Brown, 76 Peart Street, Bedminster, Bristol 1.

13th May. **HENDON & D. A.S.** Open Show. The Brotherhood Hall, Edgware Road, West Hendon, London N.W.4. All welcome. Show schedules from Mr Joe Gorman, 431 Honeygot Lane, Stannett, Middlesex.

14th May. **MIDLAND ASSOCIATION OF AQUARISTS' SOCIETIES** annual Convention and Open Show, Lockhead Sports and Social Club, Tachbrook Road, Leamington Spa (LOCKHEED A.S. will be acting as host society).

14th May. **WORKSOP AQUARIST & ZOOLOGICAL SOCIETY** third annual Open Show. Kilton Youth Club, Kilton Hill, Worksop.

14th May. **LANARKSHIRE A.S.** Open Show. Community Centre, Airdrie, Scotland.

18th May. **MIXENDEN T.F.S.** second Open Show. Mixenden Community Centre, Clough Lane, Mixenden.

21st May. **MIDLAND AQUARIST LEAGUE** assembly. Hosts are **CONVENTRY POOL & AQUARIUM SOCIETY**. Wyken Community Centre, Belgrave Estate, Coventry.

28th-29th October. **BRITISH AQUARISTS FESTIVAL** organised by the Federation of Northern Aquarist Societies, Belle Vue Zoological Gardens, Manchester.

22nd May. **LIVERPOOL SECTION of the FANCY GUPPY ASSOCIATION** Open Show. Norris Green Boys Club, Townsend Avenue, Liverpool. Bunching 1.30-2.30 p.m. Enquiries to Mr Bill Armistage, 12 Orrell Lane, Liverpool 9.

27th May. **READING & D. A.S.** are staging the 1967 **THREE COUNTIES AQUARIST SHOW** at The S.G.B. Social Club, Oak Lane, Reading. Bunching from noon, Friday 26th May. Show schedules from Mr C. Masters, 25 Morcombe Avenue, Caversham, Reading, Berks.

2nd June. **FEDERATION OF BRITISH AQUATIC SOCIETIES** Assembly.

2nd June. **CATFORD A.S.** Open Show. Full details from show secretary Mr Ken Owen, 42 Elmest Road, Catford, London, S.E.6.

4th June. **PONTEFRAC T & D. S.A.** Open Show (provisional).

4th June. **SECOND INTERNATIONAL GUPPY SHOW** organised by the FANCY GUPPY ASSOCIATION, Ardwick Barracks, Ardwick Green, Manchester, 10.0 a.m. to 6.0 p.m. Show organiser: Mr H. Bedford, 99 Valley Road, Arden Park, Bredbury, Cheshire.

10th June. **LLANTWIT MAJOR A.S.** annual Open Show.

11th June. **LYTHAM A.S.** first Open Show at the Lowther Pavilion, Lytham.

17th June. **UXBRIDGE & D. A.S.** Open Show. Meadow School, Royal Lane, Hillingdon, Uxbridge. Full details from Mr P. Grogan, 2 Clowley Avenue, Ickenham, Uxbridge, Middlesex.

18th June. **SWILLINGTON A.S.** second Annual Show. Swillington Primary School. Further details from Mr F. Smales, 22 Panton View, Swillington, Woodlesford, Nr. Leeds.

18th June. **GLOSSOP A.S.** Open Show. Details from the secretary, Mr J. Ingram, 37 Charlestown Road, Glossop, Derbys.

22nd-24th June. **BRISTOL T.F.C.** Open Show. Schedules from show secretary, Mr F. Barry, 18 Foxcote Road, Ashton, Bristol 3 (phone 666336).

23rd June. **DIDCOT & D. A.S.** Open Show. Didcot Labour Club, Schedules and entry forms from Mr P. Tuckey, 2 Marvels Close, Didcot, Berks.

1st July. **HUTTON GRAMMAR SCHOOL A.S.** second annual Open Show, Preston, Lancs. Details from show secretary, Mr D. J. Radcliffe, Kinba, Todd Lane South, Lostock Hall, Preston, Lancs.

2nd July. **LEAMINGTON & D. A.S.** second Open Show.

2nd July. **MERSEYSIDE A.S.** Open Show. (Change of date from 21st May).

5th July. **GOLDFISH SOCIETY OF GREAT BRITAIN** quarterly meeting, Corvey Hall, Red Lion Square, Holborn, London at 2.30 p.m.

8th July. **BASINGSTOKE & D. A.S.** Open Show. St John's Ambulance Hall, Victoria Street, Basingstoke. Schedules from Mr A. Marshall, 61 Pittman Close, Basingstoke, Hants.

5-12th August. **PORTSMOUTH A.S.** fifteenth annual Open Show. Bunching, 27th; judging, 6th; open to public 7-12th; 20th; prize-giving, evening of 12th.

13th August. **GORTON & OPENSHAW** third annual Open Show. Conservative Club, Gorton Lane, Manchester 18.

22nd-25th August. **MIDLAND OPEN SHOW** (the 24th). Bingley Hall, Broad Street, Birmingham. Details from Mr J. Wills, 120 Franklin Road, King's Norton, Birmingham 20.

26th and 27th August. **OSRAM A.S.** Two-Day Show.

2nd September. **HIGH WYCOMBE A.S.** annual Open Show. The Rye, High Wycombe, Bucks. This will include a guppy show put on by the **THREE COUNTIES section of the FEDERATION OF GUPPY BREEDERS SOCIETY**. Details from Mr C. E. Pike, 16 Ashley Drive, Tylers Green, Penn, Bucks.

30th September. **KINGSTON & D. A.S.** Open Show. St Luke's Social Centre, Elm Road, Kingston-on-Thames. Details from Mr H. Towell, 11 Belmont Terrace, Chiswick, W.4. Phone CH1 7335.

1st October. **HEYWOOD & D. A.S.** Open Show. Labour Club, Bridge Street (opposite the Seven Stars), Heywood, Lancs. Extra class for marines.

Classified ADVERTISEMENTS

AQUATIC SUPPLIERS

CHELTENHAM AQUATICS. Largest selection of tropical and coldwater fish in Gloucestershire. Bow-fronted and stainless-steel aquaria, equipment, reptiles and amphibians and everything for the water garden. 11 Suffolk Parade, Phone Cheltenham 24949.

HIGH QUALITY TROPICAL FISH AND PLANTS, tanks and accessories. Ronada Ltd., Queen's Park Aquarium, 153 Queen's Road, Blackburn. Phone 57654. Professional aquarists. Personalised service.

KINGPETS keep fish in BATH, tropical and coldwater. Full range of equipment and books; bow fronts. Plants for pools and aquaria. Plastic and fibreglass pools, streams, fountains. Reptiles and other animals. 23 Brock Street, Bath. Phone 4028.

TROPICAL AND COLDWATER FISH AND REPTILES, plants, equipment. Everything for the aquarist and pondkeeper. Mail order service. Why not pay us a visit? W. H. Smith Aquatics, 67 Reddish Lane, Gorton, Manchester 18.

OLDBURY'S OF CHESTER. 100 varieties tropical fish, freshwater and marine. 40 varieties plants. Equipment. Live foods. Evenings after 7 p.m. Weekends 2 to 6 p.m. 36 Pearl Lane, Vicars Cross, Chester 41671.

PLYMOUTH TROPICALS for your fish, plants and equipment. North Hill Nurseries, Tavistock Road, Plymouth. Phone 62663.

TROPICAL FISH, QUALITY PLANTS AND EQUIPMENT are now available at: Beta Pets (Bill Matthews & Don Thomson), 285 Ribbleson Lane, Preston (58709) Lancs.

SERVICES

MIDLAND AQUASERVICE. Keep your aquariums in top condition by letting us maintain them. Private and

commercial aquaria installed and serviced. Phone Kingswinford 5672.

FISH

SUPERB VEILTAL GUPIES Awarded "Water Life" diploma. Best in open show. £1 per pair, carriage 5s. C. R. Perry, Professional Aquarist, 615 West Street, Crews.

WANTED. Large Oscars, pure line fighters. Phone LON 1469. Kershaw, 19 Washbrook Drive, Sretford, Lancs.

WATER PLANTS

TROPICAL AQUARIUM PLANT SELECTIONS, books, fish foods and equipment. All available by post from K.M.K. Aquatics, Stockton, Rugby. S.a.e. for lists.

MINIATURE JAPANESE BULRUSHES (*Typha minima*). Excess requirements to stock. Good strong plants 2s. each, 18s. a dozen, £5 a hundred. C.W.O. The Water Garden Nursery, Hinton Parva, Swindon, Wilts.

MISCELLANEOUS

MAN REQUIRED to control Aquatic Department of Harrow's leading pet store. Experience of tropical fish desirable. A permanent position with excellent prospects. Salary according to age and experience. Apply: Peters Food Stores Ltd., 464-8 Alexandra Avenue, Harrow. Phone 01-866 5622.

MALAYAN LIVEBEARING SNAILS (*Melania tuberculata*) 4s dozen. *Elodea crispus* (coldwater) 4s dozen. Box 221.

LARGE AQUARIUM WANTED. Must be cheap, in reasonable condition and preferably in South London area. Box 222.

UP TO £10 paid for 1818 to 1934 5s pieces. Other coins and medals purchased. Searle, 3 Raleigh Street, Plymouth.

EQUIPMENT

FLUORESCENT and Growlight control kits. Wholesale only. All sizes, lowest prices. J. Bull Electrical Ltd, 4 Springfield Road, Eastbourne.

AIR-LINE TUBING—the finest available. S.a.e. for sample. The Stores, Ten Mile Bank, Downham Market, Norfolk (Trade supplied).

BLANKET WEED REMOVER. In stainless steel, most effective, removing blanket weed from all plants without damage. Price 3s 9d plus 9d postage.

SHREDDERS: Made of stainless steel the Super Combination comprises coarse tooth and fine tooth plates, and top plate with handle. The Shredders, the only instrument capable of reducing earthworm, whiteworm, meat etc. to a size suitable for youngest fry. Use coarse plate for larger fish. Price 26s plus 1s postage. Giant Sagittaria: young plants 7s 6d, 8s 6d per dozen; large plants 1s 3d, 1s 6d each. Postage 1s 3d. Shubunkins: Enquiries invited. Visits by appointment only. S.A.E. to E. S. Walker, 145 Bure Lane, Christchurch, Hants. Postal trade only. Local buyers see COOKS AQUARIA, Boscombe, Hants.

LARGE AQUARIA FRAMES, SHADES, STANDS. 1 x 1 x 1 in. steel angle: 30 x 15 x 12 in., 26s; 30 x 15 x 15 in., 27s; 36 x 15 x 12 in., 28s; 11 x 11 x 1 in. steel angle: 42 x 15 x 12 in., 38s; 42 x 15 x 15 in., 40s; 48 x 15 x 12 in., 44s; 48 x 15 x 15 in., 47s. Aluminium shades: 24 x 12 in., 20s; 30 x 12 in., 24s; 36 x 12 in., 30s; 48 x 12 in., 40s; 48 x 15 in., 46s. Stands: 24 x 12 x 36 in. high, 40s; 30 x 12 x 36 in., 45s; 36 x 12 x 36 in., 50s; 48 x 12 x 36 in., 65s; 48 x 15 x 36 in., 70s. Any size to order, S.A.E. Carriage paid. Money back if not satisfied. Glazing compound (1s 4d lb.) sent only with frames. C.W.O. Hockney Engineers, Derwent Place, Bath Road, Leeds 11. Phone 25061.

SHOW JARS. New glass show jars, with black screw tops, 4 in. square, 6 in. deep, 3s each, 33s dozen, for collection only (South London area). Box 53.

THE POSTMAN can bring you our CATALOGUE

OUR PROMPT POSTAL SERVICE CAN BRING YOU all you need for SUCCESSFUL FISHKEEPING

Please state whether your interest lies in Aquariums and/or Garden Ponds

Your Guarantee of Satisfaction
—since 1948

Telephone
2406

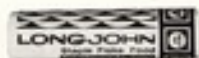
WINGATE 7, MARKET STREET
WINCHESTER

Please mention PFM when writing to advertisers



32 grams
4/3

LONG JOHN



15 grams
2/6



140 grams
14/-

NOT ONE PACK HAS BEEN SOLD at time of going to press. In fact, Long John is so new that distribution did not start until mid April, so we can't claim that it's the best seller. But we think it will be in time. Otherwise, we would not have gone to all the trouble to develop a very special pack for this very special food.

YOUR FISH will like Long John because the food is so good.

YOU will like Long John also because the pack has been designed and approved by hobbyists—and the price is right because Long John is packed in our own factory in Dorking.

YOUR DEALER will like Long John because the packs look nice and stay looking nice—are water resistant and virtually unbreakable. There are only three sizes which all fit into the same size display box so that you can select your Long John pack without him cluttering up his counter.

BUY NEW LONG JOHN TROPICAL FLAKE FOOD AT YOUR DEALER NOW

In case of difficulty—available post free from

INTER-PET . DORKING . SURREY

(Sales division of Liquifry Co. Ltd.)

Tel: Dorking 2566

"I saw your advertisement in PFM"

NORWOOD

A *We are pleased to announce the opening of our new and much extended premises at*

Q **60, KNIGHTS HILL**
U **WEST NORWOOD**
A **S. E. 27**

We would like to thank all our retail and wholesale customers for their support in the past, which has made our expansion possible. We hope to be of even greater service in the future.

* * * * *

WE STOCK A LARGE SELECTION OF TROPICAL FISH & PLANTS PLUS COLD-WATER FISH & MARINES AS AVAILABLE

* * * * *

OUR OFFER of a 24" x 12" x 12" aquarium, 1" angle fully glazed, plus heater, thermostat and thermometer at 59/6d. complete is the best value for money on the market today.

* * * * *

SPECIAL for bona fide wholesale customers, we can now offer 40-70 varieties of good quality tropical fish.

Please mention PFM when writing to advertisers

ANGLIAN AQUATICS

offer

125 varieties of Tropical and
Coldwater Fish and Plants

also

5'-6' Boa constrictors	..	£12 10 0
Rainbow Boas from	..	£5 0 0
Caimans 18"-22" long	..	£2 10 0
36" Tegu lizards (Tame)	..	£8 0 0
Giant Marine Toads	..	£2 10 0

Open 7 days a week

339 WIMPOLE ROAD
BARTON
CAMBRIDGE

Phone COMBERTON 352



EVERYBODY IS TALKING ABOUT- **Vitakraft** Antimaladin

2 in 1 Aquarium Remedy

Antimaladin the new universal aquarium remedy combats most diseases including Ick, fin and tail rot and all fungi; it also eliminates contagious diseases and provides essential minerals. It will do your plants as much good as your fish. Highly concentrated—one bottle will treat 100 gallons of water.



EMOLIN 65 A remedy-preventative, especially for Ichthyophthirius, and eliminates algae.

FLORASIN The new aquarium tablet plant food and fertilizer. Creates magnificent growth of even the most delicate plants.

CHLOR-NEUTRAL The safe aquarium aid for rapid removal of chlorine; also stimulates plant growth.

MULTI-VT-MIN The all in one vitamin complex. Contains all essential vitamins for fish and plants.

ERIC WOODS (ROSEWOOD) LTD.
ARLESTON, WELLINGTON, SHROPS. Tel: Wellington 2854

WHOLESALE DISTRIBUTORS REQUIRED

W. HAROLD COTTON

F.R.M.S.

ICHTHYONOTOMIST

POST MORTEM EXAMINATION
of tropical and coldwater fishes

Specimens should be wrapped loosely and very wet in grassproof paper, surrounded by a damp cloth and then re-wrapped in dry grassproof paper and sent in a strong container.

A brief history and any relevant details should be given. No preservatives please.

Examination fee 2/-

39, BROOK LANE, KINGS HEATH,
BIRMINGHAM 14 Phone HIGHbury 1693

WALK-AROUND PET STORES LTD.

5 TEMPLE END, HIGH WYCOMBE, BUCKS.
TEL: HIGH WYCOMBE 21357

A wide variety of Tropical and
Coldwater Fish, Plants & Accessories

Further extensions to our range of
Tropical, Coldwater & Pond stock in progress

"I saw your advertisement in PFM"

MARINES **26 STAINLESS STEEL & NYLON-COATED TANKS**

Wholesale and retail
Rail service available

TROPICALS

Over 100 varieties
in stock

Mon. 9-6	Thurs. 9-2
Tues. 9-6	Fri. 9-8
Wed. 9-6	Sat. 9-7

FREDS AQUARIUM
94 BURDETT ROAD
BOW, E.3 ADVance 5714

GROWLUX
fluorescent
CONTROL KITS

Comprising: Choke,
Starter and Holder,
2 tube ends, and 2
tube clips.

Kit A for 15 or 20 watt
tube 19/6d.

Kit B for 40 watt
tube 19/6d.

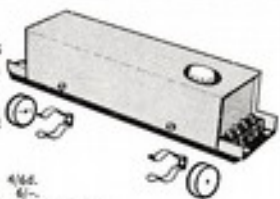
Postage: 1 or 2 kits 4/6d.

3 or 4 kits 6/-

4 kits 7/6d. 12 kits free.

Do love kits with choke and starter enclosed in pressed steel box and wired up ready, 12/6d. extra.

ELECTRONICS (CROYDON) LTD.
(Dept. PF), 102/3 Tamworth Road, Croydon (Opposite West
Croydon Station)



Angel Aquaria

open till 9 o'clock every night and
all day Sunday. Saturday 6.30.

Tropical Fish Plants and Equipment.

47 West Road, South Ockendon, Essex

BOROUGH TROPICALS

12 TRINITY STREET · SE1

Tel: HOP 3996

Large variety of Tropical
Fish · and accessories

COMPLETE AQUARIA SUPPLIED
AND MAINTAINED BY AGREEMENT

PHILLIPS
The finest fish food

For Tropicals and Cold-water
Fish. Two balanced, scientifically
blended and nourishing foods.

Extra high in protein and rich
in vitamins and minerals. Phillips Fish
Foods contain dried shrimp, daphnia,
meat meal, white fish meal, alfalfa, milk
powder, cod-liver oil, wheaten cereal
and yeast—scientifically blended for
balanced nutrition. Always buy
Phillips, the Fish Food you can trust.

Coarse grade for Cold-water Fish 1/9
Fine grade for Tropicals 1/6

* Phillips Cold-water Fish Food contains
SAPROLEGNIL, to protect against the ravages of
"cotton wool" fungus.

Phillips Yeast Products Limited,
Park Royal, London, N.W.10.



Please mention PFM when writing to advertisers

★ **AQUARIST SOCIETIES** ★

give us a ring and book a visit some evening,
or Sunday

Phone CUDWORTH Yorks, 497

Good FISH and EQUIPMENT at reasonable prices

PET STORES
206, BARNSELY ROAD
CUDWORTH, near BARNSELY

We are 4 miles from Barnsley on the Pontefract Rd.

WADE AQUATICS

333 HIGH STREET NORTH, MANOR PARK, E.12
(2 minutes East Ham Station)

TROPICALS
MARINES
AQUARIUMS

CALL AND SEE OUR SELECTION

ORNAMENTAL BOWS OR STRAIGHT
★ Including angle iron specially treated for
Marines ★

PROVIDENT CHEQUES ACCEPTED
WE ARE SPECIALISTS IN ALL THE LATEST PLANTS - PUMPS - FILTERS -
OZONIZERS etc. etc.

MARINES

**WE STOCK ONLY MARINES
OVER 20 TANKS ON DISPLAY**

Marine Fish Supplies

25 Windmill Hill, Enfield. Phone 0285

Weekdays after 6 p.m. All day Saturday
and Sunday.

WHOLESALE ENQUIRIES WELCOME

BEKAY TROPICALS LIMITED

is pleased to announce the opening of its new
RETAIL AQUATIC SHOWROOMS

at
**GROVE ROAD NURSERIES,
GROVE ROAD, HITCHIN, HERTS.**

Visits from Aquatic Societies welcomed.
Car Park under construction.
Rare fish and exhibition standard fish available.
Live foods in stock. Aquatic plants our speciality.

OPENING EARLY MARCH
BEKAY TROPICALS LTD.
37, CHASE CLOSE, ARLESLEY, BEDS.

★ Correspond with York ★

Correspond with the World
Join **YORK & DISTRICT AQUARIST
SOCIETY** as a corresponding member,
12s annually, and receive our monthly
magazine **LATERAL LINKS**. Access to
overseas magazine library. A. SIMONS,
Treasurer, 28 Abbotsford Road, York.
Phone 54380.

SPEAKERS REQUIRED on aquatic
subjects. Fees and expenses paid.
STROUD A.S. Secretary, 56 Valley
View Road, Stroud, Glos.

Visit Bean Hatchery

(Mrs K. Cooper)

at Bean, Nr. Dartford, Kent

(Just off A2 Trunk Road, near Block Horse)

Phone: Longfield (Kent) 4189

Large selection of
**TROPICALS
PLANTS
ACCESSORIES**



Call any time, including Sunday

TACHBROOK TROPICALS LTD.

244 VAUXHALL BRIDGE ROAD, LONDON, S.W.1

Telephone: VICTORIA 5179

ANGLE IRON TANKS	STAINLESS STEEL METAFRAME	3-D BACKGROUNDS	FILTERS	WHITEWORM CULTURE
18x10x10 in. £1 15 0	18x8x10 in. £2 5 0	For 18x12 and 18 in. tanks ... 14 7	Windmill Premier ... 12 6	Small 3 0 Large 5 0
18x12x10 in. £1 37 6	20x10x12 in. £3 10 6	For 24x12 ... 19 0	Biological Filters (5) 18x10 in. ... 13 0	NETS
18x12x12 in. £2 0 0	24x12x12 in. £4 7 6	For 36x12 and 36 in. tanks ... 30 8	Windmill Regent ... 10 0	Round Nylon nets:
24x12x12 in. £2 12 6	30x12x12 in. £7 10 11		Windmill Consort ... 19 6	3 in. 1 2 4 in. 1 3
24x15x12 in. £2 17 6			Internal Corner ... 4 6	Green cotton nets:
30x12x12 in. £3 10 0			Grey-Wel Bottom ... 8 3	3x2 1 2 3x6 2 0
30x15x12 in. £3 15 0			Hydro Jet Bottom ... 5 0	3x4 1 6 6x7 2 6
34x12x12 in. £4 5 0			Hydro Die Luna ... 13 6	4x5 1 9 7x9 3 9
34x15x12 in. £4 15 0			Dynaflo ... £5 17 6	Breeders short wooden handles: 6x9 4 6
34x15x15 in. £5 15 0			Super Dynaflo ... £4 14 6	Comet Nylon nets:
48x12x12 in. £6 2 6			Slime Jim External ... 14 6	3x4 2 0 5x6 3 0
48x15x12 in. £6 15 0			Clear King External ... 22 6	4x5 2 6 4x6 3 0
48x15x15 in. £8 15 0			Grey-Wel Bubble up ... 35 0	Brine Shrimp or Daphnia nets
				3x2 1 3 4x5 1 9
				3x4 1 6 5x6 2 0
				Wooden handles 6x9 4 2
				BREEDING TRAPS
				Windmill combined breeding and rear- ... 19 6
				ing ... 7 0
				Hydro 3-in-1 ... 15 0
				Reliance 3-in-1 ... 21 6
				Grey-Wel Sway ... 1 6
				American ... 5 3
				Hydro fish breeders, fine and coarse ... 4 0
				AQUAMASTIC
				1 lb. tin 2 3+p.s.p. 2 4
				2 lb. tin 3 9+p.s.p. 3 0
				4 lb. tin 6 0+p.s.p. 4 6
				7 lb. tin 9 6+p.s.p. 6 0
				14 lb. tin 17 6+p.s.p. 9 0
				DUROGNOST
				Water hardness testing kit ... 17 6
				Spare tablets P.P.S. of 10 strength N.S. or N.S. 2 0
				Indicators each ... 6 0
				COLORMETER PS
				pH testing kit ... 37 6
				MISCELLANEOUS
				Hydro Aqua Tester ... 2 0
				Hydro Leak Stopper ... 1 3
				Aquastop ... 2 6
				OTHER FISH FOODS
				Chlorella meal 2 6 and 5 3
				Wheat Germ Flakes ... 1 3
				Shrimp Meat, Medium 2 3
				"Small 1 3
				Turtle Food, Large 2 3
				"Small 2 3
				Infusoria Powder ... 3 6
				Conditioning Goldfish Food Large ... 2 0
				Conditioning Goldfish Food Small ... 1 3
				Natural, Large ... 1 3
				Glow Tablets (10 tabs.) 3 6
				Treat Packs (7 different foods) ... 0 0
				Liquid small fry live-bearers ... 2 6
				Baby Food Egg-layers 2 6
				Brine Shrimp Packs ... 8 6
				Miracle freeze-dried worms ... 4 6
				Miracle freeze-dried brine shrimp ... 4 6

Please mention PFM when writing to advertisers

The finest coldwater fish food
available anywhere is *without doubt*



SURE

GOLD

The pelletised food

NO DUST
NO BISCUIT
NO DRIED FLIES

Only the finest possible
ingredients to give a fully
balanced diet

**PACKED IN
TWO SIZES**

HOME PACK 1s. 6d.
POND PACK 4s. 0d.

And available from all good
aquarist supply shops now



Another quality product from:

S.C.A.N. LTD., OLD BATH RD., COLNBROOK,
SLOUGH, BUCKS.