

NOVEMBER 1986 95p

AQUARIST

AND PONDKEEPER

FISHKEEPING AT ITS VERY BEST. ESTABLISHED 1924

**MARINE
SUPPLEMENT
INSIDE**

Catfish Mimics

**SPOTLIGHT
ON THE
GREEN
MANTIS
SHRIMP**

**Bugs,
Beasties and
Bewilderment**



FREE WITH THIS ISSUE: YOUR GUIDE TO

BETTER FISHKEEPING

WITH THE COMPLIMENTS OF
The Aquarian Advisory Service

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Cover Story
Photograph by Bill Tomey
Cichlasoma citrinellum (now
regarded as *Heros citrinellus*
by Loiselle and others), is
commonly known as the Red
Devil, Lemon Cichlid or Midas
Cichlid. Irrespective of its
name, this attractive cichlid
occurs in the crater lakes of
Nicaragua where it can grow to
around 10 in. (25 cm.) in
length. Sexual dimorphism is
very marked in Red Devils with
the males developing a
pronounced 'nuchal' hump on
the head, beautifully illustrated
in our cover photograph.



AQUARIST

AND PONDKEEPER


FISHKEEPING AT ITS VERY BEST. ESTABLISHED 1924

NOVEMBER 1986 Vol. 51 No. 8

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Your questions answered

Having problems? Send your queries to our panel of experts who will be pleased to be of service. Every query receives a personal answer and, in addition, we will publish a selection of the most interesting questions and responses each month. Please indicate clearly on the top left hand corner of your envelope the name of the expert to whom your query should be directed. All letters must be accompanied by a S.A.E. and addressed to:
Your Questions Answered, The Aquarist & Pondkeeper, Buckley Press Ltd, 58 Fleet Street, London, EC4Y 1JU



TROPICAL
Dr David Ford



COLDWATER
Pauline Hodgkinson



PLANTS
Barry James



KOI
Roger Cleaver



MARINE
Graham Cox



DISCUS
Eberhard Schulze

Marine

An angler's needs and costs

*Please could you tell me how to set up a marine tank for angler fish. I would like to know the basic needs for the fish-habitat, feeding and so on. I am particularly interested in *Histrio histrio*. An indication of the cost involved would also be appreciated.*

Although these creatures are very hardy and have no special requirements, they do, unfortunately, need livefoods initially. Eventually, when they become tame, you will be able to wean them onto gamma-ray sterilised, frozen Lancefish.

If you do keep other fish with your Anglers, I recommend that they should be at least twice the size. I've personally witnessed an Anglerfish eat another corallfish which was at least its own size.

Now to costs. A 48in. x 15in. x 18in. tank, hood and stand will cost about £95.00 today. As the current world depression continues to deepen, such a set-up may be even cheaper in a few months so don't buy anything in a hurry. Take your time and shop around to get the best value going for your pocket-money. Two words of warning though:

(i) **DON'T** buy a cheap and nasty aquarium made of thin

glass. It may crack the first time you fill it and you may not get any recompense.

(ii) **DON'T** buy your dry goods at the cheapest shop in town and then expect good service from the only person in the area who stocks the ultra-low-profitability marine livestock itself.

The equipment and materials needed to complete the tank as a fully functional marine aquarium will cost about another £80.00 to £120.00 depending on how sophisticated the water management system is to be. The most expensive and the best system would be a power-filter operated U/G filter used in reverse-flow mode, i.e. with the mechanical filtered seawater passing through the coral-sand bed which covers the U/G filter plate, being biochemically-filtered by the bacterially active coral sand en route. At the less expensive end of the

scale, the aquarium would function perfectly well with an air-lift operated U/G filter only, provided that you remember to:

(a) fit behind a rock a small, cheap-and-cheerful, air-operated, plastic internal box-filter full of highly activated marine grade charcoal, and

(b) use each partial 25% seawater change as an opportunity not only to upgrade the chemical quality of the seawater but also to flush as much of the non-biodegradable sea humus as possible from the top 5cms. of coral sand.

Lighting for fish-only tank

I am about to take the plunge and start a fish-only marine aquarium. My system will consist of an U/G filter operated by two

powerheads, an external power-filter and aeration. I was thinking of using the following to light the tank:

1x48in. watt TRULITE

1x44in. watt ACTINIC

Do I need an additional tube?

Despite the fact that you haven't provided details as to the actual size of your new aquarium (it sounds like a 4 to 5 footer), I am certain that these tubes will be perfectly adequate for a corallfish-only aquarium.

It would only be necessary to double or even treble this lighting level, depending on the surface area and vertical depth of the water, if you had intended to keep invertebrates, "living-rock" and the larger marine algae.

Please remember to keep a careful log of the actual running time of these tubes. They will need renewal at 6-monthly intervals as their useful light-emitting life expires.



Angler fish

Tropical

Chocolate Gouramis

I would be grateful if you would supply me with details on the best set-up for Chocolate Gouramis. I would also like to know how to sex and breed these fish.

The Chocolate Gourami is *Sphaerichthys splendens*,

originally from Sumatra. It is a delicate species prone to infestation with body parasites, so good, clean water is needed. Peaty water is best; soft and slightly acid. The temperature needs to be high (28° to 30°C), and the tank should not be brightly lit.

It is very difficult to sex the fish — the best method is to choose a female plump with eggs. This fish is a mouth-brooder and only has a few small fry that grow slowly. Live food is best: *infusoria*, brine shrimp and sieved *Daphnia*; then wean them onto Carnivoec flake.

Silver Shark

I presently have a 35in tank in which I have a number of cichlids namely, Keyhole, Firemouth, Orange Chromide, 'Sheepshead Acara' (Acquidens curviceps), Kribensis and Julidochromis transcriptus — all pairs.

Included with these I have a Clown Loach, a Plecostomus and a Silver Shark. This combination of fish appears to work well and so far I have had no real problems.

I have managed to obtain information as regards country of origin, breeding habits, etc. about all except the Silver Shark.

I would, therefore, be grateful for any information you can provide me with (including correct scientific name) on this matter.

The Silver Shark is *Balantiocheilus melanopterus*, also known as the Bala Shark. It will indeed settle down in your Cichlid tank, being peaceful and accepting slightly alkaline waters. Its origins however are Thailand and Borneo where it grows to more than a foot in length. It is a good scavenger. It is an active fish and can easily flip straight out of the tank. There are no published records of its breeding in captivity.

The name 'shark' is only because of the shape of its dorsal fin; by nature the fish is renowned for minding its own business!

Coldwater

White sheen on fish

Some of my fish are coated with a white sheen and often lie listless on their noses in a corner.

What are they suffering from?

The white sheen or bloom which is covering many of your fish is caused by an organism known as *Couix*. If it is any consolation, this disease has been a great problem for many fishkeepers this year — it has been widespread and very stubborn to cure. *Couix* is a protozoan parasite which lives in the mucus on the body of the fish.

I am sure that, because last winter was so long and cold, it took its toll on fish, weakening them and reducing their resistance to disease.

The first step in bringing about a cure is to improve the general health of your fish, feeding them plenty of livefoods and making sure that their

living conditions and water quality are good.

Raising the water temperature to 78°F and adding enough Methylene Blue to make the water a deepish blue for about four days and then allowing the temperature to cool gradually cleared this pest off some of my own fish this year. This treatment proved successful after several other remedies failed to bring about a permanent cure.

Fungus treatments

My Fancy Goldfish have been suffering from Fungus. I have been told to use Potassium Permanganate or Formalin. Is this correct?

JOHN ALLAN AQUARIUMS COMPETITION PART I WINNER

The lucky winner of the £100 Eheim 2113 Thermofilter offered in Part I of our competition in September is Robert Perryman, 1 Brookfield Cottages, Brookfield Place, Ilfracombe, N. Devon EX34 8BX.

Congratulations to the winner — commiserations to the losers. Don't despair though — you could still stand a chance of winning a £330 Delta Aquarium and Cabinet if you got the answers right. These were:

1. Horizon 2. Juwel 3. Gem
Watch out next month when we will announce the name of the winners of the second Eheim 2113 Thermofilter and the Delta Aquarium and Cabinet.

NEXT MONTH Coming up in December

A small sample of what we've got in store for you in December:

● *The do's and don'ts of Koi-keeping during winter.*

● *Super Interpret Christmas Competition.*

● *Everything you wanted to know about sexing marine fish — but never dared to ask!*

● *The enigmatic and spectacular Fire Salamander.*

● *Our usual crop of popular regulars, specially commissioned articles, plus a great deal more.*

● *Avoid the Christmas rush — Order your copy of A & P early.*

Book your copy early!

If outbreaks of Fungus disease are a problem, then I am afraid that the conditions which you are providing for your fish are far from good. The quality of the water is poor and this can be brought about by over-crowding which causes stress in the fish. Water that is in poor condition is usually water which is not changed often enough, allowing a build-up of ammonia and harmful bacteria. On the other hand, many fishkeepers have found that constant running water in a tank, if it is straight from the mains, can also be detrimental to the health of the fish. Therefore, it is only rarely used on a continuous basis.

Formalin must be treated with a great deal of respect and, if only slightly overdosed, can be very damaging to the fish. I would not recommend the use of Potassium Permanganate in the treatment of fish suffering from Fungus but, instead, place the fish in clean water after first gently wiping away the fungus with a soft paper tissue while holding the fish in a wet cloth. Dab the place with Mercurochrome and return the fish to the tank. Add Methylene Blue to make the water a deepish blue and one tablespoon of salt (not table salt) to each gallon of water. Siphon the base of the tank daily and top up with fresh water and Methylene Blue, keeping the strength of the medication the same. It may take about two weeks for this condition to clear but, as soon as the fish has recovered, continue the water changes and allow the colour to fade gradually. Methylene Blue treatment is also a cure for fin congestion.

Plants

Foreground Plants

Could you recommend some dwarf foreground plants for a coldwater tank containing some small Fancy Goldfish?

Yes, you could use the native *Hydrocotyle vulgaris* or Umbrella Plant, *Samolus floribundus* or Water Cabbage, *Armoracia aquatica* or Japanese Cress, *Sagittaria tabulata* var. *psylla*, *Lilopsis novae-zelandiae* and *Acorus gramineus* var. *pusillus*.



Certain fish species (such as Discus) require precise water quality conditions before they will spawn. (Photograph: John Dawes).



The Cardinal Tetra (*Paracheirodon axelrodi*) originates from the soft, acidic waters of the Amazon. (Photograph: David Pool).



Hard water is desirable for maximum growth and fin development in Swordtails. (Photograph: David Pool).

WATER QUALITY AND THE AQUARIST

Poor quality water produces poor quality fish. In the first of two articles, Dr David Pool of the Tetra Information Centre examines two of the most important aspects — pH and hardness.

“Water quality is the root of all evil” — a slight alteration to the well-known saying, but in this form it is perhaps more applicable to the fishkeeper. Poor water quality is frequently at the root of the aquarist's problems, and is probably responsible for many of the unexplained fish losses from which we all suffer.

The health and survival of the fish and plants is closely linked to the quality of the water. In suitable conditions the fish may appear dull, listless and be more susceptible to disease, and the plants may show poor growth, pale leaves and eventually die. However, with just a little basic knowledge of water chemistry, these problems can be avoided and most species of fish can be successfully kept and bred.

Pure and impure water

Pure water is a simple liquid compound formed from two hydrogen atoms and one oxygen atom (H₂O). However, most of the water available to the aquarist (with the possible exception of distilled water) is not pure, but is “contaminated” with a range of substances giving it a particular quality.

The quantity of contaminants dissolved or suspended in the water varies from area to area and results in the water quality itself varying.

A list of the more important parameters which influence the quality of the water is provided in Table 1. This list is by no means exhaustive and a large number of extra contaminants could be added. Some of these are more of a problem to the aquarist than to the fish themselves. Water turbidity could be included in this group, with the reduced clarity benefiting the more shy species, but greatly hindering the aquarist's attempts to view the fish.

In this article I will concentrate on the two interrelated parameters of water hardness and pH, how they affect the fish and how they can be adjusted. Some of the other parameters will be examined in a second article.

pH — a question of acidity or alkalinity

The acidity/alkalinity of a solution is measured in terms of pH values, which range from 1 (acidic) through 7 (neutral) to 14 (alkaline). This scale is actually a negative logarithmic scale, which simply means that a pH rise from, say, 6 to 7 represents a 10-fold

decrease in the acidity of the solution. Therefore, even a small change in pH value represents a large change in the acidity/alkalinity of the solution.

The pH requirements of fishes vary considerably, although most species will survive in water with a pH of 6.5 to 7.5. Acid-loving species, such as those from the Amazon region (eg Discus and Tetras) will exhibit their best coloration and breed in water with a pH of 4.5-6.5, whereas Rift Valley Cichlids and marine fish require an alkaline pH of 8.5-9.0.

Modifying the pH

Depending on the fish the aquarist wishes to keep, it may be necessary to modify the pH of the water. Water may be made more acidic by allowing it to stand in contact with aquarium peat for one or more weeks before adding it to the aquarium. Do not use garden peat, as the added fertilisers can be toxic to the fish. Approximately two handfuls of peat (loosely tied in the leg of a pair of tights) should be added to every 10-15 litres (2-3 gallons) of water. This water should be tested using a good quality test kit to determine when the desired pH is reached.

To raise the pH, the water should be allowed to stand in contact with limestone-bearing rocks or shells or by the careful addition of sodium bicarbonate. Limestone-bearing rocks or gravel can be detected by adding several drops of a weak acid such as vinegar. If it bubbles the rock contains limestone. These methods of increasing the pH also increase the water hardness. However, most species that prefer a high pH also prefer ‘hard’ water (see Table 2).

The peat or limestone can be placed in a box filter, although this is less satisfactory because the aquarist has little control over the final pH of the water.

Several pH adjusters are available commercially. These substances are easy to use and very effective, but care has to be taken not to alter the pH too quickly. Delicate fish species are also reported to be adversely affected.

Alterations to the pH (and all other water quality parameters) should never be made

Table 1
Water quality parameters of importance to the aquarist

Temperature
Oxygen
Hardness
pH
Ammonia concentration
Nitrite concentration
Nitrate concentration

Table 2
The water quality preferences of tropical fishes varies considerably. Those of several of the more popular species are presented here.

SOFT ACID CONDITIONS pH 5.5-7.5 GH 0-1.5 KH 0-1.3	<i>Betta macrocarpa</i> — Clown Loach <i>Paracheirodon axelrodi</i> — Cardinal Tetra <i>Symphodon</i> — Discus <i>Ayaponema</i> — ‘Plec’ Catfish <i>Phenacogaster interruptus</i> — Congo Tetra
MEDIUM HARD, ALKALINE CONDITIONS pH 7.5-8.0 GH 10-18 KH 5-10	<i>Poecilia reticulata</i> — Guppy <i>Poecilia atherina</i> — Black Molly <i>Xiphophorus helleri</i> — Swordtail <i>Brachydanio rerio</i> — Zebra Danio <i>Symplonia nigricans</i> — Upside-down Catfish
TOLERANT SPECIES pH 6.5-8.5 GH 3-20 KH 3-15	<i>Barbus conchonus</i> — Roar Barb <i>Barbus tetrazoni</i> — Tiger Barb <i>Corydoras aeneus</i> — Bronze Catfish <i>Labeo bicolor</i> — Red-tailed Black Shark <i>Culicis lala</i> — Dwarf Gourami
HARD, ALKALINE CONDITIONS pH above 8.0 GH 10 and above	African Rift Lake Cichlids

in the aquarium. Instead several trials should be made in a bucket or spare aquarium, and this water used to alter the water conditions slowly in the main aquarium (over a period of several days).

Water hardness

Water hardness is related to the amount of dissolved salts that are present in the water. The general or total hardness (GH) is comprised of carbonate hardness (KH) plus non-carbonate hardness (NKH) and is expressed in German degrees of hardness ($^{\circ}$ dH). Water with a GH of 0-4 $^{\circ}$ dH is regarded as being soft, 5-10 $^{\circ}$ dH as medium and above 10 $^{\circ}$ dH as hard water.

Carbonate hardness is also known as temporary hardness because the carbonate salts can come out of solution when the water is boiled. This is the reason for the familiar 'fur' on kettles in hardwater areas.

As with pH, the hardness of tapwater varies from area to area and different fish species prefer different degrees of water hardness. Water hardness and pH are usually related, hence we find fish that prefer soft, acidic water (eg Barbs, Discus and Tetras) and others that require hard, alkaline water (eg Rift Valley Cichlids). When a value is given for the hardness preference of a fish it usually refers to the value of the total hardness.

To reduce the GH or KH (ie soften the water) clean rainwater or distilled water can be used to "dilute" the aquarium water. In industrial areas the rainwater may be pollut-

ed, although collecting the water from the roof in a continually overflowing water butt will dilute any pollutants present. The carbonate hardness can also be reduced to a certain extent by boiling the water. It is important to have some carbonate hardness in the water as this acts as a very efficient buffer, preventing any sudden and harmful changes in pH.

Water-softening resins are available which will effectively remove salts from the water. They work by replacing the salts which cause the hardness (eg bicarbonates and sulphates) with different ions. It is important to use a resin which exchanges the salts for OH $^{-}$ and H $^{+}$ ions which combine to form water. Many resins for commercial use are unsuitable for the aquarium as they replace the salts with sodium ions, which are toxic to the fish. Resins should always be used to soften the water before it is added to the aquarium. In this way sudden and potentially harmful changes in hardness can be avoided.

The GH or KH can be increased by allowing the water to stand in contact with limestone-bearing rocks, or by the careful addition of sodium bicarbonate. Special salt mixes are also available for reproducing the hard alkaline conditions found in Lakes Malawi and Tanganyika.

The importance of proper pH and hardness

Water from different regions of the world has greatly differing values of pH and hardness. The fish from these areas have adapted or evolved to their native water and

will often only breed and remain healthy if these conditions can be mimicked in the aquarium.

The preferred, or optimum, conditions for some of the more common fishes kept in tropical aquaria are provided in Table 2. If kept in water with these conditions the fish are more likely to display their natural behaviour and coloration, and their bodies' natural defence system will be able to withstand many of the disease organisms which might otherwise cause problems. The wrong pH and hardness can cause numerous headaches for the aquarist. Slightly unsuitable conditions may simply reduce breeding success, but extreme conditions can result in disease-like symptoms.

The delicate gill membranes tend to be the first areas to be affected. They become inflamed and irritated causing the fish to be short of oxygen, with the result that the fish breathe rapidly and gasp at the water surface. The skin may also be affected, with the fish producing excess mucus and rubbing against underwater objects in a vain attempt to rid itself of the irritation. Perhaps more importantly, the fish become severely stressed making them more susceptible to disease.

Obviously, these conditions should be avoided at all costs. The fish you keep can be chosen to suit the water conditions in your area, or alternatively you can alter the water conditions in the aquarium to suit the fish. In either case, by using a little forethought it is possible to reproduce the perfect conditions in which fish can lead a healthy and trouble-free existence.

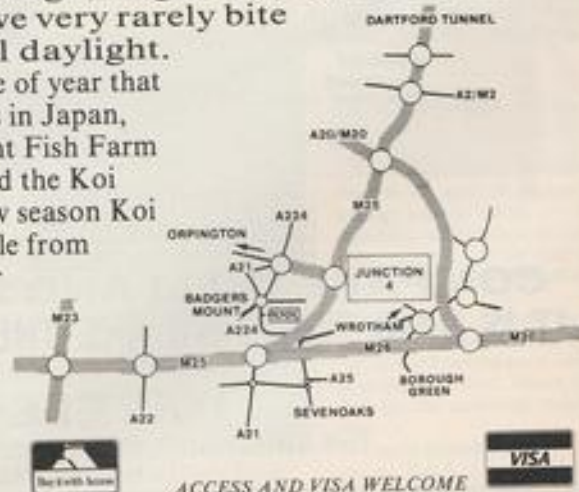
KULTURE from KENT KOI

The nights are getting longer, the days are getting short,
Soon will be the season when the best koi are bought.
If you need a brand new pump, or a little sound advice
On water treatment, fish disease or how to sleep at night
We might not have the answers, all of them at least
But to talk your problems through, might be a better beast.
So come on down and see us, we very rarely bite
Junction 4 M25, while it's still daylight.



KENT KOI KO
THE LONDON KOI CENTRE
(Adjacent to Polhill Garden Centre)
LONDON ROAD, BADGERS MOUNT,
SEVENOAKS, KENT, ENGLAND.
TELEPHONE: KNOCKHOLT 0959 33567.

This is the time of year that growing ponds in Japan, and at our Kent Fish Farm are drained and the Koi harvested. New season Koi will be available from late November onwards.



OUT AND ABOUT

with John Dawes

The New Sea Life Centre at Portsmouth

We usually hear about the 'one that got away', but at the Sea Life Centres at Portsmouth and Weymouth in England, and Oban in Scotland, visitors are able to see the 'one that got away'.

The Sea Life Centre opened its latest project on Wednesday 11 June 1986 in Portsmouth. At this new Centre, visitors can view most types of British marine life in massive fish tanks which allow an unhurried and peaceful view of the world under the sea.

The huge displays use over ten tonnes of specially strengthened glass to hold back thousands of gallons of water. The Sea Life Centre has also developed a technique of taking fibre-glass moulds from the seashore and cliff faces to produce realistic models that create a "natural" environment for marine life.

The bottom of each enormous tank is covered with finely crushed cockle shells that have been brought from the island of Barra in the Outer Hebrides. The total weight of these shells alone is over fifteen tonnes!

Over two miles of piping have been installed in the building to allow for the flow of sea water, air and cooling water.

Fish are caught as far apart as Oban in the North, and Weymouth in the South, and are transported by road to all the Centres. All fish are accompanied on their journey by a marine biologist to see they are maintained in prime condition.

The Sea Life Centre in Portsmouth has already had a royal visit. The Princess of Wales recently unveiled the Ocean Reef display, said to be the largest aquarium in Europe — 4.5 metres deep and 6.5 metres wide.

The Ocean Reef Aquarium contains more than 250 fish and other sea creatures while, in the Living 'Touch' Pool (a man-made rock pool), visitors can handle all the sea creatures they would normally find in a seashore rock pool, such as sea anemones, hermit crabs and starfish.

Out and about is designed to keep you right up to date with what is going on in the aquatic world — anything from recent or forthcoming events to special displays in shops or public aquaria. If you know of anything that warrants inclusion drop me a line at the A & P office. Brief submissions with photos (if possible) would be welcome. I look forward to hearing from you.
John Dawes.

Ideal for school parties and young visitors, the Centre has a comprehensive audio-visual theatre. In addition, the Education Officer can supply literature designed for school parties of all ages.

For further details, contact the Sea Life Centre, Clarence Esplanade, Portsmouth PO5 3PB. Tel. (0705) 734461. For bookings, or to contact the Education Officer, ring (0305) 770209.

7000 Visit the B.K.K.S. National Show

A touch of Japan came to the Essex County Showground at Great Leighs in Chelmsford on Sunday 17 August with the staging of the British Koi-Keepers' Society 11th National Show.

This year the Show was hosted by the Essex Section of the B.K.K.S. who ran and judged the event in true Japanese style. Even the programmes were sold by Geinbas.

Attendance figures of around 7000 left no doubt (as if there were any by now!) that Koi-

keeping continues to be one of the favourite and fastest expanding areas of the hobby.

In total, 321 fish were entered by 77 individual competitors (the trade section attracted 6 further entries).

Over 20 "Koi-related", and several "non-Koi-related" stands added colour to an already colourful event made even more attractive to competitors by the introduction of non-returnable trophies.

Adding to the entertainment were the Braintree Marching Band, the Southend Sapphires, Mrs Rachel Gosling's demonstration with her Spaniels and a helicopter providing "rides" for visitors.

Next year's National Show is clearly an event not to be missed. For further details, contact the B.K.K.S. General Secretary, Mrs E. Tomlinson, 87 Coach Road, Silverdale, Guiseley, Leeds, LS20 8AY. Tel. (0943) 78111.

The major prizewinners this year were:

1. Grand Champion — Tancho owned by Joe Wilmington.
2. Supreme Champion (Best Adult Koi) — Tancho owned by Joe Wilmington.

3. Supreme Champion (Best Mature Koi) — Kohaku owned by Mike Chapple.

4. Supreme Champion (Best Baby Koi) — Shows owned by Nigel Craddock.

5. Dealers' Class — First, Second and Third prizes were all won by Infiltration.

Tea and teach-in as Home Marine adds space

Barry Jackson of Home Marine, situated on the "Golden Mile" at Enfield, is expanding his already substantial retail business this autumn. The considerably enlarged shop will include reptiles, in addition to the Tropical, Coldwater and Marine sections, for which Barry has an excellent reputation.

For the benefit of customers new to the hobby, Barry also intends to run evening classes once a month in the tea-room attached to the shop. These will probably be held on Tuesdays, commencing at 7.30 pm.

As with most retail outlets, Home Marine are particularly busy at weekends when one member of staff is employed solely for the purpose of giving advice to customers.

Demand is such that a special information desk will be installed shortly. Why not pay them a visit?

For further information, contact Barry Jackson at Home Marine, Theobalds Park Road, Enfield, Middlesex. Tel: 01-367 4191.

Don't forget BAF!

The annual British Aquarists Festival — one of Europe's leading aquatic shows — is scheduled to take place on Saturday 1st and Sunday 2nd of this month at Belle Vue, Manchester.

If you haven't made your mind up yet, time is fast running out — and if you've never been to a major festival, there's no time like the present to make a start.

There's something for everyone at B.A.F. Don't miss it! We'll see you there.



The Princess of Wales examines a starfish at the Living Touch Pools, watched closely by a young admirer.

Letters

Wild-caught versus Singapore-bred fish

I am somewhat disturbed when I read or hear that people prefer wild-caught fish, fresh from their country of origin, rather than captive-bred fish from Singapore.

First of all, I agree that some species of fish, such as the Kribensis, rarely (but certainly not never) seem so colourful as they do in books and magazines. I can only guess the reasons for this, but I presume it is due either to interbreeding closely related fishes or merely because only exceptionally good specimens are photographed for publication. The answer to this problem, however, is certainly not to import wild-caught fishes. If all the specimens of Kribensis sold all over the world had been wild-caught, the species would have ceased to exist in the wild many years ago. The same can be applied to all of the commonly available fish (Neons, Cardinals, Angelfish, etc.).

Without countries such as Singapore, which in my humble opinion produces fine quality healthy fishes most of the time, the aquatic hobby would have exterminated hundreds of species of fish from their native environment — a deplorable practice. If any *A & P* readers wonder why the Black Ruby Barb is not so commonly available as it once was, the fact that it is among the four barbs listed as being severely endangered by the IUCN may afford a clue or two!

Tank-bred fish have many other apparent advantages over their wild-caught relations; they breed more readily, are less prone to stress (and, therefore, disease), are available in large numbers very cheaply, and so on.

While I am not in a position to question the belief held by some that Singapore fish carry 'some rather nasty bugs', I am certain that wild-caught fishes are much more unhealthy, and carry a wider range of diseases, many of which are exceedingly difficult to identify.

The knowledge that keeping a fish in a tank has neither harmed its natural environment, nor further depleted its

numbers affords, at least, some consolation if the fish does not turn out quite as colourful or large as it does in magazines. I have yet to find a fish in a dealer's tank that cannot be made more colourful after six months' correct feeding and kept in good water conditions. Taking a rather drab fish and turning it into a living jewel is one of the many joys of fish-keeping.

Daniel Bennett,
118 Sheffield Road,
Glossop,
Derbyshire.

Shark alert

I am attempting to carry out a survey on behalf of 'Shark Research' aimed at finding out how many people keep sharks (both native and tropical species of the class Chondrichthyes) in the UK. I am also interested in hearing from anyone who works with sharks, be they individual hobbyists, dealers or employees of institutions, zoos or public aquaria.

'Shark Research' is an organisation set up to further public awareness of sharks through literature and lectures. The latter are available to societies, other associations and, very importantly, to schools, and aim to dispel some of the myths which surround sharks and their behaviour.

If response to the survey is good, the results will be published in the form of a booklet which will be made available through 'Shark Research'. The proceeds will go towards a fund which will help in establishing a trust to set up and maintain a permanent shark exhibition as well as help finance research into shark biology and behaviour.

If you would like to partici-



'Shark Research' aims to influence public opinion on sharks and their behaviour. (See 'Shark Alert').

pate in the survey, please write, enclosing a 9in x 4in SAE, to: Les Edmonds, Shark Research, c/o 15 Foxcroft Drive, Carterton, Oxon, OX8 3HT.



Two *Ctenops nobilis* sparring

Ctenops nobilis is a mouthbrooder!

For 4 months I have kept 3 specimens of this fish in a planted 24 x 12(w) x 15(h) in. tank at 72-75°F with a gravel base. On September 7 I put in the morning feed of frozen bloodworm and noticed one *Ctenops*, did not feed. Instead, it hid near the surface at the rear of the aquarium.

Suspecting disease, as I have to dose regularly with a Velvet cure and an antibiotic, I flushed it from its hiding place so I could observe it more closely. I then noticed its mouth was distended and chewing movements were taking place. Suddenly, it spat out 4 large opaque eggs which it almost immediately picked up again. There is no doubt, therefore, that this fish, closely related to the Croaking Gouramis, *Trichopsis* spp, is a mouthbrooder.

This observation was particularly pleasing for me, quite apart from the fact that it is probably the first captive spawning and the first evidence we have of its mode of reproduction. For some time I have

doubted the wisdom of the inclusion of *Sphaerichthys*, the Chocolate Gourami, in the anabantoid sub family, Trichogasterinae, along with *Colisa* and *Trichogaster*. Both these genera have floating eggs and I believe the mouthbrooding habit could only evolve from an intermediate stage with sinking eggs. There is no such intermediate in the Trichogasterinae but now we know about *Ctenops* we have evidence of a possible link between *Trichopsis* and *Sphaerichthys* in the Macropodinae.

David Armitage.

Anabantoid Association of Great Britain.

Editor's Note

David Armitage's article '*Ctenops nobilis*, the rarest anabantoid', was published in *A & P* in August, 1986, and contained what we believe is the first-ever colour photograph of a living specimen of this species. David's letter takes us on to another 'first' in that, as far as we are aware, his observations constitute the first-ever record published demonstrating the mouthbrooding breeding behaviour of *Ctenops nobilis*. Further 'firsts' concerning this species will, hopefully, follow — watch this space!

Calling Amphibians and Reptile Lovers

The Association for the Study of Reptilia and Amphibia, wishes to make itself known to all aquarists and pondkeepers who count reptiles and amphibians among their interests.

Despite its name, ASRA does not exist solely for the benefit of research scientists, but for that of anyone, of any age, who is keen on keeping and conserving these animals. Member exchange advice through regular meetings and newsletter while experts are always on hand to answer queries — often concerning problems in care for pets.

For further details of ASRA and its facilities please contact the Membership Secretary ASRA, Gotswood Wildlife Park, Burford, Oxon OX14 4JW. Tel: Burford 3006.

News

Fish Treats from King British

King British has launched a range of Fish Treats, believed to be the first of its kind on the market (see October News).

As their name suggests, these Treats are not intended as staple foods for fish but, rather, as a means of adding a touch of highly nutritious variety to the diet.

This is achieved by packaging food in small quantities designed to provide "snacks" for 7 to 14 days, depending on the size and type of fish in question.

Full instructions are supplied with each 76p pack (all the Treats are equally priced) while, on the back, a Fish Treat Menu gives details of which items are suitable for coldwater, tropical and marine fish as well as reptiles and amphibians. The full range consists of 11 different Treats (even though the display stand which will soon become well-known in shops throughout the country only holds 10).

On the tablet front, there is the already



A selection from the new King British Fish Treats range. The centre pack has been reversed to show the Fish Treat Menu chart which is printed on every Treat pack.

popular "general" formula, along with new ideas such as carnivore, plant and vegetable, plankton and shrimp tablets. The freeze-dried selection consists of tubifex, krill, bloodworm, river shrimp, brine shrimp and red shrimp Treats.

For further information on these and other King British products, contact either Keith Barraclough (0274) 576241 or Bob Rushton 01-404 5575.

PDSA Pet-Care Resources for Schools

In 1985 the People's Dispensary for Sick Animals provided more than 1½ million treatments for sick and injured animals.

"Many households include family pets, and having a responsible attitude towards caring for them is an important aspect of a child's education. By taking just a few precautionary measures, many cases of sickness and injury among pets can be avoided — prevention is better than cure! If a child learns how to look after a pet correctly, not only will the animal remain in good health, but the child will be encouraged to develop responsible and caring attitudes."

The PDSA encourages responsible pet ownership, particularly among children and young people, through its range of educational resources which include leaflets, posters, education packs, films and videos.

Resources leaflets for schools are available both for primary and secondary schools from: Education Officer, PDSA, Dept. PR 450, PDSA House, South Street, Dorking, Surrey RH4 2LB.

Rotifer Culture Kits

Underworld Products, the Loughborough-based firm, has obtained the sole UK rights for a range of products which could well revolutionise the rearing of marine (and freshwater) fry in aquaria.

As the quality of marine fishkeeping continues to improve, more and more people are achieving spawning success with

species which hitherto proved difficult or impossible. Unfortunately, breeding success is almost invariably followed by failure to raise the fry, owing to the unavailability of an appropriate food, i.e. one that is small enough and nutritious enough for the exceedingly small marine fish larvae.

Success may now be round the corner with the UK launch of Rotifer Culture Kits developed by Frank Hoff of Florida Aqua Farms and marketed in Britain by Underworld Products.

The range consists of: Resting Rotifers (£11.39 r.r.p.), Algae Disk (£8.85), Algae Grow (£10.99) and Rotirich (£5.18). Full directions are supplied with the kits, allowing any hobbyist to culture as many as 300,000 Rotifers from 1000 eggs in just one week.

For further information, contact Dave Keeley, Snowcrest Import & Export Ltd., (Trading as Underworld Products), Unit 8, Windmill Road Trading Estate, Windmill Road, Loughborough, Leics. Tel. (0509) 214618.

Allpets Open Second Shop

Allpets, who have been trading from their base in Edgware, Middlesex, for over twenty years, have just expanded their business with the acquisition of a new (second) shop at a garden centre only ten minutes from their original premises.

The new shop trades as Allpets (Stanmore) Ltd from the Kiln Garden Centre, Common Road, Stanmore, Middlesex and offers "as much room as we will ever

need', according to Brian Jones, one of the company's directors.

The indoor area has been purpose-built and houses both freshwater and marine aquaria with loads of room for customers to walk around in complete comfort. Dry goods include aquaria, cabinets, stands and a comprehensive range of equipment, including complete Eheim and Tunze working systems.

Next year's pond season should also see the large outdoor area fully kitted out with display ponds, pumps, garden and pond lighting and a full assortment of accessories.

For further details, ring Allpets at their Edgware premises: 01-952 2995.

Long Life Surface Pond Coating from Unitex



M.C.N. 21 — special surface coating for G.R.P. and concrete swimming pools and fishponds.

United Ltd., the Knaresborough, North Yorkshire based specialist surface coating manufacturers, are now producing a coating system which has been specially developed for the protection of swimming pools and fish ponds against corrosion, chemical attack and impact damage.

The Unitex system, manufactured under the trade name M.C.N. 21, is based on a twin pack polyurethane formula providing a non-porous, high gloss, impact resistant surface which will give many years of service before re-coating is necessary.

Special primers are available with the M.C.N. system for the initial treatment of G.R.P. or the sealing of new or old concrete surfaces, to provide maximum adhesion for the final surface coating.

The material is available in a range of 11 colours and can be applied by brush or spray equipment although, as toxic solvents are used in manufacture, face masks with an external air supply must be used when spraying.

Complete details on the M.C.N. 21

Meet the societies

system are available from: Unitex Ltd., Halfpenny Lane, Knaresborough, North Yorkshire, HG5 0PP. Tel: (0423) 862677.

Dr. Axelrod receives Russian Gold Medal

Dr. Herbert R. Axelrod, founder and president of T.F.H. Publications and the senior author of Dr. Axelrod's Atlas of Fresh-



Dr. Axelrod's Gold Medal awarded for "his outstanding contributions to the course of developments of the world's aquaristics".

water Aquarium Fishes, has been awarded the Gold Medal of the Moscow (USSR) Aquarium Society, the Soviet Union's only official aquarium group.

The medal was presented to Dr. Axelrod in Moscow on 1 July 1986, by S. M. Kochetov, president of the Society and Curator of Fishes at the Moscow Zoo. The presentation represents the 25rd such medal awarded.

FFPS's British Wild Flower Poster

The Fauna and Flora Preservation Society has produced a poster, grant aided by the Nature Conservancy Council, to celebrate Britain's wild flower heritage. Its production is part of a continuing commitment by the FFPS and the Nature Conservancy Council to wild flower conservation.

The poster shows 12 British wild flowers, including the yellow and white water lilies, the yellow flag, pyramidal orchid, primrose, sweet briar and marsh violet, which are still to be seen in our meadows, woods and hedges today, where it is illegal to dig them up without permission from the landowner.

FFPS's new British wild flower poster is available from Fauna & Flora Preservation Society, c/o London Zoo, Regent's Park, London NW1 4RY. Price £1, including postage and packing in a cardboard tube. Special discounts are available to County Trusts and other conservation groups.



Reigate and Redhill Aquarist Society
R.R.A.S. was formed "some 20 or 25 years ago" with the aims of promoting general interest and increasing members' knowledge of all forms of aquatic life throughout the world.

Meetings are held every first and third Monday of the month, throughout the year, at Strawson Hall, Albert Road, Horley.

Prospective members or just casual visitors will be made most welcome at these meetings which start at 8.00 pm. and include lectures and film shows on aquatic life, as well as general informal discussions during which members' problems are considered (these can be anything from the difficulties of setting up individual aquaria to those associated with pond construction).

The society also has a comprehensive range of reference books, many of which would not be available even through the majority of public libraries.

R.R.A.S. is affiliated both to the Association of Aquarists (A of A) and the Federation of British Aquarist Societies (F.B.A.S.) and is always seeking communication with other local societies to discuss all manner of aquatic topics.

To quote from the society's publicity sheet, "If you feel you would like to get to know more about your own aquatic pets and plants, or have a particular problem, why not pay us a visit? We look forward to meeting you."

Subscription Rates: Adults, £6.00; Joint, £10.00; Juniors, £3.00.

Apply to: Syd Fewtrell (Chairman), "Syoan", 19 Newlands Close, Horley, Surrey, RH6 8JR. Tel. (0293) 786078.

British Aquarists Study Society



British Aquarists Study Society

The British Aquarists Study Society (BASS) was formed in 1952. The objectives of the Society are:—

- 1) To form a true fellowship of practising aquarists and others in the study of aquatic biology and the more advanced and abstract topics connected with the keeping of aquaria.
- 2) To promote research and the ex-

change of information on all aspects of aquarium keeping.

BASS is a society for experienced, keen and active fish keepers and covers all aspects of aquarium keeping. The Society is interested in the scientific and advanced aspects of keeping and breeding fish, topics which are not usually found in the local aquarist club, though most BASS members are also actively involved in their local club. Members are interested in carrying out scientific observations and experiments. Many of these have been carried out over the years and have been written up in the BASS Journal or in aquarist journals. These include "The Amethyst Gourami Experiment"; "Is there a place in the aquarium for liquid crystal thermometers"; "Experiments on breeding the Discus"; "A trial of two commercial fish foods"; The effect of temperature on the length of the incubation period of the eggs of Killifishes"; etc. All members are expected to participate in Society experiments. The current major research interest is carrying out observations on the relationship between the temperature of incubation of eggs and the sex ratio of the resulting fry.

The Society is privileged in having a number of professional ichthyologists as honorary members. A number of popular fish books and chapters in fish books have also been written by members.

The Society meets three times a year, in March and May in St. Albans, and in November at London Zoo.

The membership is nationwide and the annual subscription is £6.00 (£3.00 for retired members). New members serve one year as associate members before being elected to full membership.

The Society is always interested in enquiries with a view to membership from active aquarists.

Apply to: Mrs May Williams (Secretary), 85, Dorchester Road, Leicester LE3 0UJ.

Diary dates

Bradford & District Aquarists' Society
B.D.A.S. will be holding their Open Show at Clayton Village Hall, Bradford, on 9 November. For further information, get in touch with the Show Secretary, Mr. S. Hinchcliffe at 15 Back Lane, Clayton Heights, Bradford. Tel: Bradford 814799.

Chepstow & District Aquarist Club
Meetings of this society are held on the 4th Monday of every month at the Coach & Horses, Chepstow, Gwent, starting at 7.30 p.m. Contact David Stephens (Secretary), 117 Castle Lea, Caldicot, Newport, Gwent, Tel: (0291) 424121, for further details.

COLOUR PATTERN SHARING IN CATFISHES —

ZOOMIMESIS OR MIMICRY?

Is there more to colour pattern sharing than mere mimicry? David Sands explores this difficult question and proposes a new theory. (Photographs by the author)

Is it coincidence that certain fishes appear to have an identical colour pattern? Investigative scientists believe nature does not leave form and design entirely to chance.

Sometimes the colour pattern of two species, especially if they are sympatric — found side by side in the same body of water — can confuse the trained eye of the ichthyologist but not always the instinct of the aquarist.

Confusing colour patterns

Dr. Warren Burgess, described *Corydoras adolfi* in 1982. Dr. Nijssen and Isbrucker later obtained a paratype* and used the specimen to describe a new species, *Corydoras imitator*. Dr. Burgess, even to this day, believes he dealt with the description of a single species.

Corydoras adolfi, Burgess 1982 and *Corydoras imitator* Nijssen and Isbrucker 1983 (both from a white water tributary of the Rio Negro, Brazil) represent perfect examples of the confusion caused by colour pattern sharing. I wrote to Dr. Burgess in 1982, on the day he received the paper published within Tropical Fish Hobbyist, and asked the senior editor of the American magazine did he not think he was dealing with two species. The return correspondence suggested that Dr. Burgess could not see what the confusion was about!

I imported almost sixty *C. adolfi* and six *C. imitator* in 1985, and could see how the confusion had originally developed. The orange shoulder or pre-dorsal patch, present in Adolf's *Corydoras*, is absent in the Imitator *Corydoras*; otherwise they share the same colour pattern. The Imitator has a longer head length, but in the ichthyologists' defence, possibly more difficult to see in juveniles. Although this type of colour pattern sharing is thought of as mimicry, (I published an article on the subject and described it as mimicry in November 1980 edition of *Aquarist and Pondkeeper*), it is now likely that the use of this term is incorrect.

While researching for more information on mimicry in Wickler's work (1968), I came across a reference to a camouflage "mimesis" or "zoomimesis". An example of this was given by Wickler on the subject of insects and spiders that are identical to ants in shape and colour. He states 'it is clear that the ants do not appear to benefit from this mimicry — certainly it does not reduce the numbers predated on by birds to any significant amount; therefore,' he concluded, 'the development of ant mimicry cannot be to provide protection from predation.' The alternative is to hypothesize that it may well be the ant mimics' intention to go unnoticed among the ants; this is described in Wickler's work as **zoomimesis**.

Defensive mimicry

The South American pimelodid or scaleless catfish *Brachyramphidius imitator* Myers 1927, from Venezuela (and exported from Colombia) shares an identical pattern with *Corydoras delphax* Nijssen and Isbrucker 1983, also from Colombia (or other species with a "C. melanistrius" colour pattern). In the 1980 article, I suggested that *Brachyramphidius*, being scaleless, would benefit by deceiving predators into believing they are armoured 'Corydoras'. Armoured catfish constitute a difficult meal for a predator, whereas scaleless fishes are not so well protected. This is a type of defensive mimicry and comes into the realms of true mimicry — because the predator would

encounter the model (the "original") much more often than the mimic — if imported ratios are any indication.

Zoomimesis — a realistic alternative

If zoomimesis is considered as an alternative it may well be that *Brachyramphidius* wish to go unnoticed amongst *Corydoras*, 'blending in' for greater shoaling protection. Shoaling offers protection from predators because individuals are more easily picked out — but when a group scatters, the predator is left without a clear target on which to strike.

It would appear that *Brachyramphidius*, especially juveniles, "make a living" out of blending "into" other fishes. *Brachyramphidius marthae* Sands and Black 1985, as a juvenile, appears remarkably similar to *Otocinclus ventriosus* Cope 1872 and *Corydoras pygmaeus* Knaack 1966. All three fish share a lateral line body-stripe and, at the same size, are extremely difficult to separate (*Brachyramphidius marthae* grows to 4in, whereas *C. pygmaeus* is adult at 1in and *Otocinclus ventriosus* at 2½in). *Brachyramphidius* are free-swimming faster water fishes and, not so surprising, the pigmy catfish is one of the few *Corydoras* to swim in upper water levels.

A third species, *Brachyramphidius meeri* Sands and Black 1985, shares a similar lateral-line stripe with a widespread species, *Pimelodella cristata* Muller and Troschel 1848 and is imported alongside *Pimelodella lateristriga* Kappler 1885, which grows larger and is more slender than *Brachyramphidius*. Is this one more instance of zoomimesis?

FOOT NOTE

*A paratype is a specimen, other than the holotype (see below), which the "author" of a species had before him/her at the time the original description for a species was formulated. Such a specimen must be officially designated as a paratype at the time. A holotype is a single specimen selected by the author as the "type specimen" at the time of publication of the original description.

Mimesis in *Corydoras* and *Otocinclus* catfishes

It is *Corydoras* which appears to attract the most incidents of zoomimesis, both within the genus and with other catfish families. Two interesting examples of different family links can be found with the callichthyid, *Corydoras palustris* Jenyns 1842

Corydoras paleatus, the Pepper Catfish, is caught alongside *Otocinclus flexilis*. Is there a parasitic relationship between these two catfishes?

Right, below: *Otocinclus flexilis* — known to suck the body mucus of *Corydoras paleatus*.

and the loriciid *Otocinclus flexilis* Cope 1894. Both catfish share the famous peppered grey-black and pale blue-green colour pattern and are certainly sympatric. I returned to England with preserved specimens of both species, collected in the same rivers and held in the Sao Paulo Zoology Museum (now deposited in the University of Amsterdam — Institute of taxonomic zoology). The sucker or disc-shaped mouth of the *Otocinclus* is used to remove and eat mucus off the body of *Corydoras* much to the irritation of the latter, which suggests parasitism. It is difficult to know if this behaviour occurs because of overstocking in aquaria, commercial transportation and holding. In nature both catfishes are almost equal in numbers and probably form large combined and individual species shoals.

Corydoras nattereri Steindachner 1877 and *Otocinclus affinis* Steindachner 1877, share an identical colour pattern, a pencil-thin blue lateral stripe across a blue grey body. These two species, identical in aquaria at first glance, are confirmed as sympatric in Southern Brazilian rivers. This sharing of colour pattern between the genus *Corydoras* and *Otocinclus* occurs in other species and remains un-investigated. It is difficult to ascertain whether this relationship is zoomimic — is it that *Corydoras* are wanting to lose themselves among *Otocinclus* — or vice versa — or does it hide a true parasitic relationship between the two families? If this is so, it is certainly something which requires research by aquarists and scientists.

Below, *Corydoras hastatus* lives in the Paraguay River alongside *Cheirodon kreiigi* — a tetra that shares the same black diamond shaped caudal peduncle pattern.



Mimesis between catfish and characins

Catfishes 'looking like' other catfishes may not seem remarkable to fishkeepers — but what about catfishes imitating characins? *Corydoras hastatus* is a midwater swimming species and, not surprisingly, has a typical characin colour pattern. The silver body

and black caudal peduncle diamond-shaped pattern is common among small tetras. It is interesting, that as this *Corydoras* evolved from a substrate existence to inhabit a midwater corridor it developed a midwater tetra pattern. Is it likely that the shoals of *Corydoras hastatus*, sometimes numbering thousands, join forces with *Cheirodon kreiigi* shoals and lose themselves in the darting masses? If so this is surely zoomimic. *Corydoras hastatus* is found in the Paraguay River, Paraguay, and in off-shoots of the Brazilian River Negro — both rivers are home to dwarf tetras with a silver body and caudal peduncle spot.



Mimesis between Corydoras species

The genus *Corydoras* has produced many 'so-called' mimics. Ichthyologists Nijssen and Isbrucker, the leading researchers on the taxonomy of *Corydoras*, described *Corydoras otapoquensis* from the Oyapok River, French Guiana in 1972, and then discovered a mimetic species hidden among the preserved and subsequently collected material and described them as *Corydoras condiscipulus* Nijssen and Isbrucker 1980. In Colombia, *Corydoras metae* Eigenmann 1914, lives side by side with a mimetic species *Corydoras simulatus* Weitzman and Nijssen 1970. Even the similar *Corydoras melini* Lonnberg and Rendahl 1930, is closely linked with a species — so far undescribed — which also shares the same colour pattern, suggesting yet another clear case of mimesis. A high incidence of mimesis, or colour pattern sharing, is found between long-headed (or snouted) and round-headed species. In most cases the two species are



Above, *Cheirodon kreiigi*, the 'hastatus' tetra, happily shoals with the catfish in aquaria.

MIMICRY AND ZOOMIMESIS COMPARED

Mimicry:

The most frequently encountered type of mimicry is known as Batesian Mimicry after the discoverer, English naturalist Henry Bates. This type of mimicry is defined as that in which a harmless species is protected from predators by means of its resemblance to a harmful or inedible species.

The success of this mimicry is based on the idea that the mimic is found in lesser numbers than the model so that the predator would encounter the model (with its accompanying painful or distasteful experience) more frequently.

Other types of mimicry occur which do not quite fit into this definition. A good example of one alternative type would be the deadly venomous coral snakes. These mimic or, are themselves the object of mimicry, by harmless snakes and it is difficult to understand how a predator could learn from the 'nasty experience' when it would have killed them. This example is known as Mertensian Mimicry and may involve 'inherited experience' or could arise out of the venomous snake 'wishing' to appear harmless so that it does not have to waste its venom on animals that disturb it, yet cannot serve as food.

A third type of mimicry is Muellierian Mimicry which applies to overall similarity of several species (usually exemplified by similar warning colours, such as yellow/black in wasps, some hornets, bees, etc) which are harmful in some way (eg distasteful or poisonous).

Zoomimesis:

I think that this should probably be described as Wicklerian Mimicry in that the discoverer offers an explanation for the 'unobvious' forms of mimicry which seem to abound in the animal world. In this case a species is protected from predators simply by resembling a similar species and, therefore, becoming 'lost' in the majority.

sympatric. Is it that the same environment requires a similar camouflage — or cryptic colour pattern — to enable the catfish to blend into its background? Whilst this is a possibility, many species have contrasting patterns despite sharing the same river system.

Mimesis and kinship

Another question has arisen since my original research — how close to each other are the species sharing the same colour patterns? Wickler, states that 'similarity in colour is no indication of kinship' and maybe that provides the interim answer — some species are not close — but simply share a pattern.



Corydoras adolfi (smaller fish) and *C. imitator* side by side. *C. imitator* was missed in the preserved material by the scientist describing *C. adolfi* as a new species — an obvious example of my theory of fish-zoomimesis.



Brachyramdia marthae is a new species although it was already well-known to catfish enthusiasts through imports over the past ten years. In its juvenile phase, the colour pattern is similar to that of *Corydoras pygmaeus*.



Corydoras pygmaeus lives alongside *Brachyramdia marthae* in Brazilian and Peruvian waters.

Although the taxonomic history or phylogenetic lines linking the long- and short-headed forms is not proven, it might be reasonable to suggest that one form is derived from the other. This could explain the high number of so-called mimics within the genus but does not explain completely mimesis of *Brachyramdia*, *Otocinclus* and *Cheirodon*.

The real answers are never simple to discover and for this reason, observations made by aquarists of fishes in their keep, will always be of interest to the scientist. The behaviour of catfish, or their ethology, is barely touched in current literature and this is an 'open subject' for fishkeepers. The fast-swimming *Brachyramdia* shares a

colour pattern with the more sedentary *Corydoras* or *Otocinclus*, but who knows why? The pimelodid can reach food quickly and can attack tablet food, bloodworm or shredded shrimp before *Corydoras* can detect and reach it. What is to be gained by blending into a different population?

The challenge to find the answer is out for all catfish enthusiasts.

Further Reading

Wolfgang Wickler — *Mimicry in animals and plants*, World University Library (1968).

David D. Sands — *Corydoras, or are they?* *Aquarist & Pondkeeper* (Nov. 1980).

David D. Sands — *Catfishes of the World*, Vol. 1 (1983) + Vol 3 (1984) Dunure Pub.

BUGS, BEASTIES AND BEWILDERMENT

In the second part of a two-part feature, John Couvelier outlines the commonsense approach to Koi health — PART II: TREATMENT

Before moving on to actual treatment methods used on Koi, the reader should understand that there are many methods and medicaments available, but to cover them all is quite beyond the scope of this article. Reference to some of the very excellent publications listed below is highly recommended.

Golden rules

There are a few golden rules to memorise before any treatment is carried out, particularly when 'hands on' treatment is involved. Never handle a fish with dry hands or for that matter, while wearing gloves, as damage to the protective mucus of the fish will result. When treating a fish which has been anaesthetised, the fish should be placed on a soaking wet, soft pile towel and the corner folded over so as to cover the head of the fish. All treatment tools (tweezers, scissors, spoons, etc.), must be kept perfectly clean and sterile. **NEVER** administer a treatment directly to the pool unless you know the exact gallonage it contains. (When the pool is first constructed or emptied for maintenance, beg, borrow, or hire a flowmeter which, when connected to the hosepipe for the filling operation, will register the quantity of water used in either gallons or cubic metres. N.B. 1 cubic metre of water = 220 imp. gallons).

Anchor worms and fish lice

The two most common parasites which attack Koi are Anchor Worm (*Lernaea*) and the Fish Louse (*Argulus*), both visible with



Above, the Fish Louse (*Argulus*). (Photo: Laurence Perkins).

the naked eye. As can be seen from the illustrations, they are both nasty looking 'beasties' when magnified. The Anchor Worm (which is actually a crustacean!) can grow to a length of almost half-an-inch including the "anchor", whilst the Fish Louse rarely exceeds a quarter of an inch, usually much smaller. Both these animals attach themselves to the fish and bore their way through the scales to reach a blood supply. The signs which indicate infestation are frantic scratching of the Koi against the sides of the pool, accompanied by wild leaps clear of the water. Neither of these parasites, in themselves, presents problems of a terminal nature, although the resultant sore spots can lead to secondary infections which, if untreated, can soon be fatal!

Treatments (including anaesthesia)

Anchor worms are best removed with a pair of tweezers while the Koi is anaesthetised, so a few words on this subject had better be digested. There are about three brands of anaesthetic on the market, but the one I have always used is BENZOCAINE, a white powder available from the larger Koi dealers or with the help of your friendly vet. As this material will not dissolve in water, it is necessary to mix it first with a little acetone available from any chemist. One heaped teaspoonful in about one fluid ounce of acetone is just about the right amount to use in a baby bath. Use just sufficient water to cover the fish, pour in the mixture, ensuring it disperses, and carefully introduce your fish. After a short time (depending upon the size and condition of the fish), it will roll over on to its side. Place the hands under the fish and gently lift it out on to your prepared wet towel which should be on a flat surface at a suitable working height. If there is any tendency for the fish to struggle, the sedation is not sufficiently deep and the fish should be returned for a few more seconds



Top, anterior end of the Anchor Worm showing 'anchor' attachment to host fish. Above, posterior end showing ripe eggs in egg sacs. (Photos: Jerzy Gawor).

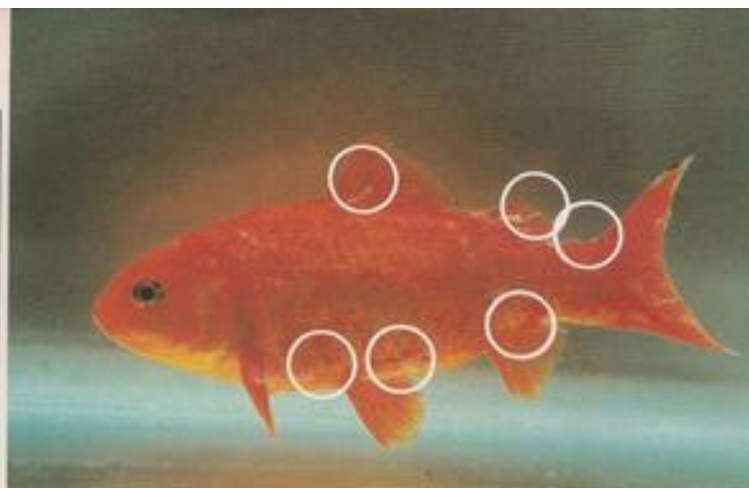
to the baby bath, but take care not to overdo it. If at all unsure of your capabilities, join forces with a fellow Koi-keeper with experience (another reason for joining your local society). After completion of treatment, the fish should be gently lifted out of the bath and returned to the pool where it is held suspended in the hands while being gently moved back and forth to generate a flow of water through the gills. After a few minutes the fish should revive and can be released to swim away. Don't just dump your fish back into the pool, as this is both cruel and dangerous!

My own method of treating Anchor Worm is to dab the spot with neat iodine which kills the 'worm' instantly and allows easy removal, at the same time disinfecting the wound. A fine pencil brush is ideal for this task. (The 'worm' can be seen as a fine white hairlike 'tail' sticking out of a small 'hump' or spot on the body or fin of the fish.)

The Fish Louse requires a different approach with the use of an anaesthetic not being required. The best method is to use a short-term immersion in a known quantity of water containing a suitable treatment medicament. In this instance, the material is a well-known garden pesticide obtainable from any garden centre under the name DIPTEREX 80 and is marketed by the Bayer Co. **Have a care when using this as it is easily absorbed through human tissue and can attack the nervous system!** The recommended dose for a short-term bath is, 6 grammes of powder per pint of water, the fish being immersed for about

RECOMMENDED READING

- **KOI FOR HOME & GARDEN**
by Glenn Y. Takeshita
Published, T.F.H. Publications.
- **PARASITES OF FRESH WATER FISHES**
by Dr. G. Hoffman, Dr. F. Meyer
Published, T.F.H. Publications.
- **FISH PATHOLOGY**
by Reichenbach-Klinke
Published, T.F.H. Publications.
- **MANUAL TO NISHIKIGOI**
by Takeo Kuroki
Published in Japan,
obtainable from most Koi Dealers.
- **TEXTBOOK OF FISH DISEASES**
by Erwin Amlacher
Published, T.F.H. Publications.
- **DISEASES OF FISHES**
by C. van Duijn Jnr.
Published, Butterworth Co.



Top, after treatment, the fish is gently held in the water until it recovers from sedation. The bluish/green patch shows the extent of the area treated with malachite green. (Photo: John Cuvellier). Above, Goldfish with Anchor Worm — typical advanced state.

five minutes only. This treatment must **NOT** be used on Gold or Silver Orfe as twisted spines can result. This effect can also occur if Koi are overdosed. Following this treatment, the lice will be seen swimming around on the surface of the treatment tank before sinking to the bottom, dead. Any sore spots observed on the fish may be dabbed with neat T.C.P. and the fish returned to the pool. A recurrence of the problem is more than likely as the eggs of both types of parasite are unaffected by these treatments. Prevention is better than cure, so ensure your fish are free of parasites **BEFORE** introducing them to your pool!

Bacterial and viral diseases are really beyond the scope of any but the most dedicated and knowledgeable of Koi-keepers, the major problem being that of diagnosis. Take my tip and seek professional help **QUICKLY**, should you suspect something of this nature. In the meantime, see your bank manager and obtain sufficient funds to purchase some or all of the recommended books which contain a wealth of information over and above the 'heavy' scientific stuff!

If you would like to drop me a line on any of the points raised in this article, I'd be delighted to hear from you. Please contact me at 'Baitings', Pontrillas Road, Ewyas Harold, Hereford HR2 0EL. Tel: (0981) 240582.

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MARINE

SUPPLEMENT

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THE RIGHT WAY IS IMPORTANT WITH MARINES

Keeping marines successfully need not be that difficult, provided you take the time to do things properly. Dr Chris Andrews of London Zoo Aquarium points the way.

The marine side of the fishkeeping hobby has clearly been gaining in popularity over recent years. Reliable equipment and good quality stock are now available and I am convinced that marine fishkeeping will really take off in the UK over the next few years. A while ago I set up a new marine tank in my home, and I hope that my comments and observations will prove useful to readers who are contemplating venturing into this fascinating aspect of the aquarium hobby.

FIRST OF ALL — INFORMATION!

To begin with, however, I must emphasise that anyone unfamiliar with marine aquarium keeping must read through one or two books on the subject.

'Marine Tropical Aquarium Guide' by F de Graaf (TFH).

'Marine Aquarium in Theory and Practice' by C W Emmens (TFH).

'Marine Aquarium Handbook' by M Moe (Noems Publishing Co).

'Marine Aquarists Manual' by H A Baensch (Tetra).

Furthermore, anyone a little confused by the complexities of marine water chemistry should have a look at 'Seawater Manual' published by Aquarium Systems, and available from most marine outlets.

Having read a little about the marine hobby, the next stage is to tour around the local aquarium shops, inspecting their marine stock and having a brief chat with the staff. Do choose a good shop (not necessarily the cheapest!), where the fish are in good health and feeding and where the staff



Above: Lionfish are venomous predators which should only be housed with similarly sized fish.

(Photograph: Dr Chris Andrews).

Left below: Hobbyists are now breeding marines, such as these Clownfish, quite regularly.

(Photograph: Dr Chris Andrews).

are interested in the marine hobby. Do not be afraid to ask to see the fish feed! It is also a good idea to purchase only stock which has been quarantined — either by the importer/wholesaler or by the retailer. Be very wary of stock which has "just flown in today".

Having found a local shop to your liking, it is time to discuss your ideas and requirements with them in a little more detail. Try to choose a quiet weekday for this type of visit though, rather than a busy Saturday afternoon. Remember, the shop owner has to make a living too! A good shop should be able to offer useful, practical advice and perhaps even put you in touch with one or two other local marine enthusiasts.

Having ironed out any theoretical problems, it is then time to get down to the business of buying and setting up the tank.

MY TANK

Having heard a lot about the Hockney tanks (and being very impressed with what I saw), I eventually decided upon a 39 x 15 x 22 (high) inch Hockney tank with reverse flow undergravel power filtration. The internal heater/aeration/filter unit was positioned at the end of the tank which would be against the wall, giving the tank a pleasant, roomy, 'see-through' look. The undergravel filter was powered by two internal power filters, and the Hockney system incorporates a useful nylon wool pre-filter to ensure optimal long-term filtration. The importance of regularly cleaning the pre-filter will be mentioned later.

REVERSE FLOW

Reverse flow undergravel filtration has several benefits over 'ordinary' U/G filtration, the most notable of which is that because the water flows up through the filter bed, debris accumulates on the surface — to be easily removed in the pre-filter upon gently agitating the filter bed with a stick. In this fashion the filter bed does not clog with debris so easily allowing stable filtration over long periods.

The remainder of the equipment is shown in the Table. A Hoffman 3040 pump was chosen to provide quiet but vigorous aeration. Vigorous aeration is vital in a marine tank, not only for the fish and invertebrates, but also for the helpful bacteria in the filter bed. Weight-for-weight the bacteria in the filter (which are responsible for converting ammonia to nitrite and then nitrate) need many more times the amount of oxygen required by fish or invertebrates. Hence a poorly aerated tank will have an inefficient U/G filter and unstable water quality. The need for vigorous aeration in a marine tank is further emphasised by the fact that salt water actually holds much less oxygen than the same volume of freshwater.

FILTER BED

In a marine tank relying on U/G filtration, it is generally agreed that you need about 20lb of filter substrate per square foot of tank floor. This substrate usually consists of equal amounts of well-washed cockleshell

(to buffer the pH) and unwashed (or lightly washed) coral sand (to act as main biological filter). The bottom cockleshell layer is kept separate from the top coral sand layer by using a 'Gravel Tidy', and this separation is important for efficient filtration.

With the filter bed and rocks and pieces of dead but washed coral in place, and the electrical equipment all connected up but not turned on, the tank was filled up with cold tap water, adding and dissolving the required amount of a good quality marine salt mix. With the tank about three-quarters full, the water was brought to the correct temperature (25°C) with some boiling water from a kettle. Once the tank was nearly full, and the salt was fully dissolved, the specific gravity was checked with the hydrometer and adjusted to fall within the range 1.000-1.022 (at 25°C).

If the SG is too high, it can be reduced by adding fresh water; if it is too low, it can be increased by adding more salt. Some marine fish require a higher SG reading than quoted above (1.025 or even higher), but for most of the commonly kept fish and invertebrates, a slightly lower value is best.

I left my tank running (lights, filter, air pump, heater, etc.) for 24 hours and then the temperature, specific gravity and pH were all re-checked. A pH between 8.1-8.3 is ideal for marine organisms. Now it was time to start to mature the system, ready to introduce some fish.

CONDITIONING PERIOD

Water quality in my tank would rely heavily on a rich bacterial flora in the filter bed converting uneaten food, fish waste, etc., from ammonia into nitrite and eventually nitrate, the latter of which is less toxic to fish than the former two. For this reason

the filters and air pump would have to be left running for 24 hours a day, and the tank nitrite levels regularly measured using a reliable test kit.

However, a new tank is relatively 'sterile' and it takes time for the bacterial flora to develop. There are various ways to encourage this — I chose to use Seamature. Following the instructions, a few drops of the maturation fluid were regularly added to the tank and the development of the bacteria in the filter monitored by using the nitrite test kit. After a week of adding Seamature, the nitrite content peaked at 10mg/l (nitrite-nitrogen), and then quickly fell to 0.05mg/l — indicating that the filter was now properly seeded and functioning.

Having seen my tank through the crucial three or four-week conditioning period, with regular checks on water quality and tank equipment, the time had actually come to add some fish!

STOCKING WITH FISH

There is a time-honoured rule-of-thumb which says that a new marine tank can hold "one inch of fish for each four gallons of water", but that this can be increased to "two inches of fish for each four gallons of water" after 6-12 months.

I estimated that my marine tank (after allowing for rocks, sand, etc.) contained about 30 gallons (135 litres) of water. Therefore, for the first six months or so I would be limited to about 7 or 8 'inches of fish' (excluding tail fins), but this could be increased to around 15 'inches of fish' in the fullness of time.

Therefore, I purchased three one-inch Green Chromis (*Chromis coelestis*) and introduced them to the tank after floating the bag for a few minutes and carefully mixing in some of the tank water. These fish rapidly settled down and began feeding on flaked food.

A week later (after having checked the pH and nitrite levels), I introduced the following:

- One medium sized *Radianthus* anemone;
- One two-inch Clown Fish (*Amphiprion xanthurus*);
- One one-inch Blue Damsel (*Abudefduf aximilis*);
- One Cleaner Shrimp (*Lysmata*);
- One small hermit crab.

All the fish and invertebrates so far introduced were relatively hardy, but a close watch was still kept on water quality (especially pH and nitrite levels) to ensure that conditions in the tank were relatively stable. It is vital not to introduce all the fish and invertebrates into a new tank (even if it has been conditioned) in one go. This can suddenly overload the filter system and bring about unnecessary losses. Furthermore, if there is some other, as yet undetected, problem with the tank, it is better (though not pleasant) to lose one or two inexpensive fish, than a whole tank full of stock!

All of the stock were soon feeding well; the fish on flaked and freeze-dried foods with the crab, anemone and shrimp taking

EQUIPMENT FOR MY MARINE TANK

- 39 x 15 x 22 inch Hockney aquarium with reverse flow undergravel power filtration
- Two internal filters
- One Hoffman 3040 air pump
- One 200 watt heater-thermostat
- Two 30 watt white light fluorescent tubes plus starter units
- 40lb cockleshell
- 40lb coral sand
- Gravel tidy
- Coral, rocks for decor
- 60 gallon Instant Ocean salt mix
- Air-line, valves, air stones
- Cable tidy
- Thermometer
- Hydrometer
- Seamature seawater maturation fluid
- Nitrite Test Kit
- High Range pH Kit
- Two hand nets
- Siphon tube/gravel washer
- Bucket

freeze-dried tablet food and gamma-irradiated frozen lance fish.

Over the following 6-8 weeks (ie 2-3 months after first setting up the tank), the following fish and invertebrates were added:

- A second cleaner shrimp;
- One medium sized green carpet anemone (*Discosoma*);
- One medium sized clam;
- Two feather duster worms;
- One *Cordylactis* anemone;
- One two-inch Cleaner Wrasse (*Labroides*);
- One one-inch Yellow Goby (*Gobiosoma citrinus*);
- One two-inch Red-tailed Blenny (*Ecania bicolor*);
- One two-inch Regal Tang (*Paracanthurus hepatus*).

This brought my fish stocking level up to about thirteen inches of fish, which was little in excess of what might be considered as the safe recommended stocking level — at least for the first six months or so. However, the fish were added one or two at a time over a several-week period, and a close watch kept on their behaviour in the tank and water quality (especially nitrite content). The fish all settled down well and were soon feeding.

No disease problems were evident, even though I did not quarantine the fish before introduction into my tank. However, I did only purchase stock which had already been quarantined — either at the wholesalers or the retailers. This, I feel, is very important if the problems associated with recently imported, un-quarantined, stock are to be avoided.

Before the fish were released into their new home, they were floated in their polythene bag in the tank for about 10-15 minutes. Then a little tank water was mixed with the water in the bag and the fish carefully released. To allow new fish to settle in, it is a good idea to turn the tank lights off for a few hours, and even rearrange the tank decor if very territorial fish are present.

INVERTEBRATES

With the exception of the *Radianthus* anemone, which insisted upon patrolling around the tank, all the other invertebrates settled in very well. In fact, the "rogue *Radianthus*" eventually found a spot to its liking — in one of the top corners of the tank!

The anemones have appeared to thrive on a diet of gamma-irradiated frozen lance fish and freeze-dried tablet food. Once every 3 or 4 days, a piece of the food is placed into each anemone and it is quickly consumed. Food morsels can be dropped into the tank and the Clown Fish will feed the anemone which is currently receiving its favours.

The filter feeders such as the feather duster worms and the clam were fed on marine invertebrate food for filter feeders and crushed freeze-dried tablet food (the latter being administered in a little salt water via an eye dropper). Once or twice a week seems to be sufficient for these invertebrates.



The 100 gallon fish — invertebrate tank at London Zoo. This overall effect has been achieved by the constant attention and vigilance of the aquarium keepers. (Photograph: London Zoo Aquarium).

PUTTING THE WRONGS TO RIGHT

- | | |
|---|---|
| Falling pH value (to below 8.0) — increase partial water changes; add a buffer solution available at pet shops. | partial water changes; decrease feeding; check for dead animals behind rocks. |
| Increasing nitrite value (above 0.1mg/l, and rising) — check filter efficiency; check aeration; increase | High specific gravity value — add freshwater. |
| | Low specific gravity value — add more marine salts. |

Seavita (a dietary vitamin supplement available from pet shops) is added to the frozen *Mysis*, lance fish and the tablet food from time to time. Naturally, overfeeding of the fish or invertebrates must be avoided. However, the cleaner shrimps and the hermit crab are excellent tank scavengers. They are rarely fed themselves, but appear to thrive on leftover food morsels, etc.

ALGAE

Within a few weeks of first setting up the tank, brown algae appeared, flourished and subsided — to be replaced by a sudden and quite heavy growth of green algae. However, this, too, soon faded, even with the addition of 'Seagreen', an algal fertiliser. At this time, the clam and one or two of the anemones were also looking a little jaded, and hence I suspected that lighting might be at fault. I had two 30-watt white fluorescent tubes which I had been leaving on for about 12 hours per day. Therefore, I installed a 20-watt 'True-lite' tube, and this was left on for about 8 hours per day (with the original two 30-watt tubes still being left on for 12 hours per day). Algal growth in the tank improved a little, but a marked beneficial effect was noted on the anemones and the clam — particularly their coloration.

PROBLEMS

Just like any other new tank, mine did not become established without one or two problems.

Even with plenty of hiding places in the tank the three Green Chromis eventually dwindled to one — which I put down to squabbling amongst themselves, with the dominant fish surviving.

Many damselfish are best kept singly or in groups of 5-10 individuals, thus avoiding the worst effects of their aggressive behaviour when only 2 or 3 are kept.

I also dabbled at keeping one or two pieces of coral such as Brain Coral and Polyp Coral. Although I had moderate success over several months, their long-term survival does seem to depend on plenty of light, water movement, regular partial water changes, and careful, direct feeding with suitable fine foods (eg crushed tablet food, invertebrate food for filter feeders).

ROUTINE MAINTENANCE

The correct care of any fish (pond, freshwater or marine) depends on sensible and regular routine maintenance. On a daily basis I fed my fish about twice, and checked that the temperature was correct, that the filters and airpump were working and turned the lights on and off. At feeding time it is important to spend just a few moments observing the fish: are they all visible and feeding? do any seem out of sorts? By getting to know the stock you will quickly spot when something is wrong.

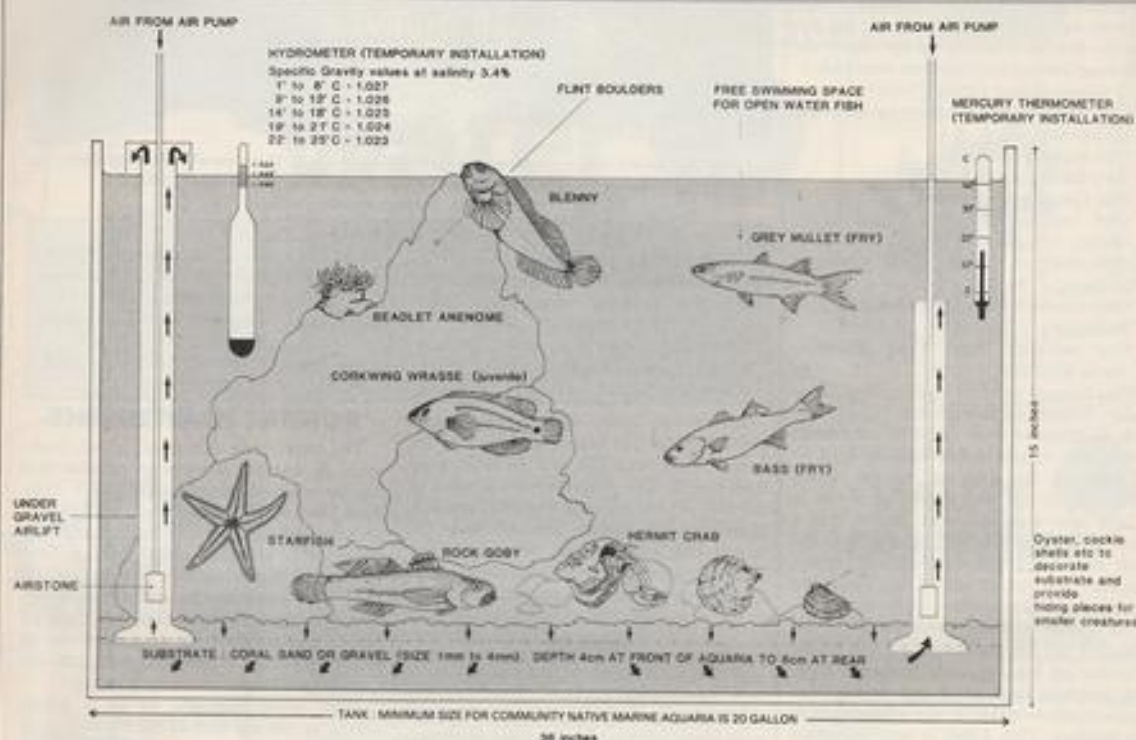
Once every fortnight or so I gently stirred up the top inch of the exposed coral sand and let the power filters draw the debris into the pre-filter nylon wool. This nylon wool was then exchanged for fresh and any remaining debris on the tank floor siphoned out (along with 10-20% of the tank water) using an efficient siphon/gravel washer.

By the way, regular replacement of the nylon wool (and occasional attention to the foam or wool inserts of the power filter) is vital for efficient, long-term filtration.

Before topping the tank up with fresh salt water, the aquarium pH, nitrite content and specific gravity were noted. Regular monitoring of water quality will detect any deleterious changes before they can have any serious effect — and let you take prompt remedial action (see Table).

With the water level reduced in the tank, now is a good time to remove any pieces of rock or coral for cleaning under a running tap. Then the tank should be topped up with conditioned tap water (brought to the correct temperature with a little boiling water), to which has been added and dissolved the required amount of marine salt to achieve a final tank specific gravity of 1.020-1.022 (at 25°C). The importance of regular partial water changes (no more than 20% every 2-4 weeks) is paramount in successful marine fishkeeping.

With a good, sound aquarium set-up, tank maintenance can be kept to a minimum, with no ill-effects — even on marine fish and invertebrates. The diversity of life forms which can be kept in a marine tank make it an interesting and attractive show piece — and keeping marines need not be that difficult!



NATIVE MARINE AQUARIA

British intertidal life has a great deal to offer the marine aquarist wishing to take up the challenge. Andy Horton, who has been involved in the natural history of our shores all his life has successfully kept much of our native marine fauna in aquaria, shows how this can be achieved and presents a list of 20 of the most interesting species.

Beneath the murky waters around the British Isles lies an astonishing and varied range of wildlife habitats and the patterns of life found in them are every bit as fascinating and educational as the exotic,

splendid creatures of warmer seas.

Unfortunately, native marine aquarium-keeping is beset with problems. So much so, that home aquariums of this sort are often regarded as impossible. Despite this, enthusiasts are likely to continue to try and

keep the fish, crustaceans, and other invertebrates collected from the British shoreline. This, of course, is not new. In Victorian times, native marine aquaria were extremely popular — so popular, that collection was denuding our coastline of some of our rarer and more attractive species. Alas, most of the aquaria flourished.

Nowadays, with modern filtration systems, it is quite possible to keep native marine aquaria. There is one major problem, however: TEMPERATURE — The water gets too hot in the summer and the fish die.

The maximum temperature of the English Channel is 17°C, although rock pool inhabitants are able to withstand great fluctuations of temperature, generally speaking. But if the temperature rises above 17°C for more than a day or two, the native marine aquarist is going to lose any fish that cannot survive this heat while the resultant pollution may finish off the remainder.

Basic considerations

The first consideration should be the siting of the aquarium. At present, cooling units are prohibitively expensive, so the best idea is to place the tank in the coolest part of the house. The aquarist will require a hydrometer, for measuring the specific gravity and calculating the salinity of the sea water, and a mercury thermometer calibrated from 0°C to 25°C. Undergravel filtration systems with air pumps are satis-



Top, Prawn, *Palaemon serratus*.

Centre, Bullhead, *Taurulus bubalis*. Note the barnacle encrusted rocks in the background. As native marine seaweeds are usually unsuitable, rocks form a major part of the decoration. Floor covered in coral sand with cockles and oyster shells.

factory but one should also ensure powerful agitation of the water surface.

The substrate can be either gravel or coral sand. Seawater can be collected off-shore; or a synthetic saltwater mix can be used. Decoration should consist mostly of rocks. These can be collected from the shore complete with attached barnacles, limpets and anemones. Seaweeds, however, will not survive, excepting the small red species known as Irish Moss or Carrageen, *Chondrus crispus*. Tanks should be as large as possible: the smallest being 2ft (60cm) x 1ft x 1ft.

Range of coastal sites

British waters combine Lusitanian species

from the south, abundant in Mediterranean waters and the Bay of Biscay, reaching their northern limit in the English Channel, but carried further up the west coast, together with the exiguous Arctic-Boreal fauna, chiefly in the north and east but extending south to overlap with the warmer water migrants. This presents a fascinating mixture of creatures, of which the more southerly species prove the easiest to keep during the hot summers.

By far the most interesting coastlines and collecting grounds are rocky, possibly with sandy patches intermingled — a mixed ground, isolated and away from the crowds. Cornwall and Pembrokeshire are richest, but any sheltered and rock-strewn beach is

Below, Anemones. Plumrose Anemone (White *Metridium senile*, with Beadlet Anemones (Red and green), the small fish is a Common Goby, *Pomatoschistus microps*, and the seaweed is Irish Moss, also known as Carrageen, *Chondrus crispus*. Photo: Andy Horton.



worth a close inspection. Shingle beaches are barren; the rolling stones do not provide suitable niches for the majority of marine organisms. Sandy areas are often rich in burrowing worms and cockles. Where hard rocks have resisted centuries of wave action, creating rock pools, gullies and hiding places for a wealth of various creatures (after the softer rocks have been eroded away) this provides the most fruitful and interesting environments.

Planning a trip

Be prepared! The dangers on the shore are not to be underestimated. It is easy to have an accident, so make absolutely sure your clothes and footwear are suitable for the task. Normally, an old pair of stout shoes is to be recommended, enabling a better grip than gumboots on slippery seaweed covered rocks.

It is advisable to plan the trip in advance and essential to check tide tables. Engrossed in observing the astonishing variety of creatures, it is easy to lose one's awareness of time. **Beware of the incoming tide!**

There is another reason to plan an outing in advance, since by arriving at low water when the ebbing tide has left the rock pools uncovered, one can find the most varied and exciting catches in pools nearest the sea.

Tide tables are usually available in newsagents or ships chandlers in seaside towns. They show the estimated heights of the tides throughout the year. When the tide is highest the water will also go out the furthest, and between five and six hours after the highest tides (add one hour for British summer time) is the best time to follow the receding waters and hunt under rocks before the creatures hide.

Conservation is vital

Like any natural habitat, the seashore is vulnerable to overexploitation by man. Therefore, never collect innumerable fish and invertebrates that you could not possibly keep in a home aquarium. It is pointless. An overcrowded tank will soon result in the demise of all the occupants. As a rough guide the amount of fish you can keep in a filtered coldwater marine tank should not exceed half the stocking levels of a tropical freshwater tank.

It is not only overcollecting, whether for food or the aquarium, that threatens the creatures of the shore. The presence of man disturbs the special environment in which colonies of wildlife co-exist, whether they are mobile and creep under cover when the tide ebbs, or sessile, perhaps fastened permanently to the underside of rocks. The latter would die or be eaten if the rock was left up the wrong way.

Therefore, it is essential for the preservation of the environment that all rocks should be returned in the same place and the same way in which they were found.

SELECTED NATIVE MARINE SPECIES

POPULAR NAME	SCIENTIFIC NAME	SIMILAR SPECIES	FOOD	NOTES:
COMMON STARFISH	<i>Asterias rubens</i>	Spiny Starfish <i>Marthasterias glacialis</i>	Live mussels & other shellfish	All coasts after storms. On mussel beds, under stones. Avoid predator on live shellfish. Keep insect small specimens only.
BLADDER ANEMONE	<i>Actinia equina</i>	Plumose Anemone <i>Metridium senhousii</i> <i>Dactyla Anemone</i> <i>Favosia felix</i>	Small crustaceans, plankton, Boiled mussel, sea fan, etc.	Attractive. Main decoration in tank. Fixed off rocks at mid tide level and below. All rocky coasts. Very common.
EDIBLE PRAWN	<i>Palaemon serratus</i>	<i>Palaemon elegans</i> <i>Palaemon longirostris</i> <i>Pandalus montagui</i>	Shellfish, Fish larvae, algae, Boiled mussel, raw fish, etc.	Netted in pools during summer. Rocky coasts. Abundant. Hardy, scavenger. Will get eaten by crabs and fish after moulting.
SHRIMP	<i>Chironomus salinarum</i>	Prawns	Worms, boiled mussel, raw fish, etc.	Push net in shallow water over sand. Abundant in winter. Quickly eaten by almost everything.
SHORE CRAB	<i>Carcinus maenas</i>	Swimming Crabs	Worms, shellfish, algae, Boiled mussel, etc.	Abundant & ubiquitous along all sheltered coasts. Very hardy, disruptive. Vulnerable after moulting.
VELVET SWIMMING CRAB (DEVIL'S CRAB)	<i>Licinia puber</i> (formerly <i>Macropus puber</i>)	<i>Licinia depressa</i>	Worms, shellfish, small fish, algae, Boiled mussel, etc.	Common on some rocky coasts. Disruptive. Efficient predator. Vulnerable after moulting.
EDIBLE CRAB	<i>Cancer pagurus</i>	—	Worms, shellfish, boiled mussel, etc.	Common under stones on lower shore on rock and sandy coasts. Not recommended. Extremely disruptive even when small. Vulnerable after moulting.
HERMIT CRAB	<i>Pagurus bernhardus</i>	—	Worms, shellfish, algae, Boiled mussel & wrack, etc.	Very common along all coasts, in doused shells of univoltine molluscs. Larger crabs in deeper water. Will fight over shells. Quarulous. Fascinating behaviour. Attacked by larger fish and crabs.
SEA SCORPION (BULLHEAD)	<i>Erophys bubala</i> (formerly <i>Taurulus bubala</i>)	Norway Bullhead <i>Erophys tilbergii</i> Bull Head <i>Myoxocephalus scorpius</i>	Prawns, small fish, worms, Boiled mussel, raw fish, etc.	Netted in intertidal pools (but <i>E. tilbergii</i> is mainly sub-littoral), rocky & weedy coasts. Most areas. Common. Extremely predatory, especially of small fish. Not hardy over 20°C. Full-grown fish require large tank.
BLenny (SHANNY)	<i>Lipostichus pholis</i> (formerly <i>Blennius pholis</i>)	Temple Blenny <i>Parablennius gattorugine</i> Butterfly Blenny <i>Blennius scottiae</i>	Crustaceans, worms, shellfish, algae, Boiled mussel, etc.	Hardy and amusing. Common under rocks, in pools & crevices, all sheltered coasts. Likes to bask out of the water in summer. Will breed.
ROCK GOBY	<i>Gobius paganellus</i>	Black Goby <i>Gobius niger</i>	Worms, shellfish, crustaceans, Boiled mussel, etc.	Rocky pools in south & west Britain. Common. Fiercely competitive & territorial. Will attack weaker creatures.
COMMON GOBY	<i>Pomatoschistus microps</i>	Sand Goby <i>Pomatoschistus minutus</i>	Small crustaceans, worms, Boiled mussel, etc.	Abundant shallow intertidal pools, estuaries, spring to autumn. Attacked by larger fish. Will breed in captivity.
BUTTERFISH	<i>Pholis gunnellus</i>	Leipout <i>Zoetes viviparus</i>	Crustaceans, worms, Boiled & raw shellfish	Common under stones on all rocky coasts. Not hardy over 15°C.
S-BEARDED ROCKLING	<i>Ciliata mustela</i>	Stone (S)-bearded Rockling <i>Gedgogasterus mediterraneus</i>	Worms, crustaceans, Boiled mussel, etc.	Common in pools and under rocks, sheltered coasts. Mostly inepitaxial & nocturnal activity.
CORKING WRASS (JUVENILE)	<i>Crenilabrus melops</i>	Rock Wrasse (Rock Cook) <i>Crenilabrus exilatus</i>	Crustaceans, Boiled mussel, Barnacles & brine shrimp for small fish	Attractive. Fiercely territorial. Full-grown fish will require large aquarium.
SEA STICKLEBACK (TE-SPIRED)	<i>Stenichthys spinichthys</i>	2-spined Stickleback (Marine) <i>Gasterosteus aculeatus</i>	Small crustaceans, plankton in very large quantities. Only live food	Requires frequent and large amounts of live food. Very difficult to keep fed for over 2 weeks. Notorious for nigger. Not hardy over 20°C.
GREY MULLET (FRY)	<i>Chelon labrosus</i>	Thin-lipped Grey Mullet <i>Liza ramada</i>	Small crustaceans, algae, worms, Boiled mussel, etc.	Netted when young in shallow waters. Slow grower in captivity and easy to keep. Sleeps on bottom at night, therefore, not too many anemones.
BASS (FRY)	<i>Dicentrarchus labrax</i>	—	Crustaceans, worms, small fish, Boiled mussel, small prawns, etc.	Quickly, in a year or two, grows too large for the average tank, and becomes ferociously predatory.
FLOUNDER (GREENIE)	<i>Platichthys flesus</i>	Oak <i>Littoridin littoridis</i> Plaice <i>Pleuronectes platessa</i>	Shrimps, worms	Not particularly exciting fish to keep.

Equipment & transportation

Problems rarely occur in the transfer home of specimens. Rock pool fish and invertebrates are remarkably hardy, and those found in rock pools usually survive a short journey in a bucket of seawater. For longer trips a battery operated aerator should be used. These can be purchased from good aquarium supply shops.

Collecting equipment need only be basic. Wet hands and a bucket are as effective as a net. Do not pick up a small fish with your fingers, though. This is likely to damage it. Cup your hands and tease the fish into a small aquarium net. This is best for the small sandy-coloured Gobies that dart across the shallow sandy pools quicker than the eye can follow. Deeper pools require a larger net with a long handle.

Feeding

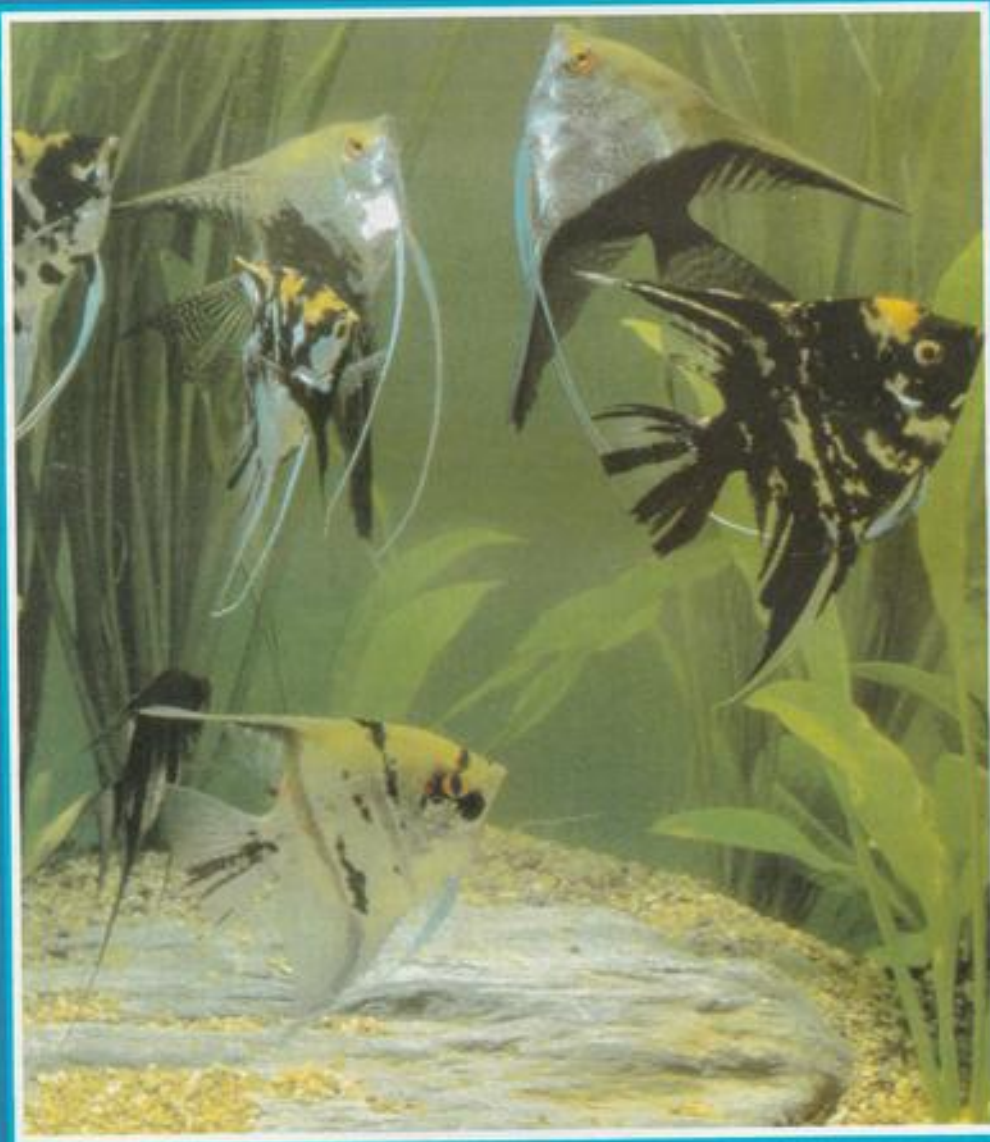
Feeding provides few difficulties. Boiled mussel is a staple, and most will take raw white fish. A few have specialist needs: Pipefish, Dragonet and Sea Sticklebacks will only take live foods. A great problem with some native marines is incompatibility with the result that there can be predation between species.

It is not my intention to classify and identify all the creatures of the shoreline. There are plenty of excellent books available from retailers and the public library that do this admirably. Rather, I have selected 20 common species and given some practical tips which I hope will prove helpful in successfully establishing a mixed native marine aquarium.

NOTES

- Water conditions**
Specific gravity at 15°C should read 1.025. This should be regularly checked and tap water added to replace losses due to evaporation. Filtration should be continuous.
Ideally, partial (25%) water changes should take place once a month during summer. If these changes take place there is no need to worry about the pH, and nitrite/nitrate levels.
- In this article, it has only been possible to cover general aspects of this branch of fishkeeping but I would be happy to answer any inquiries, or exchange information, if a return stamp is provided. Contact me either through *A & P*, or at 14 Corbyn Crescent, Shoreham-by-Sea, Sussex.
- Further reading: *Sea Water Aquaria* by L. A. Jackman (from Public Libraries). *Are You Afraid of Marines?* by Gordon Kay & Dave Garratt (*A & P*, April, 1986, p59). *Are You Still Afraid of Marines?* by Gordon Kay & Dave Garratt (*A & P*, August, 1986, p55).

BETTER FISHKEEPING



PUBLISHED BY

The 'Aquarian' Advisory Service



A Message from the Marketing Manager of 'Aquarian', Mr Ron Hillcoat

Dear Aquarist

When we launched the 'Aquarian' range of Flaked Fish Foods and Remedies in the UK in 1976, it was difficult to foresee the impact which they would have upon the fishkeeping hobby.

We knew of course, that our many years of research and development had enabled us to manufacture a very special range of products under the 'Aquarian' name.

Since its launch, 'Aquarian' has had the support and recommendation of the UK's top aquarists. These highly respected hobbyists were quick to realise the benefits to their fish of feeding a flake which was a complete balanced diet. The hermetically sealed containers were seen as convenient dispensers and more importantly ensured that the flakes were as fresh as possible when the aquarist opened them.

Today, 'Aquarian' is the undisputed market leader in the UK as well as being exported to over 50 countries. This position is one which we are naturally proud of and which has been achieved with the help of aquarists who have supported the brand by consistently using it over the past ten years.

We have tried to ensure that we, as manufacturers, put something back into the hobby as a thank you for the support which we have received. The 'Aquarian' Advisory Service has answered many thousands of enquiries and helped both established fish keepers and beginners to gain more enjoyment and satisfaction from this fascinating hobby.

In recent years we have held major aquatic exhibitions at Kempton and Sandown Park Racecourses as well as supporting the Aquarium Week at London Zoo. There are of course many other activities including support for the numerous hard working aquatic societies throughout the country. We are dedicated to helping aquarists and encouraging new people into the hobby.

This booklet has been written by the 'Aquarian' Advisory Service and contains many useful hints and tips for better fishkeeping. It features an article on showing fish by Adrian Blake past chairman of the Association of Aquarists. The A.A.S. represents a great many aquarist societies and has given valuable support to 'Aquarian' at exhibitions throughout the country.

I hope you find this publication useful and that you continue to enjoy the intriguing hobby of fishkeeping.

Yours sincerely,

Ronald C. Hillcoat
Marketing Manager

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CORRECT FEEDING

Fish Nutrition

Tracing the evolution of the higher animals back through time reveals that we evolved from the fishes. Hence our nutritional requirements are similar — certain proteins and oils are essential and particular vitamins and minerals are equally needed. This is why fish is a good food for us to eat. It is no coincidence that the longest lived humans are the greatest fish eaters (the Japanese).

The amount of food needed is different, however. Humans are hot-blooded (98°F or 37°C) whereas fish are cold-blooded i.e. are equal in temperature to their surrounding water (around 75°F or 24°C for Tropics). The fact that we are so much hotter than our surroundings means that much of our food has to be used in generating heat — up to 80% in fact. Fish do not need this life mechanism at all. Secondly, we are fighting gravity; to climb the smallest slope means burning-up lots of food-energy. Fish are supported by the water and float up and down with obvious ease and little or no energy expenditure.

Where a commercial food is used, the traditional method of preservation is by drying (or freeze drying) to remove the water. Many humans or pet diets contain up to 90% water but the dried fish foods have only 4% water. This does not matter nutritionally since fish live in water, but it does have the advantage of giving the food a long shelf life. It is bacteria and moulds that degrade foods, but such micro-organisms cannot grow where the moisture level is 4% or lower. The % edible material other than water is therefore only 10% in "wet" foods but up to 96% in flakes. This is why just one flake is so nutritious even though it looks so small a quantity for a pet fish.

Another interesting difference between our nutrition and fish, is that although the vitamins they require are exactly the same range as ours, they need much greater amounts. This probably reflects the greater sophistication of human digestion, where trace amounts can be used efficiently. One vitamin we have in common is Ascorbic Acid or Vitamin C. The latest research shows the vitamin is essential in quite large doses to avoid certain diseases in fish — and equally essential in man to avoid scurvy and possibly the common cold. (A dog does not need any Vitamin C in its diet because it can manufacture its own supply).

One of the greatest differences in requirements between humans, dogs, cats and pet fish is fat. That difference in body temperature is the reason. Surplus food is stored as fat in warm-blooded animals, where the substance is soft and fluid at 98°F or 37°C. In cold-blooded fishes, that fat would set like candle wax. Hence fish store their "fat" as an oil, either in internal organs or in the flesh. (Good examples are Cod Liver Oil or the flesh of Sardines).

This also means that white fat is quite unsuitable for fish. If you want to feed scraps such as beef steak, heart, liver, etc, make sure all the fat is removed. Fish fed on a white fat diet still attempt to store the fat,

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just like oils, but it gathers in hard globules in the gut and can actually block the digestive tract killing the fish.

The Protein Story

It is often claimed that a fish food is only as good as its protein content. Many advertisements for various commercial fish foods declare protein levels in headline values. Certainly protein is essential, but if low in value the fish will just grow at a slower rate. If too high, the water gets polluted, which is much more dangerous to the fish. The reason is that proteins are all built from Nitrogen compounds. If extra protein is present, the fish digests it and uses it as an energy source, breaking the protein down to its simplest Nitrogen-containing molecule, ammonia. If a balanced diet is fed, all the protein is used for growth and repair with energy coming from the carbohydrate content of the food. Carbohydrates break down to carbon dioxide and water.

These breakdown products are excreted by the fish, obviously carbon dioxide and water does not pollute the tank, but ammonia, and its derivative nitrite, do pollute the tank. What is the ideal level of protein? Research has shown 30 to 35% protein is best for adult pet fish and 35 to 40% for growing fish.

Fish farmers want rapid growth and firm flesh in their edible fish, hence they feed high protein pellets. The farms have ponds with flowing water to continuously flush the

they cannot be synthesised by the fish and must be present in the diet. Two important ones for pet fish are lysine and methionine. If these are absent, or even low, the protein levels could be 99%, but a growing fish will become a runt or even die, no matter how much it is fed. Here again is an advantage of commercial flake over scrap or home-made diets, such essential elements are monitored and supplemented as necessary.

Nutrition is a complicated subject to study in humans, but even more so in pets who cannot (or will not) collaborate in experiments. Another factor is that basic human nutrition is the same whether the subject is a European, African or Asian. Similarly a pet dog requires the same food materials whether it is a Great Dane or a Chihuahua, and a pet cat needs the same carnivorous diet be it a common tabby or a Champion Siamese. Fish, however, come in 20,000 different species each with its own feeding requirements. These range from the algae-eating Plecostomus to the flesh-eating Piranha, from the coral-crushing Trigger to the insect-shooting Archerfish.

Despite the complications the frontiers of knowledge in fish nutrition are widening daily. The advent of fish farming, particularly Catfish in the U.S.A., Trout and Salmon in Europe and Tilapia in the Tropics, has generated a great deal of basic research on the subject. In the field of pet fish, research is continuing in a few laboratories around the world including 'Aquarian' in Great Britain.



ammonia and nitrites away. This is why commercial foods such as Trout Pellets have protein values of 50, 60 or even 70% and why they are unsuitable for the home aquarium (or even small ponds). Many aquarists do use them for big fish, the 'Aquarian' Advisory Service postbag is full of letters from Oscar owners saying they are fed up with daily water changes — but only mention in passing that the main diet is Trout Food.

Just to complicate matters further, the quality and digestibility of the protein is equally important. Protein is built up from component molecules called amino acids. Some amino acids are essential — that is

The Hobbyist Questions

There are three questions that aquarists ask about feeding their fish — how much, how often and is variety essential?

Taking the last question first. Variety is no longer essential. The years of research have produced a range of commercial diets for pet fish that are nutritionally complete. The most popular form of these diets is the flake food, so convenient for storage, handling and feeding to top, middle and bottom feeders. Flake is available, designed to meet the specific requirements of Carnivores (such as Cichlids), Herbivores (Vegetable diet for Mollies for example), Growth (for

fry), even individual species such as Guppy flake food.

Aquarists who have kept fish for many years remember the old days when dried biscuit meal and similar cheap foods were all that was available. These hobbyists will recall their past experiences to justify claims that commercial diets are satisfactory for routine feeding, but live food and homemade concoctions are essential for breeding and growing. This is no longer true. The top quality flakes are now very palatable and nutritionally complete. Of course, "cheap" flakes and other forms of dried food may lack essential elements and these still need supplementation.

Laboratory trials, over many years, have shown that 'Aquarian' flake can be fed as an exclusive diet, producing, large, healthy, long-lived tropical, cold-water and marine aquarium fish.

How often? This depends on the type of fish. Carnivores eat one big meal and lie around digesting it for hours, whereas herbivores nibble all day long. If you own a community tank with mixed species, a compromise is to feed twice a day — morning and evening according to your own busy schedule. If you breed any of the fish, the fry will need several small feeds daily so they can feed almost continuously but without excess food polluting the water. It is simple to check that enough fry foods are being fed, just examine the bellies of fry via a magnifying glass and keep them fat and full, but do not allow the water to go cloudy (do rapid, partial water changes if it does).

It is often advocated that a day's "rest" is advantageous, e.g. do not feed on Sundays.



This is to copy nature's erratic food supply when fish feed during periods of plenty and build reserves to bide them over periods of scarcity. However, over many years the 'Aquarian' laboratory fish have been fed 6 days a week and "home" fish every day of the week — with no measurable differences in growth, colour or longevity. So we believe "rest" days are not important, but nature's system does mean that periods of starvation are not damaging.

Hence there is no necessity to worry about weekends away or even holidays of two or three weeks. If the fish are adult and healthy, they can survive for 6 weeks in an unfed aquarium before any species are lost.

How much? The first question and the most difficult to answer. 'Aquarian' have sponsored research into this question at various Universities (e.g. under the super-

vision of Professor Klontz at the University of Idaho, U.S.A.) and the latest findings indicate that hobbyists tend to underfeed their fish. Growth trials show that typical pet fish need 5% of body weight per day in 3 or more feeds daily. The lowest feeding rate for survival is 1% of body weight. In flake terms this means an average fish such as a Serpae Tetra weighing 0.5 gram needs 0.025 grams or 3 of the 20mm (Xin) flakes daily, either all at once, or preferably divided into 3 feedings. To maintain 100 average sized community tropicals, one level teaspoonful of mixed recipe flakes should be used each day, divided into one,



two or even three feeds. One of the advantages of the fish's method of feeding is that they can eat continuously, digest what they need and excrete the rest. So you can't really overfeed fish, but you can (easily) pollute the aquarium. Trials in the 'Aquarian' Laboratory using food identified with non-digesting colourants, show that if a fish likes a particular diet the food passes through the gut in a daily rhythm similar to humans. If the food is unsuitable in some way, the fish will excrete it as faeces within an hour.

To quote percentages or weights on commercial fish foods is obviously unsuitable for hobbyists, therefore most manufacturers use the "feeding time" method. This states that flake (or granules or pellets) should be fed over a period of several minutes so that every fish gets some food but surplus is not left to pollute the water. As a directive it may be vague, but it's good advice — and it works.

Live Foods

There are many pleasures in fishkeeping — just watching is of proven therapeutic value, but the only participating pleasure is in feeding them. Hence many hobbyists want to experiment with different foods or watch the "chase and kill" with live foods. If a basic commercial diet is fed, the fish can be given some supplemental diet without affecting their nutrition.

Do not feed wild live aquatic food i.e. *Tubifex* from rivers, *Daphnia* or Cyclops from ponds and mosquito or other larvae. They are all carriers of parasites and possibly harmful bacteria. Some aquarium shops stock cultured live *Daphnia* and these should be disease-free.

Non aquatic live foods are all acceptable. The red garden earthworm is an ideal food. Flies, grubs, non-hairy caterpillars, greenfly, blackfly, etc. provided insecticides have not been used.

The very best live foods are cultured ones, so you know they are free of chemicals, parasites or disease. Whiteworm, *Gammarus* worms, Micro-worms, Fruit-flies can all be bought from aquarium shops or the magazines' advertising section and when cultured as per given instructions, provide a constant supply of living foods. Best of all is the Brine Shrimp, ideal when newly hatched for baby fish, after a few days on cultured *infusoria*.

The 'Aquarian' Diet

Nevertheless you can feed your fish exclusively on 'Aquarian'. It is a complete and balanced diet — eagerly accepted by all fish. There is no need to supplement the diet with live or any other foods.

'Aquarian' is different.

Whilst many brands are made from dried fish and meat meals flaked and then different colours; 'Aquarian' is made primarily from a range of natural ingredients including vegetables, eggs, whey and cereal as well as fish and meats.

Why a flake?

The flake form of fish food is the best method of presenting foodstuffs to aquarium fish since it floats for surface-feeders, slowly sinks for middle-feeders and then lies on the bottom for bottom-feeders, remaining whole and not clouding the water.

Each flake of 'Aquarian' is large enough to allow selective feeding to individual fish, furthermore they are designed to sink instantaneously on contact with the water ensuring that fish have no difficulty in swallowing the food.

If you wish, you may of course crush the food for very small fish, or insert the flake edgewise into the water to make it sink quickly for bottom-only feeders.

'Aquarian' Tropical Fish

Flakes

'Aquarian' Tropical Fish Food is the complete, perfectly balanced diet for a wide range of tropical fish.

A blend of six different formula flakes, it not only gives your fish special diets, it also allows you to give them variety — a positive nutritional need.

Feed individual colour flakes or a mixture of colours, little and often (on average 5-10 minutes' continuous feeding per day).

If you vary the flakes routinely your fish will receive a wide variety of nourishing foods including fresh white and oily fish, meat, shrimp, kelp, soya flour, whole egg, spinach, condensed whey and milk protein, yeast, cod liver oil, blood, rice and cereal with added vitamins and minerals.

'Aquarian' Goldfish Food

'Aquarian' Goldfish Food contains all the ingredients listed for 'Aquarian' Tropical Fish Flakes but the balance has been altered to accommodate the Goldfish's need for lower protein but higher carbohydrate and vegetable matter by the addition of the white flake. Just sprinkle a pinch of the flakes on the surface of the tank or graze from a bowl two or three times a day. Do not overfeed — little and often is best.

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Since this food also contains the highly nutritious fresh fish and meat ingredients it is also suitable for other cold water species such as Catfish, Golden Orfe as well as Koi.



'Aquarian' Marine Food

Marine fish are notoriously difficult to feed, especially the exotic Coral Fish, but 'Aquarian' have found in laboratory controlled trials that providing the flake is prepared from fresh food like whole fish or minced beef and liver, the food is eagerly taken. Even the carnivorous Trigger Fish will accept the Marine flakes.

'Aquarian' Marine Fish Food contains the red and brown fresh fish and meat flakes plus the black vitamin and mineral flake, and a green seaweed flake.

Do not overfeed marines with flake food, remove any excess with a small net or dip tube to keep nitrite levels down.

'Aquarian' Carnivore Food is made from all-fresh ingredients like whole fish and minced meat with added vitamins and minerals.

'Aquarian' Vegetable

Diet

A balanced diet containing a combination of fish, meat and cereals plus a high proportion of vegetable matter. Ideal for Mollies and other vegetable-lovers such as Labeos.

'Aquarian' Guppy Food

A special diet formulated specifically for the Guppy (*Poecilia reticulata*).

It caters for the Guppy's proven need for vegetable protein and fibre in its daily diet.

'Aquarian' Fry Food

The six formulae flakes listed for 'Aquarian' Tropical Fish Flakes are used in this diet to give the optimum range of nutrients to the growing fish. The six flakes are blended to give a balanced formula, enriched with extra protein for growth. They are ground and sieved to give a narrow particle size range known to be suitable for the fry of both egglayers and livebearers. The fresh food ingredients have proved to be very digestible by the fry giving rapid growth without all the problems of screening live daphnia, hatching brine shrimps, or pollut-

ing the tank with egg yolk. In the 'Aquarian' Laboratories several line generations of ornamental fish have been bred and raised exclusively on this food.

Feed sparingly but often — keep a light dusting of the food on the surface available all day for the first few weeks, then feed twice a day until 'Aquarian' Growth Food is taken.



'Aquarian' Growth Food

The same nutritious blend of foodstuffs used in 'Aquarian' Tropical Fish Flakes but graded for young fish and with extra protein for rapid growth.

'Aquarian' Tablet Food

The range of 'Aquarian' flake recipes are combined and pressed into a tablet.

Large fish can be fed the tablet, whole or broken, according to the size of the fish's mouth. It is common for large fish to be fed on chunks of scrap food, and the use of 'Aquarian' tablets ensures that essential nutrients, missing from such a scrap diet are supplied.

One of the most useful features of the 'Aquarian' Tablet Food is the high degree of adhesion to the glass. Simply dip the tablet into the water for a few seconds to wet the surface, and then press firmly against the front glass. This method of feeding is ideal for bringing fish to the tank front for viewing.

The golden rules for correct feeding

- 1 Rely on a good quality flake for balanced nutrition.
- 2 Never use live, wild aquatic food.
- 3 If you want to feed variety, choose cultured live food or living food from a non-aquatic source.
- 4 Little and often is best, but once a day is O.K.
- 5 Feed for three or four minutes, remove any surplus.



'Aquarian' Colour Food

A basic diet containing large flakes of blended fish, meat, soya, kelp and oat meals, with shrimp, daphnia and fly larvae, egg, yeast, cod liver oil, vitamins and minerals all blended with canthaxanthin, a natural colour enhancer.

Use the food to enhance the colour of show fish by feeding this special flake for at least a week before exhibition.

'Aquarian' Carnivore

Food

Here is a specialist food for Cichlid-lovers. Published by the 'Aquarian' Advisory Service



Dr Ford congratulates Peter Meyer whose fish 'Worax' (*Pimelodella albifasciata* a South American Catfish) won SUPREME CHAMPION at the 1996 Scottish Aquarist Festival.

Top Aquarists Recommend aquarian

As a top aquarist Peter has literally hundreds of major awards to his name and has been an 'Aquarian' user since the product was launched.

"'Aquarian' is a first-class product" says Peter, "my fish thrive on it. Freshness is also very important — another plus point for 'Aquarian' with its airtight cans and resealable lids."

WATER — The key to successful Fishkeeping

Although everyone is aware of the dangers of atmospheric pollution to the health and wellbeing of terrestrial organisms, the same cannot be said about water pollution in aquaria and ponds.

Yet, water quality is of the utmost importance — poor water quality will result in poor quality fish. In the same way as stress induced by overwork, family problems or an unfavourable environment can reduce our resistance to disease, fish will experience stress and become susceptible to a whole range of illnesses if the water in which they live and breathe is unfavourable in any way.

Extreme cases are easy to identify at the very outset by the smell or turbidity of the water, or the behaviour of the fish themselves.

Clamped fins, shimmying, loss of colour and appetite are all good early indicators of unfavourable conditions. Even if these symptoms are not immediately apparent, it is still quite possible to have poor water conditions — without, at first, being aware of it.

Many of the chemicals which harm fish are soluble in water and are, therefore, invisible. Ammonia and nitrites are good examples. Nitrates, which result from the oxidation of nitrites, are just as soluble but are, fortunately, relatively harmless unless present in large amounts.

Some highly soluble metal salts are also toxic to fish. Chlorine and, more recently, chloramine are added to water in order to render it safe for drinking. However, this very same water is used to fill aquaria and ponds direct from the tap, overlooking the fact that tapwater is far from ideal for fish.

Fortunately, it can be rendered safe by following a few simple rules. For example, any potentially high levels of copper, lead or iron which may have accumulated in water pipes overnight can be eliminated simply by running the tap for several minutes before drawing water for an aquarium or a small pond.

Water hardness and pH (acidity/alkalinity) are often, rightly, stated as being significant as far as the health of certain species of fish are concerned. However, few

reasons are ever given. For example, mention is hardly ever made of the way in which water chemistry is linked with the assimilation of essential mineral salts (also known as trace elements).

Although fish obtain most of these via their food, they also absorb some directly from the water. Therefore, appropriate chemical conditions are essential for the long-term welfare of fish, particularly where delicate species like Discus (*Symphysodon spp*) or those requiring, say, alkaline water for breeding, e.g. Malawi Cichlids, are concerned.

Water, as can be seen, holds the key to health. The main determining factor is the delicate balance that exists between the fish themselves, their environment and the pathogenic (disease-causing) organisms that are always present. As long as this balance is kept under control, the fish stand a good chance of resisting attack.

The problems facing fish in a new aquarium are similar to those that exist in new ponds. However, because of the more confined nature of an aquarium, small problems can develop into crises very quickly indeed.

When filling up a new tank, "Aquarian" Dechlorinator added to the water will neutralise the chlorine. Where chloramine is present, its effects can be minimised by using "Aquarian" Tanksafe. In addition, the use of ammonia-absorbing media as part of the power filter 'sandwich', such as activated charcoal or zeolite, will help even further. In aquaria which have an established biological filter, much of the toxicity of ammonia will be eliminated by the nitrifying bacteria present. The best-known of these belong to the genus *Nitrosomonas*. The nitrites which these bacteria produce are then converted to nitrates by *Nitrobacter* bacteria.

However, this natural method of rendering water safe can take up to six months to develop fully. Fortunately, immediate water conditioning can be achieved through the use of Aquarian Tapwater Conditioner which helps prevent the harmful effects of chemical shock, provides a buffer which

protects the water against abrupt changes in pH, neutralises some potentially dangerous metal ions and generally protects the delicate tissues of the fish's gills. A dose of Conditioner will help even further by keeping excessive bacterial loads in check and by actually killing off some ectoparasites.

As this shows, it is quite possible to provide fish with the protection they require during the potentially unsettling period of a tank's first few days and weeks of existence.

The guidelines given above should be used to overcome the problems created by raw water. However, unless other factors are kept under control from the outset, the tank will soon begin to suffer from what is generally known as the 'New Tank Syndrome'. The main causes of this, besides raw water, are overfeeding, marked temperature fluctuations, overstocking with fish, understocking with plants, transportation stress, incompatibility of species and poor initial stocks of fish.

Each of these can create a specific problem on its own. Combine them and you have a major crisis. Despite all this, such problems (including outbreaks of disease) can be avoided by doing your homework beforehand.

It would be a mistake, though, to think that all sources of danger will have passed after the first few weeks. Not a bit. The aquarist must embark on a regular maintenance programme designed to keep conditions within tolerable limits at all times. This must include partial water changes (approximately 1/4 to 1/5 of the total) every 30-40 days, proper equilibration of new and old water temperatures during these changes, regular use of Dechlorinator and Conditioners, daily checks on the state of health of all fish, immediate removal to separate quarters of any affected fish, preventative treatment of the main tank, and, very importantly, the adoption of proper quarantine procedures for all new fish.

This last point is often overlooked, with disastrous consequences, often resulting in a complete wipe-out. It is so easy to avoid this. All it takes is a small tank with all the



The 'Aquarian' range of Water Treatments and Remedies
Published by the 'Aquarian' Advisory Service

basic requirements, except natural plants which could suffer if they need to be sterilised at any time. Artificial plants can, however, be washed, scrubbed and sterilised quite easily.

Each new introduction of fish into the quarantine tank should be accompanied by a dose of Aquarian Aquarium Conditioner. After this, the fish are kept under observation for a period of around two weeks (three is preferable). If they are healthy after this time, they can then be introduced quite safely into the main tank. If not, they can, at least, be treated in the knowledge that they have not passed anything on to the other fish.

About the only major 'groups' of diseases that will escape detection during quarantine are those internal ones associated with parasites such as tape-worms.

Clearly, the advantages of adequate quarantine are numerous. Although the procedures have been outlined in connection with aquaria, they can (and should), of course, be applied to pond fish as well. The only difference in the latter case is that an outside trough may be required instead of a small aquarium.

DISEASES

When the hobby started, little was known of fish diseases so the aquarium books described symptoms and their treatment. This has gradually led to a symptom being quoted as the actual disease. Dropsy, for example, is simply a swollen body. There are many diseases that can give dropsy (often the cause is heart failure). Fungus is not a disease in itself, but a vegetable parasite that is usually a secondary infestation; the primary disease itself must be treated as well as the fungal growth.

There are just three major types of diseases that occur in fish; parasites, bacterial and viral infections. First, examine the sick fish to eliminate non-disease problems. Examples of such problems are wounds derived from fighting or sharp ornaments, bent spine from genetical faults (inbreeding) or poor nutrition (skelliosis). If a disease is suspected decide to which of the three groups it belongs and so choose the appropriate treatment.

Parasites. Most of these are recognisable (white spot, fungus, itching) and can be tackled by chemical dosing (chemotherapy). Internal parasites cannot be identified except by post-mortem examination but visible signs, such as anal worms, can be reported to a vet for anthelmintic ("worming") treatment.

Bacterial Infections. Inflammation, boils, ulcers, fin rot, are all bacterial infections. Antibiotics are much more effective than chemotherapy. A prescription is necessary from your local vet.

Viral Disease. Many unexplained deaths can be traced to virus infections and unfortunately there is no effective treatment for these diseases at the moment. Immunisation may be possible someday, but until then it

is kinder to kill the fish if obviously moribund.

Fungus Remedy

Dermatomycosis, also known as fungus, or cotton wool disease, is a common disease of freshwater fish, particularly goldfish. It is caused by a fungal growth or any member of the Family *Saprolegniaceae* and is recognisable by white or grey threads on the skin or fins which may thicken until they resemble tufts of cotton wool. The "Aquarian" remedy is based on a compound that will kill the fungal threads by direct contact at a high concentration. It is best, therefore, to treat the fish by the dip method.

White Spot Remedy

As stated before, *Ichthyophthiriasis*, also known as White Spot, Ick or Ich, is the most common of all aquarium ailments. It is easily recognised by the sudden appearance of a spot somewhat smaller than a pinhead, of a white or greyish colour anywhere on the skin or fins of the fish. Each of these white spots is a bladder containing the parasite *Ichthyophthirius multifiliis*. "Aquarian" White Spot Remedy is a unique combination of several compounds that kill this parasite without harming the fish or plants.

Copper Safe

Copper is a well-proven parasiticide in both freshwater and marine aquaria. Unfortunately, it is also poisonous to fish and very careful control of the free copper ions is necessary in any treatment based on the chemical.

An alternative is to "bind" the copper with another chemical, known as a chelating agent, to reduce its toxicity to fish.

"Aquarian" Copper Safe contains a unique compound (one far superior to the traditional citric acid and EDTA etc) that renders the copper so safe it may be used with both fresh and saltwater fish.

A whole range of parasites can therefore be removed from newly acquired fish. Use also when the presence of parasites is indicated.

If White Spot keeps recurring, it may indicate one of the resistant strains. The use of Copper Safe is then indicated.

Disinfectant

When setting-up a new aquarium, it is advisable to sterilise the tank and the accessories. Additions of equipment or decoration to establish tanks should include cleaning and sterilising.

Nets, especially, should be disinfected to prevent spreading disease, such as white spot and fin rot, between tanks in fish houses. The traditional disinfectants contain chlorine, or acid both of which are deadly to fish. Aquarian's Disinfectant is powerful and acts particularly against gram-negative bacteria, such as the *Pseudomonads* (common in water-borne infections) but contains no chlorine and is neutral.

FILTRATION

You do not find power filters in the coral jungle, or undergravel filters in the coral seas — so surely such man-made gadgets are as artificial as plastic plants? If you believe a natural system is the best route to colourful, healthy fish, then why use filtration?



Part of the range of 'Atlantis' internal power filters.

The reason is that filtration does occur in nature, providing you take a global view. The hydrological cycle involves the same water evaporating from the seas, raining down on the mountains, filtering through the rocks to springs that form streams, which join to form rivers until back it all flows to the seas. Nature does not do a 25 per cent water change every two weeks!

Power filtration is a hydrological cycle in miniature. The bubble-up foam (or box) filter is a much simplified version, too. Only the undergravel system can be considered rather different to anything found in nature.

Fish swimming in a small body of water soon pollute their environment. Not only soluble excreta, but solid matter that com-



The 'Atlantis' external variable power filter.



bins with plant debris, surplus food and surface dust, forms the material known as "detritus," which aquarists call "mulm."

Mulm is the grey-brown colour of sludge, but particulate in texture. It sinks slowly to the bottom of the tank and it also coats all the solid surfaces, including the glass front of the aquarium.

A fish with powerful fins, such as a goldfish, will stir-up the mulm to cloud the water, as any owner of a goldfish bowl will confirm.

Undergravel filters tend to suck the mulm into the stones. Bacteria within the filter produce more mulm as they break down the soluble material.

The problem with undergravel systems is that the mulm remains trapped, and it is difficult to remove without breaking down the whole aquarium. A siphon tube pushed down the uplift tube for drawing off water

from under the filter base helps reduce the mulm build-up.

A better system for clear water is the box filter. It is cheap and easy to operate with an ordinary air pump. The mulm is trapped within the box filter, which should contain easy-to-replace polyester floss. Gravel or carbon can also be used as filter media. The box can be easily lifted out for rinsing clean.

Power filters are the most efficient method of cleansing the water. There are two types, internal and external. The internal filters have the advantage of being unobtrusive and silent; external filters are more powerful and require less frequent servicing.

The "Atlantis" range of filter aids includes corner and box filters, internal and external power filters and filter media including ceramic, fibre and carbon. A catalogue on the range is available from the "Aquarian" Advisory Service — see page 16 for details.

PLANTS

Plants that grow in both Coldwater and Tropical Aquaria:

Acoris gramineus (Japanese Rush)
Ammannia senegalensis (Red Ammannia)
Aponogeton madagascariensis
 (Madagascar Lace Plant)
Bacopa caroliniana (Red Bacopa)
Bacopa monnieri (Baby's Tears)
Cabomba caroliniana (Green Cabomba)
Ceratophyllum demersum (Hornwort)

Ceratophyllum submersum (Tropical
 Hornwort)
Echinodorus cordifolius (Spade Leaf)
Egeria densa (Giant Elodea)
Eleocharis acicularis (Dwarf Hairgrass)
Elodea canadensis (Canadian Pondweed)
Hydrocotyle vulgaris (Pennywort)
Lagarosiphon madagascariense
 (Elodea Crispa)

Lemna minor (Duckweed)
Ludwigia mulleritii (Red Ludwigia)
Myriophyllum aquaticum
 (Water Milfoil)
Myriophyllum brasiliense (Parrot's
 Feather)
Nuphar japonicum (Japanese
 Spatterdock)
Vallisneria gigantea (Eel Grass)
Vallisneria spiralis (Vallisneria)

Plants add oxygen to the water, they provide shade and shelter for the fish and they make the tank look attractive. However, all plants need attention.

For a 2 foot long tank, you can have up to 100 plants (if you have too few, you may get problems with algae). This can be expensive, so buy plants that grow quickly, such as *Elodea*, or plants that have "daughters", such as *Vallisneria*.

Always buy plants from a petshop or aquarists' shop. Garden plants will not do. Read around the subject before you buy, and choose plants that suit the water conditions in your tank.

You can simply push the plant roots into the gravel and anchor them with small lead weights or pebbles if necessary. It is better, however, to give plants a good rooting medium, such as moss peat. So soak the peat in rainwater to drain out excess acids and make it waterlogged. After a few weeks, take it out, squeeze it and spread it over the tank bottom in a layer about three centimetres deep. Cover the peat with a layer of pinhead size gravel about 1 inch (or 2cm). Bank up the gravel at the back.

Arrange big plants around the back or sides of the tank, and smaller ones at the front. You can root two or three plants of the same species together, in clumps. Avoid symmetrical arrangements because these look dull.

Occasionally, add a little 'Aquarian' Plant Food to the water.



Plant Food

'Aquarian' Plant Food contains a solution of trace minerals necessary to fertilise growing aquatic plants. Use routinely, and particularly when establishing new plants or cuttings.

The solution is harmless to fish.

Algae Control

Algae can quickly spread out of control in an aquarium, choking plants and spoiling the water clarity. 'Aquarian' Algae Control contains a special algicide proven harmless to fish and plants. Its presence also inhibits new growth in a cleaned aquarium.

Published by the 'Aquarian' Advisory Service

HINTS & TIPS — for Aquarists

any old leaky aquarium can be pressed into service for quarantining or treatment, just turn the inside and seal it with a ribbon of silicone sealer.

A large treatment tank can be made from any container that is non-toxic, such as a large tub, plastic bucket (pale colour or an old one), a Buxyl lined crate, even a corrugated lined cardboard box with tape reinforcing to give strength.

Small temporary tanks can be made from any tub lined with a polybag. Plastic shoe boxes are useful and any polystyrene box — if these are seamless they are waterproof and do not need lining.

When building all-glass tanks, fix strengthening strips a little way from the top to allow easy access for leads and tubes. Will that hardboard, sideboard or other take the weight of the aquarium? The average tank (24 x 12 x 12) is around 200lb when stocked, so if the furniture can take the weight of a well-built man, it can carry the aquarium.

Use 1" timber planking screwed and glued to a four-leg table construction will hold tanks up to 24 inches. Over 24 inches use 4" diameter for legs.

For the larger tanks (3ft to 6ft) build two main columns (or beech block piled flat) and lay a sheet of blockboard across the top. This base can be easily boxed into a cupboard or shelves, etc.

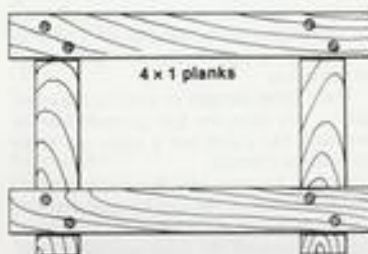
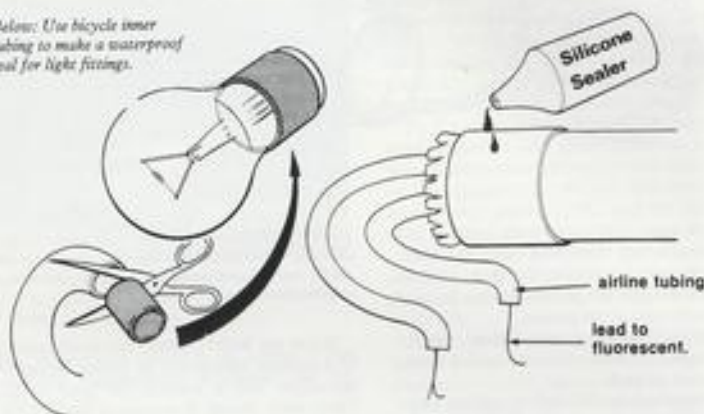
Over six feet, build three columns and make two cupboards.

In the fish house use plastic-coated steel tubing as advertised in the daily papers for 1977 and industry.

Build all glass tanks by laying polystyrene ceiling tiles between base and supports.

To stop petrified logs staining the water brown, paint with a few coats of Yacht Varnish or Polyurethane varnish (rinse well before use of course).

Below: Use bicycle inner tubing to make a waterproof seal for light fittings.



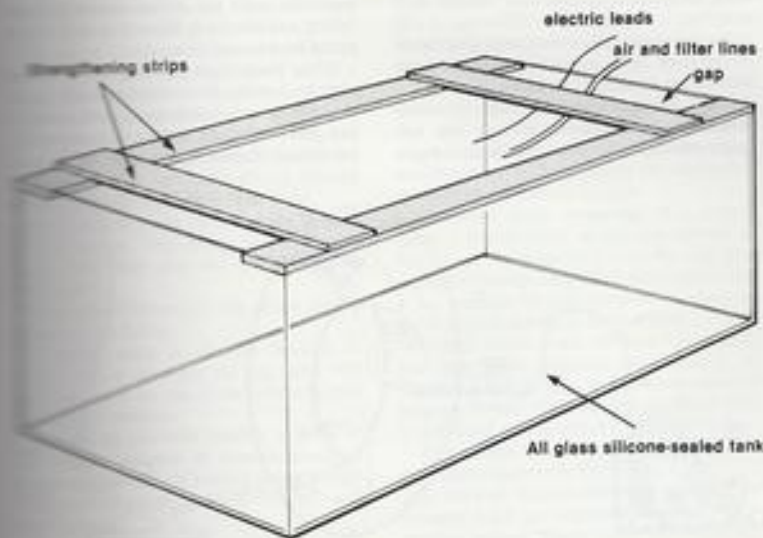
Side view: This is the construction for up to a two foot tank in 4 x 1 planking.



End view: This shows the table like construction make the top the exact width of your tank.

To make logs and bark sink, glue with silicone sealer or tie with nylon thread to a flat piece of rigid plastic or piece of slate. Cover the plastic or slate base with gravel to hold the wood down. Use an "Atlantis" tank background to complete the aquatic scene.

Below left: Use strengthening strips of glass as shown when building an all-glass tank.



Make your own caves by gluing (silicone sealer) pebbles onto jars placed sideways. They can be stacked too.

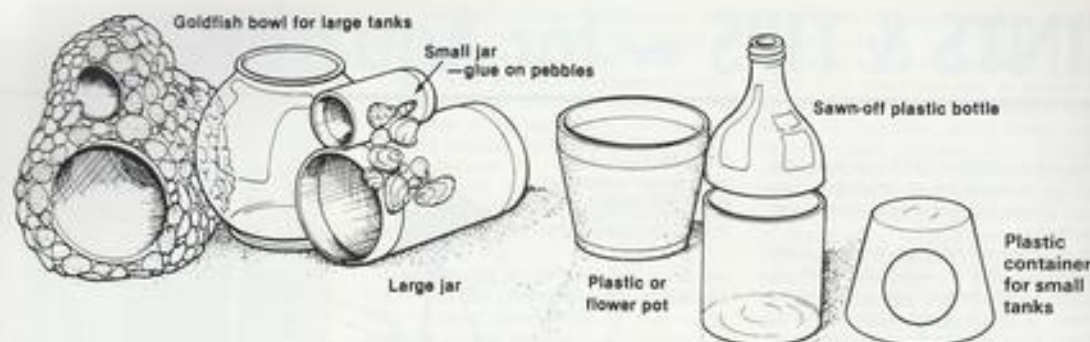
Limestone rocks are alkaline and so are unsuitable for freshwater aquaria because they dissolve and cause hardness problems — check for alkalinity by adding a few drops of vinegar, bubbles indicate that the rock contains lime.

An easy-clean display — silicone seal rocks, plastic plants and caves, etc. to a slate or sheet of plastic to make one complete unit. Lift out the whole lot for cleaning.

Want something different? Don't cover the tank with a hood, but use glass-covers and beam-in dichroic spotlights. These can be red, green and blue bulbs too.

If you use an undergravel filter, pot the plants in plastic gardener's pots filled with non-fertilized peat/bulb fibre and topped with gravel. Stand the pots behind screens of rocks.

Even plastic plants look real if 'planted' behind the aquarium. Build a wood/card/plastic false back and glue plastic plants between this back and the rear glass. Viewed through the tank they give added depth.



Above: You can create reefs for your tank without expensive and difficult to arrange rocks. All you need are some jars or containers and then glue on gravel, pebbles or rock chippings with silicone sealer. The containers can be stacked and arranged just how you want and can easily be removed and cleaned and be replaced comfortably.

Grow your own plants from cuttings in a special tank half-filled with earth and transplant the new growths to the show tank. In summer months the plant-tank can be sited in a sunny part of the garden.

Cichlids uprooting the plastic plants? Glue them to pieces of slate buried under the gravel or rocks.

Always feed the fish before adding a new arrival, it is then less likely to be harassed.

If a fish refuses to feed try a small piece of hard-boiled egg squeezed through a muslin. Use the white part.

The yolk, squeezed through a fine cloth (handkerchief) can be used to feed newly hatched fry.

For vegetarian fish, feed lettuce leaf, but scald it in boiling water first to make it digestible.

For a permanent live food supply lay an old piece of sacking in a corner of the garden and keep soaked in tea leaves and coffee grounds, etc. from the kitchen waste. Lift a corner to collect juicy, red earthworms.

Sudden batch of fry? Make 'Instant' Infusoria with the kitchen blender. Make sure that the big fish gets his vitamins and minerals by making a cut in the chunk of meat, fish or prawn, etc. and stuffing in a few flakes of 'Aquarian' fish food.

Use 'Superglue' to seal joints on airlines and add a drop after connection, but remember it is then sealed permanently.

If a noisy airpump is not faulty (eg worn diaphragm), try reducing back pressure by adding a T-piece and clamp. Open clamp to allow some air to bleed away so the pump is running flat out, which is the quietest speed.

If a pump or filter is noisy, place it in the hall, spare room, or even outside (with adequate weather protection) and drill small holes through the wall to take the air and water leads to the tank.

A few marbles in a bubble-up box filter will ensure it stays on the bottom, and it is easier to clean the unit than when filled with the usual gravel ballast.

If you use bulbs (rather than fluorescents) fit a dimmer switch and so create daylight/moonlight for a natural 24 hour cycle. Particularly useful if nocturnal feeders are being kept.

For routine water changes keep a plastic bucket and polythene tube (preferably with an automatic siphon) hanging on a hook in the garage always ready for instant and exclusive use.

Use a green (bought or dyed) net to catch fish — they show less fear (perhaps a green net looks like a leaf, but a white one looks like a shark's mouth).

Always use two nets for active fish — trap them between the nets for easy removal. To catch those difficult fish, wait until nightfall, turn off the lights and use a small spot torch to locate and net the unsuspecting fish.

Protect bulbs from condensation by cutting a few inches of old bicycle inner-tubing and slipping it over the bayonet and socket.

Smear silicone sealer over the ends of fluorescent light fittings to prevent corrosion and for added safety.

Electric leads to light fittings can be protected by slipping them inside airline tubing and sealing the end with silicone sealer — this is especially useful in marine tanks where salt tends to creep down the wires to corrode connections several feet away.

For fish with spikes and barbs that catch in ordinary nets, replace the mesh with sections cut from (old!) bed sheets.

Many other hobbies can supply useful accessories for aquarium-keeping; for example plastic kitchenware and freezer bags,

etc. from the model shops, tubing joints, bends, and T-pieces, etc. and from the Home Brew shops, filters that can 'polish' tank waters too.

To seal a small leak from the outside reduce the water level until drip stops, soak up moisture with paper towel and pour in cyanoacrylate adhesive (Superglue).

To trace small leaks in new all-glass aquaria, add a few drops of ink and note colour trace through sealer — often the site of a leak internally is a long way from the external drip. Drain, and reseal internal hole.

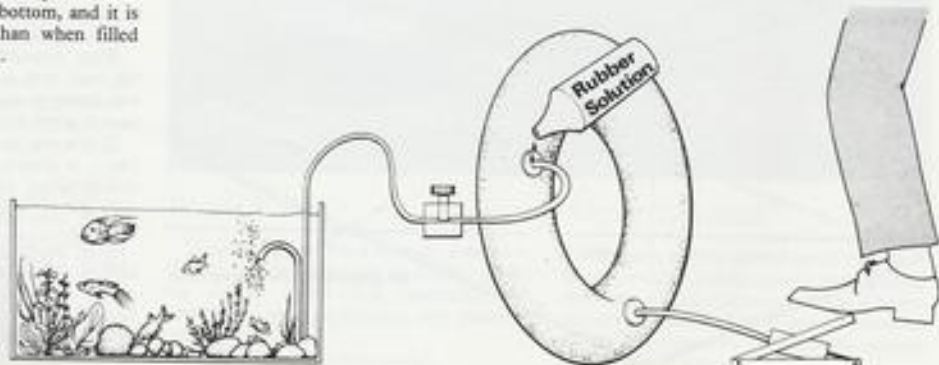
If the base of a tank cracks, measure internal size and have a sheet of 6 or 10mm glass cut to fit with 1mm play all round. Drop in the new base on blobs of silicone sealer and fill gap with sealer. It is easier than reglazing and the repair can't be seen under the gravel.

To remove scum lay a sheet of newspaper flat on the tank's surface and draw it off again — the scum will stick to the paper. If the power fails, cover the tank with a blanket and heat loss will not become a problem for hours.

If a power failure affects a marine tank dependent on aeration for undergravel filters have an angler's battery pump standing by. If the battery gives out — use an old car innertube with the airline sealed into the tubing and clamped. Blow it up with a foot pump for hours of (free) air.

If the pond starts freezing keep a section clear by leaving the sweeping brush (or an old stick) partly submerged. Each morning just give the handle a twist to break-up the ice without disturbing the fish.

An emergency air supply can be obtained by converting an old car inner-tube as in this drawing.



Published by the 'Aquarian' Advisory Service

aquarian — takes the mystery out of Latin names

One of the complaints of beginners to fishkeeping is that they cannot understand the published literature on the hobby because it is so full of scientific jargon.

It is very easy for experienced aquarists to use terms like pH, DH, nitrite, biological filtration and so on as if they were an everyday part of conversation.

When talking to a potential aquarist such terms can be patiently explained, probably several times. But in the many books on fishkeeping a simple dictionary meaning is given. This is written into a glossary or start of a chapter and the terms are then used throughout the text.

The potential aquarist thumbs through the book and views with increasing horror the apparent scientific content and decides to take up stamp collecting instead!

Consider the scientific names of fish. Nothing can cause a beginner to switch off quicker than when confronted with a name like *Carassius auratus* (only a Goldfish).

At the other extreme are experienced aquarists who delight in learning encyclopaedic quantities of latin names of quite common fish and reeling them off to impress, or confuse, any audience.

All specimens of fish — in fact all living things, and the term living includes extinct animals and plants too — have a unique proper name that identifies the creature to scientists all over the world.

The science of proper names is called Taxonomy, which in turn is part of the science of Systematics.

Systematics is study of the kinds and diversity of living things and their arrangement into a natural classification.

In order to place a fish in the classification system it has to be identified by a series of titles in an internationally agreed method of presentation. This method of classifying living things was established by Karl von Linne (1707-78) in his book *Systema Naturae* 1758.

He chose Latin names for every plant and animal then known because Latin was then the international language of science.

The use of Latin has remained to this day because it is a dead language hence, unlike a living language such as English, it is not subject to changes of meaning.

The principle devised by Linne (who also latinised his own name!) is that the animal or plant has a two part name always printed in italics or underlined in written form.

This two part name identifies the species and the genus. The genus always has a capital first letter and the species a small first letter.

From classification lists the genus can be attributed to a family.

A family name is obvious because it always ends in -idea and the full name will always be based on one of the genera (plural for genus) it contains.

As with all scientific studies it is never that simple, because of complications in fitting together closely related living groups it became necessary to have "super" and "sub" groups.

There are superfamilies (ending in -bioea)



Betta, a *Polypterus ornatipinnis*, has won 'Fish of The Year' two years in succession at the Yorkshire Aquarist Festival.

and subfamilies (ending in -inae). The complete classification is shown in the following list:

- Kingdom
- Sub-kingdom
- Phylum
- Sub-phylum
- Super Class
- Class
- Sub-class
- Infra-class
- Cohort
- Super-order
- Order
- Sub-order
- Infra-order
- Super-family
- Family
- Sub-family
- Tribe
- Sub-tribe
- Genus
- Sub-genus
- Species
- Sub-species

For a full identification the animal or plant will have a title for each of these levels of classification although in practice not all are needed. In Ichthyology (the study of fish) only 15 categories are used.

Remember that the scientific name for a fish is not really a "name" but a means of identifying the position of that creature in the grand order of living things.

Once its position has been established there are many characteristics of the fish that can be identified such as probable origins, feeding habits, shape, breeding habits and so on. Such things are impossible to glean from a common name.

The other major advantage of a proper name is that it refers to just one species of fish in any language and so is the only real method of recognising a fish internationally.

An example of this occurred recently in the Aquarian Advisory Service mail.

Letters arrive from all over the world, and one from Belgium was written in Flemish. Being less than fluent in the language I had the letter translated to find it contained queries about "Maanvis" fishes.

This means Moonfish in English, but no such name appears in literature.

A letter or request for more information brought forth the scientific name of *Pterophyllum scalare*, which is our old friend the

Angel Fish.

Even if the writer had used the English word in his original letter it would not have been clear because there is a whole range of Angel fish kept in marine aquaria which are very different to the freshwater Angel.

By Taxonomy methods 21,585 fish have been identified and given scientific names that establish their places in the classification system. Incidentally, 40 per cent are freshwater fishes (about 8,000) and the rest are marine fishes (about 13,000).

One of the problems with scientific names is that it represents a position in a classified system and not a true name for a given fish.

Hence, if the position of the fish in that system is found to be incorrect, changing its place involves a change of name.

Unfortunately the Linnean system is man-made but its members are living things in a constant state of evolution so errors are frequent and renaming of species all too common.

A newly discovered fish can be given any Latinised species name according to the whim of the biologist who either discovers it, or describes it in the scientific literature on behalf of the discoverer.

Often the name describes the fish's appearance, especially colour as in the *H. rosaceus*, the Rosy Tetra or the name of the discoverer.

The physical features of the fish determine its position in the classification system and this will allocate its genus and the family name is then predetermined.

However, since many groups of fish evolve similar features from very different ancestry, subsequent more detailed investigations of cell structures and genes may show the fish to be in completely the wrong place.

Another scientific publication will detail the reasons for its change of place and its new name. Hence you will find old and new aquarium books with different scientific names for the same fish.

The classic example is the common Guppy which was known as *Lebistes reticulatus* until 1963 when it was reclassified as *Poecilia reticulata*.

The name of the author of the first description (this need not be the discoverer of course) is sometimes quoted after the species name. This fixes the responsibility for the naming of the fish and not the credit for finding it.

Where the fish is subsequently repositioned and so renamed, the original author's name goes into brackets to show he described the same fish but under a different name.

It is not an ideal method of naming fish, but it is the best science can achieve so far and the system is improving as the years go by and knowledge increases.

Certainly the scientific name of any fish will identify it in any part of the world.

This includes the communist bloc and other countries using non-arabic symbols such as China or Japan.

Latin names may seem cumbersome but they are definitely essential!

THE DEVELOPMENT OF 'AQUARIAN'

Early in 1973 it was decided that the Mars Group should enter the Hobby-Fish food market. David Ford was an obvious choice as prime contractor because of his 10 years' experience of Product Development in the pet food industry combined with 25 years' experience as a keen aquarist. His brief was to develop from the start through to full-scale production a range of aquarium foodstuffs superior in quality, presentation, and marketing to any of the many competitors in the market. The nutritional superiority had to be proved by laboratory-controlled feeding trials.

Aqualab

The first objective was the establishment of the Aquarium Laboratory (or Aqualab, as it became known). At the time, a prefabricated building (24 feet square by 10 feet high) that had been used for cat breeding became available — an ideal site. House Services scraped, scrubbed and sprayed and eventually the hut was refurbished as an Aqualab with 30 standard tanks (30" x 15" x 12" — this being the largest empty tank one man can lift easily, and the staff was only one man!).

The tanks were nylon-coated (no painting necessary), silicone-sealed (so marine fish could be housed), having 30 watt fluorescent lights (low cost, low heating effects), under-gravel filters (for clarity) and plastic plants (for nutritional studies real plants had to be excluded). Each tank was fitted with an external thermostat (for ease of maintenance) and 100 watt internal, test-tube type heaters. The laboratory itself was heated to about 70°F by electric convectors and a gas cylinder heater stood by in case of power failure. Leicestershire drinking water is moderately hard and slightly alkaline and this was corrected by blending with 50% distilled water and adjusting to pH 7.0 with Sodium Dihydrogen Phosphate before filling the tropical fish tanks. Town water was

used for the cold water tanks and for preparing artificial sea water for the marine tanks (pH 8.5, S.G. 1.022 to 1.025 at 75°F). Aeration for the undergravel filters was effected by two half horse power air pumps mounted outside the building for fresh air and to reduce noise. The air was pumped into a 1" plastic hosepipe slung from the ceiling, the open ends of the hose sealed together to form a complete circle.

Air for each tank was bled from the pressurised hosepipe by puncturing with a 50mm plastic tube and sealing the joints with silicone sealer.

Natural Light

A few fish were installed to check the systems and some modifications made as experience grew. For example, green water from algal growths was a major problem until the natural lighting was reduced by blanking off the hut windows with aluminium cooking foil.

Meanwhile a worldwide survey was made of all the available fish foods and samples were obtained and analysed. Information on the nutritional needs of fish was gathered from U.K. institutions such as the White Fish Authority, Ministry of Fisheries, Food & Agriculture, Aquatic Pathobiology Unit of Stirling University (now Institute of Aquaculture), The Freshwater Biological Association, etc. and their U.S.A. equivalents. Public, private and commercial Aquaria were visited ranging from the local Melton Mowbray Pet Shop to the Florida Fish Farms, from Skegness Natureland to Berlin Zoo Aquaria. Membership and attendance of national society meetings of organisations such as the British Aquarist Study Society (BASS), British Marine Aquarist Association (BMAA), Goldfish Society of Great Britain (GSGB), Federation of Northern Aquarist Societies (FNAS), Federation of British Aquarist Societies (FBAS), British Killifish Society (BKS), British

Ichthyological Society (BIS) as well as the 400 local societies in the UK. Some of whom yielded lots of information. Papers and learned papers were traced and sources for data. Amateur and professional journals were obtained and studied on a regular basis. Standard books were also bought, ranging from the learned works to the "How to enjoy..." pamphlets. All the information thus obtained was catalogued and filed, and classified for use in making the choice of the type of food to be developed.

Without recounting the many reasons, the decision was made to produce a fish food that is a soft, pliable, flake (on tissue paper) exhibiting rapid wet-out properties whilst remaining discrete, able to float for several minutes but then sinking slowly. It should be nutritionally complete (containing all essential vitamins, minerals, proteins, fats, etc.) but tailored to the feeding habits of the different species (i.e. herbivorous, omnivorous and carnivorous). The first flakes were made in the Product Development Laboratory using a frying pan and a wallpaper roller! In this way we established the ideal gel-system for soft, floating, pliable, flake. Next a survey of the equipment to handle this gel-system was made and although this entailed travelling as far afield as Munich, the ideal machine was located in Nottingham. A pilot plant-scale machine was obtained and formal development work began. Again, the reasons are many and complex, but the final choice was to produce a blend of seven flakes of different formulae.

Expertise

Traditionally, fish foods are composed of dry ingredients such as fish meal, meat and bone meal, etc. blended into formulae established and proven over 20 or more years. We, however, have a great deal of experience and expertise in handling these raw materials for pet foods and so the seven formulae developed by us are composed of a blend of some dry ingredients to the established, proven levels, and mainly fresh (this term includes frozen fish and some meats, of course) ingredients. The seven formulae have been made identifiable by colouring the flakes; thus the hobbyist can identify and choose the appropriate flake to the type of fish he keeps. Colouring presented quite a problem — the traditional food dyes are water soluble and leach out of the flakes when dropped into the aquarium. Self-coloured ingredients were eventually chosen such as Caramel, Vegetables and Iron Oxides.

Acceptance

Typical mixtures used in top quality cat and dog foods were found ideal for fish acceptance and these mixtures were used for the "fresh" raw materials, but feeding trials in the Aqualab soon indicated that they were nutritionally inadequate for



The original 'Aquarian' Research Laboratory at the Centre for Pet Nutrition, Waltham-on-the-Wolds, where the 'Aquarian' range was developed.

hobby fish. Several variations on the seven basic forms were prepared to overcome these inadequacies, and feeding trials resumed.

These trials presented a problem in obtaining objective data — the traditional method of assessing the adequacy of fish diets in the commercial fish farms is to feed weighed diets to thousands of fish and catch selected samples for measurement of weight and length. Such methods are not appropriate for valuable ornamental fish. The chosen technique was to flash photograph the fish using a close-up lens with a very narrow field of view focused on a plastic ruler permanently housed in the tank. Any fish swimming by the ruler (or even in-focus and hence at the same plane of magnification) could be measured against the ruler on a colour print. A series of such photographs gave an objective and permanent record of the rate of growth and colour of the fish.

When a fish died or became ill, it was preserved and examined histologically to establish if the problem was disease, parasites, or nutritional inadequacy. In the trials, comparisons were made between our food and the main competitors' foods and the earlier and improved versions of our own food.

Vitamins

Two years' work was necessary to establish levels of such essentials as the vitamins and minerals necessary for a healthy fish. A launch formula was eventually chosen but feeding trials will continue using varying species of fish for prolonged periods to ensure that our diet is perfectly adequate and to indicate if there are any further improvements which can be made.

Installation

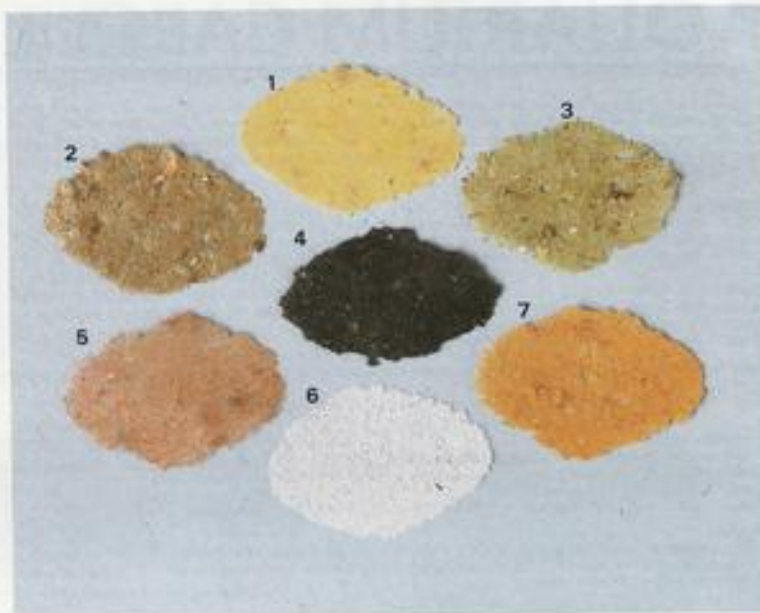
A decision was then made that the fish food should be manufactured at Thomas's. The project was passed to the Engineers who designed a plant for Thomas's based on the pilot plant machine. A special flake filling machine was also designed and built to handle the delicate flakes. Authorisation for the cost of the plant was obtained and installation began early in 1975.

Labels

Unique packaging for the fish food was developed. The final choice was an aluminium can with ring-pull top and resealable plastic lid. This pack has many advantages over the plastic tubs used for other fish foods — for example, it hermetically seals in the flakes, an important feature for our fresh ingredients formulae. The label was designed incorporating photographs of the Aqualab fish. The brand name was chosen by Marketing and registered throughout the world.

Flakes

The range of 'AQUARIAN' flakes for different types of fish was developed by



blending the basic seven flakes in different proportions. By grinding and sieving to the appropriate size and boosting the protein levels by suitable additives, a baby fish food was also developed. The blended foods were then tested, not only in the Aqualab but by various sponsors up and down the country. In every case the user confirmed that the flakes were highly acceptable and gave better colour and growth than any other food on the market. Market Research tests also confirmed the high acceptability of the products both to the fish and the fishowner. Some of these sponsors and their comments are featured in the 'Aquarian' advertising.

The flake recipes that were proven acceptable and nutritious are as follows:

1. Yellow

A strength and growth food. A special diet for growing fish being high in protein of both vegetable (via soya protein) and animal (via whole egg) origins, plus certain vital fats and amino acids. Use for young fish, fish under stress after being moved from one aquarium to another, or convalescent fish.

2. Brown

A fresh meat and liver food containing meat and liver plus blood and fresh ground bone. A very rich diet, useful for conditioning or as a treat for your carnivorous fish, eg. Cichlids.

3. Green

A vegetable diet containing a nutritionally complete blend of foods with a high added vegetable content (kelp, peas and spinach). Use as a conditioner or as a treat for your vegetarian fish, eg. Mollies.

4. Black

A fertility, spawning and health food, a complete diet with extra vitamins and minerals, including vitamins A, D, E, K, B₁, B₂, B₆, C, Folic Acid, Pantothenic Acid, Biotin, Choline Chloride and the minerals Cobalt, Iodine, Copper, Iron, Manganese and Zinc.

Useful as a general tonic for convalescing fish, and fish being conditioned for spawning.

5. Red

A fresh fish food containing white-fish and oily fish combined with nutritious substances such as condensed whey, cereals, blood and potato. Useful for those difficult feeders and to tempt fish that are off colour. Eagerly accepted by all fish.

6. White

This flake has been specially prepared to accommodate the Goldfish's need for lower protein and higher carbohydrate in its diet.

7. Orange

A colour food. A complete diet but with added Canthaxanthin, a naturally occurring compound (in crabs for example) that is known to enhance the colour of fish. Use to condition the fish, especially before exhibiting! (Also available exclusively in 'Aquarian' Colour Food).

All seven recipes are available in different blends as the 'Aquarian' range of fish foods.

These were launched in 1976 and proved an immediate success. Within a few years the brand was the market leader in the U.K. and an export drive began.

Now, just over 10 years later, the 'Aquarian' brand is international. It is produced in seven language labels and exported from Yorkshire to 54 countries!

AQUARIUM CALCULATIONS

If you are an Aquarist, or hope to become one (which you should — it's fun), there will come a time when you need to calculate something. It may be the volume of water to find how much medication to add, or the weight to see if the sideboard will take it. If you decide to keep special fish, or to breed them, knowledge of hardness, pH etc., is essential and again some calculations may be necessary because so many different units are quoted. The following list will help you with these calculations so keep this brochure handy by the aquarium for instant reference. It is written in the correct form to operate a pocket calculator.

Capacity

The traditional method of quoting a tank's size was to say it is a 2 foot or a 3 foot, according to the length of the aquarium. The modern method is to use metric units, with the actual volume of the tank in litres. The advantage of litres is that it is an international unit, whereas the gallon is different in the UK and USA. The litre can be divided into 1000 parts called cubic centimetres (cc) but since we are dealing with water where (as near as makes no difference) 1 millilitre (ml) equals 1 cc, the division can be 1000 ml, i.e. 1000 ml = 1000 cc = 1 litre. To find your tank volume measure the length, height and width, estimating the internal rather than the external values, in centimetres (cm). Then: length x height x width (all in cm) = cc ÷ 1000 = litres.

Remember when dosing the aquarium that the actual water volume is less than the tank volume because of the gravel, rocks and equipment. On average the reduction is 10%.

Tank Capacity (any units) x 0.1 = amount to subtract from total capacity.

Temperature

The use of Fahrenheit is getting old fashioned. The degrees Centigrade or Celsius (they have the same values) is the modern method. Most Tropicals need 24 degrees C (originally 75 degrees F).

Celsius x 1.8 = + 32 = Fahrenheit Fahrenheit - 32 = x 0.556 = Centigrade

Heating

The wattage rating of the heater-thermostat depends on the size of the aquarium. To calculate what size you need for an aquarium sited in a warm living room allow 10 watts for every 5 litres of water.

Weight

It is surprising how heavy aquaria can be and adequate support is necessary for even small tanks. Any support should be at least capable of taking the weight of a full grown man. Custom built stands are the best supports but very large tanks will need brick pillars on a concrete base.

Water Quality

For the average community aquarium or goldfish tank there is no necessity to consider the chemistry of the water — just use ordinary tapwater providing the chlorine is first removed with Aquarian Dechlorinator. If you want to keep special fish or want to breed fish, the chemistry of the water becomes very important and kits are available to measure Hardness pH, nitrite and nitrate.

Hardness

Characins, Barbs, Killifish and Discus thrive best in very soft water. Catfish, Loaches, Goldfish, Gouramis and most Cichlids prefer medium hardness. African Lake Cichlids, Livebearers and Australian Rainbowfishes need hard water. How to quantify the hardness is confusing because each country uses a different method. Again metric is the modern international way, in parts per million (ppm). If you read aquarium books published before the 1980s any one of three different units will be quoted. The German dH or DH, the English Clark degree and the American degree. For convenience all the chemicals causing hardness are considered to be Calcium carbonate or Calcium oxide. The German standard is 1 part of Calcium oxide per 100,000 parts of water, the English, or Clark, degree is 1 grain of Calcium carbonate per imperial gallon and the American degree is 1 grain of Calcium carbonate per million parts of water.

Acidity or Alkalinity

The acidity or alkalinity of the water is described on a universal scale called pH. This ranges from 1 (very acid) to 14 (very alkaline) with a mid point that is neutral, therefore most fish accept the value of 7. Some Cichlids like alkaline water, which should be about 8 and some Tetras like acid water, which should be about 6.5. Marine fish need saltwater of pH 8.2.

Nitrites and Nitrates

The Nitrite value shows the amount of dirt in the water:

Satisfactory value = 0.1 mg or less as Nitrogen per litre

Unsatisfactory value = 0.2 to 0.5 mg N/l. Partial water changes needed = 0.5 to 1 mg N/l

Dangerous to freshwater fish/will kill marine fish = over 1 mg N/l

The Nitrate values are not important in freshwater, but if exceeding 400 ppm in saltwater, a partial water change is advised.

Lighting

Varies widely according to individual requirements but a guide is . . .

Bulbs — 2.5 watts per inch length of tank: Fluorescents — 1 watt per inch

length: Spotlights — 4 watts per inch

If you want to grow aquatic plants use a bright light such as the incandescent bulb or special strip lights such as Gro-lux, Trulite, etc.

Stocking

The number of fish you can keep depends on their size. Most community tropical fish are bought young and they will at least double in size.

The water volume is not the main feature, it is the surface area of the water that is important. This is because the controlling factor is the amount of Oxygen that dissolves and the Carbon dioxide that escapes, all of which occurs at the water surface.

Measure the length and width of the water surface in inches and . . .

Length x Width = ÷ 20 = number of small fish (1 to 2 inch)

Length x Width = ÷ 40 = number of medium fish (3 inch)

Length x Width = ÷ 100 = number of large fish (maximum 6 inch)

For Marines, halve the number of fish in each category.

A guide in metric:

Tank size cm	Water volume	Tropicals	Coldwater	Marine
45 x 25 x 25	28 litres	38	15	no
68 x 38 x 30	68 litres	60	24	no
90 x 38 x 30	102 litres	90	36	23
120 x 38 x 30	136 litres	120	48	30

Conversion factors for volumes are:

1 Imperial Gallon x 4.55 = Litres
1 Imperial Gallon x 1.205 = US Gallons
1 US Gallon x 0.83 = Imperial Gallon
1 US Gallon x 3.787 = Litres
1 Litre x 0.22 = Imperial Gallon

Examples of wattage per tank size:

Inches	Centimetres	Heater Wattage
18 x 12 x 12	45 x 30 x 30	100
24 x 15 x 12	60 x 38 x 30	150
36 x 15 x 12	90 x 38 x 30	200
48 x 18 x 12	120 x 46 x 38	250
50 x 18 x 15	130 x 46 x 38	300

Calculations of Weight

Imperial Gallons x 10 = weight of water in lbs.

US Gallons x 8.34 = weight of water in lbs.

Litres x 2.2 = weight of water in lbs.

Litres x 1000 = weight of water in grams (hence the volume in litres is the same as the weight in kilograms)

Average weight of gravel = 100 lb per cubic foot

Average weight of glass = 5 lb per square foot

Average weight of rocks = 150 lbs per cubic foot

To convert any value:

DH x 17.9 = ppm

DH x 1.25 = Clark

Clark x 14.3 = ppm

Clark x 0.8 = DH

ppm x 0.07 = Clark

ppm x 0.056 = DH

Type of water:

Very soft water = 0 to 50 ppm

Moderately soft = 50 to 100 ppm

Slightly hard = 100 to 150 ppm

Moderately hard = 150 to 200 ppm

Hard water = 200 to 300 ppm

Very Hard = over 300 ppm

Length of tank	Incandescent Bulb	Fluorescent Tubes
Inches		
18	45	1 x 40 watt
24	60	2 x 40 watt
30	76	2 x 60 watt
36	90	3 x 40 watt
48	120	3 x 60 watt
60	150	5 x 40 watt
72	180	5 x 60 watt
		1 x 8 watt
		1 x 15 watt
		1 x 20 watt
		2 x 20 watt
		2 x 30 watt
		2 x 40 watt
		2 x 50 watt

General Conversions:

1 inch x 2.54 = Centimetres (cm) cm x 0.3937 = Inches

1 Ounce x 28.35 = Grams (g) g x 0.03527 = Ounces

1 Gram/Litre x 0.17 = Ounces/Imperial Gallon

1 Ounce/Imperial Gallon x 6.66 = Grams/Litre

1 Litre (1000 cc) = 1.75 Pints

5 Litres = 1.1 Gallons

1 Metre (100 cm) = 39 Inches

1 Foot = 30 cm

Note that the fish length is measured from tip of the nose to base of the tail (i.e. exclude the tail itself). For ponds allow 1 inch of fish per 24 square inches of surface area.

SHOWING FISH

Showing fish became popular in the early 1950's and as the imported varieties of species grew and the price of fishes fell, they came to be available to almost everybody. Aquatic clubs thrived and a system evolved on how to determine a good specimen from the others.

Individual hobbyists whose experience was regarded highly were invited to judge at fish events and these became the fore-runners of today's fish shows.

Today there are well over 150 Open Aquatic Shows nationwide, it indicates the popularity of showing fish. Exhibits can number 100-1,000 depending on the type of show, and generally all are shown in individual tanks. These can range from a 150mm (6") tank to 900mm (36") tank dependant upon the size of its inmate.

Generally at most shows any type of fish can be shown singly, there are also classes for pairs of fish and teams of 4 or 6 fish that have been bred by the exhibitor. Furnished aquaria are also included. There are on occasions, classes for goldfish and aquatic plants, so for the novice potential showman there are quite a variety of classes to choose from.

News or dates of forthcoming shows are usually advertised in the Aquatic Press, Association and club magazines.

Fish shows are a great place to see a variety of fish, many of which you may not have seen before. They have become a meeting ground for aquarists to exchange ideas and thoughts about fishkeeping. Also the club running the show will generally have a stall selling fish or aquatic goods, plus various other things going on, i.e.: auction or tombola; tea and cakes are also available.

You do not have to be a member of an aquatic club to show fish, but as a member

more information will be available regarding shows in your area. If you wish to show fish, I would advise you to join your local society. They can be of great help in letting you in to all the secrets and anomalies regarding showing, of which there are many. Show guides and rules can vary from one part of the country to another, so it is advisable always to obtain a schedule of the show you are going to attend, just to get the facts regarding classes and rules.

The judging system can vary, but generally a good specimen will always do well. The Association of Aquarists system of judging a single fish exhibit is out of 100 points with 5 features being pointed with a maximum of 20 points for each feature:

- 1 — size
- 2 — body
- 3 — colour condition
- 4 — finnage
- 5 — deportment/presentation

Therefore a good sized specimen with a well shaped body, good colour and finnage, swimming well in a clean, well presented tank will get good marks. Points would be deducted for undersize, poor shape and colour, damaged finnage, lack of swimming ability, etc.

Choose the fish you wish to show with care, exhibit him or her in a nice clean tank with room for movement, (the water must be very clean) and you may well be rewarded with a first or even a place card and trophy. Like most things in life a little effort will bring its own reward, but always keep in mind the welfare of your fish is of paramount importance while being shown.

Use a small show tank that meets the requirements of the Association under whose rules the show is taking place — in some

cases tanks are provided. Prepare the fish by feeding well, including Aquarian Colour Food to maximise its potential natural colour. Do not feed on the day of the show to avoid faeces fouling the tank. Transport both fish and water (clear, clean and mature) using a polystyrene box to maintain temperature. Place it on the show bench as early as allowed to give the fish time to recover from its journey and become colourful and active. Use an air stone if allowed and have a spare heaterstat just in case.

Remember, all today's winners were novices at showing once, so don't be put off, you too could be a winner!

Adrian Blake,
Past Chairman,
Association of Aquarists.

For information on your local aquarium society ask at your nearest aquarist or pet shop. National societies advertise in the *Aquarist and Pondkeeper* and contact their members by mail.

For further information about the 'A of A' write to:

Association of Aquarists,
Mrs. A. Ottley,
71 St. Michaels Road,
Aldershot,
Hants.



A magnificent catfish *Synodontis nanaeus* — best in show at the 1986 'Aquarian' Fishkeeping Exhibition, at Sandown Park. Owned by Ray Cooke of Tongham Aquarist Society and fed on 'Aquarian' flaked fish food.

Published by the 'Aquarian' Advisory Service



The Teak Clown, *A. melanops*, is a close relative of the more common Fire Clown, *A. frenatus*, and comes from Sri Lanka. (Photograph: Martyn Haywood).

CLOWNING AROUND

If you think there's nothing new to say about clowns — think again! Martyn Haywood of Reflections Aquatic Centre throws new light on these ever-popular, colourful fish.

Many thousands of words have been written regarding the relationship between clownfishes of the family Amphiprionidae and various species of sea anemones. But considering that the vast majority of marine hobbyists have been converted to that branch of the hobby because of this relationship very little has appeared giving guidelines on keeping clowns and anemones in the home marine aquarium.

Although this is a comparatively simple exercise in marine aquarium keeping, there are a number of pitfalls awaiting the unwary aquarist. In this article I hope to give a few useful tips upon avoiding or surmounting these problems.

Besides the obviously interesting and visually attractive 'symbiotic' relationship between clowns and certain anemones, the Amphiprionidae have many other appealing



An unusual Clownfish from Indonesia which looks like a cross between *A. sebae* and *A. polymus*. (Photograph: Martyn Haywood).

features. Possibly the foremost of these to the new convert to marines, who has been used to buying six Neon Tetras for £3, is that clowns are, size for size, among the cheapest of marine fishes, undercut only by the various damselfish species. At most good retail premises one should be able to obtain common clowns, *Amphiprion percula/ocellaris* from about £6.

Secondly, it is an indisputable fact that the clowns include some of the most brightly coloured fishes in the world. The common clown suffers, like the Guppy, from being too readily available and too easy to maintain. Both have quite stunning colours but because they are nothing like as expensive as some of the gaudy wrasses or Discus, *Symphysodon* spp, they are often looked down upon as not worthy of the consideration or time of the serious aquarist. Nothing could be further from the truth — even the most advanced marine aquarist does not know all the clownfishes' secrets.

Range of species

Let us, for the sake of argument, assume that our would-be marine aquarist intends keeping clowns and anemones and little, or nothing else. Sufficient has been written regarding tank sizes, filtration and ancillary equipment without going into these questions here. However, there are a number of points which bear consideration. Regarding the fishes, a number of species, such as the Maroon Clown (*Premnas biaculeatus*), the Saddleback Clown (*Amphiprion latriclavus/polyzona*) and the Brown and White and Black and White Clowns (*A. sebae/clarkii/xanthurus/bicinctus*) will grow much too large to be happily and healthily housed in a 20-gallon aquarium for any great length of time.

Of course, these species can, to some extent, be stunted by allowing growth-restricting hormones to build up in the water as a result of either insufficient water changes or the lack of carbon filtration. I am assuming that every aquarist wants to do things properly and so a 35-gallon tank should be considered the minimum for what might hopefully be a mature pair of these larger species, all of which may reach about six inches in body length.

The smallest clownfishes are those in the 'Skunk' group. This includes four species, *A. akallopisus*, *A. sandracinus*, *A. perideraion* and the recently discovered *A. leukocranus*, all of which reach only about three inches. Two of these could comfortably be housed in a 20-gallon tank. These species are not as brightly coloured as many other clownfishes and so are offered for sale less frequently. However, they have a subtle beauty, well developed personalities and have one extremely important point in their favour; they readily accept most anemones. All four species are characterised by a 'basic orange-pink' body colour and a white stripe down the back — hence the name Skunk Clowns — and are reputed to be slightly more delicate than most other species.

Between these two extremes in size falls the Common Clown. In its smaller size it's a vivid orange with three darkly margined white bands. As the fish matures the orange frequently turns a rich mahogany brown producing a mature fish no less beautiful than its younger brethren.

It is generally a mistake to try to keep more than one species of clownfish in the same tank. In this respect the two worst offenders are probably the Maroon clown, *Premnas biaculeatus*, and the Tomato clown, *A. ephippium*, in that to introduce other species to either of these two generally proves expensive.

If the hobbyist insists on trying to mix species then the ones which offer the greatest chance of success are *A. percula*, *ocellaris*, *sebae*, *clarkii* and the various 'skunk' types. However, it is imperative that there should be at least one anemone per species. Further, if possible, all should be of the same size and introduced to the aquarium at the same time. This way each variety has a chance to set up 'home' and none have had the opportunity of becoming territorially dominant.



The Blue-lipped Clownfish, *Amphiprion latzonotus*, a rare species from Australia. (Photograph: Martyn Haywood).

Suitable anemones

Having chosen a species of clown the next step is to consider suitable anemones.

It is a mistake to buy small anemones for these do not fare well in the presence of clowns. There seems to be too much activity for their well-being. They often refuse to feed and gradually shrink and eventually die. It is generally fairly easy to select fit and happy fishes but determining the health or otherwise of anemones is not so simple. Obviously, check that there are no dead or dying specimens in the tank and that the water is clear. Also check there are no wounds or tears in the anemone. Its tentacles should be expanded and it should react to being touched. It should not be voiding a stream of brown mucus from the oral cavity unless it has recently been overfed. Do not be alarmed if, on introduction to a new tank, the anemone contracts, often to the size of a golf-ball. It is merely changing the water in its body. Providing the new water is of good quality, then it will soon open to its former glory.

Some anemones have a penchant for moving around the tank and will occasionally settle on the front glass of the aquarium so spoiling the look of the tank. This is particularly the case with the red bodied, green tentacled *Radianthus ritteri* from Sri Lanka. But if the newly introduced anemone is sited where it receives a good deal of light, plenty of heavily aerated water and has a solid base for its foot then it will rarely move significantly from the chosen site.

Having said that mixing species of clownfishes together should generally be avoided the same may be repeated regarding anemones. All anemones release undischarged nematocysts (stinging cells) into the water along with excess body mucus. Many anemones are susceptible to the stings of other types of anemones and although the two may not be touching, either or both may slowly succumb. This is one of the

commonest causes of the downfall which sometimes occurs when an aquarist keeps anemones of different types in the same tank.

Establishing symbiosis

Clowns are naturally associated with the various *Radianthus*, *Discosoma* and *Stoicactis* anemones, all these being found in the clownfishes' natural habitat. However, I have had *A. perideraion* and *A. percula* set up home in the Caribbean anemone *Condylactis pinniflora* which they would never have met in the wild. There have even been reports of clownfishes taking up residence in some of our native North Sea, Atlantic anemones.

Unfortunately, there is no way of guaranteeing that a particular fish will accept, or be accepted by, a particular anemone. You may put a fish in a tank full of seemingly identical anemones and it will frolic through all but one. Similarly, present a group of clowns with an anemone and all but one of the fish will happily move into it.

Stilling my own preference for the Skunk Clowns I feel the newcomer to marines attempting to establish a 'symbiotic' relationship would be best advised to start with *Radianthus* anemones along with Common Clowns or those of the Sebae group.

Breeding downs

If the aquarist succeeds in this first venture there is no reason why ambitions should not broaden and, increasingly these days, more experienced hobbyists are seeking to spawn, and hopefully rear young, from their fishes.

Clownfish are the ideal subject for captive breeding trials — not least because much of the initial spadework has already been done and, indeed, tank-bred clownfish are available from the USA.

They are substrate spawners, cleaning a rock, guarding the eggs and generally behaving like many freshwater cichlids. While their fry are not large compared to many freshwater tropicals they are among the biggest produced by bony sea fishes. Although they are, by no means, easy to rear, they are far from impossible and much valuable guidance was given by Dr Robert Goldstein in previous articles in *A & P*. Like cichlids, however, chances of success are largely dependant on finding compatible pairs of fish. Only rarely are pairs available through the trade and then they are priced at a premium.

Fortunately, given a little patience, a quirk of nature makes it easy to obtain a pair. All clownfishes are born as non-functional males and they live in family groups. The dominant fish becomes a functional female and the second in the hierarchy the functional male. If the female dies the male changes sex and the next subordinate male becomes functional.

For the aquarist this means that by purchasing several small specimens of a species and growing them on together, one can be assured of ending with a male/female pair... and hopes of glory.

THE AQUARIUM, COLOMBO ZOO

It's the best aquarium in Asia, the guidebooks say. Dick Mills was enthralled — but unusually careful about litter!

The Zoological Gardens at Dehiwala, about 7 miles south of Colombo, is one of the prettiest zoos imaginable. The entrance gate (topped off with an enormous mosaic scene of animals) leads onto a 'top road' which, after continuing for about 200 yards, stops at the car park and restaurant facing the administrative building.

The elephant enclosure and large cats are all on display on this top plateau, but the rest of the gardens and enclosures are pitched on the sloping valleys on three sides. Two unusual features are a pool surrounded by high trees which are overcrowded with free-flying egrets and white pelicans, and a small semi-circular amphitheatre in which the elephants perform their daily afternoon balancing and dancing acts. Hidden, too, down in the valley is an enclosed Butterfly Park where one is surrounded by swarms of exotic insects which continuously visit the equally exotic flowering shrubs. To deter litter louts, there is a sign on a tree which says:

'If you with litter will disgrace,
And spoil the beauty of this place,
May indigestion rack your chest
And ants invade your pants and vest!'

A nice polite, and amusing, way of reminding visitors not to spoil other people's enjoyment.

Having paid the modest sum of 30 rupees (less than £1), unlike Christopher Robin who always turned right to find the bears, I turned left past the flamingo pool to the aquarium. The guidebooks to Sri Lanka and Colombo had all been unanimous in their praise of this aquarium — reputed to be the best of its kind in Asia — so I was keen to confirm this claim. As my knowledge of Asian aquaria up to this moment had been zero, I had to base any comparisons on European establishments.

The layout took the form of a series of small halls, each semicircular in shape, with a large, open-air centre area of which more later.

Each 'hall' had some four or five large display tanks set into the walls, each aquarium approximately 6-8 feet long, 4-5 feet deep and, probably, anything from 5-10 feet from front to back. The actual sizes would vary from hall to hall depending on the species being kept in them — the marine tank containing a turtle being of considerably bigger proportions than a large decorative fresh-water aquarium containing 200 Cardinal Tetras. Every exhibit was clearly labelled in a most unusual manner: there was a rock in each aquarium with the fish's



Above: Starfish, *Protoreaster* sp.



Left: Map showing distribution of Sri Lankan native fishes.



Left: *Tor kudree longispinnis*, the Mahsier, a fish similar to our native Barbel, *Barbus Barbus*.

Right: Central area marine aquarium showing large Batfish, *Platex* sp.



name written on it — taxonomic name and common name in English and Sinhalese. This nicely avoids lots of sticky fingers obliterating any externally-mounted notices!

Coming to the centre section is a surprise and, to the visiting aquarist, a source of wonder. In the very centre of a circular courtyard is a very large aquarium of probably pentagonal shape in which were displayed freshwater fishes originating solely in Sri Lanka. This is quite a sight to behold but then you become aware that the perimeter of the courtyard is an almost continuous marine aquarium (they had to leave a gap in it for a door!). This aquarium was a wonder of silicone sealant construction skills as each 'old three-penny piece' section of glass, some 6 feet by 3 feet, was merely bonded onto the next, and so on around the area. Two or three final sections were blanked off from the remainder by large perforated 'tank dividers' to form a safe area for the invertebrates which included some very delicious looking bright-blue and yellow lobsters. The water depth of this 'surround tank' was perhaps no more than 2-3 feet and maybe the front-to-back measurement of the tank no more than 2 feet, but what a swim for the fishes — nearly a Grand Prix circuit; it would have been a very close result between the Remora and a huge Batfish which could only just find enough water depth to cover itself.

Just before the exit from the central area was another large tank, say 15 feet by 6 feet by 8 feet, which had a most interesting col-



Opposite sides of the Traveller's Palm are said to face North and South, but they don't tell you which is which!

lection of 'community fishes'; the reason for the quotation marks will become clear when I tell you that in this tank were *Ophiromus* and Koi (all of similar 2 feet plus sizes), very large *Glozanosoma severum* (gold form as well as natural coloration), Oscars (*Astronotus ocellatus*), and Clown Loaches (*Botia macracantha*). With the air temperature around 85°F (30°C) there is no such thing as coldwater fishkeeping in Sri Lanka and so Goldfish and Koi have to take their chances in with the 'tropicals'. One aquarium shop owner I later spoke to was quite startled to learn that our Goldfish are kept outdoors during the winter, and had another

long-held belief shattered when I told him that Moors were quite breedable and not at all 'difficult'.

What needs to be said about the aquatic plants in the displays? Rampant is nearly an understatement, the more decorative aquaria requiring regular pruning to enable the visiting public to see the fish more easily.

In the surrounding countryside's rivers and reservoirs (the latter are referred to as 'tanks' and built by irrigation-minded forward-looking Kings centuries ago) *Salvinia* and Water Hyacinth (*Eichhornia crassipes*) have almost reached epidemic, pest proportions which should allay fears that any illegally imported aquatic plant might 'take over' if released in the wild. It is doubtful whether even Canadian Pondweed or *Cabomba* (yes, *Cabomba* does grow that fast in some areas of the world, if not in European aquariums) could make headway against the solid mats clogging waterways vital to the country's rice-growers.

Finally, just as you reach the last hall (Black Widows, Congo Tetras and Angels), you come across a very useful map of Sri Lanka indicating just where the native fishes you've been admiring were captured.

If I'd had more time in the Resplendent Land I'd have developed the photograph I took of it, bought a net and bucket and headed for the hills! As it is, I shall have to rely on photographs and memory to relive my visit to Colombo's Aquarium — the rest of Asia will need to do something special to take away its well-deserved reputation.

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Spotlight

THE GREEN MANTIS SHRIMP

(*Odontodactylus scyllarus*)

Photograph by: Bill Tomey

Dave Garratt reports on an interesting and potentially fearsome candidate for the specialist marine aquarium.

O*odontodactylus scyllarus*, the Green Mantis Shrimp, must surely be one of the most striking invertebrates that one could wish to see in a marine aquarium. The coloration is a startling combination of deep green with touches of red and yellow mingling in places to give a mottled effect. Add to this a heavily armour-plated segmented body and large stalked eyes and you then have a real eye-catcher.

However, beauty must be in the eye of the beholder and some hobbyists may find the appearance of this creature quite repulsive with memories of 'Hammer Horror' monsters. Hiding behind the colourful façade lies a fascinating but truly pugnacious and aggressive invertebrate.

The Mantis Shrimps are represented by approximately 700 species, many of which come from tropical coral waters. They all belong to the Class Malacostraca which includes 3/4 of all known crustaceans and, as such, they are related to crabs, lobsters and shrimps. Many are brightly coloured in shades of green, blue, yellow, pink or red with some species like *Odontodactylus scyllarus* and *Odontodactylus japonicus* being exceptionally colourful.

EFFICIENT KILLER

Mantis Shrimps possess two pairs of antennae, segmented bodies, armour plating, walking limbs and limbs specifically adapted for seizing and killing prey very efficiently. Some of their limbs are used for propulsion as occasionally they will swim and pursue prey, but, usually, they lie in wait and ambush their victims. These ambushes are executed from burrows which are essential to the existence of these shrimps. The burrows are excavated in the sea-bed or into the coral wall and larger species may dig them several feet long. The shrimps retreat into the burrows when threatened or when resting. Some species will block the entrance with rubble while *G. bredini* has its own spined appendage that it uses as a door to keep out intruders!

Mantis Shrimps are superbly equipped for an efficient predatory existence and are able to kill small fish and crustaceans larger

than themselves. The shrimp will wait in its burrow until prey comes within sight, then a quick dash and the intended victim is seized. The first pair of antennae quickly assess the suitability of the prey which is then held firm by the first pair of legs. The shrimp's large stalked eyes give a capability of depth perception which is obviously of great importance in these actions.

DESPATCHING VICTIMS

Once caught the prey is killed by one of two methods. The unfortunate victim may be speared by a folded appendage that can thrust forward at tremendous speed to ensure an instant kill. Larger armoured prey is battered to death by hinged club-like limbs at the front of the shrimp. The impact of the sea clubs is delivered at an astonishing speed and the impact is equivalent to a 22 mm rifle bullet! Smaller animals are often killed instantly but larger ones may be first immobilised by having their limbs smashed and then being bludgeoned to death. These shrimps also have the patience to use up to 500 clubbing strikes to break open large molluscs.

Mantis Shrimps wage territorial fights with one another over their burrows and these may result in the death of one of the combatants (these creatures have reached a stage of development where their offensive capability outweighs their armour plating and as such death of one or the other can follow these vicious fights). Even the mating of these armoured warriors is an aggressive affair with the male needing to beat a hasty retreat after the "dust" settles.

Aquarium information on these war-like creatures is very limited as their nature severely restricts the choice of tank mates and thus lessens their appeal for most hobbyists. Tank mates need to be large fish or large well-armoured crabs. Echinoderms are seldom attacked, hence other possibilities would include: Starfish, Brittlestars, Sea-urchins and Sea Cucumbers.

The shrimps themselves have few natural enemies with only large predatory fish presenting any serious threat to them. However, even Lionfish seem to find a mouthful of kicking shrimp to much to swallow. The Green Mantis Shrimp is the

only regular species imported into the United Kingdom and is also one of the heavyweight villains, growing to a length of 6 in and becoming a fearsome predator. Species sometimes imported into Europe include the pinky/orange coloured *Odontodactylus japonicus* and also *Gonodactylus guerini*, *Gonodactylus verritadi* and *Squilla oronotoma*.

Purchasing living rock can sometimes unwittingly bring small specimens into an aquarium and then real problems can occur since they can quickly wipe out all small fish and shrimps in the tank. They will also prove virtually impossible to catch because of their tremendous bursts of speed and the numerous crevices they will use as "bolt holes".

Despite their aggressiveness they make interesting aquarium inhabitants as they sit in their burrows constantly preening themselves or keeping the burrow tidy. The preening is carried out by a pair of short bristle-covered legs in front of the catching legs. The shrimps will also walk around the tank on their last three pairs of legs whilst holding the upper body aloft, thus resembling the terrestrial Praying Mantis from where they take their names.

EASY TO FEED

Mantis Shrimps are easy to feed, although they may need weaning off live food and they will take most animal foods such as mussel, cockle, lancefish and shrimps which can all be supplemented by an occasional soak in vitamin solution. The aquarist should take care when working in the aquarium as the spear mechanism is quite capable of penetrating to the bone and the clubbing action could break a finger. The aquarium should be made of a sufficient strength glass because a well-known party trick of these animals is the shattering of tank sides with their clubbing blows.

I have seen the Green Mantis Shrimp for sale occasionally but, like most hobbyists, I have not had a suitable species tank for it, or the nerve to risk such a purchase! I am sure a specimen in its own tank with a few carefully chosen tankmates would be worthwhile — perhaps this Spotlight feature may persuade a few more hobbyists to try!

Coldwater jottings



Stephen J. Smith

Fish in bowls — it can be done!

As regular readers to Coldwater Jottings will be aware, I am not greatly in favour of keeping fish in that "potential torture chamber", the Goldfish bowl.

However, recent correspondence from reader Bill Bradbury of Loughborough suggests the Paradise Fish are a sensible alternative to Goldfish as the inhabitant of your cast-off globe.

Writes Bill: "The Chinese Paradise Fish (*Macropodus opercularis*) can thrive for many years provided the water is properly maintained."

He lists the reasons for this as follows: "Being an Anabantoid, they possess a labyrinth organ in the head region and can thus breathe atmospheric air, rather than relying entirely upon dissolved oxygen in the water. Indeed, their gills are not equipped to absorb sufficient oxygen from the water alone.

"Needless to say, the water surface must be kept free of grease of any other contamination."

Bill continues by explaining that, although sold by retailers as a tropical species, Paradise Fish can withstand temperatures as low as mid-forties fahrenheit!

"Remember, though, that like the Goldfish, they come from China. Centrally-heated rooms are ideal for them but they will not need a heated aquarium."

He continues, "Their Chinese origin, though, is about all that Paradise Fish have in common with Goldfish. *Macropodus* are best kept alone — fish bowls are really not big enough for more than one Paradise Fish anyway — and they will attack a Goldfish inmate or even a probing finger!"

I still have the very Goldfish bowl with which I was introduced to the hobby as a six year-old, so I will happily concede that they do serve their purpose.

But, whichever fish you choose for your bowl, do help to maintain a suitable environment by using some of the accessories available for the bowls, such as circular undergravel filters and miniature air pumps.

Loss of a champion

I am sad to report that the superb Koi featured on the front cover of the August issue of *Aquarist and Pondkeeper* has died at its home — Kent Koi Ko in Sevenoaks.

The fish — a Gin Rin Showa Sanke — was well-known by almost every Koi enthusiast for the number of awards it gained in Japan over the past 10 years; including its last major award of Best Overall Koi (size 6) in the 1980 All Japan Nishikigoi Show.

The fish is reported to have been worth around £75,000 at its peak — for which princely sum it is understood to have changed hands some years ago! Deri and Glyn Evans of Kent Koi Ko acquired the fish earlier this year and it was a major attraction at the BKKS National Show held at Chelmsford, Essex, on 17 August.

"It was a natural show-off and obviously enjoyed the attention from all the visitors' cameras," remarked Deri.

The fish was believed to be around 16 or 17 years old although, as Deri explained, it could well be older. "Even examining a scale from the fish under the microscope would not give an entirely accurate indication of age — and we certainly would not wish to damage the fish!"

Visitors will still be able to see the championship Koi, however, as it will be preserved and mounted — an operation which will take around nine months to complete — before taking pride of place at its Kent home.

New Venue Success

The Northern Goldfish and Pondkeeper's Society (NGPS) tenth Open Show was held at a new venue this year, Trinity United Reform Church in Altrincham.

The venue proved to be an outstanding success, partly as a result of the efforts of NGPS member Bill Cumberland.

Bill spent several months constructing the two-tier stands for benching at the show, and it was heartwarming to see his dedication rewarded by his fellow members who promptly made him an Honorary Member of the society.

Prizes were presented by Dr. David Ford, Head of Aquarian Laboratories. Best in Show out of 200 entries was won by Brian Rothwell for a magnificent Bristol Shubunkin. Brian also achieved the most awards in the show with Bristol and London Shubunkins in adult and breeders classes.

Tailpiece

The following remark was overheard



Brian Rothwell, who is well-known throughout the British Goldfish scene, won Best in Show and the most show awards at the 1986 NGPS Open Show for his magnificent Bristol and London Shubunkins. (Photograph: Dr. David Ford)

from a couple as they departed from an aquatic centre with two newly-acquired Koi:

"Well, having spent £50 on these I suppose we had better find somewhere to put them."

I almost could not believe my ears! Why, oh why do some people treat fish with such extreme disrespect? As a result of lack of preparation by their new "keepers" the fish will, without doubt, suffer extreme stress and will probably meet an untimely death.

Consequently, two more people are likely to become disillusioned with the hobby and miss out on the potential enjoyment to be gained from our pleasurable pursuit of fishkeeping.

The public, retailers and, more importantly, the fish lose out. If only more people would take the trouble and use the common-sense to treat fish as animals which deserve respect, then the public, retailer and, more importantly, the fish would benefit.

Helping hand



Nick Lushchan

A & P Readers Support 'Helping Hand'

I would like to say a big 'Thank you' to all the hundreds of *A & P* readers who stated in their questionnaires (sent out a few months ago) that they read and enjoyed *Helping Hand*.

The response was tremendous and most encouraging. It gave me a shot in the arm that I am very grateful for.

It's nice to see that the message is getting through and that more and more people appear to be realising that the disabled fishkeeper is just another ordinary person, with all the same problems as anyone else — only a few more in many cases!

Encouraging Trade Response

It is also good to hear and discover that an ever-increasing number of traders are improving their premises to cater for the wheelchair aquarist.

What many of these companies are also finding is that, when they replace steps with ramps, it is not only wheelchair-bound visitors who benefit.

For example, ramps make it possible for members of staff to use trolleys to carry heavy, or long objects (such as 4ft tanks and the like). This not only makes things easier, but also safer.

So — installing ramps reduces hazards, and helps customers and staff alike.

Having spoken to a number of traders throughout the summer (their busiest period), I was pleased to hear that many already have planned alterations for their premises scheduled to be carried out during the winter months when the flow of customers is likely to be lighter.

I look forward with great interest to hearing further.

Aquarium Equipment Suitable for Disabled Aquarists

I am always on the lookout for pieces of "normal" aquarium hardware which may be of particular use to disabled fishkeepers.

Two items which have recently come into my possession appear to be extremely useful indeed. One is a heater from Hagen, while the other is a filter from Interpet.

1. Therma Compact Heater from Hagen

This heater/stat from Rolf C. Hagen (UK) Ltd. is the first one which I have come across that has a positioning bracket. By this, I mean that the heater is stuck on to the glass of the tank by means of two suction pads held together with a plastic "spacer".

This rather simple but useful device makes it possible to remove the tube, e.g. during tank maintenance, without having to remove the pads themselves from the glass. (We all know what can happen to suction pads when they are repeatedly removed and restuck.) If, on top of this, you are disabled (particularly if you have difficulty in using your hands or arms), this little device allows you to manipulate the heater/stat much more easily than would otherwise be the case and without having to fiddle about with individual suckers.

There are two sizes of this heater/stat available: a 50-100 Watt model measuring 95in and a 150-200 Watt one at 115in long.

The temperature adjustment knob is also very easy to use (but please read the instructions as I found out that adjustment is carried out in the opposite direction to other heater/stats I have in my tanks).

2. Interpet Whisper 2 Power Filter

This is one of the latest filters to be produced by Interpet.

It is an external box filter which hangs outside the tank and works silently and

efficiently for weeks on end. Having run my test model for 7 weeks without a break, I have concluded that this filter is a brilliant piece of equipment.

It is extremely easy to operate and yet is very efficient indeed. Having used a similar type of filter in the past, I found that this model overcomes most of the objections I had, as a disabled aquarist, to previous filters of this design.

For example, it has a large filtration area and a motor that does not burn out if it is run dry (I have actually put this to the test with the one I have). Another good point is that it is very easy to get this filter going simply by pouring a small amount of water into the chamber using the lid as a scoop (although the filter is self-priming, I found that it needed a "Helping Hand" if the level of the water was 3in or more from the top of the tank).

The *Whisper 2* has a flow control knob which I found so easy to adjust that I would go as far as saying that, even fishkeepers with disabilities in their hands, would find this filter manageable and comfortable to operate.

Even installing and replacing the Bio-Bag is a very simple task — just follow the instructions, clip the top on, slide it into the slots provided — and off it goes.

A final advantage is that the whole unit can be cleaned out completely in just a few minutes.

All in all, the *Whisper 2* is a filter that will help a large number of hobbyists, with the added bonus that it will also benefit disabled fishkeepers.

Invitation to Manufacturers

If you think that any of your products might be suitable for, or be of benefit to, disabled hobbyists, please get in touch with me. I'd love to hear from you.

In the meantime, Good Health and Happy Fishkeeping.

Nick Lushchan, 27 Hungerford Road, Rugby House, Calne, Wilts. SN11 9BH.

The *Whisper 2* External Motor Filter from Interpet — a useful piece of equipment for disabled hobbyists.



Tomorrow's aquarist



How would you like to be Aquarium Keeper for a day and look after fish such as this Moray Eel? (Photograph courtesy of London Zoo Aquarium). A copy of Dr Chris Andrews' new book on Fish Breeding will go to each of the three runners-up.



Red Herrings Competition sponsored by the London Zoo Aquarium

Whether you are an experienced aquarist with a tank-room, or a beginner with one two-foot community tank, a visit to a large aquarium is always fascinating; not only for the vastness and variety of their collections but also because they offer an ideal opportunity to learn more and come away with lots of new ideas. With this in mind, **Dr Chris Andrews, the Assistant Curator of London Zoo Aquarium**, is offering our readers the chance of a very special New Year.

The Prizes

The winner of our competition will receive **One Year's Family Membership** to both **London and Whipsnade Zoos**, enabling a family of two named adults and two named children, aged between 5 and 15, **free admittance** to these Zoos; which should solve a lot of Bank Holiday and school vacation problems — if the myriad activities at Regent's Park and Whipsnade are not attraction enough! Adults may use their membership individually, whilst children under 16 must be accompanied by one of their parents.

Whilst London Zoo Aquarium should need no introduction, you might not be

aware of the exciting new developments at Whipsnade. Indoor family centres are currently under construction, recreating the different environments of the world — and of particular interest to aquarists will be the marine section and a reconstruction of a tropical rainforest, complete with Discus and Piranha.

As a bonus, if you are 16 or over, you can be an **Aquarium Keeper for the day** on your first visit to London Zoo. Dr Andrews will arrange for you to be conducted on a guided tour behind the scenes of the Aquarium and you will then be handed over to one keeper for the morning and another for the afternoon. Highlights promised are feeding times of the fish — between 2.30 and 3.30 — which is one of the Zoo's major attractions (particularly the Piranhas and Octopus!) and your own private preview of the new filtration and lighting systems for the new Aquarium, which opens in 1988.

If you are under 16, don't despair. You will still be conducted on the tour behind the scenes and Chris Andrews has assured us that you will "get your hands wet"! Although you cannot be an 'official' keeper because of your age, there'll still be lots of

interesting things to see.

Three runners-up will each receive a copy of **Dr Chris Andrews' new book, A Fishkeeper's Guide To Fish Breeding**, published by Salamander. The guide explains in simple terms the techniques for breeding cichlids, gouramis, characins, barbs, danios, catfish, livebearers and some coldwater fish.

The Competition

As London Zoo Aquarium are offering a **Magical Tour**, we decided to put the **Mystery** in it — and no mystery is complete without a few 'red herrings'. So we want you to put your thinking-caps on and find the common names for four fish we have described in cryptic clues.

To help you get on the right lines, a sample clue would be: "Do these fish come from Ambridge?" The answer? What else but "Archer fish"? So here are the four clues:

1. A prize specimen for a lepidopterist?
2. Would the ewes find them appealing?
3. An instrumental fish for a hillbilly...
4. Do they fall in the Autumn?

List these four fish — remember, we want common names only — and send your answers to: **Red Herrings Competition, Aquarist And Pondkeeper, 58 Fleet Street, London EC4Y 1JU, to arrive not later than the last post on Wednesday, 26th November 1986.** The winning entries will be drawn from the hat on the 28th November.