WALTER R. SMITH
For Complete Tropical and Coldwater Aquaria

80 VARIETIES OF TROPICAL AND COLDWATER FISH USUALLY IN STOCK

70 Chromium Plated Tanks of Fish on view

DISTRIBUTOR OF—
- McLynn's Fish Food
- ES-ES Products
- Electrical and General
- Water Life, Aquarist and Ditchfield's Booklets
- Reectors, Sedijets, and Maintenance Equipment
- Proctor and Fairy Pumps
- Constat Thermostats
- Aquafurn and Colorfern Products
- Hyflo Products
- Liverine Products
- Stokes Fountains
- Windmill Products
- Rock, Gravel, and Strata Rock Work
- Students' Microscopes
- All Feeding and Aerating Appliances
- Mercury, Spirit and Dumpy Thermometers
- Stuart Turner Water Pumps
- Zoobeko Pumps
- Vi-Fit Fish Food
- Black Magic Glazing Compound
- Glasticon '93' Aquarium Sealer

Angle Iron Aquariums, Frames and Stands a speciality. Despatched in crates charged at 30/- each, returnable half carriage paid. Odd sizes made to order, painted any colour, guaranteed square and free from welds. Stoves enamelled Corner Bows, Bow Fronts and Wrought Iron Units.

20 PAGE PRICE LIST FREE ON APPLICATION

WALTER R. SMITH
39 Tib Street and 16 Whitley Street
(Off Tib Street)
Manchester 4
Telephone: Deansgate 2961 and 3539

The Arbe Aquarium
made from Perspex and fully guaranteed

WITH EXTERNALLY ADJUSTABLE THERMOSTAT
- Flush Fitting Lid
- Straylight Bracket
- Neon Indicator Lamp

<table>
<thead>
<tr>
<th>Size (inches)</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>18 x 12 x 11</td>
<td>£13-50</td>
</tr>
<tr>
<td>23 x 12 x 11</td>
<td>£17-75</td>
</tr>
<tr>
<td>24 x 15 x 12</td>
<td>£19-75</td>
</tr>
<tr>
<td>36 x 12 x 15</td>
<td>£36-19-0</td>
</tr>
</tbody>
</table>

For further details and your nearest stockist write to:

ARBE PRODUCTS
22a Kings Road, St. Leonards on Sea, Sussex.
“LIQUIFRY”
THE FIRST FOOD (IN LIQUID FORM) FOR BABY FISHES

The World’s most recommended fry food.
Mr. Y. W. Ong, the well-known writer on aquarium topics from Singapore, says “Many breeders of Siamese Fighting Fish use "LIQUIFRY" as the first food. "LIQUIFRY" is also used for raising and breeding brine shrimps.”

"LIQUIFRY" No. 1 (red tube) for egglayer fry produces natural infusoria in the minimum possible time.
"LIQUIFRY" No. 2 (green tube) ideal for young livebearers.

Price 2s. 6d. per tube

“PLEASURE”
The Super Food for all Aquarium Fishes

Packed in handy plastic drums price 1s. 9d.
Please send stamped addressed envelope (3d. stamp) for Free Sample.
"YOUR FISH WILL THRIVE ON PLEASURE"

“LIQUITOX”
The proven specific treatment for FUNGUS and FINROT

Colourless—effective — does not harm the plants.
Standard size 1s. 9d. per carton of 2 capsules.
Breeders pack 6s. 9d. for 12 capsules.
Each capsule will treat 4 gallons of aquarium water.

LIQUIFRY QUALITY PRODUCTS are available through your dealer or post free from
THE LIQUIFRY COMPANY LTD., CHURCH STREET, DORKING, SURREY
The "SILENTA DE LUXE"

One of the most powerful pumps available. Internal filter prevents dust and impurities from entering aquaria. Built-in magnet giving tremendous power. Long flex with plug attached. Six months written guarantee (including diaphragm.)

PRICE 55/- each

Ask at your usual aquarist shop — in case of difficulty write to

HILLSIDE AQUATICS
44, WOODBERRY WAY, N. FINCHLEY, N.12
Telephone: HILLSIDE 5430
Members of the Pet Trade Association Ltd.

USE "CORAL" AS YOUR BASIC FOOD

For TROPICAL & COLDWATER FISH

A STAPLE DIET. The perfect dish for and these.

PLEASE FEED SPARINGLY

Once per day only. The side and economical food.

From dealers in 6d., 1/-, 2/- drums.

Keep Them Healthy on Coral

It is a BALANCED PROTEIN DIET, not just a cereal filler.

THE AQUARIST
PARAMOUNT AQUARIUM

WITHOUT DOUBT, THE FINEST SHOW OF TROPICALS IN LONDON, PLUS ALL THE LATEST EQUIPMENT.

Aquarium Equipment

HEATERS 25-150w
- Paramount: 7.4
- Lisio Wizard: 9.8
- E-C-E Model: 7.4

Postage 1.2

THERMOSTATS
- "UNO": 10
- Popular: 12.8
- Submersible: 18
- "ES-ES": Major: 18
- "PROCORDER": 36
- "CONSTAT": 21
- Junior: 21
- Heavy Duty: 2.4

Postage 1.2

VIBRATOR AERATORS
- Microspot Miser: 21
- Microspot M A: 2.8
- Brasser Hurricane: 36
- Proctor Heavy Duty: 36
- Aircoast: 28.5
- Atlas: 27.6
- "ES-ES" Model D Pump: 7.8

Postage 1.2

PISTON PUMPS
- Hy-Lo Zephyr: 107.6
- Hy-Lo "A": 107.6
- Hy-Lo "C": 107.6

PLANTS
- Sagittaria: 6.6 each
- Vallisneria: 4.6
- Ludwigia: 4.6
- Hygrophila: 4.6
- Cryptocoryne: 2.7 and 3
- Java Fern: 1.4 and 1
- Giant Hygrophila: 1.9 and 2

By post, add 1.0

REPTILES & AMPHIBIA
- Kelped Snakes: 40
- Cat Snakes: 40
- American Snakes: 50
- Morrocan Terrapins: 9.5
- Baby Caiman (Alligators) six inches long: 7.5

Add 5 for carriage and packing

BOOKS
- "NEW" DICTIONARY OF TROPICAL FISH 45
- ENCYCLOPAEDIA OF TROPICAL FISH 60

PARAMOUNT AQUARIUM

95 HAVERSTOCK HILL, HAMPSTEAD, LONDON, N.W.3 Phone Primrose 1842

July, 1961

THE AMAZING NEW
JUNIOR HY-FLO

TROPICAL FISHES
Below is a selection of Fish from our stock of over 80 varieties.

COMMON VARIETIES
- Angelfish
- Wrasse
- Swordtails
- Rosy Barbs
- Barbapins
- Tiger Barbs
- Beavers
- Platy
- Sailors
- White Clouds
- Clown: 4.8
- Zebra Danios: 3.6
- Fat Tetras: 2.8
- Rubber Band: 2.8
- Neon Tetra: 2.8
- Rainbow: 2.8
- Clarks Rainbow: 2.8
- Dwarf Gourami: 2.8

BROOK FISH
- Brook Tetra
- Ghost Tetra: 4.8
- Brook Goldfish: 2.8
- Brook Guppies: 2.8

SOUTH AMERICAN NEON TETRA’S (wonderful . . .)
- 20 each: 2.5
- 20 dozen: 15

AMERICAN TERRAPINS
- Baby Red-Land Green Terrapins: easy to keep. 7.5 each or 12.5 per 15.

FISH "JUST ARRIVED!!"
- Large Amazonian: 16
- Amazon Catfish: 18
- Loricaria: 7.5
- Giant Gourami: 8.8
- Bossa Nova: 7.5
- New Macgillid: 10

COLDWATER SELECTION
- ALL FINE HEALTHY FISH
- Small Goldfish: each or 10 dozen
- Medium Size Goldfish: 1.6 each or 15 dozen
- Large Pairs of Breeding Goldfish: 6"/8" long 20 each
- Selected Breeding Pairs of Shubunkins: 6-8" long: 30
- Golden Orfe: 3"/4" 5 each

ADD 7.5 extra for carriage and container

WRITE ENCLOSED S.A.E. FOR OUR LATEST LIST OF FISH AND EQUIPMENT.
### PLANT OFFER

<table>
<thead>
<tr>
<th>Plants</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 ASSORTED TROPICAL PLANTS</td>
<td>10/-</td>
</tr>
<tr>
<td>30 &quot; COLDWATER &quot;</td>
<td>10/-</td>
</tr>
<tr>
<td>40 SPECIAL TROPICAL PLANTS</td>
<td>20/-</td>
</tr>
</tbody>
</table>

(All special Tropical Fish on Application. S.A.E.)

### FOODS

- Queensborough Tropical Fish Food 1 lb 2/4
- Exotic Flakes 2 lb 2/4
- Frozen Food 1 lb 2/4
- Cichlid Flakes 2 lb 2/4
- Tetra Flakes 2 lb 2/4
- Cichlid Flakes 2 lb 2/4
- Frozen Food 1 lb 2/4
- Tetra Flakes 2 lb 2/4
- Cichlid Flakes 2 lb 2/4
- Frozen Food 1 lb 2/4

### BOOKS

- Guide to Tropical Fishkeeping (J. H. P. Bowes) 20/-
- Diseases of Freshwater Fish (J. V. Van Dyke) 20/-
- All about Tropical Fish (McKinnon) 20/-
- Encyclopedia of Tropical Fish (H. F. Anderson and W. Verderwinkler) 82/-

### AERATORS & PISTON PUMPS

- "E-Z" Piston Pump 20/-
- "E-Z" Filter Pump 20/-
- "E-Z" External Filter 20/-

### THERMOSTATS

- Ceramic External 33/-
- Ceramic External 60/-
- Ceramic External 90/-

### PLANTS

- Callanthera Spathi 6/-
- Callanthera Spathi 6/-
- Callanthera Spathi 6/-
- Callanthera Spathi 6/-

### HEATERS

- "QUEENSBOROUGH" 60w, 80w, 100w, 120w, 150w, 180w
- "E-Z" External Heater 100w and 150w
- "E-Z" External Heater 150w and 180w
- "E-Z" External Heater 180w

### BACKING PAPERS

- Strata Rockwork 24/-
- Pebble Beach 24/-
- Sea & Shore 24/-

### BOW-FRONTED AQUARIUMS

- Bow-Fronted Aquarium with wrought iron framework stand 42/- 0/- complete. 50/- 0/- 100/- 0/- 150/- 0/-
- Bow-Fronted Aquarium with wrought iron framework stand 418/- 0/- complete.

### STANDS

- 18" x 12" x 36" 35/-
- 24" x 12" x 36" 45/-
- 30" x 12" x 36" 50/-
- 36" x 12" x 36" 55/-

### THERMOMETERS

- Mercury 6/-
- Gem 6/-
- Plastic Backed 4/-
- Spirit Blue Gem 5/-
- "E-Z" Digital 4/-

### REMEDIES, etc.

- Bismuth White Spot Cure 2/-
- Copper 5000 ppm 1/-
- Sea Salt 1/6
- Tap Water (Newly opened) 1/6
- Copper 5000 ppm 1/-
- Bismuth White Spot Cure 2/-

### LIVESTOCK

- Live Shrimp Egg 20/6 and 4/6
- Culture of White Worms 2/6
- Culture of White Worms 2/6
- Culture of White Worms 2/6
- Culture of White Worms 2/6
- Culture of White Worms 2/6

### QUEENSBOROUGH FISHERIES

111 GOLDFWARK ROAD, SHEPHERD'S BUSH, W.12

16 PICTON PLACE, LONDON, W.1

111 Goldhawk Road, Shepherd's Bush, W.12

Queensborough Fishery, 16 Picton Place, London, W.1

Queensborough House, Ferry Lane, Rythe End, Wraysbury, Staines

North of London: N.D.F. on Sat.

Sundays only from 10 a.m. to 4 p.m.
In this issue is a report of the highly successful British Aquarists' Festival, organised by the Federation of Northern Aquarium Societies and held in Manchester last month. The enthusiasm engendered by this annual event has, over the years, given the lie to those who say that the aquarium hobby is losing support. No one could fail to be impressed by the efforts made by the competing federated societies to present attractive displays of their aquaria. Nor could the evidence of the plentifully stocked stands of the dealers at the exhibition, and the sight of the crowds around these, be held to show that the visitors to the B.A.F. were merely curious outsiders to the hobby.

Now, is all this interest and enthusiasm confined to the north of England? We do not think so. Then why, it is being increasingly asked, is no large-scale aquarium show held in any other part of Britain? Why, in particular, are the densely populated areas of London and the Home Counties without such a show? Is the answer to this found in the fact that there is no organised body of aquarists to represent the other regions? We believe this to be at least part of the explanation. A functional organised body of this kind is needed badly, to raise the standard and scale of showing in the south of England.

We believe it is time that the Federation of British Aquarists Societies, if only to justify the national status of its title, did some thinking on this matter. The present number and strength of its federated societies is smaller than it should be, but a start could be made, and we urge such a course of action on the F.B.A.S., not in a spirit of criticism but as a friendly plea to save this body from the moribund state into which it appears slowly to be subsiding. A little more evidence that it really is concerned with the living subjects of fishkeeping and is not totally bogged in committee work and procedure would be likely to do the F.B.A.S. and, incidentally, the hobby as a whole, a lot of good.
Life in the Garden Pond

by ASTILBES

Photographs by LAURENCE E. PERKINS

MANY pondkeepers like to maintain their garden pond in as natural manner as possible. They are not concerned with breeding goldfish and so they are able to keep and study varied forms of life which would have to be excluded from the breeding pond. Such a pond can house many creatures which are very interesting and among these must be placed the water snails. When a natural-type pond is required there is no harm done by introducing a few of the pond-type snails. They may multiply rapidly or fail to become established, but in any case it is interesting to watch for the appearance of eggs and young ones.

The largest water snail usually kept in ponds is the freshwater whirl, Lymnaea stagnalis, a fine shapely snail which grows to almost 2 inches in length. It feeds on vegetation and decaying animal matter. It has been said that it will attack newts and small fish but I cannot think that one would be active enough to be able to do this. The eggs are laid in rather long strands or sausage-shaped pieces of jelly, often on the undersides of water lily leaves. The tiny snails are eaten by most kinds of fishes when they are very small but once they reach maturity few fishes can manage them. Trench will suck the bodies from the shells and are able to crush all but the very large ones.

The disadvantage of having the snails in the pond is that they can eat some of the water plants, make holes in lily leaves and eat much of the food given for the fishes. If young fish are fed in the pond with fine dust-like food the snails soon find this and with a sucking motion of the mouth draw the food to them, and what they do not eat they soon cover up with slime so that young fish cannot eat it.

Another species of water snail often kept in ponds is the great ramshorn snail, Planorbis cornu, and, as its name implies, its shell has a whorl like a ram’s horn. This species lays its eggs on water-plant leaves and rocks in the shape of an oval blob. These snails feed as the first one described but do not appear to do as much damage to growing water plants, preferring softer decaying leaves etc.

Another interesting species is the freshwater whirl, Paludina vivipara, and these snails retain the eggs in the body and release them only when the embryo is fully developed. There are other species to be found in ponds and rivers, which make interesting studies. If water snails are wanted in the pond it will be better to exclude any fairly large trench as the snails form one of the major foods of this handsome fish.

Another pond mollusc is the freshwater mussel. There are several species to be found in the British Isles; one of the finest is the swan mussel, Anodonta cygnea, but a word of warning must be given here with regard to this, as with the others, of course, and that is they are not likely to survive for long in a freshly made pond, especially a concrete one. The reason is that these mussels can only live and move about in mud or mud. This is missing from the new pond and so it can be realised that a mussel’s life would be very short in a pond which lacks plenty of mud. The danger in introducing mussels to a new pond is that once a mussel dies it soon decays and fouls the water and in a small pond this can be very dangerous.

When introducing new snails or mussels to a pond be very careful to make sure that ones collected from natural ponds go through a period of isolation or quarantine, as they can carry diseases. If possible get your snails from...
SOME OBSERVATIONS ON
Pelmatochromis kribensis

by DAVID C. SLATER

THE African cichlid Pelmatochromis kribensis is a most interesting fish for both the beginner and the expert. It has many attractive features and, unlike its larger cousins, may be kept in a community tank of small or average-sized fishes. One of its best features is its colour; in some individuals of the dorsal do not make the observer draw in his breath, then the wonderful bullfinch-pink belly will.

These colours can fade for a period according to the mood of the fish, but in my experience, faded colour periods are short and few. The female is brighter than the male, but he has wonderful finnage; his dorsal, for instance, ends in a point which, in a good specimen, develops into a filament 1 inch in length. Polyn spots in both sexes are a bright red with a bluey white leading edge. A black stripe runs from the snout to the tail and just behind the bright eye is an ocellated spot. One or more black spots appear towards the back of the dorsal fin and also in the tail fin.

The first specimens obtained were bought from a dealer's stand at the British Aquarium's Festival and were only 1 inch in length. Their colour was more or less "fish grey." However, as time passed, they grew rapidly, the wonderful colours began to appear, and in 6 months they were mature, spawning fish, and I decided to try to breed them.

They were placed in a 24 in. by 12 in. by 15 in. tank and provided with broad-leaved plants (Cryptocoryne), a plant pot lying on its side, an unarranged nylon scourer and a rockwork tunnel. I had no idea what they would prefer to spawn in, hence the array of suitable spawning gadgets.

They soon settled in their new surroundings and 2 days later were lacking jaws, wrestling and tail slapping and filling their mouths with sand from the half-sunk flower pot, and spitting it well away from the entrance. "Ah! so they prefer the flower pot," I thought. Sometimes I saw the female apparently on guard in the flower pot but I could not see any eggs.

Twelve days later there was still no evidence of eggs or fry in the flower pot; then by chance I happened to look down on the tank after removing the cover and in the 1 inch space at the back of the tank between the heater and the back glass I could see the female fanning eggs which were sticking to the tank side. The check of the brine! After all the trouble I'd taken scrubbing rocks and plant pot and boiling the water.

Next day both parents transferred the newly hatched fry to a freshly excavated shallow pit in the gravel and then to another pit and another and so on.

Two days later I was fascinated to see both parents herding a shoal of fry slowly along the bottom of the tank. It was difficult to see how many there were because each tiny fish had broken dark bands round the body, which had a metallic change, and the strange thing was that when I approached they just lay still on the gravel whilst the parent who happened to be in charge at the time came to the front glass and forbade me to interfere.

It was not until two evenings later that I was able to approach them unobserved, and what a sight it was! The fry shoal was about 25 in. across and its members were foraging on the gravel whilst mother acted sentinel a bare 1 inch above them. I tried to count them but those camouflage brown stripes wouldn't let me. I tapped the glass gently. Immediately the female backed a little and shook her head jerkily from side to side. The fry froze where they were and "disappeared" whilst their parent came and investigated. When she was satisfied that all was well, she returned to her position above her progeny and worked her pectoral fins like paddles to cause turbulence, and this must have been the "All clear," because the fry began to forage once more.

After a minute or two I tapped the glass again and the same thing happened; the same signals were given. During the next few days I observed this interesting behaviour whenever possible danger threatened.

At the end of 3 weeks, during which the female and the male took turns in protecting the young, the parents were removed to the community tank.

Now what would happen when the glass was tapped? Would the fry have associated the vibrations in the water caused by the tapping with the concussion wave that signal caused by the mother's head-shaking but lie still as usual, or would they wonder what to do about it, or take no notice or come and investigate? I tapped—they froze.

After about 20 seconds one or two wriggled with impatience as if saying, "Come on Mann, give us the 'All clear.'" Then a group of four or five swam out of the shoal without much caution and started foraging; the rest followed quickly.

To alter their reaction to my tapping I decided to "brainwash" them. I tapped—they froze. Then using a Pyrex pipette (actually a fat remover I once bought for my wife) I sucked a few hundred brine shrimp nauplii in the direction of the still shoal. As the minute creatures drifted past the fry all mother's careful teaching was forgotten and every tiny fry ended up with indigestion (even if they didn't, they deserved to).

This procedure was repeated three times a day from then on and after only 4 days fry no longer froze when I tapped but became alert, obviously expecting dinner to be served. Even to-day I still tap just before I feed them.

As for what I feed them I'll start at the beginning.

When the eggs were first discovered I straight away started hatching brine shrimp. There was a plentiful supply 24 hours later but I saw no fry under 4 days old take a brine shrimp nauplius. This does not mean they did not take any. I am merely stating what was observed. Probably up to this time they are still absorbing the yolk sac but to me these seemed doubtful. Their first food is probably infusoria and perhaps their mouths are not quite large enough for newly hatched brine shrimp for the first 4 days. It would be interesting to have other observations on this.

Brine shrimps were supplied until the fry were 6 weeks old, then small white worms, the smallest found in the culture.

When about 1 inch long the fish could manage ordinary white worms and received scrapings from the Sunday joint.
before it was cooked, a little proprietary dried food, mosquito larvae, a little crushed cooked cabbage and a few
pre-swollen porridge oats (pre-swollen by soaking in a
cupful of water then rinsed to get rid of the fine flour-like
particles).

It was weeks before an accurate count of the fry could be
made without a lot of trouble, but finally an accurate
figure was obtained. I reared 92 specimens and there
were no runts. The largest are now over 2 inches in
length and they stopped growing some time ago; I regret
this as I think there is nothing more wonderful than
watching a miniature waterfall of fish pouring over the
edge of a submerged rock.

Do keep this fish. Do breed them; they are not
difficult. Do observe them and they will repay what
little trouble you take with interest.

LIFE IN THE GARDEN POND
continued from page 62.

an established fish pond, where you can be fairly sure
that they are free from disease.

Many owners of natural-type ponds like to keep British
freshwater fishes in preference to goldfish. Fishes usually
kept are the green tench, rudd, minnow, dace and bleak.
The bream and carp are also kept but the former is rather
apt to be a bottom-feeder and so may not be seen very
often. The carp is a slow-moving fish which also prefers
to remain in deep water but it can be very long-lived
and grows to a large size. Gudgeon are also sometimes kept
but they are also bottom-feeders and may not be seen very
often in the garden pond.

Photo: C. D. Sculthorough
A beautiful cascade of maidenhair ferns. Top, Adiantum capillus-
verinis; bottom, Adiantum cuneatum

Maidenhair
Ferns

There is only one native maidenhair fern, Adiantum
capillus-verinis, and this is an extremely rare plant of
mild coastal and mainly southerly habitats. It
possesses the features common to nearly all Adiantum
species; the spreading fronds are borne on very thin,
glossy black petioles and are much divided, the pinnae
bearing many, lobed, fan-shaped pinnales. Another species,
A. cuneatum, has fronds which are more divided and which
bear smaller pinnales than our native maidenhair, so that
the first impression of the plant is of cascades of pale-green
foliage. Both these species, when once established, reach
a height of a foot to 15 inches.

Adiantum cuneatum Don is lower-growing and has smaller
fronds with more rounded, finely toothed pinnales. Fronds
arise from a creeping rootstock and the soft green foliage
often becomes tinted with gold and brown in the autumn.
Adiantum pedatum grows to 2 foot tall and has spreading,
linear fronds bearing a row of light-green, oblong pinnales
on each side of the glinting, black petiole.

The maidenhares flourish in a compost of loam and leaf
mould, and should never be given lime. All the four
species described are hardly only in very mild, humid parts
of the country and really make better plants in a draught-
free site at the water's edge in an unheated or a tropical
aquarium.

C. D. Sculthorough
THE AQUARIST
AQUARIST’S Notebook

by RAYMOND YATES

THE winter meeting of the Goldfish Society of Great Britain was held at the Kingsway Hall included a display of breeders’ classes, for which 42 entries were received. Talks on 1960 fish-breeding experiences were given by several members and some interesting points were made: (1) the cleaning of parent fish in a bath of weak potassium permanganate solution or acriflavine was a distinct aid to obtaining healthy fry; (2) hand-spawning resulted in a much higher percentage of fertile ova; (3) hand-spawned ova could be kept longer and even washed with dilute acriflavine solution whereas naturally spawned ova were at the mercy of bacteria etc.; (4) the metallic-nacreous cross appeared to give more vigorous fry, but more crosses need to be made before this can be considered a consistent result; (5) amount of light did not appear materially to affect the growth of young fry; (6) the syringe for Daphnia and brine shrimp at an early age was advantageous to young fry; (7) temperatures of 68°F to 70°F were found optimum for development of fry; (8) movement of water in a tank, however slight, was better than none, particularly if suspended foods were being given; (9) there were difficulties in breeding colostusus and bubble-eye types less than 1 per cent. of the young fish were better than the parents and about 1 per cent. were as good. The March Bulletin of the O.S.R.G. printed some interesting points from the notes of the late Dr. R. Affleck, such as: “One bad fish breed into a strain may wreck several years’ work.” “If a fish becomes ill, it is not the fish’s fault.” “It is better to eliminate too many young fish than to keep a large number of runs.” “Careful selection in the early years will save disappointment later.” “Results at the end of the season will vary as the amount of effort put into the work during the year.” “Use an air pump and diffuser for circulating water gently. Vigorous aeration often does more harm than good by stirring up sludge from the bottom.” “Don’t attempt to start a strain with poor fish.” “Never mate a good fish with an inferior one.”

The editor concludes the Bulletin with a remark which other club magazines could very well copy: “Do not forget that this Bulletin is yours to give as well as to receive.”

The Japanese weatherfish is one of those species well known by description but rarely seen. I remember about 40 years ago reading the write-up given to this fish in Bateson’s book and wishing I had one. Now Mr. Don Abel, writing in Aquatic Life (U.S.A.), tells us of his experiences with three specimens. It appears that they do not harm each other but can cause havoc in a community or any other tank. All told, 12 news, five goldfish and numerous guppies disappeared over a long period from a 20 gallons covered tank. Mr. Abel thinks this is the first time any writer has mentioned the murderous tendencies of this species. Talking of Aquatic Life the editor and publisher, Mr. A. M. Roth, is now in his eighties after 25 years of writing and publishing aquatic literature, which he started in 1916. Have you noticed that, generally speaking, aquarists as a whole are very long-lived? If anything of running the Williamette will certainly increase when the medical profession get around to prescribing aquaria for ailing patients?

Five American societies exhibited at the World Flower and Garden Show at Chicago this spring. Attendance was expected to exceed a quarter of a million and admission was about 125. (Ordinary fish shown in the U.S.A. rarely charge for admission.) The North Jersey Club are holding a show and exhibition, one contest being for five male guppies displayed in 3 gallons tanks. With this advanced breeders’ content there will be 25 open classes, including one for colour "breakdowns" of pairs of guppies and fighters. Over 70 trophies will be awarded.

A new product on the American market is a powder which is added to the tank water for water-softering purposes. It is said to be excellent for breeding almost all egg-layers, and does not cause accumulation of salt in the water.

I am very well aware that freaks in the botanical world are legion. However, unusual development in aquatic plants is always interesting and worth recording. I am particularly fond of spatterdocks, one of many plants which have two different types of leaves according to whether these are submerged or at the surface. No matter how splendid your submerged leaves prove to be your spatterdock plant will sooner or later insist on sending up some long surface leaves. If these are cut off, I have found the plant will often revert to submerged foliage again, as if it felt the circumstances were unsuitable for surface leaves. Recently I have had several unusual leaves thrown up by the same plant that are roughly half of the submerged style of translucent pale-green crinkled leaf, the remainder of each leaf being the normal ovate, wavy, surface variety of a much darker green. The effect is not especially pleasing and would not have any aesthetic effect for hobbyists. Perhaps other aquarists have come across this peculiarity with spatterdocks, but for my part it is the first time I have observed this rather odd behaviour.

There was a time when people who indulged in bird watching were considered to be a trifle odd. Nowadays nobody is ashamed to own this hobby, which is just as it should be. I was, however, more than a little surprised to hear Peter Scott admit that one of his pet hobbies was fish watching. It turned out that he had spent several hours a day skin-diving in Fiji, just for the pleasure of watching the antics of the denizens of the silent world. This is a form of fish watching few of us can indulge in, but come to think of it, aren’t we all fish watchers, aquarists? No other pet fancy allows the enthusiast to build up a near-natural surround to anything like the extent which is possible with tropical fishes and, to a lesser extent, with cold water fishes. Not for us the disgust of early rising, cramped positions for prolonged periods of distant journeys and inconvenient weather conditions. On the contrary we can sit at home and enjoy our fish watching in comfort. Of course, we are at one small disadvantage in that we know exactly what we are likely to see whereas the bird watcher is never quite sure what new discovery he may make.

There is another form of fish watching, to be sure, which entails steady walks along the banks of rivers, ponds, lakes and canals, and this can be rewarding, giving the right time and the right place. The watcher needs not only experience, however, but a keen eye and the knowledge of what he is looking for. Most people taken on such an excursion seem to be incapable of observing much, even when a fish is pointed out to them. Hobbyists will have to

Please turn to page 72
Is Your Gravel Really Clean?

by D. J. KIRK

ALTHOUGH usually it is dealt with but very briefly in the many books and publications produced for the practising aquarist, one of the most important items in the setting up of a tank is surely the gravel.

In function as a rooting medium for the main decoration of the tank, the plant life, is obvious, but too often it is looked upon rather as an evil necessity, with little thought being given to its preparation and its importance in the smooth running of the aquarium. Many otherwise beautifully arranged and balanced tanks have been spoiled by careless choice of gravel. However, the decorative aspect of gravel is not the main subject of this article, which is to recommend ensuring that the gravel used is as clean as it should be if the proper functioning of the tank is to be maintained over a long period.

Sources of Gravel

The majority of aquarists, when setting up their tanks, will settle for purchasing the gravel they need from their dealer, in pre-packed bags, but there must be many who, like the author, prefer to search for and collect their own.

The most attractive gravels are usually to be found in wild, stormy shores and usually in conjunction with severe cliffs and similar diversions which make it a much more interesting if often a hazardous and strenuous activity. (The cost of one large load of gravel which the author discovered was a broken car spring, caused by carrying the stuff over bumpy moor roads.) Those who collect their own gravel will also have to be prepared to give in to the urge to dismantle their tanks each time they find a gravel which seems more attractive than the one already being used.

The source of the gravel, however, is relatively unimportant as it will all have to be well cleaned whether it comes from the sea or from a bag marked “already washed.”

Gravel, in its natural state, is essentially an aggregate of water-worn and partially rounded fragments of rock. The actual type of the rock fragments varies enormously according to the source from which it originated and the type of parent rock from which it was broken off. In theory, the main constituents are quartz and the other hard minerals which resist weathering. Soft sandstone particles and soluble minerals such as chalk are broken down or dissolved into fragments too small to be considered gravel. (A diameter of 2 millimetres is considered by geologists to be the minimum size for particles to be described as gravel.) In practice, however, this state of affairs is seldom found. Geological processes are never really completed but are continuous, with the result that gravels found on the shores and at the edges of lakes and rivers contain much more than clean, insoluble mineral particles and crystals.

Contaminating Materials in Gravel

There will inevitably be large amounts of loose fine particles mixed through the coarser grains. This material, often too small to be seen with the naked eye, is washed away from the gravel on the shore by wave and tide action, but this same action causes the gravel particles to grind together, thus continuously forming more fine material. This is the “dirt” which is washed away from aquarium gravel when it is stirred round under running water, and, being loose, presents no great problem to the aquarist.

There is much more undesirable material in gravel, however, which is not too easily removed by simply washing it under a tap. In addition to the loose dust which will wash out in a few minutes there is a very large amount of dirt, which is loosely attached to the larger particles of gravel by one or other of the cementing substances always found coating small pieces of rock, especially when these have come from the sea. These are salts and minerals which have become deposited from the water, especially when the gravel has been allowed to dry.

These cements are usually composed of silicon oxide or iron oxide (which gives sand its typical brown colour) or calcium carbonate, which from the point of view of the aquarist the most dangerous. Now while these cements, in very small quantities though they may be, will not dissolve quickly enough to be removed by washing the gravel in cold water, they will dissolve in the aquarium. There the water is warm, which in itself is enough to facilitate the process, and also the chemical reactions resulting from the life processes of fishes and plants release substances which affect the soluble mineral content of the gravel.

In addition to this, sea-shore gravel (and often, to a lesser extent, lake gravel) invariably contains a percentage of organic remains, mostly in the form of shell fragments which are too large to be washed away but are almost unnoticeable except under close examination. These are almost impossible to remove by physical means but will dissolve slowly in the aquarium.

There are two main results of these processes. Firstly an increase in the alkalinity and hardness of the water, and as soft, neutral or slightly acid water appears to be best for the majority of tank fishes can create difficulties in time, especially if one wishes to breed fishes. The aquarist who carries out regular checks on the hardness and pH value (reaction) of his tank water will know how rapidly it can become hard or alkaline. The undesirable effects of water being “wrong” are too well known to need describing, and although these conditions can be corrected it is rather foolish to have to go to that trouble when they can be prevented from occurring.

The second effect, which is really a result of the first, is that the minute solid particles, formerly held to the larger grains by the cement, become loosened and free. Although these particles seldom appear on the surface of the gravel in noticeable quantities unless it is stirred up, they drift downwards and tend to block up the small gaps between the larger grains and interfere with the free flow of water (and subsequently oxygen) through the gravel.

Importance of Bottom Circulation

Often it is insufficiently recognised that the presence of oxygen in and beneath the gravel is as important, from a long-term point of view, as oxygen in the water above.

THE AQUARIST
Without it the bacteria which convert organic waste into the nitrates, sulphates and phosphates used by the plants cannot survive and their place is taken by other, anaerobic bacteria whose activity produces substances poisonous to fishes and plants.

This state of affairs, which is usually associated with the presence of black, odorous patches in the gravel, is usually put down to the presence of an excess of organic waste (dead plant leaves, dried food, fish droppings etc.) and this is true, but there can be no doubt that it would not occur so readily if oxygen-carrying water were able to pass easily through the gravel. This it cannot do if its path is blocked by fine particles of dirt.

A word about sub-gravel filters. There seems little doubt that these provide the most efficient and convenient form of filtration and with them the problems of the preceding paragraph should not occur, since oxygen-carrying water is sucked down through the gravel. However, experience has shown that there is no way of ensuring that even these filters can lose their efficiency when there is a large quantity of fine particle material in the gravel, and they can be seriously affected by the accumulation of insoluble dirt at the bottom of the tank, although it does require a larger quantity than would normally gather in the average tank.

So far we have discussed the possible undesirable effects of gravel which has been cleaned only superficially; but what about methods of cleaning it properly?

Best Cleaning Method

The most effective method is so simple that it is well worthwhile for any aquarist to take the time to carry it out. It is simply a matter of dissolving the soluble minerals before the gravel is put into the tank. To do this an acid is needed and the most convenient is hydrochloric acid. This can be bought in grain form in any chemist's for a few shillings and so long as a few simple precautions are taken it is perfectly safe. A quantity of concentrated acid is sufficient to treat thoroughly all the gravel for a 24 inch tank.

First, wash the gravel in the normal way until the water coming off it is clear. Then place the gravel into an enamel basin or tank (do not use metal) and add enough hydrochloric acid to cover it to a depth of about half an inch. The acid should then be poured in and the gravel well stirred about with a stick. (Always add the acid to the water and not the water to the acid.)

In nine cases out of ten the solution covering the gravel, which had been so carefully washed and seemed quite clean, will resemble in a few minutes a basinful of coffee, dark brown and thick with released dirt and with a bubbling froth from the dissolving alkali. No, your gravel was very far from clean!

It is now time to leave the gravel in the solution until the bubbling has ceased, stirring it frequently. It can then be washed again in the normal way to remove the loosened dirt. No acid will remain in amount sufficient to cause any harm in the aquarium.

Your gravel will not only be free now from alkali and dirt which would otherwise be released into the aquarium, but will look much brighter and cleaner, as will be seen if some is compared with a handful kept back and not treated with the acid.

There is one other change in the preparation of an aquarium which will bring about an improvement from the point of view of the aeration of the gravel. Normally the advice given is to place the gravel in the tank first and arrange it before adding the water. The result usually is that the gravel is tamped down too tightly and it is doubtful if the water poured on to it will have the power to loosen it. Much better results can be obtained if 3 or 4 inches of water are put into the tank first and the gravel is then poured down through it. It can still be arranged easily into hills and hollows as desired and with the advantage that each particle has a "cushion" of water around it to allow oxygen to pass through. This is one of the reasons why sub-gravel filters are being used, and if the gravel has been cleaned by the method described there will be no problem of cloudy water.

The Natural Aquarium

On Sunday 11th June, the Twentieth General Assembly of the Federation of Northern Aquarium Societies was held in conjunction with the British Aquarists' Festival in Manchester. An enthusiastic audience heard Mr. R. E. Legge, superintendent of Blackpool Tower Aquarium, talk on the subject of presentation of fishes in surroundings resembling the natural state. His talk was excellently supported by a colour film "Coralrama," which was made for showing at the International Congress at Monaco Aquarium last year, and by coloured slides of aquaria, fishes and natural rock formations.

The film demonstrated the way in which natural coral backgrounds have been built up for marine aquaria at Blackpool. The problem with coral is that it needs to be cleaned frequently because of the growth of algae on it, and this is most difficult to do unless the coral can be removed from the tank. The technique evolved by Mr. Legge permits this and also ensures that each piece is firmly held in place in an elaborate display whilst in the aquarium. This is done by forming a "wail" unit of concrete, reinforced with stainless-steel wire and coloured and brushe, to resemble the rock also used as part of the unit, and embedding the pieces of coral (wrapped in polythene) into the concrete before setting so that the shape of each piece is moulded in the surface. The polythene protects the coral but does not prevent the contours and crevices forming an exact mould in the concrete, into which the coral can subsequently be fitted for the tank display. End and side units of rock-coral-concrete are made in this way to fit the aquarium. If only side units are built Mr. Legge demonstrated that the use of blue Perspex sheet, bent to curve forwards from the back corners of the tank, forms a background that gives the effect of distance in the aquarium. Alternatively the wall behind the rear glass of the aquarium can be painted blue or a card sprayed with blue emulsion paint can be placed behind to give the same effect. Among the many practical tips given by Mr. Legge was one to restore the colour of bleached coral: ordinary dyes used for clothing have been found to be quite satisfactory for this. He also stressed that in the marine aquarium horizontally projecting pieces of rock or of coral should be fixed, to provide shade beneath them from the overhead lighting.

SPAWNING OF SEA HORSES

As we go to press we understand that Mr. D. R. Green of the Paramount Aquarium, Hemel Hempstead, has succeeded in breeding the Far Eastern marine sea horses after several years of effort. There are about 150 youngsters and these can be seen at the Paramount Aquarium. It is hoped that more details about the breeding will be available for inclusion in our next month's issue.
The British Aquarists’ Festival, 1961

by A. BOARDER

WELL—the Federation of Northern Aquarium Societies has done it again! I thought that after last year’s very successful exhibition this year could not reach such a high standard, but how wrong I was. This show was even better than ever. There were 31 clubs competing and they all made a very brave effort; all their members who actively helped are to be congratulated for doing such a fine job. What a pity such a show cannot be transferred down to the south of England to show what can be done when one breaks away from the conventional type of show merely displaying rows of tanks. The clubs really went to town with ideas to present their fishes in an attractive manner and so make the exhibition very interesting to the non-aquarist as well as the dyed-in-the-wool type of aquarist.

The tanks were at such a height that they were all easily examined and the stands were on the whole very neat indeed. Most of the stands were so constructed that only the front glass of each tank was visible, which added to the beauty of the display. The staging of tanks that was judged to be the neatest and most attractive was that of Sheffield and District A.S., and was exceptionally neat and well balanced. The front was recessed in two places and these recesses held a fine aquascape, one a copy of the Taj Mahal. The whole stand was a perfect example of neatness and well-displayed tanks of fishes. Many other stands were excellent: Blackpool and Pyle A.S. ran a close second with a very attractive display and Goole and District A.S. were rather unlucky to have insufficient curtaining at the sides of a very fine stand.

One of the many fine aquascapes was shown as the front cover of The Aquarist with the photograph feature represented by a fine watery glade, very attractive and well thought-out. Another fine one was “Swan Lake,” a beautiful wooded picture, water in front with fish and a small swan, with ballet dancers on a lawn clearing in lovely woods. The background was very finely painted. I suspect that it did not get the first prize, only second, as it was hardly suitable for an aquarist’s exhibition.

The Fancy Guppy Breeders Association had a fine display of guppies and I was very impressed by the fine triangle-tail guppies, especially by the fine females. I had always rather looked down on the drab female guppy but those on show had brilliant iridescent blue stripes on black dorsal and caudal fins, a great improvement on the ordinary type. The stand was well attended and I understand that many new members were enrolled.

As for the fishes, I saw some very fine tropicales and they were well displayed, mostly in nicely set-up tanks. I thought that the furnished tanks were very good and I could not understand why one well set-up coldwater tank was not awarded a prize, but I know that we judges rarely think alike. The coldwater fishes were a mixed bag and, of course, I realise that many of the fancy goldfish would be in the middle of their breeding season and so could not be spared for exhibition. Nevertheless there were the best-coloured shrimpkins I had seen at this show since it started in 1951. The best common goldfish was one of the finest I have ever seen. It was large, perfectly shaped and of a fine deep red colour, a real gem. The veiltails were poor: one scaled fish had fair finnage, but to no other fish in the class could I give a card.

The dealers’ stands had a wonderful array of fishes and equipment, or so I was informed. I am sorry I cannot give any first-hand information about this as every time I went near these stands they were completely hidden by about four rows of interested buyers!

The attendance on the Sunday was most surprising; it was a marvel where all the people came from to fill the grand hall. Although I saw many old friends I saw very many new faces and so I am convinced that at least in the north the hobby is gaining many fresh adherents, and from talks with the dealers I realise that the hobby is once again becoming one of the leading hobbies in the country as it was in the years after the last war.

I must congratulate the organisers of this great show (once again a few of the old stalwarts did most of the work), for the wonderful exhibition, which I rate as one of the finest I have ever seen.
RESULTS

The full details were as follows:

First prize: Mrs. R. J. Sheen (Middlesbrough) 98 points; Mrs. C. J. Ellis (Southport) 92 points; Mrs. J. E. Jones (Middlesbrough) 88 points; Mrs. J. H. Jones (Middlesbrough) 87 points. Second prize: Mrs. M. A. Cropper (Blackpool) 90 points; Mrs. N. G. Talbot (Blackpool) 88 points; Mrs. J. H. Jones (Middlesbrough) 87 points. Third prize: Mrs. C. J. Ellis (Southport) 92 points; Mrs. J. E. Jones (Middlesbrough) 88 points; Mrs. J. H. Jones (Middlesbrough) 87 points. Fourth prize: Mrs. C. J. Ellis (Southport) 92 points; Mrs. J. E. Jones (Middlesbrough) 88 points; Mrs. J. H. Jones (Middlesbrough) 87 points.

A total of 106 excellent exhibits were entered, which included a large number of rare fish and other marine specimens. The following are some of the highlights of the exhibition:

- Mrs. C. J. Ellis (Southport) won the award for the most attractive and well presents exhibit.
- Mrs. J. E. Jones (Middlesbrough) was the recipient of the special prize for the most interesting exhibit.
- Mrs. J. H. Jones (Middlesbrough) received the award for the best in show.
- Mrs. R. J. Sheen (Middlesbrough) was awarded the special prize for the best exhibit in the Junior category.

The judges were unanimous in their decision, and all the entries were judged on the basis of their presentation, coloration, and overall condition of the specimens.

A special word of thanks is due to the sponsors of the event, whose generous contributions made the success of this year's exhibition possible.

July 1961
The Senses of Touch and Distance Detection in Fish

by ALEX BARTSCH

(Based on the Author)

Because of the failure of our own senses of hearing and smell to function under water, we humans are only too prone to minimize the importance of these senses for other species in such an environment. What of the sense of taste, then? Here, we find ourselves better able to imagine the effect, because of the known capacity of water to act as the solvent of many flavored substances. But this property, again, causes doubt. How should a definite flavor be determined by a fish from amongst the confusing mixture of many dissolved substances?

What about sense of touch? Since water is an excellent conductor of pressure and sound waves, it seems reasonable to conclude that this should have a special bearing on this sense. With certain reservations these reflections, admittedly based on the sensations experienced by man, are nevertheless correct. Although all sensory receptors play a more or less important role in the life of fishes, it is the sense of touch which must be regarded as the sense peculiarly suited to an aquatic life, and from among all the sense organs of fishes this is probably the most highly developed one.

![Nerve fiber going to tactile cells](image)

**Fig. 1.** Section of fish skin showing tactile (touch) cells (modified after v. Lengerken)

Basically, we distinguish three groups of sensations of touch in fish; their sense of touch, obviously, is more highly specialized than that of man. The groups are: the general sense of touch, the so-called long-distance detection or current-detection sense and finally the sense which detects pressure and vibrations.

The sense of touch or position is understood to mean the capacity to observe sensations of pressure at one or more parts of the body and to locate them accurately. This capacity, however, may be developed in different degrees at various parts of the body of an individual, because the number of touch receptors varies between one part of the body and another. As sensations of pressure are purely mechanical stimuli, the receptor organs are called mechanical sense organs. The sense of touch or position is therefore simply a mechanical sense.

The tactile cells, which, in their most primitive forms only respond to local pressure, are situated within or below the skin. They are sense cells with a specific irritability to various types of mechanical energy. Some of these tactile cells are primary sense cells and need to be addressed directly; others are secondary cells which respond to the pressure of a substance surrounding them, usually a liquid, as for example with the lateral line organ. Both more of this later.

The tactile cells, whilst generally distributed over the whole body, are also found in concentrations, the so-called pressure points. In fishes the most frequent concentrations are found in the labial areas, in the cavity of the jaws, the pharynx and also at the barbels and fin rays.

It is often said that the principle underlying the structure of the tactile cells is a simple one, and this is perfectly true, for they are simply free nerve endings (Fig. 1). These adjoin the oval-shaped tactile cell, which is in situ about 6-12 microns (1 micron is 1/3,000 millimeters). This cell has a nucleus and in many instances carries a sensory cilium which protrudes from the epidermis. Pressure against this

![Section through length of lateral-line organ](image)

**Fig. 2.** Section through length of lateral-line organ. K, canal; P, main pores; O, epidermis (skin); Sch, scales (pierced by organ); S, sense cells; N and NF, nerve and nerve fibers (after v. Lengerken)
Cilium will cause the touch stimulus to be transmitted, as by a lever, to the tactile meniscus and thence to the nerve fibre.

Although tactile cells are present in great numbers in the bodies of fishes, all functions of their tactile sense cannot as yet be circumscribed with precision. Specific details are known of only a relatively small number of fish species.

![Diagram of cilia and tactile organs](image)

**Fig. 3. Ends of the lateral-line organ in the skin (H). Pores (P) pierce the scales (Sch), the comb-like edges of which project above the skin.**

The sense of touch is considered very important for the intake of food. The sense cells are accordingly well developed and present in large numbers in the labial and jaw areas. Detailed research results on this have been obtained from pike, a fish which as a rule consumes its prey head first. The only control organs available for ascertaining the correct position of the prey are the tactile cells of lips and jaws, which respond to mechanical stimuli and ensure the accurate positioning of prey for swallowing. It is also known that violent swallowing movements occur in freshwater fish, and carp when certain areas of the jaws are being touched.

Much more is known about the sense of distance detection, known as current-detector sense, than about the sense of touch. The sense of distance detection is seated in an organ which is peculiar both to fishes and a number of aquatic amphibians, and is placed down both sides of the body. Here, a "line," the so-called lateral line, runs from the anterior to the posterior, usually along the middle, and in

![Photograph of scale perforation](image)

**Fig. 5. Scale of block perforated by the lateral-line canal (— lower opening; \(\times\) upper opening). The canal traverses the scale at an angle (magnified 10x).**

most fish forks near the head. On closer inspection it reveals itself as a chain of pores behind which the true sense organs lie embedded in the skin. In each species of fish the lateral line is arranged in a typical way. In fishes where the organ forms a tubular, closed system its branches do not penetrate only the skin, but the scales as well. Looking at these more closely will reveal indentations or even perforations at the outer edge (Fig. 5). Inevitably the same scales are pierced in the same manner in each individual of each species, and the arrangement and the number of lateral-line scales are therefore one of the typical characteristics in the determination of species.

The lateral line, belonging to the group of tactile sense organs or receptors, is, of course, a mechanical organ. But secondary tactile cells also form part of the lateral-line equipment. They are usually placed in externally closed canals, or in tube systems. The canals may be embedded in the skin at various depths (Fig. 4). There are a large number of nerve nodules, made up of tactile cells, within the canals or in the tubes passing through the skin (Fig. 2). The canal or tube is filled with a mucous sub-

![Photograph of miller's thumb](image)

**Fig. 4. Section through skin of miller's thumb (Cottus gobius) showing lateral-line opening with its walls tapering towards the top (magnified 120x).**
stance and has a large number of branches (Fig. 3) which penetrate the epidermis and terminate as free endings on the surface. Here, the pressure and sound waves transmitted by the water act on the muscles, causing it to compress and to transmit the pressure stimulus to the sense cells within the system.

The function of the lateral-line system consists in the registration of vibrations inside the water or sometimes also outside it. Aquarium fishes, for example, will perceive the steps of a person approaching the tank. Even the smallest vibrations within the water are registered. A Daphnia swimming past the tail of a fish will be located and caught with astonishing accuracy. Other senses might, of course, also have something to do with this.

![Fig. 6. Group of three sensory cones on minnow's skin. A, cones in normal position; B, cones deflected from normal position by current of water over them.](image)

The fact that a fish is capable of perceiving even the most insignificant changes of pressure in the water lends itself to the suggestion that the fish is also equipped to detect and locate its own reflected movements, besides the pressure waves of alien objects. Thus blinded fish, for example, will not collide with the walls of the aquarium, but come to a standstill a few inches in front.

Although almost all fishes are equipped with a more or less distinct lateral-line organ, this is most highly developed in predatory fishes, because it serves them to obtain food and therefore acquires a particularly important function. Tests have shown that blinded pike, for example, will catch fish in their vicinity with absolute accuracy. Typical night fishes, on the other hand, such as for example eels, are not nearly so largely dominated by their lateral-line organ. A blinded elf will not, as would the pike, snatch at a piece of wood guided past its head, because its specially highly developed sense of smell will indicate the object as unsuitable for consumption as food.

A sharp distinction must be drawn between the functions of the sense of touch and the sense of distance detection. This becomes apparent when the nerve fibre of the sense of distance detection is severed before it reaches the brain, for the affected fish will still be able to respond to the general stimuli of touch and pressure. It is also alleged that chemical stimuli play a part in support of the functions of the lateral-line organ, but this has not yet been accurately assessed. Smith (1930-1933) reported that a few minutes after dye had been added to water, evidence of this was found in the mucus of the organ's canals and tubes. Smith concludes from this fact that a chemical stimulus exists which reacts on the lateral-line organ by means not as yet ascertained.

The third form of the sense of touch is called current-pressure detection. This sense is particularly highly developed in fishes. Nature lovers are well acquainted with the phenomenon of fishes in our waters standing head first against the current under bridges and behind weirs etc. This reaction to current may also be observed in the aquarium, where fishes are found to lie head first against currents caused by the stream from the aerator or filter. The sense of current-pressure detection is to some extent connected with the acquisition of food, for prey is expected to come along with the flow of the current. The sense is particularly prevalent in bottom-dwelling fishes.

This branch of the sense of touch also plays a very important role in reproduction. It causes salmon and eels, for example, to enter rivers by either swimming against the current or following it. In this way migratory fishes reach suitable waters for spawning or breeding.

The sense of sight and the sense of touch are co-ordinated in the sense of current detection. That is why blinded fishes lose the capacity to place themselves against the current head first. The essential means for the release of this response are the so-called sensory cones (Fig. 5), which are distributed over the skin. The current of the water deflects these structures, causing the fish to adjust itself to the direction of the current. The effects produced by the sensory cones as parts of the lateral-line organ suggest that this organ not only serves distance detection but in addition functions as a static organ. As it happens, blinded fishes, having lost the capacity to place themselves against the current in open water, regain this capacity the moment they are able to touch the bottom. Therefore, not only pressure stimuli of the water, but touch stimuli as well, are capable of acting upon the sensory cones.

---

**Aquarist's Notebook**

*continued from page 65*

consider whether the term “fish watcher” might not be brought into more general use when trying to get new members who may not have realised the analogy. Even the Boy Scout movement recognises bird watching by awarding a badge for this study.

“A rose by any other name would smell as sweet” says the poet. Well, there are many thousands of named varieties of roses, not to mention dahlias, chrysanthemums and carnations and I have often wondered if one day one might be called after a fish. Among all the many names, likely and unlikely, one would have thought the tropical fish world might have provided one, but I have not heard of such as yet. The coldwater fancy has got in first, I imagine, with the early-flowering chrysanthemum “Golden Orb,” which has a bright-golden true spray and which produces a mass of bloom flowering all at the same time. What possibilities there are for new nomenclature from our hobby, for example: “White Cloud,” “Shubunkin,” “Lionhead,” “Swordtail”—you can almost visualise the flowers to fit these names. Coming back to fishes it has been said that a man can learn his name behind for posterity through a child, a book or a flower. One might now add, a fish, for there are many fishes named after piscine enthusiasts, names we often use without perhaps realising the fact.

---

**The Aquarist**
CLOWN FISH among the Corals

AMONG the rich profusion of marine tropical fishes suitable for the home aquarium none can take pride of place. The handsome designs of body and fin, the bold abstract patterns of gorgeously coloured spots and bars, the marked individuality of each little fish, all these are matters of personal taste.

For down in the blue cerulean depths beneath the surface of the Indian Ocean and the western Pacific, vast reefs, often thousands of feet thick, extend for hundreds of miles like great submersine mountains. Built up through ages of time by trillions of incessantly labouring polyps, their mighty walls and cliffs riven by storms and split into dark submarine canyons and crevasses tower up out of the jumble of boulders, coral debris and dreary miles of silent gloom to the warm surface waters, where the sun, the wind and the churning surf bring life-giving warmth and food and oxygen to repair the ravages of erosion by the sea. At high water the glassy surface betrays nothing of what lies beneath. But as the broad ocean swell hits bottom on the falling tide long lines of foaming breakers pound the seaward edge of the reef sweeping in through the bristling forest of jagged coral branches as the huge table-like masses emerge.

Low tide reveals a stony marsh in carbonate of lime; a vast honeycomb of holes, channels, pockets, stretches of warm shallow sea and clear coral pools of quiet sunny water. Here life teems in unbeliefable abundance. Every millimetre of surface is inhabited, every crevice has its occupant. Schools of little black-and-white coral fish, sergeant majors and butterfly fish spar with each other and chase away the sunny hours among the stony branches. Electric-blue and saffron demersal fishes flash in the sunshine and are visible at quite a distance. Suddenly blurred white and orange figures appear, bobbing up and down. As you lower your water-glass on to the rippled

by JOHN BOURSOT

Photographs by LAURENCE E. PERKINS

surface and peer into the still deep water below, they are gone. But watch quietly, and soon brilliant little white and orange clown fish will appear among the deadly tentacles of their favourite giant sea anemones, some even emerging from the giants' stomachs. A second longer, and they are chasing plankton with abandon. 

Amphiprion percula, the clown fish, anemone fish or golden coral fish, is neatly described by all three popular names, though the aesthetic beauty of the last might well supplant the artless flappiness of the first, leaving the second to puzzle the curious. For reasons hard to define this little fish is perhaps the most endearing of all marine tropicaIs. It is the most striking embodiment of the typical coral fish of our imagination. The rich golden orange of the head, body and fins is relieved by three chalky bands thinly edged with black. Viewed at eye level these bands are faintly pearly blue. The first band crosses the back of the head and opercula, almost meeting under the chin. The second, starting between the anterior and posterior dorsal fins, sweeps broadly across the sides of the body, bulging forward behind the pectorals and meeting under the belly. The third crosses the canals peduncle. The large pectoral fins and tail fin are rounded, bordered with black, the border being especially heavy in the males.

The clown fish takes readily to aquarium life and is a
Scorpion fish or lion fish (Pterois volitans)

Coral fish (Amphiprion bicinctus)
model of good behaviour in a suitable community. A number of clowns will settle down peacefully if all are introduced at the same time. However, once they have accepted each other any additional clown will very likely be repulsed. As with most marine fishes they have a strong sense of territory, and will violently defend the particular rock or shelter they have chosen as home. The lone male of a pair which has lived for 5 years in a 12 gallons cement tank will unhesitatingly launch the most dramatic attack upon any intruder, striking again and again with shattering fury.

When, on rare occasions, I have to submerge my hand in the tank I am met with a series of onslaughts which would be intolerable in a larger fish. The little clown charges my fingers, forces itself into my half-closed fist and once drew a tiny spot of blood. Upon withdrawal of my hand he feels he has won a smashing victory. Another remarkable and quite singular form of defence, though milder, is the tail swipe. The fish turns its back on the aggressor (perhaps the siphoning tube, or the long wooden forceps I use for removing eaten particles of food) and with all the strength at its command suddenly gives a tremendous swipe with its tail, shooting light debris forward like pellets from a catapult and even moving small shells in the violence of the blast. This must be a highly effective way of dealing with small creatures that irritate rather than harm. When uneasy, clowns indulge in a peculiar up-and-down motion.

Feeding is no problem. Dried foods are readily eaten and live food, other than insect larvae, is especially relished. Large brine shrimp send them frantic with delight and the tender flesh of red earthworm squeezed free of earth is a rich delicacy on which they will gorge with no subsequent indigestion. Raw shrimp and raw meat washed free of juices, and cut into bite-sized pieces, are also eagerly accepted. And when accustomed they will also take fragments of oats. Unlike the male, the female of my pair relishes the freshly killed young of Mollusca spheno, and probably other species, provided that they do not exceed 1 in. in length. When in good health clown fish have huge appetites and should be fed accordingly. On one occasion I steadily fed my pair for an hour and a half, during which time they consumed 35 earthworms of about 2 inches long. In the end I was so tired I had to give up.

In nature clown fish live in friendly partnership with giant sea anemones of the genera Discomata and Stichodactyla. These anemones, which often reach a diameter of 2 feet, are mortal enemies to other small fishes, but totally innocuous to the clown fish, which will rush for shelter among the tentacles upon the slightest alarm. As in nearly all cases of symbiosis this remarkable partnership works both ways: the fish drops food among the tentacles and receives shelter and protection in return. Opinion is divided upon the exact nature of the fish's ability to penetrate the sea of deadly tentacles unharmed. One school of thought inclines to the idea that the anemone in some mysterious way recognises its little friend and avoids stinging it, and the other favouring the theory of immunity.

At this point I cannot refrain from recalling the similar and equally remarkable fish-coelenterate partnership between the virulent Portuguese man-of-war Physalia physalis and the pretty little fish Nemus gromovii. The
poison of Physalia, largely protein, is a neurotoxic poison which is nearly as strong as cobra venom, and which brings rapid death to fiddler crabs and kills other fishes in a few hours. Yet Nemoia, which habitually lives among the long trailing tentacles, picking at food caught by them and ingesting masses of the poison-bearing nematocysts, is able to withstand ten times the lethal dose for other fishes. In view of this it would not be surprising if clown fish were also immune to the poison of their own particular coelenterate partners.

Clown fish in the aquarium do very well without anemones of any kind. This is fortunate, for whereas Discombma and Stichatina are virtually unobtainable, “ordinary” anemones, which bear little resemblance to either, fail to trigger the anemone-seeking instinct and are ignored. Nevertheless, my clown fish will snuggle down in a bed of long hair-like algea and remain there for several minutes, often quite still.

Female clown fish while breeding in captivity have been seen to lay their eggs at the base of an anemone for the protection of the stinging tentacles. Both parents care for the eggs, and the young, when hatched, are dull grey for the first 2 weeks of their lives. The best temperature for clown fish is between 80° and 85° F.

Clown fish sometimes contract a marine variety of white spot. When the disease first broke out in my tank I cured it by raising the temperature to 90°F and keeping it there till all was well. On the second occasion heat alone proved ineffectual, but the addition of two level teaspoonsfuls of sulphathiazole sodium to the aquarium “did the trick.” Algae (Oscillatoria) growing on the sides and coral showed no ill-effects. Microscopic examination of these algae and their fauna isolated in dishes showed that the copepods and various protozoans usually present in all my tanks lived but a few hours, whereas nematodes (invisible to the naked eye) survived for about 3 days. During treatment, which lasted about a week, the fish developed gargantuan appetites owing to the high temperature, and had to be fed unmercifully. Finally, after the last spots of disease had gone the temperature was slowly allowed to drop to normal, and the whole unpleasant incident forgotten.

Occasionally fungus will appear on the sides of the fish in the form of white fuzzy patches. When this happens dip out the afflicted fish with a straight-sided plain glass tumbler. Then, with the three middle fingers of one hand, gently raise the fish to the surface of the water in the glass and, without pressure, dab the fungus with methylle blue applied by means of a wad of cotton wool tightly and smoothly twisted round the end of a toothpick. The fish is then left to swim about in the deep-blue water anywhere from 5 to 10 minutes while the tumbler itself floats in the aquarium in order to maintain an even temperature. Should it float so high as to obstruct the temporary replacement of the glass cover, it is best, as clown fish are good jumpers, to keep the tumbler to the centre of the tank.

The fish is released by lifting the tumbler from the water with one hand and covering the top with the fingers of the other. The blue water is then strained through the fingers into a separate container, and the fish slipped from the glass (not dropped) into the aquarium to join the others. This method is very effective, and eliminates the use of a net, with its accompanying danger of entanglement and inevitable exposure to the air. All movements should be carried out as neatly and quickly as possible in order to avoid a too sharp rise in temperature through long contact between the water and the aquarium’s arms and fingers. Needless to say, hands and arms must be perfectly free from dirt, fat, oil, lotions, creams etc. And in warm weather a protracted rinsing will ensure the removal of venin, an amino acid found in human sweat and strongly repellant to most fishes.
Just Joe
by A. A. PONTING

BIG fishes versus little fishes. So the controversy rages, with both camps insisting on the "pros" and squarely denying the "cons" of their arguments on this subject.

For myself, I like them both large and small, but for sheer personality and character my bouquets go to the "big-un." Beauty and daintiness as found in small fishes are pleasing, extremely so, but the emotions inspired by them are fleeting ones. How often does the tale proceed by "Now, I remember a --" or "I once had a --", concern something with a bit of weight behind it? Often it was a large cichlid—an angelfish, an "Oscar," or even a blue acara. Which brings me to Joe.

When an enterprising dealer prevailed upon me to invest in four or five specimens of inch-long striped aggression, I admit, albeit grudgingly, that I didn't quite realize the majestic growth to which blue acaras are given. Despite the howls of the "you'll be sorry" brigade I can say, hand on heart, eyes proudly elevated, that not for one second since that dealer prised the tin bob from my nerveless fingers have I regretted the purchase.

From the onset, I realised that these were no "fully-grown-at-2-inches" softies I had sought. Their appetites were a joy to behold and their growth was in direct ratio. Such男方 that, bitter though the thought, I had to part with two of them.

The two I kept were by this time yanking each other unceremoniously round the tank by their jaws, so aggressively martial was their behaviour that even I, in my impotence, decided I had a pair.

The larger of the two was dubbed Joe. Understand me, I have no political bias, but the spell with which he organised a totalitarian state within the tank justified that appellation.

There was some controversy concerning a name for his spouse. I was all for calling her Josephine: "Joe and Josephine sounds rather neat," I thought, giving myself a mental pat on the back. In my house, however, counting one wife and two children (female) I am grossly outnumbered. The opposition decided she should be called Mrs. Joe. For once, I must admit, womanly intuition had got something. Such is the virility of our Joe that, under no circumstances could he be imagined saying to his wife those time-honoured words "not to-night, Josephine."

Still the Philistines mocked as the pair kept on growing, but respect, even admiration, began to creep in. The word ugly began to be used less and less until Joe made a base line out of it. Displaying to his wife he was, and is, beautiful, nay magnificent. With dorsal, caudal and anal fins spread rigidly into a continuous fan of scintillating blue and deep maroon he is a regal fish indeed. He is king of his domain and leads it.

The time came when we recognised the need for the continuation of this noble line and with high hopes the pair were transferred to a 48 in. tank. No time was wasted. After a day or two of furious display by Joe, a stone, conveniently placed at the front of the tank, was cleaned to T.V. whiteness and the eggs were deposited thereon.

Surprisingly few eggs failed to hatch and within the week free-swimming fry were being sucked alarmingly into parental mouths, washed over, spin-dried, and accurately spat back into the heart of the brood in somewhat dated condition.

Parental bliss was complete but for one thing. Mrs. Joe allowed Joe his stunt at baby-minding during the day, but as night approached she gathered her brood behind a stone and with the aggression of motherhood she clouted Joe most un-symmetrically to the other end of the tank. Presumably she had weighed paternal love against maternal appetite and resolved: no Joe—no midnight snacks.

So the babies were reared until signs indicated the arrival of another regiment of swanks. It was decided not to push our luck any further and the youngsters were removed to another tank.

Since then eggs have been laid with monotonous regularity. Fry and eggs both have been given to various enthusiasts and, if even only a fraction of these reached maturity, there should still be enough around to stock a "frying-to-night" emporium for many weeks.

To be described as "fish-like" certainly does not conjure up visions of ardent and lasting passions. Fishes are often condemned as being emotionless. This may be true of the "itchies" but certainly not of Joe and his pals. No sir!

For 4 days Mr. and Mrs. Joe both moaned whilst Joe was at one of the major national shows. His return and their reunion was something to behold. One adoring glance passed between them and they swam to each other with abandon. For spells of 20 minutes at a time they locked jaws and pulled each other ecstatically around their paradise. The following morning black semicircular bruises on their jaws (Joe's upper and Mrs. Joe's lower) bespoke the heights of their ardour. Needless to say they immediately took to polishing their favourite white-stone.

Now, far be it that I should try to besmirch my paragon, but, I have to confess it, Joe has a weakness. Our first indication of this threw the family into a panic. Joe, fins folded limply round his ailing body, lay on the gravels of his tank looking lugubriously at the world without. The look of object misery on his rugged features pierced us so, that laughter in the house would have been nothing short of sacrilege. We tried to tempt him out of his melancholy by dropping tit-bits on his nose. Considerably he bravely tried a few and nonplussed one and all by being actively sick. This may sound a bit fantastic but such are the facts.

It was then we realised that Joe's beloved outline had changed somewhat and he was decidedly deeper on the undercarriage. Could it be that our lordly Joe could be constipated? The bitter answer was—"yes."

Epsom salts dropped by his head elicited no response. Tabifer worms, reputedly laxative, were contemptuously spurned. Still Joe gazed at us with accusing eyes. With trepidation I went for the biggest net. A clean cloth was soaked in lukewarm water and wrung out. When Joe was netted a typhoon seemed to descend on the tank. Water cascaded down the walls and rivulets ran down my shirt front but my mission was one of mercy, so pressed on regardless.

When wrapped in the wet cloth the patient lay quiet and trusting as if confident in my motives. True to form he opened his mouth for the pipette with the cod-liver oil, but I...
knew he'd had enough when it began to ooze from his gills.

Back to the tank went Joe, indignantly ejecting globules of oil from his bellows. Off to bed went we with hopes in our hearts and fingers crossed.

The next day dawned gymmally. Joe, Lythium-like in his slimness, had regained all the glory that was, and the family breathed again.

For months now the girls (aged 3 and 4) have petitioned for a tank in their bedroom. For months now I have held out against it on the grounds that my tanks are overstocked and that any new ones would be of more use in the fish room. My case has weakened badly in the past few weeks, however, because my wife has now allied herself with the girls. Resistance is ebbing rapidly, and in a moment of weakness I asked the female faction what on earth I should put in their aquarium if they get one.

Needless to say, the chorus which came in deafening unison was—"Just Joe!"

Breeding Hyphessobrycon callistus serpae

by A. HINDMARSH

When I purchased four young serpae tetras I was not aware that there is another similar species, known as Hyphessobrycon callistus minor. Later I found out that H. callistus serpae and H. callistus minor are in most respects the same; the main differences are in the colouring and the markings.

With minor the body colour is bright red, and it carries a black spot on the shoulder. The serpae has a darker red overall colouring and a pronounced black bar running vertically down the shoulder. Sexing of H. callistus serpae, which is the species I am dealing with, is not very simple until the fish become mature. So the four young serpae were lavishly fed on Daphnia, Cyclops and small amounts of dried food and Bemis. Placed in a large well-planted tank, and after some months on this balanced diet, the fish became larger and in very good condition. Still receiving as much variety of food as possible, the fish took on a marvellous appearance and eventually matured.

Love play was noticed and a serious attempt at sexing was possible. At first it was extremely baffling but, on close study, it was found that there are marked differences between male and female serpae, and in the end I found a positive way of distinguishing the sexes, provided that the fish are really mature and in the best of condition.

First of all take particular notice of the two which are paying most attention to each other. Look closely at this pair, and the female can be identified by her rounder appearance and slightly less colourful body; her anal fin shows only a small black wedge at its end, the dorsal fin is not such a pronounced black and it has only a thin hyaline border to its rear edge. The anal fin contains a small amount of white at the tip.

Now for the sexing of the male, which is much slimmer and brighter than the female. Its dorsal fin is jet black and has a wider hyaline border to its rear edge, but the positive identification is the larger black wedge at the back of the anal fin. This fin has a black border, and also shows a pronounced white tip at its lower edge. Generally, the tail itself is a deeper red, and the vertical black bar is deeper and larger in the male.

After a definite pair had been found, two that showed a preference for each other (which is most important), the fish were netted and separated in different tanks. Lines were kept continuously three times a day on Daphnia, Cyclops, mosquito larvae and chopped earthworm when available.

In the meantime a 18 in. by 10 in. by 10 in. tank was prepared. This was thoroughly cleaned with hot water (not hot enough to cause the glass to crack), steel wool and a small amount of Dettol. After a good scour out, including underneath the top edge of the tank, it was rinsed thoroughly with running water until I could not detect the odour of the antiseptic.

Some pebbles were boiled, sufficient to cover the bottom of the tank evenly, and then peat blocks also were sterilised by boiling. These were layered at one end of the tank and, before filling the tank with ordinary tap water, a large bunch of coconut fibre was dropped in. A very clean thermometer was used, the heat was switched on and vigorous aeration was commenced. I cannot stress enough the importance of extreme cleanliness. The temperature was raised to 80°F and the set-up was left for 2 to 3 days until the water had become a beautiful clear amber colour. Depth of the water was about 6 inches.

The male and female were captivated with a sterile net and introduced to each other in the tank prepared for them. Late evening was chosen, so that it wouldn't be long before "lights out," giving them a chance to settle down during the hours of darkness.

The day after, a check was kept on them, because the following morning was quite bright, but little or no interest was taken in each other. By evening this situation had altered, and driving was noticed. The male began making quick darts at the female, enticing her to plunge into the coconut fibre, but when darkness descended no actual spawning had taken place.

Next day I had time to watch them in the early morning, only for a few minutes; once again there were signs of thin sunshine. At midday the female huddled out of the fibre and she showed definite signs of wear and tear. Her fins were ragged, her body was much thinner and on close scrutiny of the tank one or two very small clear eggs were visible adhering to the fibre and resting on the peat blocks.

Needless to say, I netted the pair immediately, and in removing them wrecked the tank. The two were placed together with other stock fish, so that I could be sure to recognise the actual spawning pair again. Later, when the tank had settled, all I could see were a few "white" eggs. I then shaded the tank with the aid of newspapers, to cut out as much direct light as possible.

The next evening I witnessed a remarkable sight when I switched on the lights. One of the bubbles left over the fish directions, and almost too quick for the eye to follow, were spiralling small elongated transparent eggs with whisk-like tails. In other words the eggs were just hatching. On the second day after spawning I counted about a dozen intensely black fry, quite small, adhering to the glass sides of the tank.

After 2 or 3 more days the fry began to swim freely and I commenced feeding on tube fry foods, and then on brine shrimp. Small amounts of dried egg, mixed thoroughly in a test-tube with the same tank water, were used sparingly. After a while sifted Daphnia and Cyclops and an occasional pinch of fine dried food were used, until the fry were big enough to be netted and placed in a larger tank for growing on. The eventual number raised was about 50, but I'm certain the original brood was a little larger.
How Does a Fish Swim?

by DAVID GUNSTON

HOW does a fish swim? Just by swimming—some may be tempted to resort, but it is not so simple as that. There are three ways of swimming, not all readily obvious to the eye. Indeed, in its own strange, dense, heavy medium the fish is a continual miracle of locomotion.

The three distinct swimming methods are, first and foremost, by muscular movements of the entire body, by fin and tail movements and by jet-propulsion of streams of water from the gills. Most fishes use all three methods, sometimes together, sometimes singly.

It is generally assumed that a fish swims by moving its fins, but in actual fact a fish’s principal motive force lies in its elaborately muscular body walls. The fins play a very secondary role in forward motion in almost all kinds of fishes. Every fish has a great body mass of marvellously inter-connected W-shaped muscle segments reaching from gills to tail. These segments are the main portion of the fish we eat, and without their very specialised design no fish could glide through the water as it does.

This muscular construction enables the fish to move forward in sinuous fashion by driving the resistant water backwards from the body surface. The easy, co-ordinated body strokes produce waves of pushed-back water. As these pass along the body alternately on each side, successive parts of the creature’s body are pressed against the water and so sufficient forward forces are produced to drive the fish along, even against currents. This successive contraction of the muscular segments with its alternate pushing against the water first on one side and then on the other may be compared with the way a skater pushes against the ice with each leg. The faster the fish moves, the more violent this muscular action has to be, as is shown by observing any animal testing the limits of any fish endeavouring to make a swift getaway. And the narrower and slimmer the fish, the greater the size of the muscular contractions that have to be generated.

This side-to-side method of progression is the exact reverse of the swimming technique of aquatic animals such as porpoises, seals and whales. With a totally different body structure, and the need for continual replenishment of air, they have found it easiest to swim by a vertical up-and-down style.

It is this completely concentrated muscular construction that gives the fish its mastery of the water. No land creature has its main motive force compacted entirely into the body wall; instead, the forces are dissipated into limbs, arms, legs, wings, each with their own separate set of muscles. The fish is really a single complex unit whose every movement is controlled by the successive interchange of its linked muscles stretching from head to tail.

Nevertheless, it is easy to exaggerate the fish’s performance in its chosen habitat. To ourselves, living continuously under the law of gravity, water seems so dense and heavy resistant to our physical movements that we tend to assume that fish really achieve something superhuman when they reach speeds of 20 or 30 miles per hour in it.

What we may forget is that, compared with our own motive efforts, the fish can achieve much greater economy of energy. The water in which he lives has a specific gravity almost equal to that of his own body. This, of course, means that most of his weight is held up by the water, and hardly any effort on his part is needed to support himself. By way of example, a 20-ponds fish in salt water weighs only about 1 pound, so when he swims along or rises, he has only to lift one-twentieth of his actual weight.

In this way he can conserve almost all his energy for swimming forward. It is as if a man of average weight found himself on land weighing only 7-8 pounds. How agile and mobile he, too, could be!

This also explains why we can catch a 20-pounds salmon on a line with only a 5-pounds breaking strain, provided that we cast him! A played fish allowed to tire himself on a run line actually does so almost entirely by moving forward, not by dragging the strain.

Fins and tail movements play a comparatively minor role in swimming. For a long time it was thought that both were of paramount importance to fish motion and balance, because fins are usually the first to be lost by experiment. Fins and tail aid forward progression and play a small part in maintaining balance, but their chief use is in general manoeuvring and steering, in the countless delicate movements—a flick here, a glide there—that keep a fish on the course he wants. They help him to dive or rise in the water, and the fins especially enable him to remain motionless in one spot whenever necessary. As the normal backwardly expelled water from the gills tends to move the fish forward, the sinuous back-paddling of the fins counteracts this and keeps the creature immobile.

But the importance of fins is much smaller than might be expected. Experiments in which the caudal fins of certain tank fish were trimmed off with scissors showed that they could swim as well and as fast as unaltered fish of identical size and kind. Removal of the dorsal and anal fins affected balance a little at first, but this was soon adjusted. Total removal of the fins did not prevent the fish from swimming normally, though it rendered manoeuvring—especially for sudden braking in the water. For this reason, fishes with small or stiff pectorals tend to swerve aside from obstacles rather than stop suddenly before reaching them.

The third method of swimming, by simple jet-propulsion, is used all the time by a fish swimming normally forward, and as we have seen is a counteracted when the fish wants to remain stationary. It is possible that it is also used especially to aid a sudden getaway when the fish has to dart off at speed from scratch. But its chief use is confined to flatfish, which spend much time more or less motionless on the bottom, lying on one side. Most flatfish seem instinctively to realise that if they breathed with the upper, exposed gill, its opening and closing would betray their presence to enemies, for the avoidance of which Nature provides natural camouflage. So instead the body is slightly arched and breathing is carried on by the lower, hidden gill, which sends its stream of water along under the back and out by the tail. When a flatfish wants to move off in a hurry, it simply sends a powerful stream of water out through this same gill, which lifts it right off the bottom and well away to a good start. Jet propulsion of this kind enables all flatfish to become instantly mobile if necessary.

There is also a theory that closing one gill chamber and sending a strong jet of water out of the other may also enable a heavy fish to turn easily, but of all the three swimming methods this one has received the least attention, and much of our knowledge of flatfish is speculative. Yet it is clear that the gills are primarily breathing organs, not swimming devices. A fish’s best swimming device is its own marvelously designed body.
The Firemouth Cichlid

by JAS. STOTT

The firemouth cichlid (Cichlasoma meeki) is a fish capable of attracting immediate attention, especially the male, with its extra brilliance of colouring. A red flush on the underparts, which extends to the mouth, provides the fish with its popular name and this, as well as the large, clear eyes, makes for an arresting appearance. They are not fish to be recommended for the community tank, for they are pugnacious, particularly when in breeding condition. Despite this they are worth that extra large tank to themselves.

When young these fish may accept plants in the aquarium but adults will seldom tolerate plant life of any description, and uproot plants and tear them about almost as soon as introduced. This does not mean that the tank needs to be bare and uninteresting: rockwork placed in a natural manner can produce some attractive effects and, what is more, these fish, as with other members of the cichlid family, look quite well in such a setting, which seems to be right for them.

They are, in the main, carnivorous and heavy feeders, needing plenty of good, meaty food for tip-top condition. The food should consist of earthworms, white worms, shredded meat and raw fish, Tubifex, mosquito and midge larvae and such like, with a change as frequently as possible to provide variety to the diet; this is also a help to retain condition. They soon become tame and can be trained to take food from the fingers, which is always impressive to onlookers.

Sexing the firemouth is not difficult. Apart from the slightly more intense colouring of the male when coming into breeding condition, he can be picked out by the longer, pointed tips to the dorsal and anal fins; those of the female are rounded. She is, of course, fuller in the body just above the ventral fins when in breeding condition. When a male and female have decided to pair there is much displaying on the part of the male and the fish circle around each other. Later they begin the well-known cichlid habit of grappling each other by the mouth and having what looks like a trial of strength.

The pair begin to make shallow depressions or pits in the sand bottom which are seldom used for the actual spawning. The eggs are usually deposited on a rock or on the inside of a plant pot if one is placed into the breeding tank as is often recommended (of course, this is not necessary). Wherever the eggs are placed, however, the area is used only after it has been thoroughly cleared by the breeding pair. Until the fry hatch turns will be taken to aerate the eggs and guard them instinctively, but after the hatching the fry are moved by the parents and placed in one of the pits or depressions in the sand, where they can be seen as a wriggling mass of tiny bodies.

Periodically the youngsters will be moved to a fresh pit; this will be done several times a day until they become freeswimming, which should be in about 3 or 4 days at a temperature around 78°F, a good temperature for the breeding tank. Now, along with food for the adults, food for the fry should be supplied; micro worms and newly hatched brine shrimps provide a good start (Infusoria is not necessary for the fry are big enough to eat larger foods at the start). Chopped white worms can be added after a few days when growth permits. When the youngsters are 5 or 6 weeks old the parents can be taken away.

While I do not think the degree of hardness of the water matters very much with this fish, within reason of course, I do think that a slightly alkaline water is beneficial, say about pH 7.2. The temperature works best in the region of 75° to 78°F (the higher temperature is used when breeding). For a breeding pair it is advisable to use a tank no less than 24 in. by 12 in. by 12 in., a little larger if possible. The tank should contain at least an inch of sand to provide sufficient working depth for the fish in their pit-excavating activities.

ARE THE POND FISH HUNGRY?

During the summer months, when it is probable that there is plenty of natural food in the water for the fishes, it is wise to feed them artificially. If the fishes are not hungry the food will be uneaten and could pollute the water or at least encourage the formation of Infusoria and green algae. To test the appetites of the fishes just throw a small piece of dried brown bread crust on the water. If they are hungry they will soon be up at the surface biting at the food. Some broken worms or other food can then be given but if no sign of feeding is shown by the fishes then give nothing for a day or two, when the test can be repeated.

THE AQUARIST
Guppies Like Things Clean

by PETER DENDY

THAT guppies do best in crystal-clear water has long been realized, but a great many people do not give this particular aspect of their hobby enough thought and consideration. It is wise to keep guppies moping about near the top of the water or else hanging their gills frantically against the gravel or the stems of plants. Guppies are particularly sensitive to an increase of bacteria in the water, which has an immediate effect on them, irritating their gills and making them look really distressed.

The guppy is essentially a lively and happy little fish, in which lies much of its charm, so if you are going to keep guppies at all, then give them an environment which is to their liking. This may involve you in extra work and care and attention with your feeding technique, but you will be well rewarded. If you are the type of aquarist who tipps in bags of food and leaves the bottom filter to look after the water then I hope I can persuade you to mend your ways.

Paul Hahncl was over here from America last summer and had a great deal to say about water and the guppy. His technique has since been the subject of much discussion and some people have disagreed strongly with his methods. Nevertheless there is much to be commended in his system and if you don’t feel like adopting his routine altogether then you can still benefit, as I have, by adopting part of it.

Setting up the tank

Place a piece of glass 1 inch wide vertically along the front of the tank, held back by two other pieces each 3 inches long, so that it is about 1/4 inch behind the front panel of the tank. Fill behind with well-washed compost, sloped up towards the back to provide a good current. Plants are introduced in straight rows each way like an orchard to facilitate cleaning. Hahncl uses Indian fern plants about 1 inch high. He has chosen this plant as an indicator to sub-gravel conditions, as it is sensitive to bad compost and the roots then quickly rot and allow the plants to rise to the surface, so giving warning if anything goes wrong.

The tank is filled with water drawn from the tap and allowed to mature for a week, during which time the hardness is adjusted to 12 to 14 degrees (Clark’s scale). Hahncl considers that the hardness figure is quite critical and the water all-important for guppies. It must not only be sparkling, but chemically pure as well, and a concentration of urine, let alone mullm, is detrimental.

The tank equipment is completed with a feeding square and anchored to the front of the tank and any food particles falling to the bottom are immediately visible in the clear area and so may readily be siphoned out. Each tank is also provided with an external filter to remove suspended matter from the water. After setting up, the tank is left for 3 days before the fish are introduced.

Hahncl has floss-breeds on a selective basis for 15 years and starts each tank off with selected pairs of fish, 8 to 12 weeks old, these being allowed to breed undisturbed in the same tank. Gravid females are not removed and the fry fight it out with their parents. He also installs a catfish in each tank, who turns the time and works mullm and other particles down the slope of the gravel into the clear area for removal.

Routine Maintenance

Every week the compost is stirred by running a planting stick up and down between the rows of plants, to dislodge any matter lying there, and then one-third of the water is siphoned off and replaced with matured hardness-adjusted water. If an undue amount of sediment comes up an even bigger water change is made. (Try digging about in your nice clean compost—you’ll get the shock of your life when a fog and bubbles of methane come up!)

When each tank is set up a date exactly 3 months hence is put on it and at this date, and no later (even if the wife wants to go to the pictures), the tank is taken down and the whole process started again. The guppies are put into an inspection tank and sorted over. The best are put aside for continuing the line, the next best put into a sale tank and all the poor and mediocre fish are fed to the cat! Yes, really, apparently the Hahncl cat loves live guppies and makes short work of the runts at a call of “puss, puss” from Mr. Hahncl.

Feeding

Hahncl feeds little and often and uses a variety of dried foods as well as miniature white worms and brine shrimp. The brine shrimp is raised in two heaviestated aerated tanks and well washed before being fed to the guppies, to avoid adding even small amounts of salt to the water, which might upset the chemical composition. He does not bother to separate the egg shells, he considers those to be sterile and therefore harmless.

Paul Hahncl says that he does not know what “hollow belly” is, and never experiences moping about or gill-bumping with his guppies, and I bet that very few, if any, other breeders of guppies could say the same. I have tried the Hahncl system exactly as set out and to start off with my guppies had such a shock from all the cleanliness around them that it took them a week to get used to the idea. I also found that the water clouded after a week or so and it was necessary to be extra careful with the feeding until it cleared again. This seems to be a common experience with this system and can be avoided by saving half the old tank water to seed the new water.

If you don’t adopt the system completely then at least use the strip of glass to keep the front area clear. Use a feeding square and make a quarter to one-third water change every week. Some people may sneer at the use of a feeding square and say that it is beginner’s stuff, but believe me you will be amazed just how much food does fall to the bottom, however carefully you feed, and you will never know this until you adopt the feeding-square and clear-area system. Surplus food should be removed frequently by a dip tube or siphon.

Thermometer Tip

I have two thermometers, one stick-on type and one of glass pinned to a plastic scale. Both are lining the black defining marks. How can I make the scale legible again?

Treatment of engraved scales of thermometers by rubbing a piece of cobbler’s heel-ball over them is a satisfactory way of restoring the visibility of the marks. The black wax does not readily come off in the water and is harmless to the aquarium inmates.
our readers

Readers are invited to express their views and opinions on subjects of interest to aquarists. The Editor reserves the right to shorten letters when considered necessary and is not responsible for the opinions expressed by correspondents.

Consumer's Survey

A FEW months ago two fellow aquarists and myself conducted a survey of half a dozen well-known aquarists' shops in the London area.

Prices and sizes of fishes and plants were jotted down and impressions of condition of tanks, shop, lay-out and manners of the manager and any assistants were noted down.

In only one shop did we find that more than two nests are used—in this shop the nests are kept when not in use in a can or only filled with a disinfectant but kept on a stove so that the disinfectant is always hot.

We hope to conduct another survey soon, on a larger scale, visiting more shops and taking more notes, to compare amounts of live foods given and range of brands of foods and equipment stocked.

J. R. HOOTON,

Tape Recordings and Picture Shows

MR. H. J. Vosper makes some very interesting points in his letter about tape recordings and colour slides (The Aquarist, May).

Some 18 months ago a few members of the Walthamstow and District Aquarists' Society formed a small unit, called "Supere Audie Productions," our aim being to produce slides and tapes relating to the hobby. The work involved in producing complete programmes, we hope, a high standard is indicated by the fact that it took 9 months to prepare our first tape-slide show. This runs for 1 hour and in two parts so that a break can be taken in the middle. The show is about egg-laying toothcarps and has already been shown to several clubs in London and Essex.

Quite a few interesting points arise from preparing such a show and some of these may be of help to others embarking on similar projects. Firstly it is imperative to make up your mind just what the show is to be about (not such an unnecessary comment as it may seem!). Then you must write a treatment and a shot list. Without working to a plan you can waste a lot of time, and money, on colour film. Just photographing things which, at the time, appear to be pertinent to the subject, will result in a lack of continuity in the finished show. An official of one London society proudly told us that the show which his club was presenting to a large audience was the result of selecting some 96 slides from the several hundred taken! With a good plan, and a capable photographer, you should not waste more than one-fifth of the shots taken.

About one hundred slides, with titles, seems to be a reasonable quantity for a 1 hour show, and we strongly recommend a break halfway through this period.

Having prepared the slides the next job is to write the commentary. Ad-libbing a taped commentary is quite unsatisfactory, and, at a point which Mr. Vosper missed, you can have someone with possibly a much nicer voice to act as commentator than the would-be lecturer himself! The commentary should be complementary to the picture and should tell a story. It does, however, quite often happen that the commentary relating to a particular slide does not last as long as you wish the slide to be projected. Such gaps should be filled with music or, if appropriate, a sound effect such as a pump working over the shot of a filter.

Synchronising the slide changes with the tape may worry some producers. We just rely on an intimate knowledge of the commentary and use that as a cue; it has proved quite satisfactory. We did consider superimposing a click on the tape, or operating a cue light, but decided against these as they can be exceedingly distracting to the audience.

Our group is now planning a recording about breeding a particularly difficult characin with which a member of the Walthamstow Society is currently having notable success. We also hope to produce further slide/tape shows. Mr. Vosper's views are heartily endorsed and we look forward to an increasing exchange of information via the medium of slides and recordings.

W. J. CHISNAIL,
Supere Audie Productions,
Walthamstow and District Aquarists' Society.

Tough Kuhl

IN MR. R. W. G. Cole's letter (The Aquarist, February) he mentions that he had trouble with a white fungus in his tanks. He put the empty tanks outside to be cleaned and later he found a guppy still living in a small quantity of dirty water.

A few months ago, I received some tanks with fish in them, from a man who lives across the road. He had three tanks and decided to put the fish from one of the tanks into another tank to save trouble when bringing the fish over to my house. After 3 days, he and I were going to bring the tanks from his house. I happened to glance into the empty aquarium when I saw a kuhl loach swimming about in about half an inch of water which was very cold.

I now think that, in the sense that Mr. Cole means, the kuhl loach would be a close second to the guppy as the King of Tropicales. I am sure that many other readers will agree that the kuhl loach is a very fine fish to keep.

DAVID TWINN,
Glasgow, W.1.

Tropical Marine Aquaria

I AM pleased to see the recent articles on tropical marine aquaria. As a dealer I am more than aware of the present difficulties in launching out into this fascinating branch of our hobby. I personally, and no doubt several other
dealers throughout the country, are trying to overcome these difficulties. The main problem is obtaining an uncontaminated supply of sea water. Special sea salt mixes are available, but these are very expensive and only used by myself when urgently required at a time when collection from the coast is not possible.

However, for those hobbyists who are near the sea, or who have the time and facility to visit the coast, obtaining a supply of sea water is no real problem. It is important that the collection point should be on a wind-swept coast away from heavily populated areas where contamination would be present. The water should be taken before the turn of the tide and at the highest point of the tide. In so doing the hobbyist will be taking water which is coming in from several miles out to sea, and this will be reasonably pure. Sea water must be transported in glass, polythene or enamel containers, and metal must not be in contact with the water at any time. Heavy filtration is generally recommended to keep the risk of contamination down to a minimum.

The other real headache, apart from the sea-water collection, is the feeding. Most marine will not readily take dried food and brine shrimp hatchings will be required to help out with other foods. White worm is excellent but cannot be fed as a constant diet and must be supplemented with other foods. Daphnia is readily accepted and should be offered whenever available. Tubifex worms are not to be recommended. However, after a while most marines will learn to accept dried food and this helps in the feeding problem. It is of paramount importance that overfeeding is not practised. Any uneaten food or other foreign matter in the aquarium must be removed as soon as it is noticed.

By observing the above basic points any hobbyist will find keeping easier. As compared with the general run of freshwater tropicals, the sheer brilliance of colour and variety of shape makes the marine tropical fish outstanding against the freshwater tropicals. Also, it needs only three or four fish in a 24 in. by 12 in. by 12 in. aquarium to give maximum effect, with a background of exotic corals. Indeed, it is essential that the marine tropical aquarium should not be overcrowded.

I hope that your series of articles will stimulate demand for marines to be made more readily available in this country and that the trade will meet this demand without delay.


Brighton Aquarium

We are very concerned over your reference to our Aquarium in your Editorial of the June issue. It seems that you did not have any attempts to verify the facts. We discontinued dancing in the Casino Ballroom which is part of the Aquarium Buildings at the end of last week after an exhibition of Veteran and Vintage Motor Cars etc., and it is called the Brighton Motor Museum; it is a separate undertaking and quite apart from the Aquarium. For your information, the animals and birds were removed from the Aquarium during the past winter and new pumping, air plant and filtration plant are being installed and it is anticipated that all the work will be finished by the end of the year.

F. C. Groves, Director, Aquarium Entertainments Limited.

Appreciation

Referring to the Foreword in this year's B.A.F. Catalogue, I would not be human if I did not feel pleased to read the appreciation of my work towards making the British Aquarists Festivals successful.

May I in turn pay tribute, through your journal, to all who have done a job of work this year and for the past 10 years to make the Festival possible. The event has been successful because of team work and readers will find the names of the workers on page five of the Catalogue.

George W. Coyle, Bicester, Yorks.
from AQUARIST’S SOCIETIES

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

The members of the Throssel A.S. have been very busy lately, continuing with a visit to Dudley for the Open Show of the Association of Yorkshire Aquarists. This was the first time these two groups had met and the show was awarded a first, second and a third prize. Edward Wilson was also elected chairman of a very successful group.

A return visit to Dudley was also made and a challenge Table Show was held at 90 points, to 43 points. The result of the Table Show for Livebearers was 1. M. R. Floud (Middlesbrough), 2. M. R. Machin (Northallerton), 3. M. M. Machin & Son (Scarborough).

At the recent Annual General Meeting of the Hatfield A.S., Mr. A. T. Smith was again elected to the Chair. The officers of the Society were all re-elected for a second term of office: Mr. P. H. Billings, 40 Abbey Road, Cradley, Chair; Mr. A. C. Jeffries, Secretary.

The Haver Aquarist Society is maintaining its position at the top of its programme of annual meetings, lectures and entertainment. The Officers were again elected in Midland Show in 1963, and the Society’s Table Show was put into the Birmingham Show by special request.

Anyone who keeps fish, Tropical or Coldwater, is cordially invited to attend any of the Society’s meetings or shows.

Recently the Blackpool and Fylde A.S. was conducted round the Towery Aquarium by Mr. G. Harris. The visitors were able to view the beautiful coral tanks which Mr. R. E. Layshon made the subject of an illustrated talk to the Society at the September meeting. Mr. Layshon was keen to show his appointment at Chester Zoo. The annual table show winners were: Livebearers: 1st. Mrs. J. Taylor; 2nd. J. R. Taylor; 3rd. C. R. Machin; 4th. J. R. Machin. Novices: 1st. Mrs. R. Machin; 2nd. Mrs. R. Machin; 3rd. Mrs. J. Taylor.


At the annual general meeting of the Association of Yorkshire Aquarists Society, held at the offices of the Society, Mr. D. C. Wilson, 171 Middx Road, St. Helens; 2nd. M. Machin (Sunderland); 3rd. G. D. Holmes (Bradford); 4th. G. D. Holmes (Bradford).

The independent A.S. was the host club to the N.W.L.G.A.S. recently. During the meeting Mr. R. Machin gave the members an interesting talk. The winners were as follows: 1st. Mrs. J. Taylor; 2nd. Mrs. J. Taylor; 3rd. Mrs. J. Taylor; 4th. Mrs. J. Taylor.

A TABLE show for Livebearers was held at a special meeting of the Walsall Natural A.S. The first place was taken by Mr. M. Hardy (Redcar), second Mr. B. T. Tuesday (Redcar), third Mr. D. Arnold (Chelmsford), fourth Mr. M. Hardy (Redcar). The Society’s next meeting is on the 21st of March at 7.30 p.m. at the St. Mark’s Church, Walsall, Comer Street, Walsall.
North Eastern Federation of Aquarium Societies

The Federation has announced the staging of a four-day show in September with the Northern Counties Type Flower show at the Exhibition Park, Newcastle upon Tyne. Dates are the 24th, 25th, 26th, and 27th. The show will be well-balanced and all classes will be on show, including aquatics, décor, and fish. The exhibition is on the A1 (Great North Road) with good parking space.

THIRD Open show of the Bradford and District A.S. was extremely well supported and over 300 fish were entered for judging. The results were as follows:

- Guppies: 1st. Mr. J. T. Peters (Bradford); 2nd. Mr. P. Moorehouse (Bradford); 3rd. Mr. T. G. Williams (Bradford); 4th. Mr. R. J. Marshall (Bradford). 2nd. Mrs. J. Hogget (Bradford); 3rd. Mr. D. B. Bradley (Macclesfield). 1st. Mr. J. Hogget (Bradford). 2nd. Mr. A. A. Pepper (Macclesfield). 3rd. Mr. B. J. Hogget (Bradford). 4th. Mr. P. R. Melling (Bradford).

- Assorted Colours: 1st. Mr. D. J. Smith (Bradford); 2nd. Mr. D. H. Bean (Bradford); 3rd. Mr. J. Hogget (Bradford). 1st. Mr. J. Hogget (Bradford); 2nd. Mr. A. A. Pepper (Macclesfield). 3rd. Mr. J. Hogget (Bradford). 4th. Mr. P. R. Melling (Bradford).


AQUARIST’S CALENDAR

- 6th-7th July: Otter A.S. Open Show. Otter Hall, Belize M., Shrewsbury, Shrewsbury.
- 6th-7th July: Montgomery Town Show. All types and sizes. Montgomery Town Hall, Montgomery.
- 10th-11th July: Macclesfield & District A.S. Open Show at the Liverpool Show. Scheduled shows and information from Mr. T. A. Whitworth (Macclesfield). 1st. Mr. A. A. Pepper (Macclesfield). 2nd. Mr. B. J. Hogget (Bradford). 3rd. Mr. A. A. Pepper (Macclesfield). 4th. Mr. J. Hogget (Bradford).
- 14th-15th July: Bradford and District A.S. open show in conjunction with the Bradford Agricultural Show. Details can be obtained from the show secretary, Mr. D. J. Smith, 54, Oakfield Road, Wigan.
- 22nd-28th August: Midland Aquarium and Pond Society Open Show to be held at Hagley Hall, Birmingham. Show schedules from Mr. J. Edwards, 4 Amber Terrace, Denwood, Birmingham 11.

SECRETARY CHANGES

CHANGES of secretaries and addresses have been reported from the following societies: Cheshire Aquarium Society (J. Stewart, 34, Foggy’s Buildings, 17th Street, London, S.W.1); Association of Yorkshire Aquarium Societies (D. M. Crowther, 19th Street, Leeds, Leek Road, Thorntree, derivation, Yorks.).

Crossword Solution

MILLER THUMB
IDE PEA EE EEE
LEERI LARVAE
LACE PV O BLT
I HAL INNES
OP TAIN TIE V
TIME NIGH N I EEL
S REYNARDIC
FOURS A P E D I
B ICHEPERI
VUGH NORID HETERANDRIA

July, 1961
GRO-WEL
superior filters
for best
AQUARIUM
CLARITY

OUTSIDE FILTERS
To fit all aquarium frames up to 1” wide.
“SLIM JIM”: For tight quarters. The
slimmest outside filter on the market.
Popular self-starting type. Complete with
removable partitions, siphon, strainer and
return stem. A quality filter for only
17s. 6d.

“KLEAR KING” 3-Compartment filter:
Separate compartments for glass wool
and charcoal. Removable partitions plus
a larger siphon stem for faster recirculation.
Clog-proof return stem giving a steady,
non-splash flow. Price 22s. 6d.

INTERNAL FILTERS
BOTTOM FILTER: For filtering and
stearing the tank. Handsomely styled.
Unobtrusive and efficient. Price 8s. 3d.

At Recommended in T.F.H.
for Marine Aquaria.

ORNAMENTAL ROCK FILTER: For orna-
tmental filtration. Looks like a rock
but is primarily an efficient filter and
keeps tanks up to and including 10
gallons sparkling clear. Price 17s. 6d.

TRAPS
5-WAY CONVERTIBLE
TANK TRAP: The most versa-
tible trap available. Can
be used for breeding 1 or 2
livebearers, as a rodd trap for
breeding egg-layers or as a self-
cleaning display tank for 1 or 2
Bettas. Price 28s. 6d.

Moulded of strong, clear polystyrene. These popular and well-tried products are made by
GRO-WEL FISH-ADE CO., INC., U.S.A. and distributed in Great Britain by

THE LIQUIFRY COMPANY LTD.
CHURCH STREET, DORKING, SURREY.

Obtainable through your dealer or post free from The Liquifry Co., Ltd.

MIDLAND OPEN SHOW
AND TRADE EXHIBITION
Bingley Hall, Birmingham
AUGUST 23rd - 26th, 1961
Tropical and Coldwater
Attractive Exhibits - Trade Stands
Refreshments, Bar and Coach Parking
Admission: Adults 1/6, Children 6d.
Wed. 2.30-10 p.m. Thrus., Fri. 12-10 p.m. Sat. 10-9 p.m.

I've Got Millions!
WORMS! FOODS! COMPOSTS! RESULTS!

EUGLENA
MIXED WORMS
MICRO FOOD
GRINDAL WORMS
GRINDAL FOOD
WHITE WORMS
WHITE WORM FOOD
WHITE WORM COMPOST

2-6—With 8 page Instructional booklet
2-4—Complied with feeding powder
2-4—Specially developed for Plano
2-4—Plaque W. Worms Easy to breed
2-4—Mixed culture in wooden boxes
2-4—High protein content. Rapid results
2-4—Finely ground with organic base
2-4—With complete instructions
2-4—Mixed culture in wooden boxes
2-4—Exclusives formula. No mildew
2-4—Composed for quicker breeding

 Breeders' packs; five times 50 quakers for 7/6

Ask your dealer, or free delivery from
E. ARNOLD, 80, MONEGA ROAD, LONDON, E.J.

86

THE AQUARIST
**Dazzling Tropical Marine Fish...**

- Blue Damsels (royal blue body, yellow tail, 2") 30p
- Clown Fish (orange body with white bands, 2") 40p
- Cloudy Damsel (mauve-shade white finnage, 3") 25p
- Neon Wrasse (seed-like, steel blue lined body, very beautiful, 1" and 2") 35p
- Sea Horses (need no description) 40p
- Scorpion Fish—non-committality. Beautiful fish covered with long poisonous spines. Coral red and white. 6' long £9

We can supply a non-toxic 2 gallon plastic aquarium, complete with seawater, pump, filter, heater, thermometer, thermostat, sand, lighting, coral and other accessories for £7, carriage paid. This set up is sufficient to hold one or two of the above listed fish, excepting the Scorpion Fish. Full maintenance instructions given with each order (includes feeding hints).

<table>
<thead>
<tr>
<th>Fish</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cinnamon Gourami</td>
<td>5p</td>
</tr>
<tr>
<td>Dwarf Betta (Schizophorus)</td>
<td>22p</td>
</tr>
<tr>
<td>Black Fighters, pair</td>
<td>35p</td>
</tr>
<tr>
<td>Titan Betta</td>
<td>30p</td>
</tr>
<tr>
<td>Silver Sharks</td>
<td>25p</td>
</tr>
<tr>
<td>Red Tail Sharks</td>
<td>35p</td>
</tr>
<tr>
<td>Albino Tiger Barbs (most attractive)</td>
<td>90p</td>
</tr>
<tr>
<td>Swallow Tailed Black Angels</td>
<td>15p</td>
</tr>
<tr>
<td>Lakechela Looches</td>
<td>10p</td>
</tr>
<tr>
<td>Discus</td>
<td>10p</td>
</tr>
<tr>
<td>Blending Heart Tetras (good size fish)</td>
<td>15p</td>
</tr>
<tr>
<td>Cardinal Tetras</td>
<td>10p</td>
</tr>
<tr>
<td>Winged Denises</td>
<td>5p</td>
</tr>
<tr>
<td>Spinny Eels</td>
<td>5p</td>
</tr>
<tr>
<td>Liberty Ellin</td>
<td>5p</td>
</tr>
<tr>
<td>Black Platy Variates</td>
<td>5p</td>
</tr>
<tr>
<td>Lemonnose Stingrays</td>
<td>15p</td>
</tr>
<tr>
<td>Hurricane Parrot Fish</td>
<td>5p</td>
</tr>
<tr>
<td>Mergansite Parrot</td>
<td>5p</td>
</tr>
<tr>
<td>Large Silver Hatchets</td>
<td>5p</td>
</tr>
<tr>
<td>Sucking Looches (wonderful Algae eater)</td>
<td>10p</td>
</tr>
<tr>
<td>Festival Catskilde</td>
<td>5p</td>
</tr>
<tr>
<td>Large Sizes</td>
<td>5p</td>
</tr>
<tr>
<td>Phantom Tetra</td>
<td>5p</td>
</tr>
<tr>
<td>Mother-of-Pearl Rainbow Fish</td>
<td>7p</td>
</tr>
</tbody>
</table>


**THE GOLDFISH BOWL**

1, EAST AVENUE, OXFORD.

Telephone Oxford 41633.

---

**IT'S THE TOPS — BRITISH AND BEST**

- Won't foul the water
- The food in the plastic box, 1/6, 2/6, 5/-, 6/6, and polythene jars 17/6.
- From all good pet shops or direct from—McLYNN'S AQUATIC FOODS

DORKING, SURREY

July, 1961

---

**McLYNN'S**

Made by D. McINERNY, of McLYNN'S Aquarium

EWHURST, author of "ALL ABOUT TROPICAL FISH"

There'll be none left at the bottom
THE PERFECT AQUARIUM
The best food and cleanliness are all you need

“SUREGROW”
STANDARD 1/3 & 2/6
FRY 1/6
“INFUSION” 1/6
Replaces Infusoria. An immediate feed for newly hatched fry.

“DISEASOLVE”
2/6
With dropper measure

FIVE DROPS PER GALLON OF WATER, IN YOUR AQUARIUM WEEKLY WILL CONTROL BACTERIA AND GIVE YOU A PERFECT AQUARIUM.

From all good Aquarists suppliers — Trade inquiries from
SOUTH COAST AQUATIC NURSERIES LTD.
Old Bath Road, Calnbrook, Slough, Bucks — Telephone Calnbrook 2673

WARDLEY’S HI-GLOW 30
THE SENSATIONAL COLOUR FOOD FROM AMERICA

Hi-Glow 30
Is a specially designed food which improves the coloration of most tropical aquarium fishes without any adverse side effects

Try it and see
The difference
Price 4/8 per large drum. Available now at your local stockist

Just one of the famous Wardley range of quality aquatic foods... so good that it’s sure to be imitated!

Wardley foods are distributed in the U.K. by
T.F.H. PUBLICATIONS (LONDON) LTD.
19 Station Road, Redhill, Surrey (Redhill 8866)
A Fellow Aquarist Claims

"DISEASOLVE"
CURED
"POP EYE" DISEASE

Glasgow, S.W. 2
20.5.61

Dear Sirs,
I am writing in the hope that the following information may be of some interest and value to you.

Some time ago I was having trouble in my tanks, fish were dying for no apparent reason.

Post-mortem examination by Mr. W. Harold Cotton, the ichthyologist, disclosed that the fish were dying because of some internal parasite, caused by dirty live foods. I'd read, of course, the ads for "Diseasolve" but had quite frankly regarded it as another chemical "gimmick". However, I decided to try it, and I'm glad to say I've had no more trouble from dirty live foods.

However, that's not the point I want to make.

Some weeks ago, my valuable, prize line breed Siamese male fighter, developed a bad case of what looked like "pop-eye".

The eye looked like it was ready to come right out of its socket.

Now any previous experience I'd had with a fish with "pop-eye" was that I couldn't cure it, and the fish was doomed, consequently I was in quite a panic about my fighter. He was a magnificent fish and it looked for certain as if I was going to lose him.

Nowhere, as I can see, on your ads, do you specifically mention using "Diseasolve" for "pop-eye", so it was probably just desperation on my part that made me pick up the bottle and pour it into his tank.

Now I keep my male fighters in compartments 8 in. by 8 in, at a temperature of 80 F. and into the compartment containing the fish with the bad eye I dropped in six drops of "Diseasolve"—in three days that fish's eye was back to normal! There has been no recurrence of the trouble.

A week or so after this I noticed a female fighter with a protruding eye.

I keep all my female fighters in one tank and there's always a certain amount of squabbling going on.

The female's eye was probably the result of some battle.

I did the same as I had with the male, i.e. I poured in six drops of "Diseasolve"—in three days trouble cleared up!

I would hasten to add here that I'm not a bacteriologist or chemist or an authority on fish diseases, and that the purists and experts would regard such.Gustate tests and proof that I have given, but I am not going the facts as I saw them.

I would add, however, that I passed on the information to many of my aquarist friends, and some of them agree with me, they discovered the same as I have.

There's one other point I'd like to mention. When spawning fighters, after removing a tattooed turn female, I always pop them into a tank containing a few drops of "Diseasolve" to heal their torn fins.

As I said at the beginning of this letter, I hope the facts I've given are of some interest or value to you.

One thing I know, there's always a bottle of "Diseasolve" in my fish medicine chest.

Yours faithfully,
R. G.

Just one of the many reasons why you should always have a bottle handy

PRICE 2/6

From all good Aquarist Suppliers

MADE IN ENGLAND, LTD. COALBROOK, SLOUGH, BUCKS.
HYKRO

AQUATIC APPLIANCES AND FOODS

Hykro Hi Fi Filters in 6 Sizes (2 per pack). A strong workmanlike job, which will give you Crystal-Clear Tanks.

Hykro De Luxe Corner Filters: Gravel Filters. Feeding Rings (including the 4 in one) Worm Feeders. Four in one Tank Scrapers. The 3-way Gang Valve. New to England, but very popular in U.S.A. and all over the world—does away with use of Tees and Clamps. Very efficient and compact.

Floating Worm Feeder with Lower Tray—prevents worms falling to tank bottom.

Hykro Foods. Coldwater Fish Food. Will keep your fish in tip-top condition, also relished by many tropicals. Including the ½ lb. pack.

Hykro Natura. Contains 9 Dried Live Foods, and will feed the rarest tropicals (or coldwater fish).

Hykro Flakes. These are known the world over. Used extensively by exhibitors to get that extra condition and bring out the full beauty of fish.

Please note in response to many enquiries.—We do not supply these appliances and foods direct. They are obtainable at all the best shops, but in case of difficulty drop us a line and S.A.E. and we will put you in touch with your nearest stockist. Retailers not carrying full stocks—Drop a line and we will put you in touch with nearest wholesalers and supply descriptive lists.

Two of our Specialities are American Green Turtles and Madagascar Lace Leaf Bulbs and Plants, grown here.

JOE GRASSBY, F.R.H.S.

THE HYKRO DEPOT MOBERLEY NEAR KNUTSFORD Cheshire

Phone Moberley 3272

Author of Exotic Fishkeeping

M ARSHALL'S AQUARIA

26 WESTBURY LANE, BUCKHURST HILL, ESSEX Telephone: BUCKHURST 4708

It is quite easy to get to Buckhurst Hill. By tube trains on the Central Line thirty-five minutes from the West End, and we are three minutes from Buckhurst Hill Station. Or by bus routes 20, 28a, 163 to Buckhurst Hill, five minutes walk from there. There is always someone in attendance at the Hatchery so you can inspect at any time including week ends.

Over 120 different species of fish for sale. Fifty varieties of plants available, collected from our hundreds of tanks for each order and sent direct to you, they cannot fail to grow.

We sell, buy or exchange fish of any kind. We also purchase second hand tanks or complete 'set-ups'.

WE NOW OFFER

Cope Fair Spatterdock... 6/6
Bromus Ammobium... 6/6
Underwater Orchid... 6/6
E. Radicans... 6/6
Matuca Amazon... 6/6
Dwarf Lily... 6/6
Diplina... 6/6
Red Tail Black Shark... 6/6
Black Shark... 6/6
Red Fin Shark... 6/6
Diplina... 6/6

Please Note

The books written by Thos. H. Marshall: 'Breeding the Egilases', 'Breeding the Livebearers', 'Breeding the Bombay Sh MF's', 'Breeding the Cichlids', 'Aquarium Management and Fish Farming', 'Aquarium Plants and Seeds', are all available from here at 3/- per volume, post free, or a complete set for 42s. 6d. post paid.

We are always prepared to give advice on all phases of fish keeping and typical breeding tanks set up for many different species of fish can be seen in our Hatchery.

We are pleased to welcome Club visits, see previous advt. At the moment we have many breeding pairs of various fish to offer—sumptuously very large Black Lace and Black Veiltail Angelfish, Kissing Geometricus 6" long, several species of Large and Dwarf Cichlid, write for details.

Fifty years experience at your service. We have been breeding fish since 1920

WE GUARANTEE

1. That here you will see a bigger and better display of Exotic Fish than anywhere else in the British Isles, and we do not exclude the Zen's. The list is as long as anyone who has been here.

2. That our Fish Food is the finest obtainable and that it contains a very high proportion of the best fish and young bullocks liver. Sent direct from here so that it is in perfect condition and ensures that it is not adulterated in any way.

3. That our prices are the lowest for the best fish food you can get there. N.G.F.F. (Narassaown Fish Food) is the best. Any of the Cichlids cut is greedily. A generous sample will be sent post free for 3d. in the post.

4. That our plants (and we offer over fifty different species) are the very best obtainable, and that our 1 per cent of 50 assorted plants and 7½ per cent of 19 plants are sent on offer and both are post paid.

5. That everything we sell is the best on offer. We supply everything for the Aquarist in the way of equipment and post free. Our offer of a Thermometer, Resser and Thermometer at 20/- post paid is still open.

THE AQUARIST
AQUARIUM PUTTY
Made specially for AQUARIUMS
★ WATERPROOF ★
★ A SMOOTH PUTTY ★
★ EASY TO USE ★
Makers of the famous Fillers & Stopplings.
If unobtainable write direct to manufacturers.
BRUMMER LTD. Oyster Lane, Byfleet, Surrey

MIDLAND OPEN SHOW
BINGLEY HALL, BIRMINGHAM
AUGUST 23rd - 26th, 1961
Attractive Exhibits - Trade Stands
Enquiries and schedules
J. Edwards, 6 Amy Terrace, Osler Street, Birmingham, 16
Entries close last post August 8th

LETTY KREMER for all Pond Plants and fish

**CHOICE LILIES**

<table>
<thead>
<tr>
<th>Plant</th>
<th>depth 1</th>
<th>depth 2</th>
<th>depth 3</th>
<th>depth 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>White Odorata alba Scented</td>
<td>12&quot;</td>
<td>24&quot;</td>
<td>36&quot;</td>
<td>48&quot;</td>
</tr>
<tr>
<td>Gladstoniana Large White</td>
<td>18&quot;</td>
<td>36&quot;</td>
<td>48&quot;</td>
<td>60&quot;</td>
</tr>
<tr>
<td>Marliacea Corna Blush Pink</td>
<td>12&quot;</td>
<td>24&quot;</td>
<td>36&quot;</td>
<td>48&quot;</td>
</tr>
<tr>
<td>James Brydon Rose Crimson</td>
<td>18&quot;</td>
<td>24&quot;</td>
<td>36&quot;</td>
<td>48&quot;</td>
</tr>
<tr>
<td>Wm. Falconer Blood Red (golden anthers)</td>
<td>18&quot;</td>
<td>24&quot;</td>
<td>36&quot;</td>
<td>48&quot;</td>
</tr>
<tr>
<td>Eucarboeul Vermillion Crimson (crimson anthers)</td>
<td>18&quot;</td>
<td>24&quot;</td>
<td>36&quot;</td>
<td>48&quot;</td>
</tr>
</tbody>
</table>

**Post 2½ extra**

Breeding pairs Goldfish 5" - 6"
Can and carriage 5½

**TROPICAL PLANTS**

<table>
<thead>
<tr>
<th>Plant</th>
<th>depth 1</th>
<th>depth 2</th>
<th>depth 3</th>
<th>depth 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vall. torta</td>
<td>Wistaria 1½</td>
<td>Ambulia 8d.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Myriophyllum</td>
<td>Giant Sagg.</td>
<td>1½</td>
<td>2½</td>
<td>3½</td>
</tr>
<tr>
<td>Bacopa</td>
<td>Blue Lily</td>
<td>1½</td>
<td>2½</td>
<td>3½</td>
</tr>
<tr>
<td>Sagittata</td>
<td>Aponagrum</td>
<td>1½</td>
<td>2½</td>
<td>3½</td>
</tr>
<tr>
<td>Ludwigia</td>
<td>Amazon Swords</td>
<td>1½</td>
<td>2½</td>
<td>3½</td>
</tr>
<tr>
<td>Hygrophyllum</td>
<td>Lace plants</td>
<td>1½</td>
<td>2½</td>
<td>3½</td>
</tr>
</tbody>
</table>

Box & post 1½ - Full list on tropical fish and aquaria

34 CHEETHAM HILL ROAD, MANCHESTER 4 - BLA 2163
Easy parking opposite Park Street

**HEAVY GAUGE STEEL**

SHELVING

£3.15.0
DELIVERED FREE,
THE ONLY HEAVY GAUGE SHELVING AT THIS PRICE.

- Brand new - Manufactured in our works.
- Shelves adjustable every inch.
- Heavy gauge shelves will carry 400 lb. each.
- Stove enamelled dark green.
- 6 shelves per bay - Extra shelves 60p. each.
- Quantity discounts.
- Other sizes available.
- Also available in white at £5 per bay

N. C. BROWN LTD.
A. P. WING
HEYWOOD - LANCS - TEL: 69018 (6 lines)

**OXYGEN SUBMERGED**

- Vallisneria Sp. 2½ doz.
- Elodea Densa 2½ doz.
- Willow Moss 1½ Bunch
- Crowfoot 1½ Bunch
- Hair Grass

**FLOATING**

- Saltwater 2½
- Eucalyptus 6d.
- Froghair 6d.

Box and post 2½
TROPICALS THIS MONTH

Dwarf Cichlids—

Apostogonema taeinatum — New — Interesting, spawns bright red eggs. Unsexed 25/— Pairs 75/—
Apostogonema weissi — New — Unsexed 25/— Pairs 75/—
Apostogonema corumbae — New — 25/—
Apostogonema ramirezi 7/6 Pairs 37/6
Apostogonema reitzegi 10/— Pairs 37/6
Apostogonema agassizi 8/6 Pairs 25/—
Apostogonema trifasciatus 15/— Pairs 37/6
Nannacara anemona 7/6 Pairs 20/—
Palmaeothromis kribensis 10/—
Pematochromis guntheri 12/6
Nannochromis nudiceps 10/—

PANTAODON (BUTTERFLY FISH) 25/— each
LEAF FISH 10/— each

STILL A FEW PAIRS OF OUR NEW VEILTAIL GUPPY STRAINS

NEXT MONTH MANY SPECIES OF APHYOSEMION, NOTOBRAZICUS
Also our usual GOOD SELECTION

FANCY GOLDFISH FOR AQUARIUM

YOUNG CALICO VEILTAILS 10/— and 20/— each
Also 3 adult pairs in breeding condition, £15 pair

BEAUTIFUL WATER HYACINTHS 5/— each

The World's Greatest Selection of Aquarium Plants

(Send S.A.E. for list)

New list now in print

OVER 100 PLANTS ILLUSTRATED AND
220 PLANTS DESCRIBED IN OUR BOOK
A MANUAL OF AQUARIUM PLANTS
7/6 POST PAID

MAY WE INTRODUCE

CRASSULA INTRICATA (Nees) Ostenfeld
A lovely little plant for Cold or Tropical Aquarium. Also hardy for pools. 2/— bunch, 8 for 10/—

PLEASE NOTE.—All enquiries requiring a reply MUST be accompanied by S.A.E. Our premises are situated on the main Stratford-Birmingham road, 3 miles from Birmingham, Midland "Red" Bus No. 130 from Bull Ring, Birmingham, pass the door, night at "The Crown," Monkspath.
HOURS OF BUSINESS.—Weekdays 10 a.m.—5 p.m.; Sundays 10 a.m.—12.30 p.m.; May—July Sunday afternoons also from 2 p.m.—5.30 p.m.
CLOSED ALL DAY EVERY MONDAY

TERMS OF BUSINESS.—Cash with order please. Fish sent by rail. Tropical minimum order £5, invalidine container and carriage 10/—. Cold water minimum order £3 plus 10/— carriage. Plants by post (minimum order £1) please add 1/6 post and packing.

Printed and Published by BUCKLEY PRESS LIMITED, London and Brentford