WALTER R. SMITH LTD.
For Complete Tropical and Coldwater Aquaria also Tropical Marine
100 Varieties of fish usually in stock on view
in 76 polished stainless steel aquariums

POLISHED STAINLESS STEEL

Frames Aquariums
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30 x 15 x 12 £ 8.80 £ 11.10
36 x 15 x 12 £ 10.10 £ 13.10
48 x 15 x 12 £ 13.10 £ 21.00

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UNSURPASSED FOR TROPICAL FISHES

VISIT THE MOST COMPREHENSIVE COLLECTION OF TROPICAL AND COLDWATER FISH IN THE MOST BEAUTIFUL SHOWROOM IN LONDON

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'SUPER SUMMIT'
VIBRATOR

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ABUNDANT AIRFLOW

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May, 1966
GET ALL YOUR AQUATIC NEEDS FROM YOUR ARM-CHAIR
FULL RANGE OF EQUIPMENT
200 VARIETIES OF TROPICAL FISH

Coldwater Fish and Water Garden Equipment by return of post (fish by rail)

All fish guaranteed live delivery and in good health free from disease. 3/- rail and packing charge to be included with every order. All consignments of fish to be collected from nearest main-line railway station.

Catalogues and Lists sent by request, or come along and see the best display of fish in the North

Interesting Fish in Stock at present

<table>
<thead>
<tr>
<th>Albino Tiger Barbs</th>
<th>6½ 6/6 each</th>
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<tbody>
<tr>
<td>Indian Spiny Eel</td>
<td>6½ 8/8 each</td>
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<tr>
<td>Roberts Tetras</td>
<td>1½ 12/6 each</td>
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<tr>
<td>Ember Barbs</td>
<td>1½ 10/6 each</td>
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<tr>
<td>Copeina Arnoldi</td>
<td>1½ 5½ each</td>
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<tr>
<td>Aphyosemion Australi</td>
<td>1½ 15½ pair</td>
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<tr>
<td>Hemoglossus Chatham</td>
<td>1½ 5½ each</td>
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<tr>
<td>Red eye Red Swords</td>
<td>1½ 4½ each</td>
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<tr>
<td>Unidentified Catfish</td>
<td>1½ 7½ each</td>
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BREEDING PAIRS OF COLDWATER FISH

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<tr>
<th>Goldfish</th>
<th>6½ body £2.50 pair</th>
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<tbody>
<tr>
<td>Shubunkins</td>
<td>6½ body £4.50 pair</td>
</tr>
<tr>
<td>Comet-tails</td>
<td>6½ body £7.50 pair</td>
</tr>
<tr>
<td>Golden Orfe</td>
<td>6½ body £10.00 pair</td>
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KEITH BARRACLOUGH
215 GREAT HORTON ROAD - BRADFORD 7 - YORKSHIRE

Telephone: BRADFORD 75572
TACHBROOK TROPICALS
England's Renowned Suppliers of High Quality

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18" TANK SIZE (S) 12/-
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RARE SPECIES FROM ALL OVER THE WORLD
INCLUDING MARINE TROPICALS

WHOLESALE ORDERS EXECUTED IMMEDIATELY

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CONVERT YOUR AQUARIUM
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WITH

wardley's

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display stand
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your shop

Wunderbar™
imported flake food

Full 1oz pack 3/6
(Bottom row)

2oz pack 6/9
(Middle row)

8oz pack 22/6
(The big one on top!)

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T.F.H. Publications (London) Ltd
13 Nutley Lane, Reigate, Surrey (Telephone Reigate 47305)
### Coldwater Fish Now in Stock

<table>
<thead>
<tr>
<th>Fish Type</th>
<th>Price</th>
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<tbody>
<tr>
<td>Red Fantails</td>
<td>6/6</td>
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<tr>
<td>Calico Fantails</td>
<td>7/6</td>
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<tr>
<td>Comets</td>
<td>3/6–8/6</td>
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<tr>
<td>Nymphs</td>
<td>3/6–7/6</td>
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<tr>
<td>Golden Orfe</td>
<td>3/6</td>
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<tr>
<td>Goldfish and Shubunkins</td>
<td>1/6–7/6</td>
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### Pond Fish

<table>
<thead>
<tr>
<th>Fish Type</th>
<th>Size</th>
<th>Price</th>
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<tbody>
<tr>
<td>Goldfish and Shubunkins</td>
<td>5–6&quot;</td>
<td>15/- pair</td>
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<tr>
<td>&quot;</td>
<td>7–8&quot;</td>
<td>25/- pair</td>
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<tr>
<td>Golden Orfe</td>
<td>9–10&quot;</td>
<td>50/- pair</td>
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<tr>
<td>Nymphs</td>
<td>6&quot;</td>
<td>30/- pair</td>
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<tr>
<td>Calico Comets</td>
<td>5&quot;</td>
<td>30/- pair</td>
</tr>
<tr>
<td>Higoi Carp</td>
<td>5–6&quot;</td>
<td>25/- pair</td>
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<td></td>
<td>5–6&quot;</td>
<td>35/- pair</td>
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### Pond Plants Now in Stock

<table>
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<th>Plant Type</th>
<th>Price</th>
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<tr>
<td>Water Lilies:</td>
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<tr>
<td>White</td>
<td>5/-</td>
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<tr>
<td>Red</td>
<td>15/-</td>
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<tr>
<td>Yellow, Pink and Cream</td>
<td>12/-</td>
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<tr>
<td>Spatterdocks</td>
<td>4/6</td>
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Minimum order for plants: 5/-

Minimum order for fish: £2 plus 15/- carriage, packing, etc.

All enquiries stamped envelope please.

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### Pond Accessories

<table>
<thead>
<tr>
<th>Accessory</th>
<th>Price</th>
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<tbody>
<tr>
<td>Plant and Lily Baskets</td>
<td>2/6 &amp; 3/9</td>
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<tr>
<td>Polythene Pond Liner (7'6&quot; x 6' x 15&quot; deep)</td>
<td>35/-</td>
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<tr>
<td>Stokes Fountain</td>
<td>£7–19-6</td>
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<tr>
<td>Otter Fountain Kit</td>
<td>£9-5-0</td>
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<tr>
<td>Otter Waterfall Kit</td>
<td>£9-5-0</td>
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<tr>
<td>Lotus Combined Fountain and Waterfall Kit</td>
<td>£10-10-0</td>
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**Plastic Spiked Anemones**

### Live Foods

<table>
<thead>
<tr>
<th>Food Type</th>
<th>Price</th>
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<tbody>
<tr>
<td>Wingless Fruit</td>
<td>7/6</td>
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<tr>
<td>Fly Culture</td>
<td>3/-</td>
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<tr>
<td>Grindal Worm Culture</td>
<td>2/-</td>
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<tr>
<td>Micro Worm Culture</td>
<td>2/-</td>
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<tr>
<td>White Worm Culture</td>
<td>3/-</td>
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<tr>
<td>White Worm, 1 oz.</td>
<td>6/-</td>
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We now keep in stock metaframe aquariums and hoods. S.A.E. for list.

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We can offer an extremely Good and Healthy Variety of Tropical and Coldwater Fishes.

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Unit fully guaranteed for one year

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JOIN THE RANKS OF OTHER AQUARISTS
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Europe's best selling fishfood. Best value for money. Made in the most modern fish food factory in the world in Bremen-Mo., West Germany.

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THOUSANDS OF POND FISH IN STOCK

SPECIAL PLANT COLLECTIONS (post only)
All post enquiries: 111 Goldhawk Road, W.12. 2s. post and packing on all collections.

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<th>TROPICALS</th>
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<tr>
<td>A</td>
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<td>50 plants including Dwarf Lily Cryptostegia Water Iris etc.</td>
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<td>12 Vallisneria</td>
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<td>12 Myriophyllum</td>
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<td>3 Micro Sagittaria</td>
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<td>4 Ludwigia</td>
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<td>1 Amazon Chain Sword</td>
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<td>1 Nymphaea Tetragona</td>
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<td>1 Gloriosa Hydrangea</td>
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<td>1 Agapanthus</td>
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<td>1 Iris</td>
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<td>1 Gloriosa Superba</td>
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<tr>
<td>Cultures of pure Infosia for your fish</td>
<td>5/-</td>
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<tr>
<th>Aquarium or Pond</th>
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OWING TO POPULAR REQUEST OUR WRAYSBURY BRANCH WILL BE OPEN ON SUNDAYS AS WELL AS SUNDAYS FROM 10 A.M.—4 P.M.

QUEENSBOROUGH HOUSE, FERRYS LANE, HYTHE END, WRAYSBURY, BERKSHIRE

May, 1966
Nitella flexilis

by B. Fry

Nitella flexilis, a plant (actually one of the higher algae) which is widely distributed in the still and slow-moving fresh waters of Europe, Asia and America, is well worthy of introduction into any rank housing a pair, or collection, of diminutive carnivorous or viviparous tropicals; for apart from its delicate charm and easy cultivation, it makes a splendid depository for fishes' eggs and a fine refuge for tiny fry. Added to this, the plant is an excellent producer of oxygen.

The semi-transparent branching stems are needle-like, attain about 12 in. in length, and usually bear six or seven forked filaments arranged in dainty whorls. These whorls are set rather widely apart and, like the stems, vary in colour, according to the quality and duration of light and the nature of the bottom, from pale to dark green.

But to come back to the cultivation of nitella. The aquarist should always start it off in a somewhat subdued light. If this piece of advice is ignored the plant will almost certainly suffer from the unwelcome attentions of some of its ominous relations, to wit, the pestiferous forms of algae, which will show up with the abruptness of Aladdin's genie and proceed to strangle it in an unloving embrace.

In the matter of temperature, Nitella flexilis has a wide range and seemingly flourishes just as well in an unheated aquarium as it does in a heated one. But be that as it may, any change of temperature should be brought about very gradually. Another point which cannot be overemphasized is the importance of keeping the delicate stems from drying out between the time of purchase and subsequent replanting. The last is easily accomplished by pushing each stem or separate parts of a long, branching stem into the compost. Alternatively, stems may be kept in position with twist of lead wire.

Within the space of a month or so the anchored stems will lengthen, branch and branch again, and form a fairy underwater scene of enchanting loveliness.
Starting with plants and fishes

by B. WHITESIDE

In the normal cycle of aquatic life, plants and fishes are, to a certain extent, dependent on one another. In trying to simulate nature in the confines of a small aquarium, the aquarist can, with a stroke of luck, hit the ideal conditions in which his particular collection of fish and plants will thrive to their mutual advantage. To repeat such a set-up is not always possible as two seemingly identical tanks may vary greatly in their ability to support given fish and plants. For the aquarist with some scientific knowledge of botany, zoology, chemistry and perhaps horticulture, the chances of being able to establish his ideal aquarium are increased.

There are many excellent books on how to set up an aquarium but not all of them emphasise the necessity of setting up aquaria using gravel which does not contain any calcium carbonate (limestone, shell fragments etc.). Many tanks containing unripe fish or plants are due to the presence of calcium carbonate in one or more of its forms, in the gravel or coddlework. It is not an easy matter to obtain such 'lime-free' gravel. To test if gravel does contain calcium carbonate, some dilute hydrochloric acid can be added to a sample of gravel in a jam jar. The presence of the unwanted substance can be seen by the evolution of bubbles of carbon dioxide gas from any fragments of calcium carbonate in the gravel. A lighted splinter of wood will be extinguished by carbon dioxide gas, after a quantity of it has been evolved. Ordinary vinegar (acetic acid) will also cause the release of carbon dioxide from limestone, marble chips, sea shells etc., although it will work much better with dilute hydrochloric acid.

Some plants and fishes will live quite happily in an aquarium containing limestone in the gravel but as this substance slowly dissolves in slightly acid aquarium water, it would be better to discard such gravel (or rocks) and try to obtain some which do not contain any. Unsuitable gravel can be improved, if the quantity of calcium carbonate is small, by stirring into it quantities of hydrochloric acid until no more bubbles are released. The gravel then has to be washed many times until all the free acid is removed, and this is checked using litmus paper or a liquid pH indicator.

Briefly, pH gives a measure of the acidity or alkalinity of substances. The pH scale runs from 0 to 14. Substances with a pH of 0 are concentrated acid, those with a pH of 14 are concentrated alkali. Most fish and plants thrive in water which has a pH of 7. Such water is neutral, that is, neither acid nor alkaline. Tap water is seldom neutral, but is usually slightly alkaline, about pH 7.4, unless reservoir water supplies come from an area where there is a lot of rust, in which the water may be slightly acid, pH 6-7. Different plants and fish are happy in different types of water.

Another factor which influences the ability of fishes and plants to thrive is the hardness of the water in which they are kept. Water hardness depends upon the amount of dissolved minerals in the water. Hard water contains a lot of dissolved mineral salts; soft water contains few or no dissolved mineral salts. Hardness of water is measured in degrees, there being several different scales. Perhaps the most useful scale is measured in German degrees of hardness. One German degree of hardness is written: 1°DH, and represents 17.4 parts per million of calcium carbonate in one litre of water (or 17.8 p.p.m. of CaCO₃, per litre). Distilled water bought from a chemist, if pure, should have a pH of 7 and a DH of 0°. Such water is rather expensive and would be unsuitable for fish-keeping without any additions.

Hardness in water can be divided into two types, permanent hardness and temporary hardness. The former is difficult to change but the latter can be removed by boiling tap water and allowing it to cool. This process will also remove any chlorine which has been added to the tap water to kill bacteria, chlorine being a poison which can harm fish.

What affects do water hardness have on fish and plants? Many plants and fish are happy in water with a hardness of about 100 p.p.m. of calcium carbonate, and quite a few will exist happily in water with a hardness of up to 200 p.p.m. of calcium carbonate. Hard water can be softened by diluting it with bought distilled water or with rain water collected in a clean plastic bucket just after a heavy shower of rain has started. The first rain in the shower will contain dirt, such as silt, from the air, and should be avoided.

The pH of aquarium water can also be adjusted using...
phosphoric acid. This acid will also help to lower the hardness of the water. A little acid should be added in a very dilute form to a drop at a time and the PH checked, after mixing well with the water, after each addition. Do not suddenly adjust the PH of your aquarium water; otherwise it will probably end up with dead plants and fishes. A much better way is to steep some pure garden soil in a bucket of water, for a few weeks and to strain off the yellow brown liquid. Small quantities of this acidic solution can be added to the aquarium water over a period of days, as should be done when using any type of acidic additions to aquarium water, and the PH checked after each addition.

How can you test the PH and hardness of aquarium water? In your local market, from the larger aquatic dealers, small PH and hard- water testing kits are inexpensive and can be used to carry out a large number of tests. They are very simple to use and are well worth the consideration of any keen aquarist, especially those interested in breeding some of the more difficult fish.

Back to the question of obtaining gravel and rocks which are free from calcium carbonate. One large dealer supplies this commodity although it is rather expensive. The reason for this is the cost of getting them free from calcium carbonate. They are finally washed and thoroughly cleaned. This will ensure, as with the painted base, that no light gets to the plants' roots which normally grow away from light.

Having considered the question of water, gravel and rocks, next come to the question of fishes and plants. Most good books on aquaria deal fully with water conditions which suit different species of fish. Aquarian water conditions for different plants has not received nearly as much attention as has that for fish. There are several useful books devoted to aquarium plants but information on water conditions is rather vague. A request for information on growing water plants in aquaria, made by myself in a previous issue of The Aquarist (Nov. 1965. "Our Readers Write") did not bring forth one reply, so we must assume that either there is little interest in the subject of aquarium keeping, or else readers themselves have little exact information to impart.

Like fish, plants will grow under wide and varying aquatic conditions but each plant must surely have a given set of conditions under which optimum growth will result. It is difficult, and perhaps unwise, to lay down any rules for the successful growing of any named plant unless a lot of information has been collected from a number of independent sources, but it is of great use to publish any information which you may have obtained even if it is only to hold true for the conditions in every aquarium. A recent article in The Aquarist described how easily Water Wistaria can be grown yet having tried to grow this plant under a variety of conditions I have had no success. The following conditions are those under which I have successfully grown the plants named. At pH 6.9 and 7.4, the aquarium situated out of direct sunlight and receiving six hours of light daily from a 40 watt bulb over a 20 in. x 10 in. x 12 in. aquarium: Ludwigia, Vallisneria, Bacopa, Sagittaria, Water Lettuce and excellent large plants of Indian fern. Under these conditions I was unable to grow several species of Cryptocoryne, Amazon Sword, including the chain sword, Elodea densa, Hygrophila and Water Wistaria.

Under conditions identical to the above except for a change in pH to 7.5, the following plants grew well: Ludwigia, Bacopa, Sagittaria, Water Lettuce, Indian fern, Chain Sword, Elodea densa, Hygrophila and some Cryptocoryne species. Under both sets of conditions the plants were calcium carbonate free, and an under-gravel filter was in use. All aquaria were well stocked with the smaller varieties of tropical fish and kept at a temperature of 78°F.

Two more factors can now be considered. These are the addition of extra food for aiding plant growth, and the use of aquarium filters. I am quite convinced that a properly adjusted under-gravel filter aids plant growth as well as keeping the water clear. The latter I have found only to be true when the aquarium is not over-populated with fishes. One advantage of such a filter is that, should it not be required, it can be disconnected and left in place without detracting from the aquatic scene, the air lift or-young being visible. Such filters suck fish droppings and other waste into the gravel and these are acted upon by aerobic
Why not try marines?

by J. H. SOANES

The keeping of marine creatures is a branch of his hobby that the average aquarist imagines to be beyond his scope. This attitude has come about due to so many articles about marine aquaria indicating that the maintenance of a salt water tank is both difficult and expensive. I suggest that this is not so, and hope to persuade readers that they could, without much expense, find this out for themselves.

The beautiful tropical marine fishes capture the imagination, but many species of fish that make up for their lack of brilliant colour with bizarre shapes and unusual behaviour can be caught around our own shores. There is the interest of being able to catch them in their natural environment, and the not unimportant point that they cost nothing. When one is trying something new this last fact always bears consideration.

The ideal tank in which to keep these fish is one with which the sea water does not react. Filling the condition is the all-glass or the all-plastic tank, but an iron framed one can be used providing the frame itself is not in contact with the water. If the frame is well painted I find that there is not too much corrosion. The fibre glass and nylon coated frames that are now available are excellent, but still rather expensive. With regard to the size of tank required, obviously the larger the better, but bear in mind the quantity of sea water you will need to fill a large tank. I have found that about six specimens do very well in an 18 in. x 10 in. x 10 in. aquarium, and this is not an excessive amount of sea water to collect and carry home (providing you are an amateur weight lifter).

Sea water should not be collected from the vicinity of a harbour or any other place where there is likely to be pollution. I am fortunate that, although living in Essex, I am frequently able to collect water in Devon where it is very clear and free from impurities. Water from the North Sea is very cloudy and needs to be allowed to stand for some time before the clear water is decanted off from the sediment.

When setting up the aquarium a very thin layer of fine gravel can be used to cover the bottom. Coarse gravel should not be used as particles of unedible food get down into it and rapidly pollute the water. The marine enthusiast is limited in the way in which he can make his set-up look attractive. Seaweeds cannot be grown under aquarium conditions, and so rocks, coral, and sea shells are more or less all that is available for decoration. (Do not forget that coral and sea shells should never be included in a freshwater aquarium.) With a little ingenuity, however, your set-up can be made to look most attractive.

Aeration and filtration are not, in my experience, required as often as is frequently suggested. I find that an established tank can go for long periods without needing either operation, but just to be on the safe side I do use an air stone occasionally (once a fortnight or so), and even more infrequently (no more than once a month) I put on a filter for a few hours. A filter medium that seems very successful consists of four layers; glass wool, activated charcoal, glass wool, and marble chips. The marble chips help to keep the pH value of the water high. This is an important point with marine creatures.

Now we come to the stage of introducing our specimens. One creature that I would always include is a sea-anemone. They are extremely interesting, and quite easy to keep. The commonest type in Britain is the basket anemone (Actinia equina), which can be found in a variety of colours from red to green. When located in a rock pool they should be handled carefully from their position as they can easily be damaged and even killed. Once in your tank they will pick a suitable spot and anchor themselves there, and only very occasionally will you find that they have changed.
Starting with plants and fishes

bacteria which thrive in the aerated water. The waste is converted into soluble salts and carbon dioxide. The instructions supplied by the makers of the filter should be followed closely as too much or too little air will not permit the filter to operate at its most efficient.

When using such a filter do not expect brilliant plant growth overnight. It takes a settling down period before the bacteria increase sufficiently in numbers to make the filter operate properly. Such filters, like peat, produce acidic water conditions. These can be useful or harmful depending upon the plants and fish kept in the aquarium. Soluble salts released by the bacteria can also cause an increase in the hardness of the water. Some of the water in the aquarium can be changed every month or so to counteract the above.

External filters can also be used to good effect in the modification of aquarium water conditions. Peat, for example, can be used as one of the media in such a filter. It will render the water slightly acid, and family brown in colour. Activated charcoal will absorb carbon dioxide gas, and some other substances such as pigments which make aquarium water look cloudy. It is cheap and can easily be included as a filtering medium. More expensive substances in the form of filter resins can now be purchased in small quantities for aquarium use. They remove harmful chemicals which accumulate in aquarium water and which have a harmful effect on plant growth and on fishes.

The controversial problem of whether or not to add extraneous foods to aquarium often arises. This problem should be considered fully before any action is taken, perhaps the safest substance to use is ordinary peat. Loose horticultural peat is suitable if well soaked and broken into the form of fine particles of dust. Even better are blocks of 'raw' peat cut from a peat bog. Soak such blocks in water for several weeks when they should be waterlogged. The blocks can then be cut into thin slices and arranged on the base of the empty tank, in the rear half. A layering of gravel is then placed over them, and the aquarium carefully filled. Plants are planted in the gravel and will later root down into the peat slices. Special aquatic plant foods may also be used.

Another method is to make a mixture of pure clay and water and to paint the dry base of the aquarium with this. The clay is allowed to dry and is covered with gravel and the tank filled in the usual way. Other methods suggested are pushing into the clean gravel, beside plants' roots, pellets of dried clay or of humus mature. With any of the above methods the risk of polluting the water is always present.

Perhaps the last factor to influence the health and growth of fish and plants is the lighting of the aquarium. It is difficult to lay down hard and fast rules for this complicated topic. Much has been written on this subject and back numbers of The Aquarist contain a host of articles on it. Using these as a guide, and from personal trial and error methods, the aquarist can usually discover the correct lighting conditions for his particular aquarium.

If you are confused by all the facts which I have mentioned previously then the simplest answer is to try out a number of varieties of fishes and plants. Find out which ones thrive in your own particular aquarium, and purchase more of them. Discard the ones which do not thrive or give them to another aquarist who may have in his aquarium conditions which are more suitable to the health of the ones with which you have failed. Remember that no two aquaria are the same even if they have been set up in an identical manner.
Troubles in the pond

by A. Boarder

The most frequent trouble with fishes in the garden pond is the complaint commonly known as Fungus. The correct name is Saprolegnia, but in some parts it is also called 'Cotton Wool' disease. Although this disease can appear at any time of the year there is no doubt that it usually attacks fishes in the early spring when they may be in a low state of health after the cold of the winter. The species of the disease are present in most still waters but healthy fishes are not attacked unless they receive some damage to the skin. Healthy fishes have a complete covering of mucus, a slimy substance which protects the fishes from external pests and diseases. This mucus is kept in good order by glands under the skin.

When a fish is in poor health the mucus covering is disturbed and parts of it may fail or become weak. It is then possible for any germs to enter the skin of the fish. The mucus covering can also be broken by some form of damage, either by the fish knocking itself on a rock or by the interference of a cat or bird. It is also very easy to disturb this covering by careless handling. Some fishes have a heavier coating than others and the freshwater fish, the Roach, is quite thickly covered with this mucus. When such fishes are caught and handled much of their slime is removed especially if they are handled with dry hands or a cloth. This is the main reason why Roach are rarely recommended for garden ponds for it is well known that they often suffer badly from Fungus disease because their mucus covering has been disturbed to allow the spores of Saprolegnia to enter. Providing great care is taken when moving Roach there is no reason why they cannot be kept like other fresh water fishes.

Although Fungus is the chief cause of the loss of many goldfish every spring it is not often that it is the primary cause. Apart from the possibility of damage to the fish in the water itself it is probable that the condition of water in the pond is the most important. Fungi, often the causal and dorsal fins first. Providing the disease is noticed before it has spread to a large extent on the fish, a cure can be effected. The disease does not travel very quickly and a fish can live for some considerable time before it dies.

As the disease takes a firmer hold on the fish, the fungus spreads over the whole body and when the gills are reached there is usually little chance of recovery. Sometimes a fish will have the eyes covered with a thick film of fungus causing blindness and sometimes the mouth is also affected and then a trouble is not easily cured. One of the first signs of trouble in the garden pond is when a fish swims by itself away from the main shoal of fishes. Such a fish may have had a chill or be a female which is filled with eggs and whose swim bladder has been affected. The short-bodied fancy goldfish are susceptible to this trouble during sudden cold spells. Once the dorsal fin of a fish is lowered it is a bad sign as usually any healthy fish will keep its fins erect and spread. There are one or two exceptions to this rule, and one sometimes seen is when an otherwise healthy fish has an attack of swim-bladder trouble. In such cases it is possible for the fish to keep its fins extended as its general health may be quite all right. At other times a fish may be seen with a thin covering of a greyish matter. This may not be the usual Fungus disease but another caused by a parasite which may be Codia. If a fish is discovered soon after the occurrence of the trouble it is quite possible to effect a cure. However, if the fish is not seen until the disease has a firm hold there is not much hope of curing it. Therefore it is important that the pondkeeper inspects the pond every day or so in the early spring. If a fish is found with just one patch of fungus on the body this is almost certain to have been the result of a wound of some kind. In such cases the affected part can be wiped with cotton-wool dipped in equal parts glycerine and iodine. An application of salt will also often cure this bad spot. Providing such a fish can be caught easily it need not be removed from the pond. It is unlikely that the disease will spread to any of the other fishes providing they are in a good condition.

If a fish is affected badly it must be removed from the pond for treatment. A spare container should be quite clean and need not have any compost or water plants in it. Place the fish in the water and then add a tablespoonful of sea salt or enough salt to taste the water but let the salt gradually dissolve so that the increase in strength of the solution becomes gradual. Keep the fish in a shady place and do not feed. If no improvement is seen then uproot some soil from the bottom of the water and add extra salt, so that the solution is stronger. Say half as much salt again as was given before and much better to see that the container is large enough to use very shallow water. Deep water is not as easily oxygenated as shallow water. A slight precipitation from the extended dorsal fin of the fish is sufficient. If the water starts to smell it should be changed to a fresh solution of the same strength. When the disease appears to have cleared up, the water can be either changed to a freshwater solution or, if it is still in good condition...some fresh water can be added. Once the fish becomes active again it can be offered small pieces of broken worm but do not return it to the pond until it is quite clear of the disease.

There are several cures on the market for this trouble. I have not used them myself but have heard of pondkeepers who have had good results. One thing is most important when using any fresh treatment. Wash the fish well in fresh water before changing from one type of cure to another. Ordinary table salt should not be used as it has had something added to make it free-running which may harm the fish. Use sea salt if possible and if not, then block salt will be all right. Fungus of the eyes or mouth can sometimes be cleared by soaking for a few days whilst the treatment is being carried out.
Stones from the sea

by HENRY TEGNER

I found the necklace in an antique dealer’s tray at Scarborough. It is a beautiful example of the 19th century lapidary’s work. Each agate has been cut and polished to an even, matching shape and the graded whole makes this piece of ornamental jewellery a sheer delight to touch and see. It is, I think, the considerable amount of work and sense of artistry, which has gone into the creation of this Victorian necklace, which makes for a great part of its appeal.

The day of the small lapidary is now past, but at one time many minor jewellers were to found in many a seaside resort and particularly at the popular seaside places like Brighton and Scarborough. Even now, in the various antique shops of these two towns, nice pieces of pebble-jewellery may be found. Harrogate too seems to have inspired a quantity of this Victoriana. Many of the stones in this jewellery may have originated along the long Yorkshire coast. The jet of Whitby was, at one time, world famous for its lustre and quality. In the days of our great-grandfathers and mothers, jewellery consisting of jet was almost universally accepted as the most suitable ornamentation for a widow.

Before inexpensive synthetic jewellery came to the fore to supersede the less flashy natural products of our shores, foreign semi-precious stones largely coveted the British pebbles. The agate of Brazil and Uruguay and sardonyx from Arabia and India began to flood the market and at times, in Germany, a considerable industry came into being for the cutting, polishing and marketing of these semi-precious stones. In spite of this foreign competition the British lapidary continued to thrive, in a small way, in a number of coastal towns. There is no doubt that some of these craftsmen were not above using imported material such as the lovely banded agates of South America. Another popular substitute used in jewellery, and supposedly culled from our British beaches was bottle-glass. Semi-precious stones like citrine, opal, quartz and carnelian have all been created, over hundreds of thousands of years, by the fretful away of the tides on the shore, and in their formation into little balls and ovoids they have assumed a coating such as broken glass does when left to the constant action of the sea. Bits of green bottle-glass are often to be found on the seashore and much of this material used to come to the lapidary by finders who thought they had picked up such lovely pebbles as chrysoprase or chrysocolla, natural greenstone which, in fact, are highly unlikely to be met with along Britain’s coasts. Many semi-precious stones, nearly all of which consist of basic rock-forming minerals, have acquired extraordinarily attractive names—sardonyx, jasper, onyx, agate, citrine and carnelian are but a few.

Towards the end of the last century, and the early years of this one, pebble-collecting was quite a popular pastime and beaches from Cornwall to the north-east of Scotland were combed for their stony harvests. Nearly all of Britain’s varied shoreline may produce interesting stones but where pebbles abound, as at Brighton, the chance of picking up nice specimens is so much the greater.

My own particular hunting ground has mainly been the coast of Northumberland as I live within eight miles of the sea. It is a rewarding shore and contains a wide variety of pretty stones which are being constantly washed southwards along the coast by the ever tireless North Sea. It is not easy to get pebbles cut and polished by a lapidary today and this can be an expensive business when you have found a jeweller prepared to undertake this work. However, if you only require your stones for decorative, or display purposes, and not as a form of jewellery, there is a substitute and that is a clear varnish or shellac which painted with a soft brush on to a stone, scrubbed clean with soap and a stiff brush, will show up the gem in its pristine form as seen wet when the tide recedes.

We each have our favourite stones and mine is the citrine, usually a pale lemon in colour owing to the iron oxide in the pebble. Its shades are many and varied from orange to pale gold. At one time citrones were much sought after and in the jewellery trade they were frequently referred to as fake or Scotch topaz.

It would be quite misleading to suggest that the pebbles of our shores are valuable gems. They are not but they may be pretty and on occasion decorative. To call them semi-precious stones is perhaps a form of flattery for intrinsically they are mostly of little worth. Nevertheless, if most of us collect something even if it be match boxes, beer mats, cigarette cards, stamps or string, and much of this material is worthless, there is no doubt that in collecting, the search or hunt for items is perhaps the most delightful part of the game and certainly in this respect the collecting of small stones can rank very high for it nearly always takes place in delightful surroundings with the ever-changing sea as one’s companion.

A nice collection of pebbles should not be hidden away in some drawer or cupboard; rather it should be displayed in a glass-topped cabinet. A nice lump of carnelian may make a useful paperweight or an ornament for the mantel piece. A smooth, clear quartz ovoid is as pleasant an object as many a factory-produced piece of bet-a-溴. The sea is a great craftsman and given pretty minerals it can do wonders with them.

BRITISH AQUARISTS’ FESTIVAL
Will be held this year on the 29th-30th October at Belle Vue Gardens, Manchester. Full details will be available later.

May, 1966
Amphibian antics

by RICHARD GUPPY

In the course of a decade or so of experimenting with amphibians as pets, I have run into some experiences which may be interesting and, I hope, in some cases helpful to others who may follow the same hobby.

Most of my amphibian pets, including all frogs and toads, have been kept in outdoor enclosures; I have had no experience with salitorial amphibia in indoor vivaria, but it appears that there is some risk, when the accommodation is small and low, of their inflicting serious damage on themselves by jumping against the cover. I have been able to observe this type of injury in a bullfrog, *Rana catesbeiana*. This amphibian, which is not native to British Columbia, nevertheless turns up here from time to time. The most probable origin of these strays is from tadpoles sold in pet shops. While I do not believe that these could complete their metamorphosis under the usual aquarium conditions, some may be turned loose to feed for themselves before too much damage has been done by unnatural confinement and inadequate feeding.

My specimen was caught by a young boy who, having no idea of the construction of a vivarium, put the frog into a 5 gallon crock with a piece of glass over the top. In a matter of 3 or 4 days the captive had raised a raw place on the tip of its snout by jumping against the glass. The boy’s mother, realising that the frog stood no chance of surviving under the circumstances, persuaded her son to make me a present of it. The injury evidently became infected, and the inflamed area spread nearly to the frog’s eyes. This condition persisted for nearly 5 years; finally the end of the nose gummed and sloughed off. Healing then proceeded quickly and the frog is now normal except for his truncated snout, which gives him a rather truncated expression.

I have several times come across written accounts of goldfish having been killed by male frogs grasping them as if they were female frogs. I can easily believe these stories though I imagine that the fish would have to be somewhat sluggish in order to allow the amphibian to take hold. I have myself observed several pairings nearly as strange: Pacific tree toad, *Hyla regilla* on red legged frog, *Rana aurora*; red legged frog on bullfrog; Pacific newt, *Taricha granulosa* on great crested newt, *Triturus cristatus*. In every case the individual which was taken for a female was actually a male. It seems that the males of amphibian species which resort to amplexus while courting, will grasp any animal approximately their own shape and size. They are not, I think, attracted to anything smaller than themselves, but will tackle those that are quite a bit larger. The males of every amphibian of this type must be equipped with some means of warning other males that they have made a mistake but they naturally do not react to the signals of a different species. It is interesting to note that this failing in nature is often, to some extent, the variety of amphibians which can occupy the same habitats. It does not seem possible that two species prone to mistaken pairing with one another could breed in the same body of water at the same time.

As an argument against the maintenance of mixed collections of amphibians in captivity, these mismatings need not be taken very seriously. Objections come usually from the soft-hearted observer but I doubt whether the victim ever suffers much harm. One experiment which might lead to losses would be the keeping of European newts together with the American green newt, *Dicrotopus vividens*. The latter species uses a peculiar style of amplexus. The male grasps the female by the neck with his hind feet. It certainly looks as if he were going to choke her to death and it seems possible that she has some special adaptation to prevent this outcome. I have not had much luck in breeding these newts—whether the Triturus species, which do not resort to any kind of amplexus, could survive the *Dicrotopus* treatment, is still an unanswered question—so far as I am concerned.

For quite a different reason, the keeping of bullfrogs with any but the largest of amphibians, is certain to lead to disaster. Quite by chance, I had possessed my bullfrog for several years before I learned of his cannibalistic tendencies and incredible swallowing capacity. I happened to put him into a pen, built primarily for terrapins, which was covered only with wire netting of one inch diameter...
muck. Since most amphibians could easily squeeze through this, only the very largest went in with the terraria. Besides the latter, the bullfrog's only pen-mates were three full grown western toads, Bufo boreas, an amphibian much like the common European toad, *Bufo bufo*. These he did not manage to ingest, but I now feel sure that he was responsible for the disappearance of the smallest of the terraria. At the time I supposed that it had escaped.  

On moving to a new location, I built a 12 ft. x 9 ft. pen in which I introduced the bullfrog along with my 6 large terraria, 5 red legged frogs and 5 western toads. The two latter species ranged in size from half-grown specimens to adult females. This was a bit more of a concentration than I would usually allow but it was necessary to make do and I got more accommodation ready. Bullfrogs are warm-loving animals, sluggish when the water temperature is below 50 degrees F., while red legged frogs normally turn on the temperature is only a little above freezing point. These facts account for my red leg getting away with what could have been a fatal mistake in attempting to use the bullfrog as a spawning partner. Later in the spring events took a different turn. There was a good deal of snow in the pen and when I could not always spot all my pens I easily deluded myself into thinking that they were freezing. The horrible truth I learned when I saw the bullfrog squatting calmly with the hind feet of a frog protruding from his mouth. This was a large female red leg, much bigger than the small male shown in the photo. A check showed that all the frogs and toads, except the two largest Bufo, were gone.

One would naturally suppose that such a voracious beast would be death to goldfish. As it happens goldfish shared a pond with this bullfrog for several years with no casualties. I never saw him attempt to take food from the water but it seems that his actions while under observation may be misleading. The difficulty he experiences in seizing the larger pieces of food offered him on land certainly imparts to the observer the idea that he could never grasp and hold as a lively, struggling victim half as large as himself. Norbitt (1951) gives an impressive list of food items taken from the stomachs of dissected bullfrogs. These include fish as well as small birds, baby alligators, and a venomous snake 17 inches long. The frog which engulfed that last item must have been much larger than mine, since to be measured the evidence must have been complete inside him. He could not have dealt with it in the way that my bullfrog managed his larger meals, swallowing them bit by bit as the part that went down first became softened by the digestive process. All things considered, I would not advise trusting any bullfrog with pond or tank mates of lesser size than himself, whether they be fish, amphibian, or reptile.


Fish diseases (24) Pox disease

by R. E. MACDONALD

Pox disease can be diagnosed on the appearance of hard, greasy, white spots that grow considerably in size until they finally merge with each other to cover a fairly large area of the body. On mentioning the manifestation of "white spots" it should be made quite clear that this disease has no connection with the well-known Ichthyobodoidea white-spot infection; it is quite easy to recognise the difference in practice.

It may be noticed that when large areas of the body are covered with the pox, sections of the encrustation may dislodge itself; this should be taken as being part of the normal course of the disease.

Pox disease does not appear to be contagious or fatal nor does the victim appear to suffer much discomfort. The disease appears to attack anything other than cold water fishes and can be cured quite easily by (a): promoting excellent living conditions, (b): feeding with a good varied diet, and (c): by ensuring a constant supply of clean, aerated water.

May, 1966
HAVING read with interest the recent articles published in "The Aquarist" about Home Breeding and on the "inch of fish" permitted in the average sized tank, I felt readers might be interested in my experiences while trying to stabilize a strain of Guppies. Since Guppies are such enthusiastic breeders, and the males are sexually mature at an early age and before exhibiting all their potential colouration, I was faced with the dual problem of the need for numerous tanks coupled with severe lack of space.

Working on the assumption that, given sufficient aeration, Guppies could survive quite happily although considerably overcrowded, I duly purchased a fairly powerful air-pump and a number of diffuser stones. My single fish-tank was by this time filled with an alarming array of floating coffee-jars jarred with fish of various ages and sex.

Alas, the diffuser stones, far from improving the situation, merely swirled the accumulated bottom sediment transforming the previously clear water into a thick soup-like consistency. The resulting picture was rather grim as can be imagined, and obviously not beloved either by the unfortunate fishes or by my landlady.

After racking my brains to think up a suitable filtering system and a means of making the whole ensemble a bit more presentable, I hit upon the following idea. After purchasing a few lengths of angle iron I persuaded a friend to weld them together for me into the shape illustrated in the diagrams.

The whole structure was arranged on legs thus giving a convenient and attractive central table for coffee, telephone, plants, etc.

The central portion I divided into two merely to make the whole unit completely self contained. In one side of this (which was not filled with water!) I placed the air pump and in the other the filtering unit, heater, thermostat and diffuser stones. The four panels bordering on this central unit should be glazed with a non-transparent material, in my case green frosted glass, but several other things would serve equally well, e.g., acrylic sheet or, alternatively, some material such as black polythene may be placed against the back glass. When experimenting with this I found, rather to my surprise, that the water pressure alone seemed to keep it in place quite satisfactorily, but I daresay a spot or two of Histon might be safer.

The other panes were glazed normally. An economic point perhaps worth noting is that since the panes between sections holding water have the same pressure on each side, very thin glass is in fact all that is strictly necessary. This, however, does present problems should you ever wish to drain a single section.

Water is carried by means of a simple air lift from (a) through the carbon-glass wool filter into the central tank where it is heated and further aerated after which it is carried by siphons to section (b) and thence to (c), (d), (e), (f), (g) and back again to (a).

For the top of the table I used veneered chipboard covered with a good coat of Polyurethane varnish. Formica might be better. This lid is surrounded by a rim wide enough to enable the lighting mechanism to be contained under the roof (say 6" or so depending upon the type of equipment used—a fluorescent tube was my personal choice).

And that is all there is to it, apart from stocking the tanks themselves which is again purely a matter of personal preference. Since the set up is designed to be the centerpiece of a room it is better to cover the floor of the tanks with something a little more showy than the usual drum gravel—well washed chips of coal for example. I am sure that these tanks can be adapted to suit many uses; imagine for example where many of the occupants, e.g., sea anemones, small fishes and crabs might not live together amicably and could thus be easily separated.

THE AQUARIST
The X-ray fish
by STEPHEN F. LANGTON

THIS brilliant little fish has had a very chequered history at the hands of the taxonomist for it seems that no one really knew where to place it within the broad confines of the characin family. Earlier workers put it under Aplocheilus, and later ones with the tetras (Hemigrammus sp.), which it clearly does resemble but from which it may be distinguished by its possession of an upper jaw which is toothed along almost the whole of its free edge (hence the scientific name Pristella, a little saw). It is now placed for convenience in the sub-family Characidinae of the family Characidae.

It is called the 'water diamond' (although this name seems to be rarer than it was) and the 'X-ray fish' because the bone-structure is easily seen through the transparent scales although, in truth, it is no more transparent than many another tropical.

First imported into Europe in 1924, P. ridlioni soon won favour because of its liveliness and bright, almost cheerful, ammonium. Its native habitat is the clear swift streams of Guiana, Venezuela and the Lower Amazon generally so the aquarium in which it is kept needs to be as clean and clear as possible if the fish is to keep its natural vivacity.

The body-shape is short and deep, especially in the female, getting more slender towards the deeply-forked and characteristic of the swift-swimmer. The ground-tone of a healthy fish is bright silver-grey with a yellow-brown sheen. There is a dark spot behind the opercle and a black spot on the dorsal, anal and pectoral fins. The anal and dorsal fins are yellow with white tips and the caudal should be red-tinged in a healthy fish, the upper parts being an even deeper red. The smaller, or adipose, dorsal fin is colourless.

Males grow up to 1½ inches long and females to 1½ inches as a rule. Seeing these fish should present little difficulty to the beginner. The male, besides being generally slimmer, shows a pointed hinder end and its abdominal cavity, the females being more rounded. Here the transparent qualities of the tissues allow the abdominal cavity to be seen without the necessity of getting the fish between the observer and a light-source as would be the case in a more densely-dashed fish. Young males, in addition, show even more distinct reddish colouration of the tail as well as having a white border to the anal fin.

The prime essential for breeding Pristella ridlioni and one which cannot be stressed too strongly, is a well-matched pair. Mismatching for size is, in the author's opinion, perhaps the commonest cause of failure with this fish. A large tank, well-planted with Ambulia and Myriophyllum and well-lighted, with the temperature kept rigorously within a degree or two of 78°F. (26°C.), I have found to be the best equipment for the job. The strict maintenance of temperature will be conducive not only to successful breeding but also to the survival of the fry which, of all the fish I know, are amongst the most susceptible to the evil effects of temperature fluctuation.

Keep the prospective partners apart for a while feeding them up well, then put the female in first followed by the male after she has had time to acquaint herself to the new tank. When the spawning I have been able to observe (mine always seem to spawn at about 3.30 a.m.) is as follows: the male chivies the female about the tank ever closer to her until eventually they seem to grow as one fish, twisting and turning about the tank for some time before getting up to a level just below the surface but above the plants. There they spawn, the eggs dropping on to the plant leaves, hence the importance of having plenty of them. In a matter of 3 hours or so several hundred eggs may be dropped, the exact number being difficult to ascertain as the eggs are clear and glassy and thus hard to see against the plants. If the tank has been kept faithfully at the optimum temperature quoted above, hatching should have taken place in about 30-40 hours.

A very necessary word of warning here: net and remove the parents immediately after spawning as they are avid egg-eaters.

The fry at this very early stage are greyish in colour and vulnerable to the extreme shock of practically any kind. I have lost innumerable fish through allowing visitors close enough to what appears to be an empty tank to be able to knock on the glass. The tank looks empty because the fry are very good at taking advantage of absolutely any kind of cover. They must feed at this stage of their lives on the very smallest of infusoria since their mouths are too tiny for anything else. Dr. Ansfeld recommends that they be fed on newly-hatched brine-shrimp as soon as they begin to swim and this certainly seems like a good idea. After 10 days smaller daphnia may be fed to them as well as micro-algae if available.

The bigger, faster growers will have begun to eat the smaller fry by this time and some keepers remove them for this reason but I prefer to leave them keeping a careful watch, of course, to ensure that things do not get out of hand. One will naturally get fewer fish this way but they will be the liveliest and most vigorous of the brood and, after all, this is what attracted me to the fish in the first place and I think that in the long run stock will be improved in this way.

If all goes well and you have kept the essentials in mind viz. a well-matched pair, optimum temperature, and the correct food for those vital early fry-stages as well as protecting the young from shocks, then you should end up with about a hundred and fifty or so of these vastly interesting and vivacious fishes. Above all, have the patience to try again if you do not bring it off the first time.

May, 1966

The X-ray fish, Pristella ridlioni
OUR EXPERTS' ANSWERS TO TROPICAL FISH-KEEPING QUERIES

I have just purchased a dozen young Parophthalmus_regius. How long will it take for these fish—now about 2 in. in length—to reach breeding size?

At a rough guess, about six months provided you give them plenty of swimming-space in clean, well aerated water and a diet rich in chopped earthworms and scraped raw beef.

Could I keep and breed tropical fish in a tank heated by oil? If so, any comments based on practical experience, with special emphasis on the type of apparatus required, would be appreciated.

Tropical fish can be kept and bred just as well in a tank heated by oil as in one heated by gas or electricity. The chief points to observe are: adequate ventilation without draught; the provision of a thin metal screen just below the bottom of the tank to spread the heat and prevent the glass cracking; and the use of a top-grade paraffin oil in a lamp designed for trouble-free burning. The chimneyless lamp made by the firm of P. J. Bryant, the greenhouse heating specialists, of Fishponds, Bristol, is ideally suited to aquarium heating. This lamp can be supplied with either a 6 in. or 1 in. wick, and its strongly constructed copper reservoir holds enough oil to burn for a fortnight without refilling.

A few months ago I introduced two very fine specimens of the red ramshorn snail into my tropical aquarium. Yesterday I noticed that the shells of the snails have developed white fissures and depressions. Please tell me what has caused, or is causing, this trouble?

When the shells of snails start to show ugly fissures and depressions it is a sign that corrosive acids are at work. It follows, therefore, that the best way of guarding the shells of snails against erosion is to keep the molluscs in neutral to alkaline water with no acid-forming debris (decaying plants etc.) left to accumulate on the bottom.

Recently I installed a 24 in. by 12 in. by 12 in. tropical aquarium in my lounge, but although I set two dozen Vallisneria plants along the back of the tank the water has not stayed clear. What has gone wrong?

Firstly, you need more plants in your aquarium than you have at the present time to trap some of the waste products of the fish and use them as food. Secondly, check up on the behaviour of the fish. If you find you have several bottom-grabbers among them remove all but four; for too many species forever turning over the compost are not conducive to clear water. Thirdly, do not overfeed the fish. Not only will algal clouds still water faster than unsoiled food left to go bad on the bottom. Finally, if the plants and fish are obscured by what looks like a green haze, the best thing you can do is to shake the aquarium slightly, so that the free-swimming algae which cause this discoloration will be deprived of bright light and die down of their own accord.

Will the most nutritious food by vegetables such as lettuce make a good food for tropicals?

Meat maggots, or grubs, make a very useful food for tropical fish large enough to swallow them whole or chew them into swallowable pieces. But you would be wise not to feed these fattening worms too generously in case they lead to minor or major intestinal complaints.

I have just bought two black sharks (Morulias oxyrhinohiodon). Will these prove suitable inmates of a community tank and about how long will they grow?

The black shark does not make other fishes and is quite suitable for a community tank. In the wild state it attains about 2 ft. in length, but most aquarium specimens appear to stop growing when they reach a third of this size.

Many queries from readers of "The Aquarist" are answered by post each month, all aspects of the fancy being covered. Not all queries and answers can be published, and a stamped self-addressed envelope should be sent to this effect that a direct reply can be given.

I have been given a glass-sided tank with a galvanized iron bottom. What can I do to make this bottom harmless to tropical fish?

For a permanent sealer spread a creamy mixture of one part of cement to two parts of washed sand to a depth of about 1 in. over the metal floor. After this has set hard give it a good scrubbing and soaking under several changes of water to remove the free lime. Alternatively, you could give the bottom two or three applications of bituminous paint. But you must bear in mind that a painted bottom is only as long-lasting as the paint.

The guppies I keep introducing into my community tank never live more than six months or so. Yet according to the book the guppy has a life-span of about two years. Please may I have your comments.

In all probability the guppies introduced into your community tank do not get their proper share of food and are in constant fear of molestation. Ideally this species should be kept only with its own kind in a brightly lighted and well-planted tank. Given these conditions it will usually stay alive for eighteen months or more.

What information can you give me about a fish called the swamp-barb?

The swamp-barb, formally known as Barbus suans, is a member of the family Corydoras. It is indigenous to eastern India and attains a length of about 3 in. to 4 in. It has one pair of barbels on the mouth. In coloration it is silver-blue to green, darker on the back and lighter below. The base of the tail is adorned with a bold black spot outlined with gold. This fish will eat anything alive or dead and will do so to the last. To maintain a temperature in the middle sixties ('F). In addition to these merits, it is peaceful and reasonably easy to breed.

Would a cutting from the common naphr, which is very common in the same kind of home, grow in a heated tank?

A cutting taken from our native naphr or spatterdock (Naphr sp.) seldom lasts long in any sort of indoor aquarium. But a seedling plant dug out of the mud and transferred to an aquarium maintained at room temperatures may continue to grow provided it is given a good light.

I have been told that Alpinus margar is absolutely trustworthy in a community tank, but as this fish is a fairly large-growing fish I have doubts. I would be glad of your advice.

What you have been told is perfectly correct. Even fully grown specimens of this charming fish rarely, if ever, take any notice of other fishes, small ones included.

My young son has been trying to keep goldfish quite unsuccessfully in a 10 in. by 22 in. by 12 in. tank. The propulsion and water displacement that we change over to tropicals which, he says, are far easier to look after and keep alive than coldwater species. Is this true?

Yes, tropical fishes are easier to care for and keep alive in a restricted space than most coldwater species. We think that you would be well advised to take your dealer's advice.
COLDWATER FISH-KEEPING QUERIES answered by A. BOARDER

I wish to raise frogs and tadpoles and keep the mature specimens. Is there a book on the subject?

The book Reptiles and Amphibians, as advertised in The Aquarist, will help you and you might find the book, The Freshwater Life of the British Isles, by John Clegg, published by Warrer, may not be able to give off as much poison. Tadpoles of both amphibians until they leave the water but after that the difficulty is in rearing them arises when you have to feed them. They take small types of live foods and these may not be easy to come by. Try fruit fly, small maggots and white worms until they are large enough to take small garden worms, etc.

Last year I got an old bath-tub and made a pond with it in the garden. I planned it with a water lily and several other plants. I added nine fishes and some red ramshorn snails. The water has never been really clear and scum is forming around the edges. What is wrong with the set-up?

It is always very difficult to keep a small pool such as yours in a healthy condition. I find that the smaller the pond is the more difficult it is to keep in good order. You may have checked it and it is better to try to stock and maintain a very small pool in the same manner that you would keep a small fish tank. Try cutting down the feeding and the snails may not be still living, usually red ramshorn snails are bred in a tropical tank and soon die in cold water out of doors.

My fishes in the back garden pond have become infested with anchor worms and they appear to be round the edges of the pond at night. Is there anything I can put in the water to stop the anchor worms from appearing.

There is nothing strong enough to add to the water which will kill the anchor worms (Lernaeid), which will not also kill the stock. You will have to remove the fish from the pond and then try a strong solution of household ammonia. Borax the strength until all the worms are dead and then empty, clean out and refill. You will have to remove all the worms from the fishes with tweezers or by dabbing them with Dettol or cotton wool. A bather in a solution of a quarter teaspoonful of Dettol to a gallon of water should also clear the fishes of the parasites, but do not leave the fishes in the solution for more than a few minutes; watch them whilst in this and remove at once to fresh water if they turn over.

I have a pipe dripping water into my fish pond at the side of which is about three feet of copper tube. Is this enough to harm the fishes?

Copper is deadly to fishes in a concentration of a fifth part to a million of water. If the water is soft the danger can be greater than if it was hard or limey. The latter water soon forms a scale of lime inside the pipe and then the copper may not be able to give off as much poison. However I have had so many cases of losses of fishes through the use of copper in the water in any form that I would trust as very dangerous the use of it in any way where fishes are concerned.

I have a large shallow zinc tank that I wish to use for fish or reptiles. Will it be safe or what treatment would you recommend?

The tank should be safe for reptiles but for fishes it depends on whether the tank is a new one or fairly old. New zinc can be dangerous to fishes, as it contains copper.

You could paint it with a bituminous paint, wash it out and it should then be safe for fishes.

I would like some information on the care and breeding habits of golden orfe.

You will find references to these handsome fishes in the book, Coldwater Fishkeeping, as advertised in The Aquarist. They breed in a manner similar to that of goldfish but like a very well oxygenated water and plenty of swimming space. They may not breed until they are about a foot long and must have plenty of live foods to condition them. They will spawn on tree roots or fine water plant leaves and the eggs are similar to those of goldfish, laid singly and adhering to plants etc.

Do shubunkins show the tubercles on the gill plates when in breeding condition the same as ordinary goldfish?

Shubunkins will show the white tubercles like ordinary goldfish. However it must be realised that all males may not show these marks even when breeding; and a better way of sexing them is to notice the thickness of the body. When in breeding condition the females are usually much fatter than the males.

I have a tank 18 x 12 x 12 inches with six fishes in it. Recently I noticed that the tail of one of the goldfish appeared to have been nipped off. What is the reason for this?

It is probable that the fish had an attack of fungus or fin-rot. Ordinary goldfish are not likely to bite other goldfish. You may have too many fishes in your tank, it depends on their size and condition. The tank should not have more than nine inches of fish, and more than that the inhabitants can soon become ill and be subject to fungus or other diseases.

I would like to attempt to breed bitterling, and wonder how I can be sure that the pointers mussel will get enough nourishment?

The musells will not thrive in a well functioning clear tank. They must have plenty of mud or sand at the bottom in which to move about and feed, without plenty of this they would soon die.

Pair of bitterling inspecting mussel
Aphyosemion cognatum

Some experiments conducted on this egg-laying tooth carp

by THE BRITISH AQUARIST STUDY SOCIETY

To carry out all the work needed on the "egg-laying tooth carp" is probably a life time's work for all the members of B.A.S.S. because there are many questions, to which no answers are known, on this family of fishes. Some species are not clearly defined, cross breeding takes place between different "species" and in our tanks colour variations appear which have not been given the names of different species in the books. Much of this work needs careful observation and properly documenting. It is regrettable that relatively little professional research work is done on fish, unless they are "food fish" with a commercial value.

Some interesting questions on tooth carps are:

1. How long do these fish live?
2. What is their total egg production during their lifetime?
3. What are the sex ratios in each spawning? Do these vary much from spawning to spawning?
4. What is the effect of temperature on the incubation period of the eggs?

Tooth carps can be roughly divided into two groups:

1. Those fish which lay their eggs on the roots of floating vegetation or the leaves of plants, and these are known as the egg-hangers. These eggs have a relatively short incubation period. The most frequently quoted time in the books is 14 days.
2. Those which lay their eggs in the mud at the bottom of the pond—these eggs have an incubation period of 3-4 months and often need to be "dried out". These fish are known as the bottom-spawners or "burrers."

It was thought by the Technical Committee of B.A.S.S. that some observations on the "hangers" would be useful. It seemed to us that the following factors could influence the incubation period of the eggs.

(a) Constitutional factors.

These are factors inherent in the egg, dependant on the species and perhaps even on individual parent fish. In this Aphyosemion cognatum experiment all the eggs came from one pair of fish which themselves had been line-bred for four generations.

(b) Environmental factors.

1. Water, pH, and mineral content could affect the incubation period of the egg and there is evidence to suggest this.
2. The oxygen or carbon dioxide tension in the water. This may be dependent to some extent on the volume of water in which the eggs are kept, its depth and its surface area, and the number of eggs present in the water. These factors may be more important when eggs are kept in 10 ml. of water in small vials which is the way in which we have conducted our experiments.
3. Temperature. The level of the temperature is obviously important: but can the fluctuation of the temperature influence the incubation period of the eggs?

Mechanical agitation may help the eggs to hatch. We have had experiences where eggs have refused to hatch and then shaking them has stimulated or helped the fish out of the eggs.

The amount of light which the eggs receive may be important.

The presence of protozoa or bacteria in the water. In order to test the experimental procedure we decided to carry out an experiment on the eggs of Aphyosemion cognatum.

Method

G. Cast acted as supplier of eggs. The eggs were laid by one pair of Aphyosemion cognatum. The pair were kept separate for 4-5 days and then placed in the breeding tank. The fish were allowed to spawn for 12 hours, during which time between 10 and 50 eggs were laid. It is interesting to note that the eggs were laid on any part of the spawning mop and these eggs are more sticky than Aphyosemion vanellifer, A. hirutum or A. callianum.

Ten eggs from the same spawning were placed in a vial containing 10 ml of water. The vial was wrapped in polythene and sent through the post to the experimenter. Each experimenter was sent a sheet of instructions and an observation sheet. The supplier put batch number, name of species, number of eggs, date of spawning, temperature of water in the vial when the eggs were put in. Each experimenter had to make a daily observation on temperature, number of eggs hatched and any other comments. When all the eggs hatched or after 50 days the observation sheet was returned to the Chairman.

Results

The observations covered 243 eggs of which 73 (30%)
Insect individualists:  
Gerris and the surface film  
by Fred Wilmott

The well-known Pond Skater or Water Strider (Gerris) is a good example of an aquatic insect which makes use of the condition, common to all water, which is known as "surface film".

At first glance it might seem that this little insect can run and jump upon the surface of the water, without even its feet becoming immersed, because of its lack of weight, but further consideration shows that this is not so. For it is a well-known law that a floating body displaces its own weight of water and one would therefore expect the tiny feet and spindly legs of the Pond Skater to be pushed below the surface by the weight of the whole of its body.

The answer to the puzzle is that all water, both indoors and out, has surface film. This is not a film formed by dust, oil, or any other substance, but is caused by a special property of the surface water itself. The effect is that of a very thin, rubbery covering which can be seen, when examined under a magnifying glass, to give slightly under the weight of the insect without actually letting its feet through.

If pushed beneath the surface of the water the Pond Skater will immediately, because of its low specific gravity, rise to the surface but will often have some difficulty in forcing its way back through the surface film. It will sometimes even run along the underside of the film like a fly on a ceiling, and close observation through a lens shows that as it does so its feet make dents in the film which appear as small bumps on the topside.

Many other aquatic insects make use in one way or another of the surface film, but I have always had a soft spot for little Gerris which can often be seen skating marvelously about the pond on mild days in winter... days when all other pond creatures appear to be hidden or dormant.

May, 1966
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.

Brine Shrimp Eggs—A Correction

In my article “Food for Tropical Fish,” March issue, it was stated, regarding the hatching of brine shrimp eggs, that a “brine solution made by dissolving about four tablespoons of salt in a pint of warm water” should be used. This should, of course, have been one tablespoon of salt per pint of water.

B. WHITSTON
“Wilson,”
91 Glenarm Road,
Larne, Co. Antrim,
N. Ireland.

That Biting Catfish

The albino catfish described in the March issue is *Clarias platycephalus*. The wound described is inflicted by the barred pectoral fins.

I have been “pricked” three times whilst trying to catch my specimens which are nine inches long. The pain caused is out of all proportion to the size of the puncture; therefore I believe that the fish is equipped with some sort of venom or electric shocking equipment.

These fish should be caught in a large-meshed net as when they are captured in the normal nylon type their barred fins pierce the fine material and are impossible to remove without ruining the net. Another interesting feature of this fish is its walking ability. One of mine escaped from a tank when the cover glass was left off and was found walking around the floor on its pectoral fins.

The fish can live for a long time out of water.

G. PARR, Unbridge, Middx.

Fishes of India and Pakistan

Can you recommend a book or other source which describes the fishes of the Indo-Pakistan Subcontinent? I have a copy of Freshwater Fishes of the World and while this describes a number of fishes to be found here there are many it does not.

In the last year or so I have collected many different types of fishes from the lakes, rivers and canals within sixty miles of Karachi and I am unable to identify them.

J. N. S. CRASIER,
Karachi.

Fishes of the Ganges by Buchanan (published by Hamilton).

All available papers and works by S. L. Hora.

See bibliography in Freshwater Fishes of the World by G. Starra (published by Vesta Books Ltd.).

—EDITOR.

Bags of White Worms

Having had great difficulty in keeping white worms, I tried keeping them in a large plastic bag (18 by 12 in.) filled with equal parts leaf mould, peat and sand. I bought a jar of white worm (approximately 1 oz.) from which I emptied into the bag after first moistening the mixture of leaf mould etc.

After one month, the white worms had considerably multiplied and are as fresh as the day I set up the culture.

M. STERNET
142 New Road,
Staines,
Nr. Barnes.

The Biting Catfish: Further Notes

In reply to W. Bowman, Stockton-on-Tees, in your March issue, he obviously has a *Clarias batrachus*. I have seen two varieties of this fish, the difference being the Albino has pink eyes.

I was once the proud owner of an albino which is now in the Regents Park Zoo, as it rapidly outgrew my three-foot tank. I, too, purchased mine when it was about two inches long and inside three months it had reached six inches, eating anything that was dropped in the tank.

Its favourite meal was earth worms shredded at first, then taken whole after about two months.

Although it lived in a community tank along with neon glow lights and small guppies, it showed no signs of troubling the other fish, its worst fault being that if a plant was in his way he would just uproot it rather than go around it, so after a short while the whole tank was full of a mess.

He also would stand on his nose and burrow down into the gravel, sending up great clouds of gravel and dirt and leaving big holes everywhere.

One piece of advice to Mr. W. Bowman: Keep your tank well covered as the fish is liable to jump out of the tank. Although a gentleman in America says his catfish has lived out of water for about three hours I feel this is a big chance to take.

A. DAVY,
12a Ridborne Close,
Mumrill Hill,

Characins and the Like

In furtherance to the question I posed in my article “Fishes of the Characin Family” (Aquarist, March) as to whether the giant pencil fish (*Anostomus antiquus*) was in fact a member of the Characins family, it is
apparently separate *Acanthomoridae* group, I raised the matter with the Judging and Standards Committee of the Federation of British Aquatic Societies, from whose chairman, Mr. A. G. Jenner, I received the following reply.

“The Characidae (Characin) family covers fishes of a great many various types and shapes, which in older classification justified the formation of a series of subfamilies, one of these being *Acanthomoridae* in which is the genus *Acanthomorpha*.

In modern classification because of marked differences, some of these sub-families have been separated off as families by the recent works of new authors, who, until referred to as Characin-like fishes and for this reason we feel they still be included in the Characin class on the show bench.

For your further information, the Americans are now examining all the genera of the Characidae to reclassify them into sub-families and families, and their information should be published in about six weeks.

The above extract, therefore, denotes the view of one of the governing bodies of the aquatic hobby in Great Britain. Whilst not necessarily disagreeing with their views, I would still be very grateful and interested to hear from any aquarist with similar or, indeed, opposing views, explaining how his/her conclusions are reached.

M. J. PARRY,
45 Western Drive,
Gebals, Cardiff.

Ozone Releasing Air Stone

In the February issue of *The Aquarist*, in the article “A Start with Marines,” by T. Hinton, he mentions an “ozone releasing air stone”. I should be pleased if you can give me any information on this item, where it can be obtained, etc.

J. ENNIS,
Barnoldswick, Lancs.

Longer Life for Light Bulbs

As most aquarists know, light-bulbs “blow” remarkably quickly in tropical aquariums. This is caused when clouds drift through the glass bulb. This increases the light bulb when the lid is raised, perhaps for feeding. The water then rapidly cools the outside of the glass bulb and due to uneven convection the glass breaks. This loss can work out at several pounds worth of bulbs in a year.

I decided that the best way of treating the problem was somehow to separate the condenser water from the bulb. I first thought of using a plastic bag over the bulb, but the bag was soon found. I then came across some transparent plastic material which had been used for “double-glazing” windows. I cut out a piece which fitted the inside of the lid then pulled it taught, stuck it with rubber tape in position. A hole can then be cut where required for aerator tubes and heater wires, depending on the type of lid.

A variation of the above is to stretch the material loosely over the whole of the “open end” of the lid and then stick it on the outside. When the lid is pushed down it bends the plastic round the corners.

I thought at first that it was getting very hot in the lid, but the ventilation holes in the lid and the heat lost through the metal surface provided adequate cooling. Air was able to pass over the surface of the water through the holes cut in the plastic for the aerator tubes and electrical wires. An unforeseen advantage was that the metal of the lid was not rusted because water could not come into contact with it.

I hope that the above idea will be useful and economical to anybody who uses it.

I. S. MacKenzie,
31 Eascomb,
Chippingham, Wilts.

Daphnia Cultures

HAVING been a regular reader of your magazine for a number of years, I notice that from time to time articles appear on the breeding of *Daphnia* cultures.

I have been breeding *Daphnia* with very little trouble for some time, and as we are at the beginning of a new season, I would like to pass on my method to others.

I use a present an old porcelain sink, though I have used polyethylene bowls and baths.

The sink is put in a sunny position and filled with tap water and into this is put cut grass (clippings). I introduce the *Daphnia* as soon as the container is set up, and for a few days I feed them on tubed fish-food as used for egglayers.

After about ten days, I add fresh grass clippings and/or dead oak leaves, bits of pond plants (some of the latter have taken root) and a small amount of garden soil. I do not use potato peelings, banana skins or the like. The container is then left alone for the *Daphnia* to breed.

I set up such a culture last year, and to start the *Daphnia* culture, I only had one solitary *Daphnia*. I usually collect them from a small natural pond near my home, but last year I was unlucky. I caught a number of *Cyprina* and *Bosmina*, but only one *Daphnia*. A few days later the pond was filled in by the farmer on whose land it was. Despite the lack of “breeding stock,” when the frosts came the one had multiplied to several hundred, along with the *Cyprina* and *Bosmina*.

I left this culture alone through the winter, not bothering to remove dead oak leaves that had blown into the culture, nor to remove ice that formed on the water during the winter. On Wednesday, 16th March, 1966, I noticed fourteen *Daphnia* in the water of the container. The water itself is clear and slightly browned in colour.

I have used the same method, with varying degrees of success in the raising of *Brine Shrimp* to maturity. The differences are salt water instead of fresh, and the almost continuous feeding of tubed fish-foods. First, that used for egglayers, then as they grow larger, tubed food for livebearers throughout the summer. I have not yet attempted to bring the *Brine Shrimp* through a winter.

G. NOLLE,
61, Merridale Road,
Wolverhampton,
Staffordshire.

Could You Help Us Please

We in Malta are soon forming a Society of *TROPICAL FISHES* and we are in need of material of how to run such a Society such as the publication of Newsletters, magazines, etc., which are printed by Societies and what they contain.

Could you give your address to different Societies, so that they could give us all the help we need to run such a Society?

J. J. MATT
“Pat House,” Church Street,
Paceville, St. Julian’s,
Malta.

In the “bating catfish” of Mr. W. Bowman. Could this fish be one of the *Malapteruridae* family of electric catfish such as *Malapterurus electricus* (ref. p. 231 Freshwater Tropical Aquarium Fishes by G. F. Hervey and J. Ham). The fish can apparently give a good electric shock and grow to 6 in. in an aquarium or up to 3 ft. in the wild. The “blue” received by Mr. Bowman could well have been an electric shock.

R. H. MORRIS,
Connahr’s Quays, Chester.
Botia hymenophysa
by JACK HEMS

This loach was first introduced to tropical aquarists about thirty years ago. It appears to be quite common over large areas of Thailand, Indonesia, and Malaysia. In the wild state it reaches a length of about 9 in., but aquarium specimens rarely exceed half that size. So far as the writer knows, it has not been bred in captivity, and externally there is nothing to distinguish the sexes. It keeps itself to itself, and does not molest other fishes.

The body is longish with a slightly arched back and rather compressed sides. There are three pairs of barbels on the thick-lipped mouth, and an erectile spine below each eye. The coloration is greyish brown on the back shading through gradations of slaty-blue to whitish on the belly. About thirteen grey-green bars with dusky edges adorn the body between the tail and the tapering head and continue onto the yellow dorsal fin. The bars are almost, if not quite, horizontal anteriorly, and vertical posteriorly. The pectoral, ventral, and dark-spotted caudal fin are, like the dorsal fin, coloured yellow.

Two or more of the fish rather than a single specimen, that seldom stays alive very long deprived of the company of its own kind, will flourish well in any thickly planted aquarium maintained at a temperature of 72°F. (22°C), but a variation of a few degrees (°) either way does no harm.

The fish likes to live in a group beneath a low-lying canopy of submerged vegetation, or under an overhanging or propped-up ledge of rock. But it should be noted that, although the fish is of a retiring nature, it likes to fit about the aquarium every now and again. As soon as dusk comes on or the tank lights are switched off these fittings are most purposeful and more prolonged, for the search for food ranks high in this loach’s nocturnal ramblings. All the regular live and dried foods, and lean meat scraps, are taken from the bottom and, as will be readily realised, scavenging ranks high on the list of this fish’s merits.

Botia hymenophysa

The AQUARIST Crossword

Compiled by L. BRADLEY

CLUES ACROSS
1. Female of angelfish (6, 4).
2. Powder found in a metal carbonate (4).
3. Wind (3).
4. Live food for fry (9).
5. Light-rays marriage (8).
6. Home of the blue goby (7).
7. A Roman coin (8).
8. Pestle: longest class of multicellular protozoa (7).
9. 70.000000000000000000 (7).
10. To eat (11).
11. If aged it is 90 (5).
12. Latest (9).
13. No use for marine aquaria (10).
14. Live food for fry (9).
15. A French ginger (7).
17. A native of Western Europe (4).
18. A Roman coin (8).
19. A part of a mammal (7).
20. To make to become immobile (3, 9).
21. A Roman coin (8).
22. A Roman coin (8).
23. Most of the time (7).
25. A part of a mammal (7).
26. A Roman coin (8).

CLUES DOWN
1. English bird (4).
2. Aphididae species (9).
3. Name for example (7).
4. A desert (11).
5. A desert (11).
6. A desert (11).
7. A desert (11).
8. A desert (11).
10. A desert (11).
11. A desert (11).
15. A desert (11).
17. A desert (11).
18. A desert (11).
19. A desert (11).
20. A desert (11).
22. A desert (11).
23. A desert (11).
25. A desert (11).

Solution on page 27
The March meeting of the Worthing Tropical Fish Club turned out to be an interesting meeting. It was held on the premises of the Worthing Aquarium. The meeting was well attended, and the aquarium was filled with a variety of tropical fish. The club's members discussed the care and breeding of tropical fish. The Aquarium is located in Worthing, West Sussex, England.

At the meeting, the members discussed the different species of tropical fish that are popular in the aquarium hobby. They shared their experiences with breeding and maintaining these exotic fish. The club's chairman, Mr. T. Whalley, also spoke about the importance of conservation and the need to protect endangered species.

The Aquarium is known for its collection of tropical fish and other aquatic species. It is a popular attraction for both locals and tourists. The members of the club are passionate about their hobby and are dedicated to sharing their knowledge and experiences.

The Worthing Tropical Fish Club meets regularly to discuss all things related to tropical fish. Whether it's breeding, care, or simply admiring the beauty of these fish, the club provides a dedicated community for enthusiasts.

The March meeting of the Worthing Tropical Fish Club was a success, and the members are already looking forward to the next one. They are excited to continue their discussions and share their expertise in the world of tropical fish.
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THE AQUARIST
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