JULY 1990

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AQUARIST AND PONDKEEPER

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HAMPTON COURT POINTS THE WAY

Flower shows have tended to come and go without even the merest hint that there's such a leisure activity as watergard ening in existence. Admittedly, some of the larger shows have, in recent times, demonstrated a little greater awareness and have included a few aquatic exhibits here and there, indicating (quite rightly) that there *are* alternative/complementary forms of gardening to the more traditionally accepted ones.

All the while, though, things have been stirring in the aquatic undergrowth. So much so, that what was once undeniably a minority pastime, is fast adopting a 'majority interest' reputation.

In the early 1980's, we didn't have any accurate records of how popular pondkeeping actually was, but, by 1987, when the last major detailed survey was carried out (Mintel Leisure Intelligence), there were already an estimated 1.5 million ponds established in UK gardens. Since then, the healthy growth of the coldwater side of the aquatic hobby has continued apace, probably assisted by fortuitous factors such as last year's very hot summer.

Whatever the cause, or causes, behind this upsurge in interest, the encouraging reports that we've been regularly receiving indicate that we could already have something like 2 million ponds installed in gardens throughout the nation.

Figures for the current season won't be in for some time yet, of course, but we can at least already say that enthusiasm for pondkeeping and other aquatic pursuits remains very firmly on the up.

It is therefore particularly pleasing to see that, for the first time ever, there's going to be a special, totally aquatic section at a major flower show. Full marks to the organisers of the Hampton Court Palace International Flower Show (11-15 July) for realising the growing importance of pondkeeping, watergardening and aquatics in general.

Where they tread today, may other enlightened organisers follow tomorrow. Pondkeeping and watergardening are becoming an ever-greater and important part of our lives, so let's hope that, from now on, they receive the credit they so richly deserve.

We look forward to seeing you at Hampton Court.

John Dawes

John Dawes
Editor

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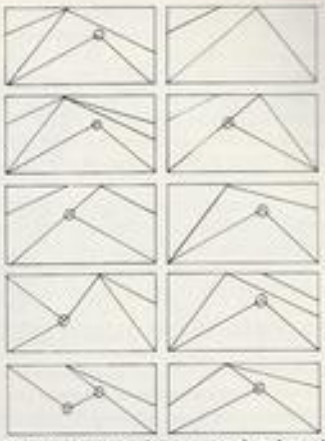


Different layouts for an aquarium based on the principle of The Golden Section. O = points where single plants can be placed for maximum effect.

GOING DUTCH

(PART 4: THE GOLDEN SECTION)

Arie de Graaf completes his series on how to set up a spectacular Dutch Aquarium

(Photograph and illustrations by the author)

First STEPS

One of the dangers of setting up a large planted aquarium is that, if you are not careful, you can easily end up with two more-or-less identical aquaria in one. This usually happens because, in aquascaping, one tends to match one half of such a system with the other.

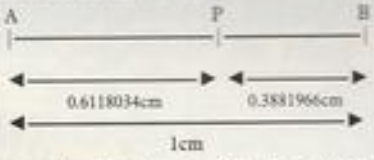
A further 'risk' is that, unless remedial action is taken, one can often end up even being able to say whether the owner is right-handed or left-handed! The reason for this is that a right-handed aquarist will usually start to fit out an aquarium on the left side, working towards the right. The result is that the left side is often more beautiful than the right, as most of the better plants will tend to be used first. The opposite, of course, applies to left-handed aquarists.

THE GOLDEN SECTION

One way of preventing this is through the designing of a layout plan based on what is known as **The Golden Section** (sectio aurea). This principle was popular with the Greeks and still is among artists and mathematicians.

Basically, the mathematics is as follows:

Take a line (AB) measuring, say, 1cm (or 1in, or one 'other' type of unit). Divide this line into two parts such that one (AP) is 0.6118034cm (or in) long, and the other (PB) is 0.3881966cm (or in).



Such a line bears the following proportions:

AP : PB = AB : AP

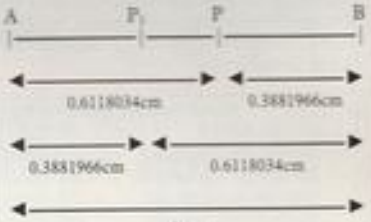
0.6118034 : 0.3881966 = 1 : 0.6118034

Another way of writing this is:

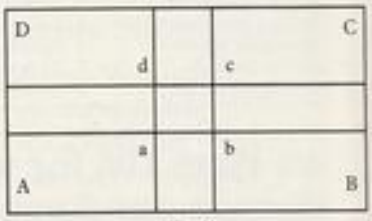
AP x AP = AB x PB

0.6118034 x 0.6118034 = 1 x 0.3881966

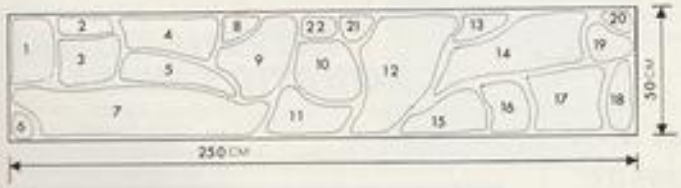
The same line can also be divided in the above way, but starting from point B instead of point A. When this is done, the figures become reversed so that AP becomes 0.3881966cm and PB becomes 0.6118034. By carrying out both the above operations and combining them along the same line, we end up with AB carrying two points (say P and P_1) along its length, something like:



This 'rule' can be applied to any line, including, say, the length of an aquarium, or its depth from front to back. When this is done, and all the lines are joined up, we end up with the following (Fig 1):



(Fig 1)



The problem, of course, is that no aquarium is 1cm (or in) long or wide. So how can one determine where the points are going to fall? The answer is simple.

Take an aquarium that is 175cm long. This figure becomes our line AB. Applying the above formulae, the point P is obtained by multiplying 175 by 0.6118034, i.e. 107.0656. Therefore, point P is situated 107.0656cm along the front of the aquarium, starting at point A. Point P_1 would then be this same distance starting from B . . . and so on.

One important factor that should be borne in mind, though, is that aquarium calculations do not, of course, need to be as accurate as this. It is reasonable, therefore, to read 0.6118034cm as 0.6cm, 0.3881966 as 0.4cm, etc. The main reason why accurate figures have been given above is merely to illustrate the mathematics behind the principles.

APPLYING THE GOLDEN SECTION

If we return to Fig 1, the points where the lines cross each other (a, b, c, d) are regarded as 'strong points' and it is here that solitary (specimen) plants or decorative materials should be placed for maximum effect. However, to avoid obvious, artificial symmetry, points on the same line sould be avoided, e.g. 'a' and 'b', but points on different lines, say, 'a' and 'c' produce good results.

Starting at point A and counting clockwise, there are 12 points at which lines meet. Add to this the four points — a, b, c and d — and we get a total of 16. By connecting these 16 points in different assymetrical arrangements, a large number of possible aquarium layouts can be created. Fig 2 represents ten examples of potential layouts, but there are many more possibilites, of course.

As with the 'a, b, c, d' situation above, points of intersection between lines are ideal locations for specimen plants or decorative materials, such as bogwood.

The photograph accompanying this feature shows a large aquarium (250cm — c 100in) owned by Dutch aquarist Mr Ruwe. It is designed using the Golden Section principle and demonstrates just how attractive such a system can look. A plan view of the layout, plus a full list of plants and fish are also included. Lighting for the tank consists of eight fluorescent tubes of 40 watts each, switched on for 14 hours per day. Filtration is by means of two Nuova pumps with a flowrate of 600 litres/hour (c 130 gallons/hour).

CONCLUDING REMARKS

In my four articles in this series (published in the February, March and May 1990 issues of *Aquarist & Pondkeeper*), I have attempted to provide a fairly comprehensive guide to the setting up of Dutch Aquaria. Some of the aspects of setting up these systems may, at first sight, appear to be a bit complicated, but the effort is well worth it as, I hope, the photographs of established Dutch systems which I have used to demonstrate.

PLANT AND FISH SELECTION

PLANTS	
1) *Bacopa amplexicaulis*	16) *Ludwigia palustris*
2) *Hydrocotyle leucocephala*	17) *Echinodorus tenellus*
3) *Hygrophila polysperma*	18) *Microsorum pteropus*
4) *Alternanthera reinechii*	19) *Rotala indica*
5) *Saururus cernuus*	20) *Spathiphyllum wallisii*
6) *Ceratopfyllum demersum*	21) *Cryptocoryne cordata*
7) *Cryptocoryne beckettii*	22) *Ceratophyllum demersum*
8) *Vallisneria spiralis*	**FISH**
9) *Heteranthera zosterifolia*	6 *Gasteropelecus sternicla*
10) *Alternanthera sessilis*	6 *Rasbora caudimaculata*
11) *Echinodorus tenellus*	6 *Paracheirodon axelrodi*
12) *Anubias barteri* var. *nana*	8 *Nematobrycon palmeri*
13) *Hygrophila difformis*	2 *Pterophyllum scalare*
14) *Lobelia cardinalis*	7 *Xiphophorus variatus*
15) *Cryptocorne wallisii*	7 *Corydoras* sp

See Page 106 for what's in store in our August issue

The mature cascading waterfall (seen at the far end of this general view)

UK KOI & PONDS

(No 1 — Edward Clark)

Some of the world's best Koi and Koi-keepers are to be found right here in the UK. Over the next year or so, **Nigel Caddock** of Nishikigoi International will be introducing the very best.

(Photographs: Courtesy of Nishikigoi International)

One of the great things about Koi-keepers is their capacity for innovation. This capacity is only exceeded by their ability to adopt other people's ideas and apply them to their own individual systems.

There are many excellent Koi ponds throughout the country and it is the objective of my new occasional series **'UK Koi and Ponds'** to concentrate on hobbyists whose ponds have features that are both very attractive and innovative and which may, at the same time, stimulate ideas for us all to 'pinch'.

It is appropriate that the first in series features a man who, in addition to being one of the UK's foremost hobbyists, is also someone who has made a significant contribution to the development of the hobby of Koi-keeping in Britain — Ed Clark.

Ed's pond is unique in many ways, but the most significant fact that makes it so impressive is that it manages to achieve that elusive balance between the needs of a good Koi pond and the need for a high degree of aesthetic beauty.

Ed has achieved this objective totally. In addition to a technically effective pond (designed and constructed by In-filtration Ltd) that really 'does the business', it is also a very attractive pond with many interesting features.

Basic statistics

Ed's pond contains 14,500 gallons (75 tons), and is broadly kidney-shaped, with overall dimensions of 32 x 12 and 7 ft deep. The metric equivalents are: 65,250 litres (c. 76 tonnes); 9.75 x 3.65 x 2.13 metres.

Six bottom drains, yes, six bottom drains(!) are available to remove bottom water and the main filter feed is via a 10in (25.4cm) pressure pipe feed into a very large settling chamber crammed with filter brushes. The settling chamber's dimensions are 8 x 4 x 6 ft deep (2.4 x 1.2 x 1.8m).

The water then flows through three filter chambers measuring 4 x 5ft (1.2 x 1.5m) and containing a highly aerated filter mat and onto three further chambers — 6 x 4 ft (1.8 x 1.2m). Two of these chambers contain aerated filter mat and the final one, Zeolite.

The water returns to the main pond through a 30in (76cm) sand pressure filter and a Laars bioler via eye-clean Pia and Venturi returns. The waterfall is fed by a power skimmer and returns to the pond over a well established cascading waterfall, powered by an ITT Marlow pump which returns 3000 gals (13,500 litres) per hour.

The main system uses ITT Marlow pumps which jointly turn over some 5,000 gals (22,500 litres) per hour.

The pond is covered by a pergola constructed in oak, which now has been overgrown by a range of climbing plants such as Clematis and Wysteria that combine with

the hanging baskets to create a marvellous overall effect.

Superb Koi collection

In addition to a superb pond, Ed has a superb collection of Koi. The finest of his collection is a magnificent Sanke. This Koi is a majestic 28in (72cm) female Koi imported by In-Filtration in late 1985. It was acquired in Niigata especially by Peter Waddington, for Ed.

This snake, then (and still) rated among the top Koi in the UK, has continued to develop and has finished as a spectacular Koi of awesome quality. The status of the Koi was reinforced by its placing as Grand Champion at the 1989 UK dealers' show, and Grand Champion in the dealers' section of the 1989 BKKS national show.

In addition to being a totally committed hobbyist, Ed, is also one of the hobby's most genuine and sincere supporters who has made an enormous contribution to the development of Koi-keeping in the UK, in particular through Koi show sponsorship and development.

It is therefore appropriate to take this opportunity to thank Ed sincerely on behalf of the UK's Koi-keeperes for his tremendous and unselfish past, present and very much ongoing, support.

For further information contact: Nishikigoi International, 109b Snowden Avenue, Flixton, Urmston, Manchester, M31 3EF.
Telephone 061-747-3390

A touch of Japan in the UK — Ed Clark's Koi garden.

Ed Clark's prize-winning Sanke.

PORTABLE PONDS

Providing suitable short-term accommodation for pondfish during periods of quarantine or treatment, or during the breeding and winter seasons, can pose major difficulties, particularly when long-term space is at a premium. Faced with such problems, **Alan Evans** decided to design his own portable/temporary ponds.

(Drawings by the author)

Just as the aquarist often finds the need for an extra aquarium, so may the pondkeeper have the need for supplementary temporary accommodation, e.g. when clearing or cleaning out an established pond. Breeders of Goldfish and other aquatic livestock will also find such ponds a boon during the breeding season. Koi-keepers, in particular, often need to erect temporary ponds in garages and sheds for the growing on of young stock over the winter period.

Both of the designs for portable/temporary ponds that follow can be folded away when not is use and take up very little space; certainly a lot less than the several old aquariums, bowls and buckets that are sometimes kept in case of emergency. Would-be pondkeepers who don't have the space for a conventional pond may also find that either of these two designs can be used as a permanent structure.

All that is required, in such cases, is a coat of wood preservative on the outside and some form of decorative cover on the sides exposed to view. Logs on a roll would look very nice. My own idea is to use chicken wire tacked in place and florist's moss pushed between the wire and the sides. Alpine plants, such as small pinks and the many *Sedum* varieties can have their roots pushed into the moss, and it won't be long before these plants cover the sides with a riot of colour and scent.

In the case of permanent fixtures, the moss plant growth will also provide insulation during the winter. If moss is not available, then straw will do, but it won't look as tidy, of course, at least not until it is covered by the plants.

STEP-BY-STEP GUIDE

Both ponds are simple and cheap to make. Mine have been in constant use for well over a year now.

Using 8ft x 4ft x ¾in plywood sheets known in the trade as Sheathing Boads, some 2 x 2in timber, a few nuts and bolts, and a polythene sheet or pond liner, there should be no difficulty in putting together either design.

Pond Design No 1.

The first pond is, 8ft long x 4ft wide x 3ft deep.

1 You will need: 36 Dome-head coach bolts, 2½in long; a plywood sheet, 8ft x 4 ft x ¾in. (this is to be the BASE); two sheets, 8ft x 3ft x ¾in (mark these SIDES 1 and 2); two sheets, 3ft x 4ft 4¾in x ¾in (mark these END 1 and 2); timber: (i) two lengths of 2in x 2in x 8ft (mark these A and B); (ii) two lengths of 2in x 2in x 3ft 8in (mark these two pieces C and D); and — finally, (iii) four lengths of 2in x 2in x 3ft (mark these E, F, G and H).

2 Well, that's the hard bit over! Now all you have to do is drill 36 holes and bolt the whole lot together. If this pond is to be a permanent fixture, you could use 1¾in wood screws if you prefer. Be sure to fix the bolts or screws with their heads on the plywood side for a smooth interior finish.

3 Bolt the timber marked A, B, C and D to the BASE and E, F, G and H to the ply marked END 1 and 2 (see Fig 1).

4 Turn the BASE over and drill and bolt on SIDES 1 and 2 to it. Then drill and bolt on ENDS 1 and 2 to the BASE and SIDES. (see Fig 2).

5 Fitting the liner can be a bit fiddly. The best way I have found is to remove your shoes and climb inside. You may find double-sided sticky tape is useful to help hold the liner in position while you sort out the corners for a nice neat finish.

FIG 1

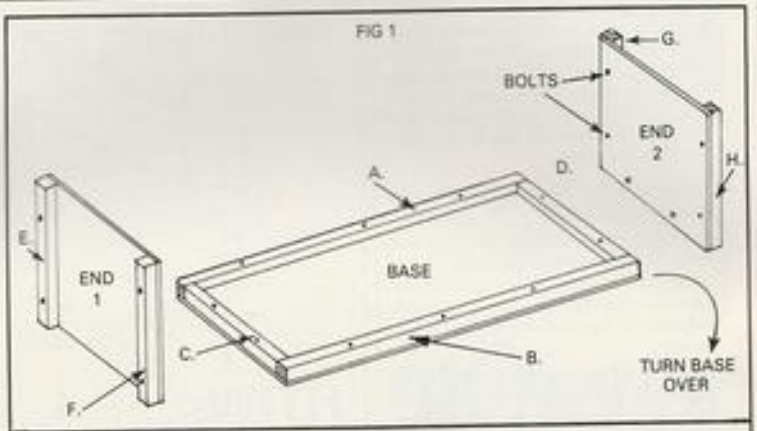
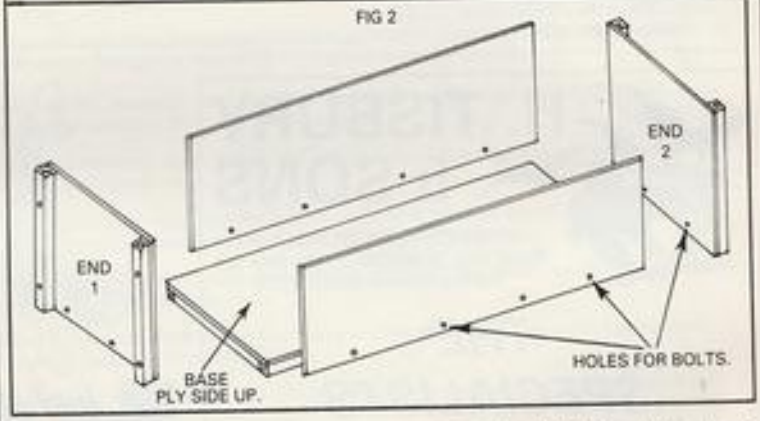


FIG 2



Pond Design No 2.

This second design is a real cheapo.

1 You will need: Two angle-iron single bed frames; one sheet of 8ft x 4ft x ¾in ply, plus another odd piece about 3ft x

2ft x ¾in; four 4in corner brackets; 16 small Dome-head bolts 1in long, with nuts; and the liner (this will be the most expensive item). I used Polythene originally but had to change over last winter as the Polythene was going brittle and wouldn't have lasted much longer.

2. Remove the springs from the bed frames and paint the frames if necessary. The actual size of this pond is dependent on the size of the frames, of course. They vary between 6ft x 3ft and 6ft 3in x 3ft 3in.

3. Measure the inside angle along the frame length and cut two pieces of this length, 2ft wide, from the plywood sheet. Place these in position inside the frame and measure the width. If your frames, like mine, are over 6ft long, you can reduce the 2 ft depth of the pond so that two sides and one end can be cut from one plywood sheet.

4. Using the corner brackets, bolt the sides and ends together.

5. Put the bottom angle in position and drop the sides and ends into place. I used sifted soil covered with newspaper as the base but you can measure the inside dimensions for a plywood base if you prefer.

6. Fit the liner, holding it in place with the sticky tape mentioned under Design No 1., above and complete the whole thing by putting on the top angle-iron. (see Fig 3 for assembly details).

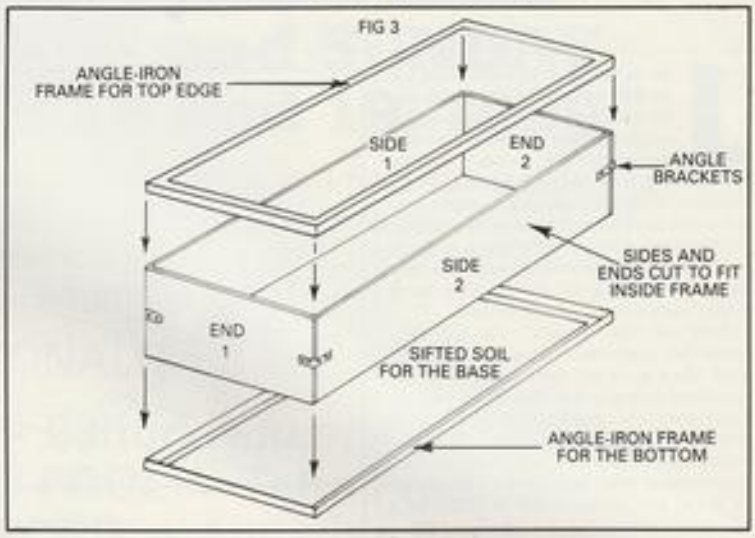
MAINTENANCE

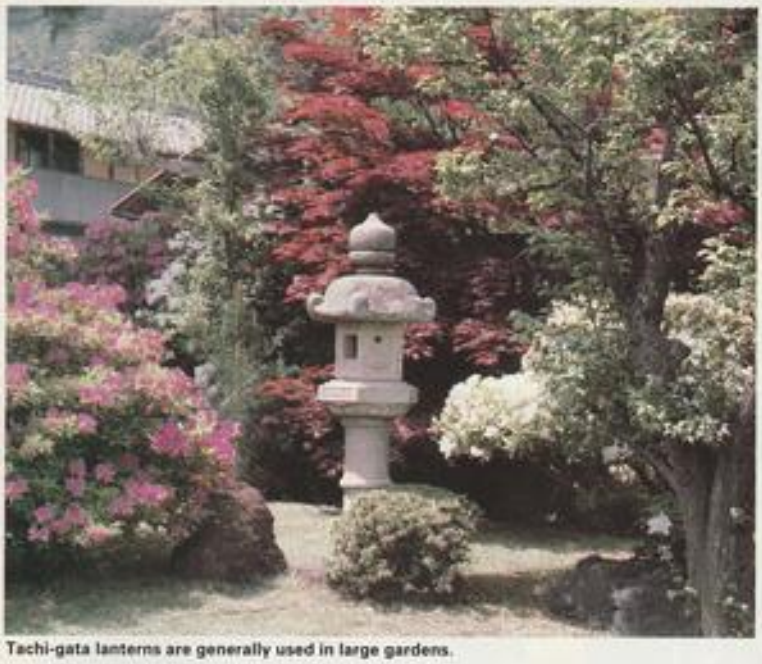
For draining, I use a sink plughole and plug, with a little smear of aquarium sealant around the plug so that it won't fall out accidentally and empty the pond.

Last year, I had no filtering system on these two ponds. However, I kept up a regular water change routine — a time-consuming occupation. This year, I intend to use some form of filtration. Other aspects of pond maintenance, such as appropriate stocking and feeding, are of course, just as important in the case of these portable, or temporary, ponds as with more 'permanent' systems.

Finally, these designs are not intended as alternatives for the more permanent range of ponds that are currently available, but more as a means of overcoming temporary problems easily, particularly where long-term space availability is at a premium.

FIG 3





Tachi-gata lanterns are generally used in large gardens.

An Ikekomi-gata ('buried') lantern. These lanterns have their shafts (or stems) partly buried in the ground.

ILLUMINATING IDEAS FROM JAPAN

For that special extra touch of the Orient, few garden or pool ornaments can beat a good Japanese lantern, as **Roger Cleaver** demonstrates.
(Photographs — unless otherwise stated — by the author)

With the increasing interest in keeping Koi in garden pools in this country, there seems to be a corresponding interest in trying to give the garden an Oriental flavour. This is perhaps partially due to the fact that most Koi pools are devoid of plants, encouraging people to find some alternative means of decoration around their pond.

As Koi are 'Japanese', one answer is to create a Japanese-style garden. However, it is very difficult to do this correctly, so most people opt for giving the surround to the pool a Japanese flavour, instead.

One of the easiest ways to give a garden just such a Japanese touch is to use Japanese-style lanterns. A few years ago, this was difficult to achieve as lanterns were scarce in this country but now, one of the large manufacturers and distributors of water garden equipment (Blagdon Water Garden Products Ltd) offers a range of eleven Japanese-style stone lantern ornaments. These are available from many outlets around the country and seem to be very popular. As well as these manufactured lanterns, traditional hand-carved models are available in a limited number of places, e.g. Infiltration Ltd.

ORIGINS

Although thought of as Japanese lanterns, stone lanterns originated initially in India where, from very early times, they were used as fertility symbols. China then adopted the lantern, where it was used in the Buddhist religion, originally as a monument in cemeteries.

Lanterns were introduced to Japan with Buddhism from Korea and many were given as offerings to Buddhist temples and also to Shinto Shrines when petitioning for a special blessing.

As well as stone, lanterns were also made from wood, bronze and even precious metals. Many of the bronze lanterns were of the hanging type and were used to light the four corners of the temple or shrine. They could also be used grouped together in the eaves to

A Yukimi-gata lantern with its base in a pool. This type of lantern is the most popular among Koi-keepers.

give light to the ceremonies which originally were held at night. In Japan today, many fine examples of these metal lanterns can still be seen, particularly in the larger temples.

The lanterns associated with gardens became popular in the Edo period (1603-1886) when the Tea Ceremonies became popular. As many of these ceremonies took place at night, the guests required light in order to be guided through the garden to the tea house. Many of the styles of lantern now used were developed by the tea masters for their own gardens, many of them giving their names to several of the types available.

LANTERN TYPES

Although lanterns come in different styles, they can be classed into four main types:

Tachi-gata, or pedestal, lanterns;
Ikekomi-gata, or buried, lanterns;
Oki-gata, or small, lanterns;
Yukimi-gata, or snow-viewing, lanterns.

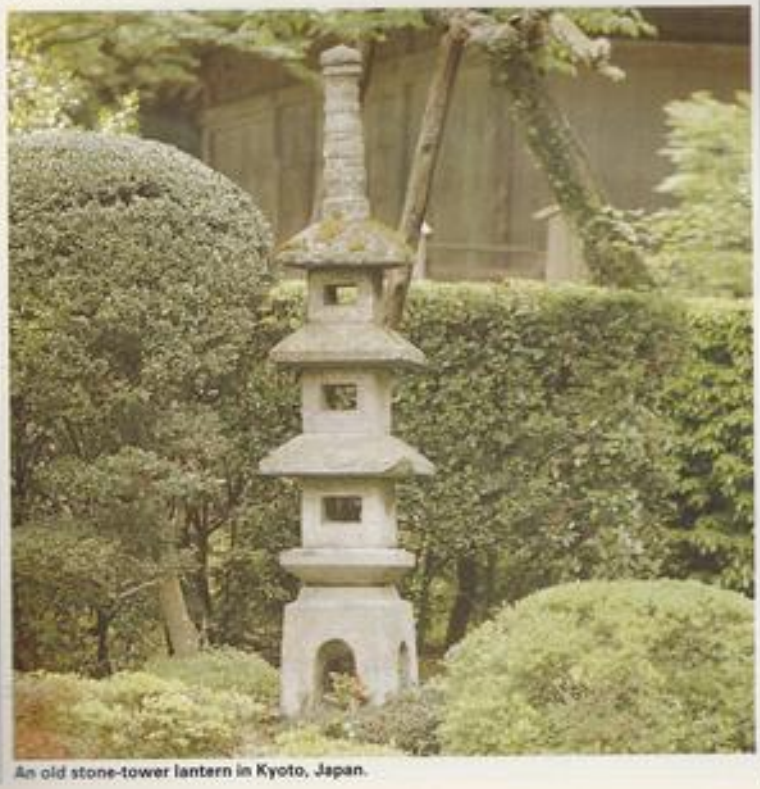
Occasionally, tower or pagoda-type lanterns are seen, but strictly, these should be classed as stone towers and not as lanterns.

Tachi-gata

Tachi-gata lanterns are mainly used in large gardens owing to their size which is normally about one and a half metres in height (though sometimes they run to three metres or more). Usually, they come in five parts which are meant to symbolise the five elements from which everything in life derives, the **Go-rin** (earth, water, fire, air and ether). The five parts comprise the shade (*kasa*), the flame bed or light box (*hibukuro*), the central section (*chudai*), the stem (*sao*) and the base (*godai*).

Three cantilevered lanterns from Blagdon's extensive Henri Studio range.

This basic scheme was developed by the tea masters and stone carvers into many forms. Often the base and central section were carved with petal motifs, while the upper part was carved to look like a lotus flower. This type of lantern is often used as the central focus of part of a garden or to light where paths cross.



An old stone-tower lantern in Kyoto, Japan.

Ikekomi-gata

In the Ikekomi-gata, the base is missing because the whole of the shaft or stem is buried into the ground. Although they look good anywhere, these lanterns were often used to light behind Tsukbai (water basins) in tea gardens.

Oki-gata

Oki-gata lanterns are small lanterns which are usually set in the ground at the sides of pools or paths to mark the way. These lanterns are usually designed in three pieces.

Yukimi-gata

The Yukimi-gata are probably the most well-known and popular type of lantern. They are referred to as snow-viewing lanterns because of the way their large flattish roof retains the snow.

These lanterns are usually made up of

three sections which, again, have symbolic significance: the upper part represents Heaven, the central part with the flame represents Man, and the base, the Earth. The base usually consists of three or four legs and these are often placed within the pool

As Yukimi-gata lanterns are often fairly small, they are well suited to be used in most sizes of garden.

SUGGESTED USES

If you want to use lanterns in your garden, then try to think along Japanese lines, and think simple.

Elaborate lanterns should be made a feature of on their own, as it is difficult in most settings to create the correct planting to do them justice. The simpler style lanterns should be made the principal element in an arrangement, using smaller rocks arranged to balance the height of the lantern. They look very good if you can plant a small tree or shrub behind them and then train the odd branch to hang across the front, gently to mask part of the lantern.

Wherever you decide to use them, you should take care to see that Japanese lanterns sit on a very firm and sturdy footing. To avoid distracting from the lantern itself, this footing should be set just below ground level. This is particularly so if siting a lantern within a pool, when it should give the appearance of just rising from the water.

Obviously, lanterns are meant to give light. Japanese lanterns, however, should be used just to illuminate a small area and not to bathe the garden in light. Many people install electric lights inside the light box of the lantern, but this can give a harsh illumination. Often, it is better to revert to the old-fashioned candle. Paper or glass screens can be fitted to the light box in order to prevent the wind from extinguishing the candle and also to help soften the light. A lantern flickering away behind leaves, creates a very pleasant mood on a summer's evening.

Adventurous pool keepers may even like to try to make their own lanterns. I know of one gentleman who makes a fair number of lanterns out of concrete, and their quality is excellent. Timber could also be used and, being a natural material, would be well suited to this sort of project, and very much in keeping with Japanese ideas. Even old stone, if it is not too hard, could be carved to make what could look like a very old stone lantern.

Cantilevered Yukimi-gata models (this one was photographed in Kyoto), are particularly attractive.

One final point: to show how popular lanterns are in Japan, the manufacturers of some types of commercial pool filter (the style which sits within the pool) include a lantern head in the filter which doubles up as a lantern and somewhere to house the motor for the filter.

Providing you keep your ideas simple and do not try to include too many styles, or too large an ornament, then Japanese lanterns can give a very Oriental touch to your pool and garden.

SUPPLIERS

Henri Studio range of lanterns:
Blagdon Water Garden Products Ltd, Units 6 and 7, Commerce Way, Walrow Industrial Estate, Highbridge, Somerset, TA9 4AG. Tel: 0278 781556; Fax: 0278 782079.

Hand-carved lanterns:
Infiltration Ltd, Units 12 and 13, Millingford Industrial Estate, Bridge Street, Golborne, Nr Warrington, Cheshire. Tel: 0942 724896; Fax: 0942 721525.

A selection of Mount Parnell fish.

PENNSYLVANIAN SUPER GOLDFISH BOWL

Sparsholt College student **David Brooks** recalls his Diploma assignment — a highly enjoyable and valuable experience at a giant US Goldfish and Koi farm.

Set in the rural Pennsylvanian countryside, at the foot of Mount Parnell, is one of the largest goldfish producing units in North America. Mount Parnell Fisheries Incorporated is a family-run business established by the present manager's father in 1923. Originally just three ponds in ten acres of land, it has grown to cover four separate sites totalling some three hundred acres with as many ponds. Individual pond sizes range from a quarter to three acres.

The opportunity to work for two months at Mount Parnell arose from my studies at Sparsholt College, Hampshire. With industrial placements an integral part of my Higher National Diploma course, I chose to visit the States for my assignment. I have a particular interest in ornamental fish and Mount Parnell was a marvellous opportunity to examine, at first hand, large-scale production. My arrival was to coincide with the busiest time of the year — spawning.

The journey from Hagley in Worcestershire to Mount Parnell took about twenty hours. I had a weekend to settle into the new environment, eased greatly by the warm and generous welcome received from the manager and his family.

Monday morning and time to go to work — it was 5.00 am! I had to get used to this idea quickly as it was the norm. Cloudy and cool weather during the first week brought the inevitable jokes about the English climate. However, things soon improved and, by the following Monday, with temperatures reaching 28°C (82°F) spawning was underway in earnest. On reflection, this turned out to be the single best day for spawning, with approximately four million eggs collected!

Market, of course, determines much of the production process. Mount Parnell produces small Comets as feeder fish, mainly for sale within the States, and a variety of ornamental fish, mainly for export, particularly to Europe. Comets, Sarasa Comets, Shubunkins and the more common double-tailed breeds of goldfish, together with Rosy Red Minnow, Koi and Gold Catfish, are the main breeds produced.

Aerial view of part of Mount Parnell Fisheries. Many of the ponds are empty, having only recently been harvested.

Annual production has reached 55 million fish. Of these, some 35 million are 1–2½in (2.5–6.4cm) feeder fish, with an additional 15 million bought in to meet demand. The remaining 20 million are made up of pond and fancy varieties (up to 14in – c35cm).

PRODUCTION CYCLE

The production cycle for each species begins with the brood fish which are kept outdoors throughout the year. The Fancy Goldfish varieties are held in the smallest ponds closest to the buildings. This eases their supervision and helps to keep predators away. Chief among these are the American Blackbird which appears in large numbers across the hatchery and feeds directly off the spawning mats, the Green and Great Blue Heron, reptiles and amphibians such as snappers and Painted Terrapins, water snakes and bullfrogs (and their tadpoles). Vigilance and precautionary methods are needed to reduce fish losses.

Initial broodstock was bought from suppliers around the world. (The Shubunkins, for example, were obtained from England). Once the strain has been established, future brood fish are selected from the offspring. These will be the ones showing desired body shape, finnage and colour, together with any specific requirements.

Spawning

All spawning occurs naturally in the ponds which are kept free of plants since they could be used as a spawning medium. An exception to this are Koi which spawn on to cultivated grass and are removed once spawning is completed, thus allowing the fry to develop in situ. In most ponds, such growth is not a problem. However, the larger brood ponds contain some Grass Carp which will devour aquatic vegetation, so alternative arrangements must be made for these.

Spawning mats, an artificial substitute replacing the weed, are placed at regular intervals around the edge of the pond on to fixed frames. Each mat measures 3ft × 18in (90 × 45cm) and is placed at a depth of 2–5in (5–12.7cm). These are made on site from rolls of manufactured material comprising 50% pig hair, 45% tampico fibre and 5% horse mane. The mats are placed in the ponds during the afternoon and are examiend the following morning at regular intervals. If a satisfactory (experience judgement) number of eggs have adhered to the mats, they are removed and placed on to the back of a truck. Fresh mats are left as replacements. Obviously, a large number of eggs will be eaten by the adult fish, but this loss is not regarded as significant because of the large numbers involved and the mats being replaced regularly. This process becomes very hectic at the height of the spawning season.

DAVID BROOKS

Harvesting small Comets.

Hatching

Each truck-load is covered with a damp hessian cloth to prevent drying and the mats are taken to ponds where they will hatch. These may be up to five miles away. Each mat is placed carefully into shallow water. Grass and other vegetation will have begun to grow in the emptied pond. As they are gradually filled with water, these plants will provide shelter for the developing fry. As the pond levels rise the vegetation eventually dies off.

The ponds are filled by pumping water from the Conococheague Creek which flows through all of the sites. While the creek provides most of the water required, a borehole is used for topping-up. Water quality is generally good, being only adversely affected when heavy rainfall produces a relatively high level of suspended solids. At such times, pumping is kept to a minimum.

With water temperatures reaching 30°C (86°F), the eggs will hatch within three days. The spawning mats are then removed, once the fry are free-swimming. This is done by wading into the pond, lifting one edge of the mat, usually with the foot (a hiding snapper is capable of taking a finger off!). After turning them to ensure all fry are free, the mats are thrown on to the surrounding bank. Again, they are loaded on to trucks, taken to be washed and then spread out to dry, ready for further use. Water snakes frequently hide under such mats.

Rearing

Initially, fry feed on food occurring naturally in the ponds, the level of which is increased by throwing cow manure into each of the ponds. Within 7–10 days of hatching, the natural food is supplemented daily with a specially prepared diet. This consists of cottonseed meal, wheat midlins and dried meat. The mixture is reduced to a fine powder and blown onto the surface of each pond from a truck-mounted feed-blower. Fertiliser is again added some four weeks later. This time, chemical fertilisers are used (23:23:11 mixture of nitrogen, potash and urea). Broodstock are fed on commercially produced trout pellets.

Comets can reach a marketable size within a few weeks but many, together with other species, remain in the ponds for about a year. During this time, they are regularly checked, with samples taken to the laboratory. Here, a number of tests may be carried out, including a parasite check, and remedial action is taken if necessary.

Harvesting

Speed and care in the handling of fish is paramount. One of the reasons for the early morning starts is to move fish before temperatures begin to rise. Each pond will be harvested in several stages, with only the approximate number of fish ordered being removed at any one time. Feeding is normally used to attract fish into the corner of a pond while a seine net is drawn behind them. This is repeated as necessary until enough fish have been removed.

As the stocking density falls, it becomes necessary to reduce the pond's level in order to net the remaining fish. Draining is achieved through a simple elbow-jointed pipe, the water flowing back into the creek. A one-acre pond usually yields about half a million 1–2½in (2.5–6.4cm) fish. Although business is reduced during the winter months, fish are still harvested. Thick ice may cover the ponds at this time of year, so chainsaws are used to cut out blocks of ice that are then lifted clear by crane, thus allowing access to the fish.

Each drained pond is limed in order to kill any remaining organic matter, including parasites. Although it is preferable to leave ponds to dry out before restocking, demand for space may mean very quick re-use. It is also essential, of course, that no fish remain before restocking, since they would eat both eggs and fry.

The harvested fish are removed by vehicles carrying twin holding-tanks and oxygen diffusers. On arrival at the building where they are to be held until sold, the water temperature in each tank is first reduced by adding borehole water from the indoor ponds. Shortly thereafter, the fish are gravity-fed into these ponds. Aeration comes from agitators placed at regular intervals within the ponds.

After a 'recovery period' of several hours the water supply is turned off. Salt is added at a rate of 4% along with the antibiotic Oxytetracycline, using a 2oz stock solution per 100 US gallons. This will help mucus development and reduce the risk of bacterial infection. The following morning, the water is turned on and the medication is gradually flushed out of the ponds.

Grading and packing

Bar graders are used to separate the various sizes of the small fish, the larger ones are measured by hand. Uncoloured Comets may be removed if specified by a customer. Fancy Goldfish are hand-graded to remove abnormalities. Koi are size-graded and those with poor coloration are removed. Future broodstocks are also selected at this stage.

Once graded and counted, fish are put into small holding systems ready for packing. Again, the early morning start is advantageous, since trucks will be loaded and on their way to catch the earliest flights. The packing process involves a production line with twenty eight employees at the busiest time. Hundreds of reinforced cardboard boxes, previously assembled, fill every available space. A small amount of water is added to each polythene lining bag, followed by a measure of Acriflavin, a bacterial disinfectant, before the fish are put in. The boxes then pass along runners to receive the customer's delivery details. Next, air is removed from each of the bags and replaced by oxygen. The boxes are then taped and stacked. The largest packing session I experienced lasted over nine hours, during which time 1070 boxes were filled!

Larger trucks move the assembled orders along the 'Inter States'' (State highways). The airports at Baltimore, Washington, New York and Philadelphia handle 95% of the farm's production, and each is reached within a few hours. Outside the United States large consignments are sent to Europe and Canada, with much smaller quantities going to Jamaica, Barbados, Bermuda and Mexico. The first British importer, some ten years ago, was Blagdon Water Gardens.

Despite the scale of production, the handling and management throughout the Mount Parnell Fishery is very professional. Quality of fish is therefore high, and always improving, and losses are minimal. The family and their employees ensured that I had both an immensely enjoyable and beneficial visit. To them all, I am deeply grateful.

Koi Talk

By John Cuvelier

Apology

WE start this month with an apology to all those readers who searched fruitlessly for a copy of van Duijn's book *Diseases of Fishes*. Of course, it's out of print and yours truly didn't do his homework, did he?

Whenever I make a mistake, you can rely upon it being a beauty! Having said that, there"s still hope of obtaining a copy by contacting one of the companies specialising in tracking down copies of out-of-print books. I've used them myself in the past and they are surprisingly successful. It's certainly worth trying.

Compression doddle

Moving on to safer territory (I hope), my latest sortie around our local DIY store unearthed a new type of plastic fitting for use with one-and-a-half inch plastic piping. I feel quite sure that, like me, you have cursed those 'push fit' unions when they fall apart or refuse to accept a different make of tube.

Those problems appear to be a thing of the past, thanks to the appearance of 'compression type' fittings. These not only make assembly a doddle, but their construction will even allow the use of slighly different sizes of tubing, because of the neoprene 'ferrule' or ring embodied in the design. Keep an eye out for these fittings; they're easily identificable by the serrated locking ring.

My first use for them came with the fitting of a UV clarifier into my pool system in an attempt to reduce the growth of nasty green 'gunge' which has plagued me for the last couple of years. I elected for one of the 'Cyprio' range and have to admit to being impressed by its clever design. Nice one, Malcolm!

Upon completion of the installation, a quick coat of semi-matt black paint was applied to the white 'plumbing' and a perfect and unobtrusive match was obtained with the UV unit. One can only count oneself fortunate in never actually suffering the dreaded 'green water' syndrome in the pool, but believe me, blanket weed and floating rafts of coagulated algae can strike at the best of us! Even the knowledge that the stuff will only flourish in water of good quality does not make it any easier to remove.

Of course, the peculiar warm weather we seemed to have been blessed with in spring was the prime cause of our early problems this year. Even water treatment plants suffered from algae - blocked filter beds, so what chance do we have?

Non-Exhibition Koi

One of the nicer things about being a columnist for a mag like *A&P* is the steady stream of visitors and correspondence which lands on one's doorstep.

I never cease to be surprised at the amount of 'Koiology' knowledge displayed by some of my visitors, many of whom have not yet even built their pools. It is really nice to realise that so many people are researching the subject in depth before committing themselves actually to building a pool and associated systems. No matter how well any book is written, a face-to-face discussion with another enthusiast is the finest way to learn about all the pitfalls to be avoided.

What really delights me more than anything is the reaction of visitors to my statement that none of my Koi are of so-called exhibition quality, just ordinary 'pond fish' a title which I personally detest as it is so often used in a deprecating manner by those of a 'Holier than Thou' disposition.

The fact that perhaps a fifth of my Koi are the results of home spawning gives an added boost to the spirits of prospective hobbyists, who depart safe in the knowledge that a future collection of really beautiful Koi need not necessarily cost them an arm and a leg!

Temporary residents

Becoming a Koi-keeper entails quite a responsibility as we are custodians of living creatures that, without our loving care, would simply die. A prime example of this has just happened to us following a phone call from a local enthusiast. Having sold his house and purchased another, for some reason, the deal for his new house fell through at the last minute. Would I be interested in buying his fish, some 30 assorted Koi, shubunkins, orfe etc as he didn't know what to do with them in temporary rented accommodation? I could see that he was reluctant (as I'm sure we all would be), and the pools he was leaving behind bore all the signs of the real enthusiast.

To cut a long story short, 'Baitings' went into the B&B business with sudden increase in the population of our second pool which, funnily enough. I had resolved never to place Koi into. But, rules are meant to be broken, and the new, if temporary, inhabitants, have, settled in and have even spawned (which is more than mine have done!) thanks to the change of water, etc. With a bit of luck, we might have some results from my gesture to this unhappy individual.

Reliable caretakers

Going away on holiday can sometimes be a problem for the Koi-keeper as one can guarantee that, if a breakdown is going to happen, if will happen while you are soaking up the sun on some beach. This is the time to enlist the help of another enthusiast as caretaker.

It's an awful risk to depart without leaving someone to keep an eye on things. We used to do one better and never go away without leaving someone living in the house and I can't remember a single year when something didn't go wrong, even minor things. Thankfully, our days of travelling away on holiday are now over as we live in an area where we feel we are on permanent holiday.

Non-Koi-keepers left in charge of your pool can be more of a threat than help, particularly where feeding is concerned. There's always the risk of "just one more handful of food" because "they still looked hungry". Much safer to lay out each day's food in separate containers or, better still, if you are only away for one week, don't feed the fish at all; they will be quite happy.

JOHN CUVELIER

My latest batch of 'temporary residents' have even spawned — something that my 'permanent residents' have, so far, failed to do.

Spotlight on *Marines*

IT'S A WOMAN'S LIFE IN THE MARINES . . .?

Successful, dedicated women marine aquarists are few and far between. Puzzled by this apparent anomaly, **Nick Dakin** decided to investigate, with very interesting results

(Photographs by the author)

Pondering the mysteries of the universe one evening (you know how one does), a thought crossed my mind . . . WOMEN! The question was a serious one and did not elicit a ready answer: "Just why is it that so few women get involved with the marine side of the hobby?"

I'm not talking about the woman who helps her partner lug the odd bucket around at water change time, but the 100% committed hobbyist. Think about it for a moment, see how many you know; not that many, if any, I would care to venture.

Is there a reason why more women should not get involved, or does the hobby hold so little attraction? Who better to ask than some of those few already firmly involved. A look at their fishkeeping history might also furnish some clues. So, with that in mind, I set off to interview three likely candidates in what turned out to be one of the most interesting assignments I'd undertaken in a long time.

MARION SIMMONDS

Most marine aquarists are eminently practical people and Marion is no exception. Birmingham born and bred, she helped her father in the family electrical business as soon as she was old enough to grasp a screwdriver. Don't get the idea that this is some Barry Bucknell of the briny, just an organised, caring person, brimming with commonsense. All the right ingredients to be a successful aquarist.

Her first foray into fishkeeping is a not-too-unfamiliar one. Having expressed an interest in tropical fish, her husband's surprise 1964 Christmas present was a three-foot community tank. Even in those early days she greatly admired the exotic beauty of marine fish kept, albeit in a very basic way, by a local pet shop.

However, she had to wait another 22 years before an extension to the house gave her the necessary incentive/excuse (not to mention space) to consider a marine aquarium as being, at last, a serious proposition. Being a good planner, she read around the subject thoroughly, and a subsequent visit to a local dealer gave her the confidence to proceed.

Her first set-up was a 42 × 18 × 15in (105 × 45 × 38cm) cabinet style tank run on undergravel filter plates and two powerheads. She also started with a protein skimmer which she now thinks is essential in any marine aquarium. A 24 × 15 × 12in (60 × 38 × 30cm) quarantine tank was set up at the same time and has proved invaluable, mainly for isolating aggressive specimens, as, fortunately, Marion's fish have never had any disease problems. Stock included Common Clowns, Neon Gobies, Green Chromis, a Yellow Tailed Damsel and Cherub Angel.

She has never considered regular maintenance to be a chore, but more an opportunity to improve conditions, thus safeguarding the well-being of her livestock. 20% water changes were undertaken fortnightly as well as the addition of buffering solutions and trace elements.

A year ago, Marion progressed onto a 51 × 20 × 20in (130 × 50 × 50cm) H39 MiniReef system as she felt that her greater experience and success with fish would justify a move into the more complicated world of coral invertebrates. Her confidence was rewarded by a healthy display of corals, fish and crustaceans, as well as strong growths of macro-algae.

She keeps an aquarium diary in which all purchases are logged, together with a record of successes and failures (not many of those!), as well as test results and events of interest.

Marion found the keeping of marines to be a challenge but she is not easily discouraged and found success to be more attainable than she had first imagined. Female friends have admired her aquaria and even enquired about the possibility of taking up the hobby, but most thought it too complicated and too time-consuming.

As an avid reader, Marion feels that she is in touch with the hobby and likes to keep up with modern advances. She's a busy person with other interests but still finds time to enjoy marine fishkeeping and tells me she would have no hesitation in recommending it to other women prepared to "accept a challenge".

Marion Simmonds with her spectacular Minireef H39 mixed fish/invertebrate system.

DEBRA HILL

Admittedly, Debra has a headstart on most women aquarists (and most men for that matter): her father used to own an aquatic shop! Nevertheless, the interest she has maintained over the last nine years, five of which have been in marines, has been very much of her own volition.

Not one to do things by halves, her first marine tank measured 66 × 18 × 42in high (c170 × 45 × 107cm)! Unfortunately, that had to go, for a very good reason — she couldn't reach the bottom without a snorkel and mask(!), although she did successfully keep a Snowflake Eel, Spiny Boxfish, Lipstick Tang and several other large fish.

Moving onto a more conveniently sized aquarium, Debra transferred the existing stock into an even larger 83 × 30 × 24in (210 × 76 × 60cm) set-up while also starting a 53in (135cm) invertebrate system as well. Her existing set-up is a 79 × 20 × 20in (200 × 50 × 50cm) MiniReef H39 mixed fish and invertebrate system.

It's an impressive sight, packed with large leather corals, anemones, gorgonia, mush-

Fiona Laidler believes that aquariumkeeping is, essentially, a matter of personal achievement and creation.

rooms and an incredible range of macro-algae, mainly *Caulerpa* species; at one time she had no less than 21 different varieties, but it's now nearer 8 to make room for the flourishing invertebrates. No hard corals are kept as she finds they don't last long (I whole-heartedly agree there) and remains with species that she already knows do well.

Her 'boys', referring to the fish, include a Royal Gramma (five years with her and still going strong), a pair of Common Clowns, a Firefish, and various Blennies and Gobies. They're fed only four times a week, but all are in the peak of health without a hint of disease (a great example of correct feeding).

Debra Hill's son Pete admiring his mother's masterpiece.

Not overly keen on maintenance, Debra reckons that the rewards of looking at a well-presented aquarium after a hard day's work is well worth the effort. She comments, "Marine fishkeeping need not be time-consuming and, in that respect, I'm pleased with the MiniReef system. I don't keep anything that I know has little chance of long term survival, but I'm not afraid to try something new, within reason."

When I asked her views about more women getting involved in marines she thought it was, "an ideal hobby, well within the scope of most women."

FIONA LAIDLER

Although only in her early twenties, Fiona already has many year's fishkeeping experience. Her first freshwater tropical community tank was a present when she was just eight, and the small seed of interest was sown, blossoming over the years, until she's become a committed hobbyist. Her last freshwater aquarium was 8 feet (2.4m) long and housed many large catfish, (you don't get much more committed than that!).

A move of house forced the sale of her prized catfish but enabled her to consider a change of aquatic direction. A friend had a 4-foot (120cm) marine aquarium for sale and Fiona duly purchased it, without stock. This gave her time to read quite widely around the subject. Eighteen successful months gave her the incentive to go for a more ambitious project and the existing set-up was replaced by a 51 × 21 × 16in (130 × 53 × 40cm) John Allan aquarium. In common with Marion and Debra, she settled for a mixed fish-invertebrate system.

Even though she is a busy career woman, every spare moment is spent studying the fascinating life forms within her tank, and time is *always* made for essential regular maintenanace. She is absorbed totally by this new-found area of the hobby and is not afraid to mention it to her girl friends. "Some of them would love to take it up, but none have, so far," says Fiona. "I think many of them would like to take up the hobby but are afraid of the 'interference factor' in the form of their partners. They know that they would never be left alone to get on with things!"

Fiona feels that fishkeeping is essentially to do with personal achievement and, although everyone can share in the final product, the creation and maintenance must be left to the individual.

SHARED ATTRIBUTES

Through these case studies several things seemed to have become apparent: all three women shared the same attributes, conscientiousness, a will to succeed, a caring personality and a willingness to learn and ask questions. They also carefully chose the most appropriate set-up to suit their own situation, time and money.

My own opinion is that the qualities to become a good marine aquarist are largely represented above and remain the same, whether male or female. However, men seem more willing to give it a go and suffer more through the consequences of impulse buying (ring any bells?), whereas women tend to underestimate their own abilities and gracefully decline involvement.

Married or single, each one of my case studies expressed a desire to be left alone to get on with things without constant interference, thus increasing the sense of personal achievement. I'm inclined to agree and maybe here we are moving closer to the heart of the matter. Do men give women the opportunity to create their own successes and failures in an area of fishkeeping traditionally regarded as the difficult end of the hobby?

Is it possible that the more technical nature of marines has drawn out a similar set of attitudes normally found in the eternal male/female car triangle? It's an interesting proposition.

When all is said and done, the great thing about fishkeeping is that, young or old, male or female, disabled or able-bodied, as long as the interest is there, the hobby has something to offer everyone.

What do you think? Any comments you'd like to make? Write to me care of *Aquarist & Pondkeeper* and all your letters will be read with great interest. If a reply is required, please remember to include an SAE. So, get those pencils sharpened!

★★★★★★★★★★★★★★★★★★★★★★★★

As this photograph of Fiona Laidler's aquarium beautifully demonstrates, a little creative flair, plus regular attention to detail, can produce stunning results.

Books

SHES FOR THE IVERTEBRATE QUARIUM HIRD EDITION)

Helmut Debelius
olished by: a) original German edition — **Eugen Ulmer GmbH**
b) English language edition printed for and distributed by — **Aquarium Systems**

ce: £18

ny dedicated, 'mixed fish/invertebrate' pical marine hobbyists will be familiar th earlier editions of this invaluable book. The latest (3rd) edition follows very much same line and format as its predecessors, turing Helmut Debelius' fine photoaphy (with the same notable additional otographic contributors, plus a couple of hers). Chapters on Dragonets (family Calonymidae) and Jawfishes (family pisthognathidae) have been added, along ith their accompanying illustrations, makg this new edition — which is now in igh-gloss, tough paperback — also a little ore complete than earlier versions, themlves more complete than anything else on e market.

The quality of both the text and photographs is very high throughout, with Debelius' frequent accounts, based on experience, adding flavour and credibility to the contents in a very readable and informative way.

There are no details of aquarium care of the fish discussed, though — just useful hints here and there. This is predominantly a book which sets out to educate the reader in the characteristics of the fish themselves, rather than their upkeep. However, as a comprehensive guide to species of fish that can be kept with invertebrates, this edition is surely the best publication on the subject around at the moment.

I wish, though, that such an otherwise thorough and competent piece of work would have followed the standard technical 'rule' of italicising scientific names. This apparently small, but somewhat infuriating, oversight (try finding a scientific name on any page and you'll see what I mean!), tends to detract from what must be, in every other sense, *the* book on this very important and ever-more-popular aspect of the tropical marine hobby.

John Dawes

Spotlight on *Marines*

BRITISH SEA SLUGS

Bill Simister turns the spotlight on these fascinating molluscs which aquarists and beachcombers often overlook — or miss altogether.

(Main photograph of Yellow Tropical Sea Slug: Max Gibbs, Goldfish Bowl, Oxford. Drawings by Ford West)

Anyone who has never previously seen a sea slug, and has the impression that all slugs are nasty, slimy creatures, with a depressing coloration, will be pleasantly surprised at their first sight of a sea slug. However, these creatures are not easy to find — until you know how — and to discover them in all their glory, you have to search for them very thoroughly indeed.

Sea slugs, like the slugs on land, are snails without any apparent shells, and belong to a class of molluscs called Gastropoda, some of which have a single small shell that is usually coiled. Within the Gastropoda is an order called Opisthobranchia, most of whose members lack shells; the sea slugs belong to this order.

Many sea slugs are strange-looking creatures with variously shaped outgrowths and flaps on their back, and most species are brightly coloured. The flaps may be finger-like, or in the form of elaborately branched tufts, and often serve as gills, although these slugs can also absorb oxygen from the water through all their body surfaces.

Unusual diet/unique defence

Most sea slugs are carnivorous, and extremely selective in their choice of prey, so any that are kept in an aquarium must be provided with their own brand of food. A few feed exclusively on sea anemones, whose tentacles are armed with stinging cells. These sea slugs are not deterred by the tentacles. In fact, they make use of them for their own protection in a most extraordinary fashion. The sea slugs eat and digest the anemones without the stinging cells being discharged; these are then transferred intact from the stomach of the sea slug to the filamentary tufts on its back, where they serve to protect their new owner from attack by other predators.

The discharge of the stinging cells consists of them shooting out tiny darts which inject poison into the pierced skin of any living thing. They are alive to some extent in their own right, but their 'life' is derived from the sea anemone in which they originally grew. This 'life' is retained when they are incorporated into the defence system of the sea slug. Nothing remotely like this is encountered anywhere else in the animal kingdom, and it appears to function in opposition to all we know about the way a body defends itself and rejects foreign bodies.

Sea slug search

Finding sea slugs is very difficult, even though they are relatively common all around our coasts, for their colour and shape almost exactly match those of the food on which they are found. In rock pools and underneath large rocks low down on the beach, there are many patches of small weeds, sponge, and anemones that could be 'home' for dozens of sea slugs, and yet they do not appear to be there. I have often found it necessary to rub my finger tip very gently over the seaweed or sponge to feel the presence of a sea slug. (It imparts a jelly-like difference to the feel.) Then, if a hand lens is used, the sea slug jumps into prominence. Surprisingly, after finding one like this, it is very much easier to spot others nearby; the eye appears to adapt to what it is looking for.

Identity problems

Occasionally, sea slugs are difficult to identify, as I found out the other day. I found two 12mm (0.5in) or so long sea slugs on some coralline weed, and could not identify them. They were short and fat, with a circle of filaments sprouting from the back, and the mantle was drawn up into short spiky tentacles. Their colour was a sort of pinkish-green, and there were many spots on them that showed up as bumps under the hand lens.

The presence of these two small slugs on the coralline weed did not necessarily mean that this was their food, for the weed was the only place they could have cover in an otherwise bare pool. Therefore, I could not use their special food preference as an aid to identification.

When transferred to clear sea water in a test tube, these sea slugs adopted a humped-up position, and, in that attitude, I obtained my first clue to their real identity. The Venus Slug (*Idalina elegans*) is described as taking this attitude when at rest, but its main colour is pink, with yellow or white edges to its freely spotted mantle.

These two small slugs were so greenish in colour that I had passed over the Venus Slug when trying to identify them, but now I made comparisons. The rocks all around the coralline weed were greenish sandstone, so it was possible that these very young slugs (they could reach 40mm [1.6in] when fully grown) had taken on the green tinge while young, for all sea slugs are variable in colour.

Venus Slug ***(Idalina elegans)***

Later on, perhaps, when they had fed more on the sea squirt that is their main food, they will turn more pink. In all ways, these looked like small Venus Sea Slugs, but I could not be quite sure at that stage. Later, I found some more of various sizes in the same area, and was able to confirm they were, indeed, all young of the Venus Sea Slug.

Other species

Grey Sea Slug (Aeolidia papillosa)

The Grey Sea Slug is also called the Plumed Aeolis, and is more garden-slug-shaped, reaching a length of over 75mm (c 3in), but it is far more ornamental than a garden slug, for its back is covered with rows

Grey Sea Slug ***(Aeolidia papillosa)***

of plumes like those of a sea anemone. Its body is whitish, with grey or reddish marks, but its plumes may be anything from grey or brown to red, according to the type of anemone it has been eating. When this sea slug is feeding on an anemone, as shown in the drawing, it usually appears as if two anemones are close together.

This is one of the sea slugs that carries stinging cells in the plumes. These plumes perform more than one duty: they act as breathing organs by carrying blood which becomes oxygenated in their outer layers; their centres are directly connected to the stomach and contain parts of the liver, with partially digested food being sent there; each plume tip is pierced (the stinging darts can be shot through these tiny channels to frustrate enemies); and the whole appearance of the plumes provides good camouflage because they give the sea slug a certain likeness to an anemone.

This is a good kind of sea slug to keep in an aquarium, but there must be a constant supply of anemones for it to feed on.

Sea Hare (Aplysia punctata)

One of the largest sea slugs is the Sea Hare, which can reach 150mm (6in) long, and has a bewildering range of colours at various stages of its growth.

It normally feeds on seaweeds of many

Sea Hare ***(Aplysia punctata)***

sorts, but, just occasionally, it browses on beadlet anemones. Therefore, it can be found almost anywhere, from shallow water to the depths where the largest brown seaweeds grow. In addition to crawling on its large foot like other slugs, it can also extend its mantle flaps and swim quite well through the water.

Large Sea Hares usually remain in deepish water, but in summer, they approach the shallower parts to lay eggs on seaweeds there. Young Sea Hares can be bright crimson, dotted with white, and lie concealed on red seaweed fronds in shallow water. As they grow, their colour tones down to brownish-red, then deep red-brown, purple-brown, olive-brown, and olive-green, while, at the same time, they move gradually towards deeper water.

There is a small round flattish shell concealed under the mantle, and this slug can alter its shape from the fully extended specimen shown in the drawing to a humped-up blob resembling a closed anemone. In addition, it has the ability, when frightened, to pour out a purple fluid which forms a smoke screen — as does its cousin, the octopus.

Hairy Sea Lemon (Acanthodoris pilosa)

The Sea Lemon can be anything up to 75mm (c 3in) long, and any colour from white, through yellow and brown, to grey, and even black. The two tentacles near the

Sea Lemon ***(Acanthodoris pilosa)***

front are ornamental, while around the anus (towards the rear on the back) is a circle of gill-plumes, all standing proud of the otherwise sponge-like back.

This sea slug is fairly common, and feeds on the Breadcrumb Sponge. It is not often seen because it adapts to the colour of the sponge on which it feeds.

Crowned Aeolis (Facelina coronata)

This is one of the most beautiful sea slugs, and one that is fairly often found by the novice. It is rarely more than 25mm (1in) long, and feeds mainly on the beadlet anemone, though it also eats various sponges, and, at times, a diet of other sea slugs.

Crowned Aeolis ***(Facelina coronata)***

Normally, the colour of this slug is transparent-white, tinged with rose-pink, while the head, back and the plumes are tinged with blue. There are six or seven sets of plumes arranged in curved rows, and these plumes, or cerata as they are sometimes called, change colour according to the food that is being eaten, but are usually some shade of red. This species should be searched for near the lower tide marks.

Crowned Sea Nymph (Doto coronata)

Crowned Sea Nymph ***(Doto coronata)***

A smaller and less easily found sea slug is the Crowned Sea Nymph, which only reaches a length of 13mm (0.5in). It feeds on hydroids (sea firs) and coralline weed, and manages to look so much like them that it is extremely hard to detect.

The rows of plumes on its back contain the liver of this tiny animal entirely. They are therefore always exactly the same colour as the food just eaten. I have sometimes found this species by accident when handling sea weeds or sea firs, and then, its jelly-like smoothness is unmistakable.

White Aeolis (Favorinus albus)

Another 13mm (0.5in) sea slug which is elegant in form and colouring is the White Aeolis. This is a mainly white slug, tinged with yellow, but its two tentacles are brown with white tips, and show up distinctly.

The plumes along the back are arranged in five or six curved rows, and, although mainly white, they also have olive-coloured bands

White Aeolis ***(Favorinus albus)***

around them near the tips.

Red Angled Doris (Goniodoris castanea)

On some colonies of sea squirts, notably the star-patterned thinly encrusted type, one can sometimes find the Red Angled Doris — but only with difficulty. It is about 14mm (c

Red Angled Doris ***(Goniodoris castanea)***

0.6in) long, usually reddish-brown, but often other colours to match the sea squirt on which it is currently feeding.

The feelers and tentacles at the front are matched at the rear back by a section that is more intensely coloured, and which is divided into a number of cusps.

Green Elysia (Elysia viridis)

This is a small sea slug of about 13mm (0.5in) maximum size that always takes its colour from the seaweed on which it feeds. The overall colour is usually a shade of

Green Elysia ***(Elysia viridis)***

green, but it can be reddish, brown, or even dark olive-green, generally well speckled with green, blue or red spots.

A hand lens is needed to appreciate the full beauty of this species, but it can be seen well in an aquarium furnished with seaweeds of different colours, and there, provides lots of interest. The body is fairly flat but its base is narrow, something that enables it to grip the plants on which it climbs. The mantle is

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parts of the liver, serves as a breathing device, and helps in swimming.

Despised Aeolis (Tergipes despectus)

One of the tiniest sea slugs you may find is only 8mm (0.3in) long, but it is so distinctly formed that you should have no difficulty naming it. This is the Despised Aeolis, which owes its name to its small size, rather than to any other character.

It lives below the lower tide marks on

Despised Aeolis *(Tergipes despectus)*

Laminaria seaweed, and its foot (body) is transparent, so that the colour of the weed shows through, and so helps to camouflage it.

There are four plumes on each side of the back, arranged alternately, and these are connected to the digestive tract which is clearly seen running down the back. The tip of each plume is white, often banded with red, while the head and shoulders are streaked with pink.

dosus)

The most distinctly decorated sea slug in our waters is the Bushy-backed Slug, which is adapted for its life among very frondy seaweeds and corallines. The plumes along the back and sides are branched and forked in a way that makes them resemble the small red-brown seaweeds so closely that it is extremely difficult to detect this sea slug until it moves.

The colour is mainly reddish, marked with brown, yellow and white, and its length

Bushey-Backed Slug *(Dendronotus frondosus)*

is about 38mm (1.5in). It feeds on sea firs among the seaweeds, and is an ornament to any marine aquarium.

Closing remarks

If you do decide to keep some of these fascinating sea slugs, it is worth remembering that the water must be kept fairly cold at the lower 60°sF (15 or 16°C) will not do too much harm — provided it is not for too long.

The water must be well aerated, and renewed regularly, and you absolutely must provide the correct type of food for each kind of sea slug, remembering that they are very choosy eaters.

FOR THE BEST ADVICE ON ALL AQUATIC PROBLEMS WRITE TO OUR PANEL OF EXPERTS

Spotlight on *Marines*

THE RED LIONFISH

(Pterois radiata)

Frank de Graaf takes a closer-than-usual look at the Red Lionfish and some of its nearest relatives

(Photograph by Arend van den Nieuwenhuizen)

(Translated by Mary Bailey)

The White Fin or Red Lionfish belongs to the family of the Scorpion Fishes (the Scorpaenidae), which, in turn, belongs to the sub-order Scorpaenoidei of the order Scorpaeniformes. To this sub-order also belong, among others, the Carancanthidae (Velvetfishes), the Triglidae (Gurnards or Sea Robins), and the Pataecidae (Foreheadfishes).

All Scorpaenidae (and the entire order as well) possess a bony ridge, the suborbital stay — an extension of the third suborbital bone — which extends across the cheek, from the eye to the gill cover. These animals have a somewhat Perch-like appearance (the order is sometimes regarded as a sub-order of the Perciformes) and have a large head with a large terminal mouth. The head is wholly or partially armoured with bony plates bearing spines. Likewise, there are spines on the gill-cover.

As far as is known at present, all 'Dragonheads' possess poison glands, or poison cells, at the base of the dorsal spines. The pectoral fins are large and usually broad. In many species, there are also appendages of skin on the head and body. The majority of Dragonheads are substrate dwellers, and are extraordinarily well camouflaged as they lurk between stones, waiting to capture passing fish.

FAMILY MEMBERS

The family includes several hundred species which inhabit all the tropical or subtropical seas. A few genera also live in cold seas. The family can be subdivided into a number of sub-families. The sub-family Scorpaeninae contains the largest number of species and genera (among others, *Scorpaena, Scorpaenopsis, Parascorpaena, Scorpaenodes).* The other sub-families (according to which authority is consulted) are:

Pteroinae — the Fire-Fish or Coral Devils — with the genera *Pterois, Dendrochirus, Nemapterois, Parapterois.*

Tetraroginae, with the genera *Paracentropogon, Taenionotus,* and *Amblyapistus;*

Synanceiinae — the Stone-fishes — with the genus *Synanceia;*

Inimicinae, with the genus *Inimicus;*

Minoiniae, with the genus *Minous;*

Apistinae with the genus *Apistus;*

Aetaphinae and Sebastinae.

Various of the above sub-families have been raised to family status by some authors — for example the Synanceiinae and Tetraroginae.

AQUARIUM NEEDS

In general, all Dragonheads are easy to maintain as aquarium fishes. Almost all species learn to feed on dead flesh in captivity, although, in nature, they react only to live prey. During the acclimatisation period, they must, at first, be fed on live shrimps or fish. Then, one can try to accustom them to dead food. Normally, these fish react to dead food only as long as it is moving down through the water. The aquarium should, therefore, be of a reasonable depth if one wishes to use dead food.

Most Dragonheads cannot be kept with smaller fishes as they can devour prey of their own size. In community aquaria, they do not usually receive sufficient food, so they should be kept alone or with other Dragonheads, or else one should make an effort to feed them individually by proffering the prey with forceps or some similar method.

As all Dragonheads possess poison cells, one must avoid a prick from the dorsal spines. If one is pricked, then the affected area should be quickly immersed in the hottest water possible until the pain subsides. The poison cannot withstand heat. There is no other remedy. It is, of course, advisable to consult a doctor, should you get stung.

GENERA & RANGE

There are three Firefish or Lionfish genera: *Nemapterois,* to which belongs the Ocellated Lionfish *(N. biocellata);* the genus *Dendrochirus* with, among others, the Dwarf Turkeyfish *(D. brachypterus* — see *A & P* cover, March 1990) and the Zebra Lionfish or Zebra Turkey Fish *(D. zebra* — synonym *Pterois zebra);* and the genus *Pterois* to which belong, for example, *P. antennata, P. lunulata* (sometimes confused with *P. volitans), P. radiata* (the subject of our **Spotlight** photograph), and *P. volitans.*

The range of the *Pterois* species covers the Red Sea, and the Indian and Pacific Oceans. The fish are distinguished by the possession of unbranched pectoral rays. The upper rays are almost free-standing with a membrane joining them only at the base. All Firefishes of the genus *Pterois* are inhabitants of coral reefs, but they are also found on isolated coral formations in lagoons and similar habitats. Young specimens are often found in very shallow coastal waters under fallen palm trunks.

In Sri Lanka, the author found young *P. volitans* and *P. antennata* in brackish water at the mouths of rivers and in brackish lagoons. All Firefishes are predators which feed on fish and larger crustaceans (above all, shrimps).

FEEDING HABITS

As a rule, these fish rest motionless in the shelter of a coral, their heads inclined diagonally downwards waiting until a prey animal comes into range and can be snapped up.

The sudden opening of the large mouth creates a drop in pressure in the gullet so that water, together with the prey, is sucked in. Firefishes are also active hunters, unfolding and spreading their pectorals and seeking to drive prey animals into crannies between stones or corals, so that they can be captured and eaten. This hunting normally occurs at twilight. During the day, Firefishes are often found resting head-down under overhanging corals or in caves.

Pterois radiata and *P. antennata* are very similar in their habits and aquarium maintenance. *P. radiata* is fully grown at about 25 cm (c10in) and is thus somewhat larger than *P. antennata* (20cm -c8in). *Radiata* also often rests belly-up on the bottom in its home patch, hunting at twilight and early in the morning.

P. radiata is a good species to keep in an aquarium, as long as the acclimatisation steps outlined earlier are followed. This species is not aggressive towards conspecifics or other fish which are too large to eat.

Young specimens of *P. radiata* and *P. antennata* are sometimes confusingly similar but the young of *P. antennata* can always be recognised by the typical form of the tentacles above the eyes; these are ringed in black and white and have lateral membranes (literally, small flaps of skin).

Handled and acclimatised with care, the Lion/Firefish — or Dragonheads — make long-lived, colourful and very interesting aquarium subjects.

Spotlight on *Marines*

ENVIRONMENTAL HEALTH FOR NATIVE MARINES

(4: WATER)

Good-quality water produces good-quality fish. Nowhere is this more important than in the case of native marines, as **Andy Horton** explains.

(Photographs by the author)

Turbulence, in the form of waves, ensures effective interchange of gases at sea. In aquaria, some appropriate alternative is necessary.

Since the first animal life forms appeared in the oceans 600 million years ago[1], and the appearance of the abundance of fish during the Upper Palaeozic Era (known as the Devonian, and the 'Age of the Fishes') approximately 400 million years ago, the relative proportion of chemical constituents, and the acid-alkaline hydrogen ion balance (pH) of seawater in the oceans has remained pretty constant. The salinity has also remained within narrow parameters in mid-ocean, with important variations in the proximity of freshwater outflows, and higher salinities in smaller tropical seas cut off from the larger oceans.

We can conclude that marine life has not experienced great changes in their environment during evolution, and that these species cannot adapt to drastic alterations in conditions. The massive volumes of the oceans have a stabilising influence and can therefore almost balance themselves of their own accord. The aquarist, on the other hand, keeps fish and invertebrates in a minutest fraction of the seas (natural or artificial), and must therefore take continual care over the water quality.

NATURAL SEAWATER

The various merits of real seawater and commercial marine salt mixes have long been argued over by aquarists. On this occasion, I would like to have a look at the ingredients of the real stuff.

Seawater collected offshore contains:

1) Water (H_2O)
2) Dissolved salts
3) Dissolved gases
4) Living animals and plant life
5) Dissolved organic matter
6) Particulate inorganic matter

Dissolved salts

85%, by weight, of the two principal compounds, sodium and chlorine, make up the bulk of the salts (the plain sodium chloride of table salt). In addition, various other salts are present, including sulphate, magnesium, and calcium. These, and other, elements present are necessaary for marine life forms to survive. Table salt will not suffice.

Artificial 'marine salt' mixes will also contain as many as 70 trace elements found naturally in the oceans, some of which are essential ingredients.

Dissolved gases

All gases that occur in the atmosphere are likely to be found in seawater, their concentrations being dependent on their solubilities, their chemical and biochemical reactions, and the temperature and salinity of the water.

Oxygen was discussed in the previous article[2]. Nitrogen is important in aquarium conditions because of the introduction of nitrogenous material as food and its conversion by the nitrifying bacteria[3], but is less important in the sea.

Carbon dioxide is highly soluble in seawater. It will enter the water through the respiratory activities of fish, invertebrates, algae and bacteria. It will leave by atmospheric interchange at the surface, or by complex chemical reactions with other elements in the 'Carbon Cycle'.

Living animals and plant life

Real seawater contains masses of invisible (or nearly so) planktonic life. The sea can be best described as a soup of minute plant organisms (phytoplankton) and microscopic animals (zooplankton). In spring, the inland waters surrounding the British Isles may be coloured brown by naturally occurring blooms of phytoplankton.

In collected seawater, this phytoplankton can die within one hour and rapidly turn the water toxic.

Natural seawater also contains bacteria and there is a theoretic chance of introducing pathogens, including free-swimming stages of parasitic animals, such as *Cryptocotyle lingua*, if untreated seawater is used for filling aquaria.

Dissolved organic matter

Marine creatures excrete soluble waste, urea, ammonia etc, which will be present in small quantities in seawater, but larger proportions are likely in aquarium conditions. However, coastal waters can also contain a large amount of dissolved organic carbon — as much as 8 mg/litre in the Baltic Sea[4] — from the decomposition of dead organisms, especially phytoplankton.

Particulate inorganic matter

After storms, or in the vicinity of dredging operations, seawater is likely to contain suspended silt or sand from the bed of the sea. This can be clearly seen from the turbidity of the water. However, even seemingly clear water may contain minute particles.

ARTIFICIAL SEAWATER

Artificial marine salts are readily available from retailers, manufactured from pharmaceutical grade chemicals, in a crystalline

form so that all the salts dissolve and do not precipitate out. Ensure that you specify your requirements for a marine aquarium, as tonic salts are sold in the aquarium trade for use in treatment of freshwater fishes.

The only other ingredient that you need is tapwater. All tapwater contains added chlorine, which is toxic to fish at low levels (0.2-0.3 mg/litre). It can be removed by chemical treatment or aeration, using a diaphragm air pump with a length of tubing and airstone for at least 12 hours before fish are introduced. However, various reports indicate that the water companies may add other ingredients to the supply, including chloramine, aluminium (as a flocculate), and inadvertent ammonia and nitrates, and, possibly, an insecticide which is likely to be a synthetic form of pyrethin, originally discovered because natives were using the plant as a fish poison.

Local aquarium retailers should, hopefully, be able to advise of the local conditions of the water supply. (See Bibliography — reference No 5).

MERITS AND DEMERITS

For practical purposes, natural seawater tends to pose problems in use, rather than advantages. It should (ideally) be collected and used within one hour, although, sometimes, it will be safe to use three hours, or even six hours after collection. Seawater undergoes organic and bacterial activity that rapidly turns the living substance into a toxic mixture.

As the collected plankton has a limited lifespan, the introduction of fresh seawater results in an introduction of dead, or dying, organic matter. Primitive invertebrates like the sponges, obtain nutrition from this source, but, essentially, the aquarist will just be introducing organic substances that will not be utilised by the larger animals, and will need to be broken down by the oxygen-consuming bacteria.

When establishing a large aquarium for the first time, though the introduction of seawater can be advantageous, mostly in terms of cost. The organic input can also provide the basis for a thriving population of nitrifying bacteria. The following points should be noted:

1. Seawater collected offshore is likely to be more stable in quality, less polluted, and of an even salinity. Water in rock pools is unsuitable.
2. Waters collected in estuaries are possibly considerably diluted by freshwater, which, because of its reduced density, may be contained in a layer above the more saline tidal inflow. Check the specific gravity using a hydrometer.
3. Seawater may be murky and contain a lot of suspended matter after a storm, or in the vicinity of dredging operations.
4. Containers should be non-toxic plastic.
5. Pathogens, toxic blooms, or free-swimming stages of parasites can be introduced with seawater.

If real seawater is not to be used immediately, it can be rendered safe by being kept completely in the dark for 6 months, by which time all the plankton will have died and been consumed by bacteria. Some authorities advocate a period of as little as 3 weeks or one month, but this will depend on where the water was collected. In my experience, seawater collected in nutrient-rich areas and kept in the dark for one month is 'rapidly' toxic to small fish.

SALINITY

The seas surrounding the British Isles are consistent in their salinity; the offshore waters of the North Sea are recorded at 3.4% of dissolved solids (or 34‰ — parts per thousand), and on the Atlantic coasts at 3.5% (or 35‰).

Some British fish are also found in the warmer waters of the Mediterranean where evaporation can result in salinity of 3.7% (37‰) in the eastern basin. Some other British species are euryhaline and will enter estuaries where fresh water can rapidly reduce salinity levels.

A guide to low salinity tolerance can be gained by observations in the wild, and by examining the distribution maps of species found in the Baltic Sea. Because of the outflow of rivers into this enclosed sea, the levels of salinity are much reduced, and in the Kattegat, on the east coast of Denmark, the level will vary between 3% (30‰) in the north to 2% (20‰) in the south, depending on the prevailing currents[6].

It is important to keep the salinity in aquaria within narrow bounds. I suggest that the aquarist should endeavour to stabilise the salinity at 3.4% (34‰), and replace losses by evaporation with fresh tapwater. Salts also tend to leave the water in the aquarium and accumulate on the cover glass. So, if the salinity falls too low, it should be adjusted at the regular monthly water changes.

USING A HYDROMETER

A hydrometer is an essential item of equipment for measuring the Specific Gravity, and hence, calculating the salinity, of the water. There are two types available.

If the bulb-type hydrometer is used, it should be placed in the aquarium water when the filtration is turned off, and the reading taken at the water surface level.

The Specific Gravity of water is denser at lower temperatures, and the reading on the hydrometer scale will be correspondingly higher as shown in the accompanying table.

Specific gravity of seawater with a salinity of 3.4% (34‰)	
Temperature	6°- 8°C = 1.027
	9°-13°C = 1.026
	14°-18°C = 1.025
	19°-21°C = 1.024
	22°-25°C = 1.023
	26°-28°C = 1.022
	29°-30°C = 1.021

The ability of fish to tolerate changes in salinity varies with different species. Invertebrates, especially anemones, will not thrive in reduced salinities. As a very rough guide, a Specific Gravity reading of 0.001 corresponds approximately to a 0.1% (1‰) alteration in salinity, and this variation is the tolerance limit. Water with a salinity of less than 3% (30‰) is defined as brackish; in excess of 3.7% (37‰) as metahaline, and likely to be found only in enclosed lagoons.

Hermit Crab (*Pagurus benhardus*) with commensal anemones (*Calliactis parasitica*). Hermits require perfect water conditions, while *Calliactis* is very handy, if adequately fed.

Synthetic marine salts should not be mixed in an inhabited aquarium. A fermentation bin, as used in beer making, is an ideal container for mixing the salts prior to changing a 20% maximum proportion of the water.

HYDROGEN ION CONCENTRATION (pH)

Natural sea water is alkaline and has a pH of 8.3. Under aquarium conditions, the biological filtration process produces nitric acid, and this will tend to lower the pH towards neutral. Regular water changes will, however, help to keep the figure above 8.1, which is the minimum level.

Test kits are available to monitor pH levels which can indicate when water changes are necessary. This aspect of aquariology will be discussed in the next article.

NOTES/BIBLIOGRAPHY/ REFERENCES

(1) Oceans probably attained their present-day characteristics 2,000 million years ago, leading to the first appearance of life on this planet, ie, amoebic-types and bacteria. First fossil forms recorded 600 million years ago.

(2) *A & P* (May 1990) Environmental Health 3 (Foods and Feeding).

(3) *A & P* (April 1990) Environmental Health 2 (Oxygen).

(4) *Encyclopedia Britanica (Oceanography).*

(5) *Interpet Guide to Fish Health* and books by Dick Mills, and G Lundegaard.

(6) *Fishes of the British & Northern European Seas* by J Møller **[Penguin Nature Guide 1977].**

Further reading: *Keeping Marine Fish* by Graham Lundegaard. *Chapter on the Seashore Environment includes a list of components of seawater, and those needed to support life.*

Seaview

By Gordon Kay

One of my regular correspondents — **Carol Davies,** from Swansea — has suggested I do more 'teaching' in **Seaview.** She feels that I have a way of passing things on in an understandable form (Thank you, Carol). Well, Carol, flattery will get you everywhere, and I am only too pleased to give people what they want. So here goes.

I have said many times that we know so little about fish nutrition that the only sure way of providing all the dietary components a fish needs is to feed a rounded, well-balanced diet, one that contains as much variety as possible.

However, we can do a lot of good by studying the natural diet of the fishes which we intend to keep. In this way, we can go a long way towards duplicating their natural diet in captivity. Below are some of the more popular coralfish families, their diets in the wild, and some guidelines about feeding them in the aquarium. I will start with the most complicated first.

ANGELFISHES

This group — along with Butterflies — present something of a challenge. There are various groups within the family — based on their diets in the wild — so it is absolutely essential to do that homework I mentioned earlier. Luckily, all species fall into one of four categories. They are:

Sponges and Tunicates: The vast majority of the 'Big' angels fall into this group. Sponges will never be replaced in the aquarium, and yet, many people have kept large angels — like the Emperor Angel — for years, so this would suggest that sponges are not essential to the fishes' wellbeing. Variety is the key here. Use every type of food you can and — under no circumstances — let your fish become 'hooked' (sorry!) on any one kind so that it will accept no other.

Plankton: A few angels — of the genus *Genicanthus* — are plankton feeders and this makes them easy subjects in captivity. Just feed them Brine Shrimp, *Mysis*, Bloodworm and the like, and they will be fine.

Algae: These are the main food source of all dwarf angels. It is far and away preferable to grow naturally-occuring algae. However, if you can't manage that, use vegetable flake and plenty of lettuce and peas.

Omnivores: These are the easiest of the lot! Just feed plenty of variety and get them eating flake as soon as you can.

BUTTERFLIES

As with the angels, it is imperative to read about the species BEFORE you buy it. Having said that, you should read about *all* species before you part with your hard-earned cash, but I digress. The diets of Chaetodons fall into the following groups:

Coral Polyps: Never, ever buy a butterfly which feeds exclusively on coral. It will die — no question.

Crabs, Worms and Invertebrates: Quite easy these. Again, feed as much variety as you can.

Omnivores: The best group of the lot to buy. Feed as above.

NOTE: All of the above feeding groups denote the MAIN dietary components of each group. Most do, of course, eat other things.

SURGEONS and TANGS

Although, if introduced into captivity at an early age, tangs will eat nearly anything, they eat algae almost exclusively in the wild, and so, should get plenty of it in captivity. The substitutes mentioned in the angelfish section can be used, but it has to be said that they can never be as good as the real thing.

TRIGGERFISHES

Triggers are predators of, mainly, starfishes and sea urchins. You could, of course, buy Echinoderms to feed them in the aquarium but I, for one, would find this more than a little distasteful, not to say expensive! Luckily, these fish will greedily accept anything — although preferred foods are cockle, mussel, beef and lancefish. Be warned, also, that triggers are one of the easiest families to overfeed — so be careful!

BLENNIES and GOBIES

Members of these families are opportunists and feed on anything they come across. This makes them terrifically easy to feed in the aquarium. Plenty of variety — presented in pieces which are small enough for their tiny mouths — should keep them content for years.

PORCUPINEFISHES

The natural diet of the porcupines is largely made up of gastropods, but, in captivity, they fare well on any kind of meaty food. Prawns and shrimps go down very well, and earthworms are particularly relished. Be warned, however, that earthworms need to be thoroughly 'cleaned out' prior to being used in the aquarium. This is best achieved — as any angler will testify — by keeping them in damp sphagnum moss for a few days. This may appear to be a lot of fuss and bother, but rest assured that your fish will really appreciate the effort.

WRASSES

This group is so vast — approximately 400 species — that I have to speak in very general terms here. However, there aren't many wrasse species which do not feed readily on Brine Shrimps, *Mysis* and all the other standard aquarium fayre.

BOXFISHES

These species will eat anything, but watch them eat bloodworm and *Tubifex!* In fact, they seem to love any kind of worm to the point that they prefer them to anything and will reject any other kind of food if you give them the chance. I shouldn't have to say (again) that it is dangerous to allow any fish to eat any kind of food to excess.

BATFISHES

Batfishes are so accommodating that they would even eat catfood — assuming, that is, that you were stupid enough to give it to them!

CLOWNS and DAMSELS

Both of these families eat mainly planktonic organisms in the wild, and this is wonderful news for the fishkeeper. Most types of meaty food — finely chopped — will keep them happy. They will love flake of all kinds, and algae are eagerly accepted. Incidentally, for meaty foods, read 'meaty or fishy'. I'm not talking lamb chops here!

(Continued next month)

LAURENCE E. PERKINS

Clowns and Damsels (this is *Dascyllus reticulatus* — the Reticulated Damsel) will eat an extremely wide range of foods.

Herpetology matters

By Julian Sims

CALCIUM FOR REPTILES

Calcium is a mineral which is required for the healthy growth and metabolism of animals with backbones — the vertebrates. Reptiles are certainly no exception; they definitely need a regular supply of this mineral in their diet. Calcium is absorbed into the bloodstream through the wall of the gut during the process of digestion. However, the absorption of calcium from the intestines is far from complete, and as much as two thirds of that which was originally eaten may be lost in the faeces.

Calcium is particularly important for ossification. This is the strengthening of the bones of the skeleton with deposits of calcium salts (together with another mineral, phosphorus). A strong skeleton is necessary to support animals as they move about on land. To ensure strength, an adequate supply of calcium must therefore be provided for all terrestrial vertebrates which are still growing. In contrast, vertebrates which live in water, for example fish and totally neotenous amphibians, are partially supported by buoyancy.

In addition to calcium for healthy bone formation, access to sunlight (or an artificial source of ultra-violet light such as TRUE-LITE) is also required. If the skeleton is weak, then the weight of the animal can cause the legs to bow outwards. This condition, called rickets, can be a particular problem with lizards.

The bones of the skeleton act as anchors for the muscles which are attached to them. As the muscles contract, they can pull the bones of a weak skeleton into a deformed shape.

In addition, calcium is necessary for the healthy formation of the carapace and plastron of tortoises and terrapins. Unfortunately, symptoms of mineral deficiency are quite common among chelonia maintained in captivity. Terrapins which have been deprived of calcium at some time during their development can be deformed, their muscles pulling the internal organs forward and causing the front of the soft carapace to bulge outwards and become misshapen.

Calcium is also needed by adult female reptiles when they reproduce. The method used by females to form the next generation of reptiles can be broadly sub-divided into two groups:

(i) **Oviparous** — females lay eggs in which the embryo has not started to develop or is only just beginning to form. This method is predominant among alligators, crocodiles, tortoises, terrapins and turtles. Many species of lizard and snake also lay eggs.

(ii) **Ovoviviparous** — embryos develop inside the female, although they are separated from her through most, if not all, of their development, by egg-membranes. This method occurs in some species of snake and lizard.

With the first method, the outer shell of the egg and the internal yolk which nourishes the developing embryo, both contain a high proportion of calcium. With the second method, the developing embryo also derives nourishment from a yolk and not directly from the mother. Therefore, in both methods, the female reptile needs a good supply of calcium to make each yolk mass.

Sources of calcium

However, although it is clear that calcium is essential, it is not always easy to get reptiles to eat sufficient to remain healthy.

One way in which calcium (together with other essential minerals and vitamins) can be offered, is by dusting the food with a multi-mineral and vitamin powder such as **Vionate**. This is manufactured by: **E. R. Squibb & Sons Ltd., Regal House, Twickenham, Middlesex.**

Most forms of food which are offered to reptiles can be treated in this way. Unfortunately, the mineral dust can easily be lost during feeding if the food is shaken by the reptile before being swallowed. With terrapins, multi-mineral/vitamin powder can get washed away as these reptiles usually swallow their food underwater.

Species of snake which swallow small mammals or chicks, obtain their calcium from the skeletons of their prey, of course.

Cuttle-bone

An alternative method of providing calcium for chelonia and some species of lizard is to use cuttlefish bone.

In the case of terrapins, an entire bone can be floated in the water of their tanks. These reptiles have powerful jaws and can bite off 'mouth-shaped' pieces. Similarly, an entire cuttlefish bone can be provided for European Tortoises maintained in the garden. Tortoises from warmer parts of the world, for example, South American Red-footed Tortoise (*Geochelone carbonaria*) and Indian starred Tortoise (*G. elegans*), kept in heated vivaria, will also bite into a complete cuttlefish bone.

Lizards kept in indoor vivaria need a regular source of calcium to prevent rickets. Oviparous female lizards, in particular — those which lay eggs — require relatively large amounts of calcium. This is especially true for geckos of the genus *Psychozoon*.

It is comparatively easy to identify calcium deficiency in these female geckos before the condition proves fatal. Healthy females have tiny calcified deposits in their ears. These deposits can be seen through the ear-drum (tympanic membrane). After egg laying, the deposits are not evident for approximately ten days.

At this time of potential calcium deficiency, there is a very real possibility that the eggs will be eaten by the female. Therefore, female geckos should be removed from the vivarium after they have laid eggs. (Adult geckos of either sex will catch and eat hatchlings, so it is prudent to remove the adult male as well as the female from a vivarium in which eggs have been laid).

Cuttlefish bone is also a suitable source of calcium for these geckos; small cubes (approximately 2 to 4 mm square) placed in a shallow dish in their vivarium are eaten with relish.

Female Hermann's tortoise *(Testudo hermanni)* eating a piece of cuttlefish bone prior to egg formation.

Naturalist's notebook

By Eric Hardy

New finds

Echo-location has shown that Britain's rarest native fish, the Vendace, though extinct in Scotland, still has substantial populations in its only other haunts outside Scandinavia, Basenthwaite and Derwentwater in Lakeland. Sewage from Keswick may endanger its future there, but artificial fertilisation and captive breeding may counteract this.

The Chicago Field Museum has collected four new species of 'frogs' in Borneo: a narrow-mouthed toad, *Microhyla maculifera*, 5 of the previously 18 species of this vocal rainforest genus being already kept by pet-owners; two species of tree-frog-like *Philautus*, *disgregus* and *aurantium* (several other species are already kept for their out-of-water bubble-nests); and *Megophrys edwardinae*, a spade-foot related to several known pets. Another new frog, *Rana barmoachensis*, was collected in S. W. Azad Kashmir for the Rabwah herpetological laboratory in Pakistan. Liverpool Museum's curator of vertebrates collected a new genus of short-headed Breviceptine frog, *Balbreviceps hillmani*, from the mountains of Ethiopia.

Two new species of the tree-living Mexican salamanders, *Pteudoeurycea saltator* and *P. parvo*, were found by the Smithsonian Research Centre, in the Oaxaca highlands. A new genus of Mexican woodland Plethdontid salamander, also largely independent of water, *Ixaloerton niger*, was collected by University of California zoologists at Chiapas, while a new *Eupsophys* frog, *E. emiliopugini*, has been collected in south Chile, plus two new species of long, slender *Lerista* lizards, *L. allochira* and *kennedyensis*, from the Cape Range and Kennedy Range of Western Australia.

A new American chameleon, *Anolis placidus*, has been collected in the Sierra De Neiba of Hispaniola, a new mountain lizard, *Japalura*, from Taiwan and a new white-lipped bullfrog from Batan Island, Phillippines, *Leptodactylus bailiobarus*, by a Ryukus University (Japan) biologist.

The preying mantis is notorious for its ferocity and, in New Jersey, it has been found to prey on the red-backed Salamander. A natural hybrid between the Common Rock Rattlesnake, *C. lepidus*, and the near-related *Crotalus willardii*, has been found in New Mexico. Most hybrids occur in captivity, but they were found recently between Blue-spotted Salamanders, *Ambystoma laterale*, and *A. jeffersonianum*.

An Arkansas university zoologist has found further evidence of snakes locating their dens by scent, in scent-trailing by Garter Snakes in autumn. Although tail-length varies in individual snakes, it also varies between the sexes. The parietal, or third eye, is well known in lizards. At Oklahoma University, another zoologist believes that it aids temperature-control in Collared Lizards.

Most animals seem to possess a homing sense by sun-position, scent or otherwise. Naturalists at the American Museum of Natural History have recently shown it with the mountain-dwelling Yarrow's Spiny Lizard.

Acid controversy

The Forestry Commission's Director of Research challenges the widely published opinion that forestry trees acidify lakes and streams. The primary source, he claims, is atmospheric pollution, adding that there is no evidence that the trees themselves cause it in the absence of atmospheric deposition. Even where trees filter pollution from the atmosphere, adequate calcium in the soil would effectively neutralise it.

This seems to contrast with the recent annual report of the National Environment Research Council (Swindon, £6) which claims Welsh afforestation at Beddgelert and Plynlimmon increased sodium, magnesium, aluminium, chloride and sulphate in the drainage water, up to 5 times more than in water drained off open moorland. Liming the water harmed lowland bog-plants. Other workers in the Irthon Valley previously claimed afforestation increased acidity and reduced aquatic insect life, and, consequently, dippers which fed on it. One certainly finds more life in a chalk stream, like the Hampshire Avon, than an acid one, and its fish, like trout, grow larger.

Miscellanea

Fishermen agreed to ban scallop-dredging within half-a-mile of Skomer, the planned marine nature reserve off South Wales, but potting crabs and lobsters will continue.

Although the Goose Barnacle, so common in southern inshore water, isn't included in Liverpool University's book on Hilbre Island in the Dee estuary, hundreds have become established in recent years on high water stakes on nearby Hoylake shore. Its less common relative *Lepas pectinifera* has also been added to the book's list. Further north, in Morecambe Bay, Tim Dean, who is writing a book on Walney Island where he is warden, tells me he has only one record of Goose Barnacles, in a fishermen's net. I haven't another for Morecambe Bay either.

For several years, four species of saddle oysters have drifted ashore at Hoylake attached to polythene and plastic rubbish, but not on anything else. Inland, bird-watchers are engaged this year in another national Mute Swan nesting census, to update data on the recent small increase after the setback in modern times from lead poisoning from gunshot pellets, anglers' weights, and boat-paint. Cheshire had a 6% increase last year.

Many sea creatures hitch a ride on the bottom of ships and, thus, get around the world. In 1953 the Japanese Sea Squirt *Styela clava* (then called *S. mammiculata*), first reached Britain this way near Plymouth and spread rapidly along the south coast and up to Loch Ryan. It's now established in New Brighton marine lake, in the Mersey estuary.

Evolution worked backwards with these little bags of sea-squirting jelly. Their tadpole-like larvae find a suitable rock and settle down head-first for a sedentary life as a tunicate whose heart reverses the direction of blood about every 3 heart-beats; the most primitive of vertebrates.

"Life in this tank has never been the same since they bought those Banjo Catfish!!"

San Francisco on the cold and misty morning of our whale-watching expedition. The boat nearest the lighthouse is typical of those used on these trips.

WHALE WATCHING

Billy Whiteside fulfils one of his childhood dreams . . . some 25 miles west of San Francisco.

(Photographs by the author)

Many years ago, while at primary school, a dead whale was washed up on the beach at Whitehead, in County Antrim, Northern Ireland, a small town situated about ten miles from where I lived. I persuaded by father to drive me there in the car to see it. I was suitably impressed by the gigantic body of the dead whale and, as a keen aquarist, decided that, one day, I must see and photograph live whales. I know whales are not fishes — but I'm quite happy to extend my interest in fishes to include whales, dolphins and seals, and large fishes such as sharks.

My first view of live whales came at New York Aquarium, in August 1988, when I watched Beluga whales for the first time. I was so intrigued that I made a return visit in November 1989. There were also some small sharks on display at New York Aquarium, but no very large whales. To see live whales, in their natural environment, I decided to cross the world to California, to the 'Wild West', to take a trip into the Pacific Ocean.

On my first visit to America, I bought a photographic magazine that carried a fascinating article and photographs about Bob Talbot and his expeditions to photograph whales. I was arrogant enough to think that I, too, could photograph whales as well as he could. Little did I know!

Taking the plunge

My first step was taken when I telephoned San Francisco and spoke to a member of The Oceanic Society Expeditions, of Fort Mason Centre, San Francisco, California. I learned all about their Farallon Island Excursions and decided, then and there, to book a trip at a cost of $50 — about £30 or so. It seemed a fair amount of money when one compared it to, say, the price of theatre or concert seats in the USA. Anyway, I wanted to see live whales swimming in the sea, and a trip with The Oceanic Society into the Pacific Ocean for a day, seemed the best way to accomplish it.

A few days later my booking was confirmed by post and I received a list of directions from San Francisco. What about sea-sickness, I wondered. The Oceanic Society — which is a non-profit making organisation dedicated to promoting the preservation of the marine environment through responsible and enjoyable tourism, education, conservation and research — strongly recommended that I consult my doctor or pharmacist about modern sea-sickness remedies. I bought a packet of appropriate pills. I was also told to have breakfast early on the morning of the trip, but to avoid fried and greasy foods. I should also get to bed early the previous night and bring with me a packet of crackers to combat nausea.

I was also informed that it is always cold out in the Pacific, so sweater, jacket, overcoat, hat, gloves, heavy socks, strong shoes or waterboots were essential. An insect repellent was recommended, together with suntan oil, sunglasses, binoculars and a camera with a tele-photo lens — and a polythene bag to keep the spray off the camera. Food was not provided, although the ship did provide free hot water and coffee. However, there was a cook on board the ship and she produced chips and hamburgers at a range of prices. (Possibly food for fishes, I thought!)

The length of the trip — about eight hours — and the possibility of rough seas, mean that there are age restrictions on participants. Children under 10 are not allowed on the trips, and special arrangements have to be made for children under 14. Obviously, trips may have to be cancelled when the weather is unsuitable, and the Society provides a telephone number that can be rung from 6 am on the day of the trip to check that it will be held. There are also complicated arrangements about refunds if the trip has to be called off after it has departed.

Continued on page 98

Fur Seals, Sea-lions and a wide selection of sea birds occur on the Fallarons.

Your questions answered

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Please indicate clearly on the top left hand corner of your envelope the name of the experts 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, 9 Tufton Street,
Ashford, Kent TN23 1QN

Herpetology, Julian Sims. **Koi,** Roger Cleaver. **Tropical,** Dr. David Ford. **Coldwater,** Pauline Hodgkinson. **Plants,** Barry James. **Discus,** Eberhard Schulze. **Marine,** Graham Cox.

KOI

Stunted Koi

Why has my Gin Rin Sanke not grown while my other Koi have?

Several years ago, Dr Cohen of Birmingham University suggested to me that you should consider fish to be similar to humans in so far that they suffer the same, or similar, complaints to those that affect us.

Some humans grow tall or large, while others remain small. This is hereditary and the same can apply in fish. Some fish come from fast-growing strains, others do not. This is possibly one reason why your Koi has not grown.

A second reason may be that the Koi may well have been kept in confined quarters as it was grown and, possibly, has been stunted in the process. Young fish need the best possible conditions if they are to grow to their full potential. If they are not given these conditions, then, usually, small fish are the outcome and, if the conditions carry on for a great length of time, then the fish will never recover and grow to any size at all.

One or other of the above, or even a combination of them both, is what I would suspect is at the root of the problem. I have known Koi which have remained the same size for several years, eventually begin to grow. Time will tell with your fish. If you continue to give it the best possible water conditions and plenty of good food, your Koi may well still surprise you.

BILLY WHITESIDE

Despite being kept under identical conditions, hereditary and other factors will ensure that these fish will not grow to the same ultimate size.

PLANTS

Problem Violets

I am very much taken with the oxygenator known as Water Violet. I have tried two or three times to establish this plant but it always breaks up and disappears. What am I doing wrong?

Water Violet (*Hottonia palustris*) is a native water plant locally common in South East and Central England.

There seem to be two distinct races of this plant. One lives only in soft, acid water, while the other will tolerate hard, alkaline water as issues from taps in certain parts of the country. I assume your supplies of this plant have been of the acid-loving race which would account for your losses.

Try cultivating the plant in a container filled with rain water. If it flourishes, then you will know the answer to your problem.

Holes in leaves

Some of my plants, particularly Lizards Tail and Amazon Swords, have holes in their leaves. In the Swords, leaves begin to grow but soon look like lattice work. The edges are OK, though. The plants develop patches and then lose their colour. I haven't seen any snails in my tank for months, so something else must be causing the problem. Lighting: 3 Triton tubes, plus one Grolux (tank size — 48 x 12 x 15in). The pH is between 6.5-7. CO_2 Floramat is added to the water, along with Everplant M and D. Your assistance would be most appreciated.

Certain essential elements, i.e. iron and manganese are only available to the plants in the presence of organic acids. It would therefore be a good idea to add sphagnum moss peat to your filter, or use one of the proprietary 'Blackwater' water conditioners.

Of course, both Amazon Swords and *Saururus* will deteriorate after a time if permanently submerged, and should be periodically replaced. However, in your case, I think the Amazons, in particular, may not have been submerged long enough for this to be a problem.

BARRY JAMES

Some Amazon Swords and other plants often experience periods of exposure in the wild and will therefore die if kept permanently submerged.

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BARRY JAMES

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TROPICAL

Acid changes

I would like to raise the pH of my aquarium water from its present acid level to the alkaline part of the scale. Could I do this by adding shells to the aquarium? If so, how much would I need to add to 4ft (120cm) and 3ft (90cm) aquaria? My fish, by the way, appear to be OK.

Frankly, I would not alter the pH of the aquarium water if the fish are happy and healthy. You should only interfere with the chemistry if there is a problem for the fish, or if you want to breed special species that require a certain pH.

Make sure also that your testing kit is reading correctly. I have often investigated strange pH values that were worrying fishkeepers, only to find it was the kit that was faulty. The chemicals used in the tests have a limited life, especially when sealed bottles are opened.

Shells have a very small effect on pH. If you really want to raise the pH, use dolomite, which can be held in a nylon bag and placed in a power filter. Stored bulk water for partial changes can be neutralised with sodium carbonate (do not add such powerful chemicals to the aquarium direct).

Wide-ranging Jewels

JAMES VAN DYK

Jewel Cichlids are widespread fish which are hardy, territorial ano interesting to breed.

I have read in one book that Hemichromis bimaculatus, *the Jewel Cichlid, comes from Tanganyika, while in others, it says that the species comes from the River Nile, River Zaire and River Niger. Who is right? Also, how can I keep and breed Jewels?*

Hemichromis bimaculatus, the Jewel Fish, Red Cichlid or Jewel Cichlid, is widespread throughout tropical Africa, so all the claims to its home you read are correct, particularly since there is some debate regarding the actual identity of different populations of this fish.

There are several species in the genus *Hemichromis*, e.g. *bimaculatus, fasciatus guttatus, cristatus, thomasi* and *elongatus*. Being so unusually widespread, Jewel Cichlids have developed into many varieties; furthermore the colour changes in both sexes when breeding are dramatic, hence aiding the claim that they are different species.

Again, as a consequence of their distribution, these fish are found in all waters: hard, soft, still and flowing. Use any water type, but heat to 25°C (77°F). A large aquarium is needed because a pair normally occupies a large territory and is prepared to fight for it. *H. bimaculatus* grows to 15cm (6in) on a mainly carnivorous diet. A pair will breed readily and are good parents, raising lots of hungry fry.

Jewels can be housed with other species if these are not small, if the tank is not crowded and if hideaways are supplied to avoid confrontations.

HERPETOLOGY

Hard-/Soft-shelled compatibility

How many Red-eared Terrapins can I keep in a 36in (90cm) tank? Can I keep Red-ears with Florida Soft-shelled Terrapins? Finally, how do I look after Terrapins?

A tank 36 x 12 x 12in (90 x 30 x 30cm) will be suitable foe three small Red-eared Terrapins (*Pseudemys scripta elegans*), as long as space is available for a basking island made of brick.

I would not use gravel on the floor of the tank — refer to **Herpetology Matters** in the October 1989 edition of *Aquarist & Pondkeeper* (terrapins accidentally eat gravel with their food).

A medium-sized tank can be kept clean by regularly changing the water using a siphon. External power filtration is not really necessary with a 3ft (90cm) aquarium.

Diet should be as varied as possible and should include pieces of raw LEAN beef and earthworms. Well-soaked, pelleted dog food (high protein or extra calcium varieties), pond pellets and Tetra ReptoMin food sticks, are also eaten with relish. Dried 'Turtle food' which consists mainly of dried *Daphnia* has little nutritional value.

An entire well-washed cuttlefish bone should be placed in the tank as a source of calcium, needed for healthy skeletal and shell growth. Terrapins bite into the cuttlefish with their powerful jaws.

Illumination (approximately five hours per day) can be provided by a TRUE-LITE fluorescent tube. Further details about these tubes can be obtained from:

General Acoustics Ltd,
Salter Road,
Cayton Low Road Industrial Estate,
Scarborough,
North Yorkshire, YO11 3UZ.

Hard-shelled terrapins (there are three different species in this photograph) should never be kept with soft-shelled types.

It is not a good idea to keep 'hard-shelled' terrapins, such as members of the genus *Pseudemys*, with soft-shelled terrapins of the genus *Trionyx*. Soft-shelled terrapins are very vulnerable — the edges of their shells and their webbed flippers get 'nibbled' by other terrapins.

To protect themselves from this type of damage, soft-shelled terrapins tend to be quite aggressive reptiles. They snap at other terrapins, and can also give human fingers a very painful bite! For this reason, soft-shells are best kept on a solitary basis in an aquarium by themselves.

Soft-shelled terrapins also like to dig into fine, rounded gravel. They hide under this for protection. As previously indicated, it is not normally a good idea to use gravel in terrapin tanks — they accidentally swallow this with their food, and gravel makes regular and thorough cleaning of the aquarium difficult. Soft-shelled terrapins are the exception to this general guidance — another reason why they are best kept by themselves and not with other terrapins.

COLDWATER

Aggressive residents

I have three fully-grown goldfish in a 36in (90cm) tank. They are the survivors of a total of six which were introduced some seven years ago.

I have tried on several occasions to introduce new fish. These have always been small, and have been treated very aggressively by the three 'residents', before eventually being lost. Is there a solution to this problem?

It is not uncommon for newly-introduced fish not to survive in an environment where well-established inmates thrive.

There can be several explanations for this. For example, have the new fish been properly quarantined before they were introduced, thus allowing a proper health check to be made on them? It is possible that the fish were not in the best condition healthwise and were therefore unable to stand up to any harassment which they might have had from other fish.

The environment may only be able to sustain the number of fish it is already supporting. If so, then any extra animals are likely to suffer. This usually means that the weakest are the first to succumb in such situations and, as your original stock appear to have adapted well to their environment, and are in good health, it is the newcomers that will suffer.

It could also possibly be that the new fish had not adapted to the water quality and chemistry as this does vary from area to area. Fish must be allowed to adapt slowly. Whenever you purchase fish from different areas, add new water to that which the fish is swimming in gradually so as not to shock them.

I strongly suspect that, as your fish are fully grown, the environment is only capable of supporting the present residents. If you wish to attempt to add other fish, do please make sure that they are in the very best of health before doing so. This will mean at least (in my opinion) six weeks quarantine before you introduce them to the tank and, if this also proves fatal, then it really will mean starting again with an additional tank.

Leaky Liner

I am losing about 6in (15cm) of water from my butyl pond every two weeks or so. There are no apparent holes so I can only assume that the liner (3 years old) has become porous. Is this possible? Alternatively, if the liner is, indeed, punctured, how can I find the leak, and how can I repair it?

I doubt very much that your butyl liner has become porous after only three years. This quality of rubber liner should last, at least, 25 years, or so the makers claim.

It is far more likely that there is a puncture. Small stones which may have been present on the base or sides of the excavation can cause damage if adequate precautions are not taken to prepare the hole before the liner is put into place. Lining with sand, cardboard, newspaper, or even old carpeting, should cushion the liner to prevent damage.

Locating the puncture can be tricky, but one sure way is to allow the water level to fall. Once the level has remained constant, the puncture can be located along that line. It might even be necessary to search for the hole with the help of a magnifying glass, a real trouble but, in some instances, a necessity.

Once the leak is found, it can easily be repaired with one of the liner patching kits available from all good water garden centres and aquatic shops. The repair kits contain a cleaning fluid, patch and glue, and cost around £5. Once the damage is located, the repair is very quick and simple and, what is more, permanent.

Although goldfish are not generally aggressive, young specimens, like these juvenile Veiltails, can suffer when introduced into an aquarium containing fully adult 'residents'.

MARINE

Centrally heated warning

I am planning to set up a 30 x 30 x 42in (c 76 x 76 x 107cm) tank and would like to use a spare 36 x 15 x 18in (90 x 38 x 45cm) tank, sited below, as a reservoir for heating, filtration etc. I have managed to arrange all the pipework between the two tanks using 22mm plastic overflow pipes and fittings which I have been assured will be non-toxic in a marine aquarium. My question is on the use of a pump such as those normally used for central heating systems. Would such a pump be safe to use in this system?

Your two tanks will have a combined gross capacity of 171 gallons (= 776 litres) and will form a superb basis around which to build a marine aquarium system.

With regard to using a domestic central heating pump to operate your system, I regret that I must 'pass the buck' here to the manufacturer of these units since, although I have seen many of them used over the years to operate filtration systems for Koi ponds, I have never actually taken such a unit to pieces to study the materials of which it is made.

If, in the interior of the pump, the only materials exposed to seawater contact are plastics, stainless steel, ceramics or cast iron, then such a pump would be safe in a marine aquarium, since none of these materials is toxic to marine-life. On the other hand, should a careful examination of the pump's interior reveal the presence of copper or any of its alloys such as *brass* (copper/zinc) or *bronze* (copper/tin), then don't touch it with a barge pole!

I suggest that you contact the manufacturer of these pumps with a copy of this letter and request a WRITTEN GUARANTEE that their pumps would not prove toxic to marine life. If they are unable to give you such an assurance, then it would be much safer to use a powerhead such as the Project or Aquaclear type which I know, from personal experience, are perfectly safe in seawater.

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News

NEW BRITISH SHARK DISPLAY

The Sea Life Centre at St Andrews in Fife, eastern Scotland, has inaugurated a fascinating new display of British Sharks and Stingrays as part of an entirely re-designed visitor route for the 1990 season. These impressive creatures add an important extra dimension to the range of marine displays at the centre.

The shark species on show include Tope and Spurdog, plus a batch of Common and Starry Smoothounds. When fully grown, some of these will measure up to two metres in length, although, at present, the largest members just exceed one metre. The sharks are housed in a huge 40,000 litre display tank with a multi-level viewing facility which enables visitors to observe the creatures from several vantage points.

For further information please contact **Mark Walker. Telephone 031-228 6262.**

The Sea Life Centre's (St Andrews) latest display brings visitors and sharks face-to-face.

US AQUARIAN WINNERS

The USA distributors of 'Aquarian' Flaked Fish Foods, **Mardel Laboratories,** of Glendale Heights, near Chicago, joined forces recently with **Thomas's** to run a competition among aquatic stores state-wide for the best display of the 'Aquarian' range.

Four winners were eventully chosen on ingenuity and originality of the displays. The prize: an all-expenses-paid trip to England with their partners. Some of the Mardel salesforce were included, so 16 very happy Americans descended on London in April/May for the West End shows, followed by a trip to Birmingham to attend **Pet '90** at the NEC, and to Thomas's at Birstall, Yorkshire, where 'Aquarian' flaked fish food is manufactured.

At Thomas's they were shown how the food they sell in the USA is actually made, along with many other pet products manufactured by Thomas's. The trip was then rounded off with a formal evening meal at a Halifax restaurant. While in Yorkshire, the group also visited Bronte exhibits at Howarth and toured York with their guide, **Dr David Ford,** of the 'Aquarian' Advisory Service.

Winners of the Mardel/ Thomas's competition at the 'home' of Aquarian fish food manufacture — Birstall, in Yorkshire.

RSPCA PET POLL

In the largest pet survey ever undertaken by the RSPCA, the Society asked more than 10,000 pet owners under 17 years of age in England and Wales about what pets they keep. The results make very interesting reading.

Top of the list were dogs; cats came in a close second and goldfish made a splash in third place. Biggest surprise of the survey were stick insects. They just missed the Top Ten and are the eleventh most popular pet among young people in England and Wales.

The survey revealed some interesting regional differences. Pet ownership is most common in the South West and least common in London — a reflection, pehaps, of the difficulty of providing a suitable environment for pets in an inner city. The top area for keeping budgies is the North; the greatest concentration of ponies kept as pets can be found in the South West, and the South East has the highest number of hamster keepers. Goldfish (at 31%) are more popular in Wales (just), followed by the North, East Anglia and the Midlands. The highest figure for tropicals among the under-17s was 9% (South East and London).

Some young people have more unusual tastes in pets. Not everybody could get attached to a leech, locust or maggot, but all had loyal fans. Ants also had their adherents, with newts, beetles, an eel and iguana, also proving popular.

Young pet owners are not always kind to their pets, though, according to the survey. In fact, some of those who answered may be committing serious pet care blunders. For instance, most budgerigar owners were only keeping one bird, but budgies like companions and should always have, at least, one other mate. "This is where the survey will come in handy, by showing the RSPCA where more information is needed to help improve the lives of animals," said RSPCA Senior Education Officer **David Graham.** No details of fishkeeping habits/ blunders have, however, been released as yet.

AQUARAMA '91 DATES

Aquarama '89, first held in Singapore in June, 1989, attracted 64 trade exhibitors from 12 countries, 50,000 visitors and numerous delegates from all over the world.

The four-day show was the first-ever totally aquatic trade/ consumer international exhibition, competition and conference to be held in Singapore, and proved to be so successful, that a larger venue — still within the World Trade Centre — has been earmarked for the 1991 event scheduled to take place between **27-30 June.**

Two days of the four-day event will be reserved exclusively for trade visitors, with the doors being opened to the public during the other two. Interest from both trade and hobbyists is already running high and bookings for stands are, reportedly, pouring in, thus indicating that the inaugural 1989 figures for exhibitors will be surpassed in the very near future.

The organisers, **Academic Associates,** are very keen to receive enquiries from UK companies. Many UK representatives did, in fact, visit Aquarama in 1989, but relatively few exhibited first time around. The organisers are, therefore, hoping for an increase in both visitors and exhibitors from these shores.

For further details contact: **Miss Irene Goh, Academic Associates Pte Ltd, Blk 808, #03-185, Kitchener Complex, French Road, Singapore 0820, Singapore. Telephone:** (010 65) 292 6166; **Fax:** (010 65) 292 46265. **Telex 34032 ACADEM.**

ALTERATIONS AT THE GOLDFISH BOWL

The Goldfish Bowl, Oxford's highly-regarded aquatic shop, is undergoing major alterations, starting this month.

The reconstruction work will probably take about three months to complete. Fitting out of the new building will be undertaken "as soon as the builders have moved out".

Max Gibbs, proprietor of The Goldfish Bowl, informs us that trade will continue while the work is in progress, although there will be an unavoidable temporary reduction of some stocks.

New displays, filtration systems and enlarged quarantine/ conditioning areas, plus an open-plan showroom and information centre, will all help make the **New Goldfish Bowl** and even bigger attraction for discerning aquarists.

For further information, contact **Max Gibbs, The Goldfish Bowl, 118-122 Magdalen Road, Oxford. Tel 0865 241825.**

Fancy Danios are always popular. This long-fin Zebra from Ekk-will Tropical Fish Farm won the top prize in its category.

The winner of the Swordtail category, and runner-up in the Best in Show (Livebearer) — a Marble Sword from Imperial Tropical Fish Farm.

FLORIDA '90 — SUCCESS AGAINST THE ODDS

It takes more than freezing weather to beat the Florida fish farmers, This year, they had to battle against the after-effects of near record-breaking low winter temperatures and still managed to put on a show of exceptional quality. *A & P* editor, **John Dawes,** was one of the judges at this prestigious event, and was hugely impressed both by the fish he saw, and the determination of the Florida farmers themselves.

(Photographs: Harry Grier/ Florida Tropical Fish Farms Association)

While December 1989 was one of the mildest winter months on record in parts of the UK, Florida was gripped by one of the coldest spells anyone can remember.

Prolonged freezing temperatures meant that large numbers of the tropical fish that normally spend winter in outdoor, unprotected ponds throughout the state, died over a period of a few catastrophic weeks.

Some farmers lost all their stocks. Others suffered very heavy losses. Those who could offer their fish some form of protection, either inside permanent buildings, or by covering their ponds with the tried-and-tested plastic tunnels, fared considerably better. By January, once temperatures had begun to pick up, it became painfully evident that the Florida ornamental fish industry had been hit by one of the worst disasters in its history... and this, just a few months before the Flordia Tropical Fish Farms Association was supposed to be staging its spectacular annual show in Tampa.

When the going gets tough

It is often said that when the going gets tough, the tough get going. Well, they don't seem to come any tougher than the Florida fish farmers! Not only did they take the savage blow like the true professionals that they are, but they also decided to go ahead with the show, and, in the end, managed to put up a brilliant spectacle that came very close indeed to matching even the outstanding record-breaking event of the previous year.

The number of entries was, as expected, slightly down, but not by much. As far as the quality of the fish themselves was concerned, some (those that are traditionally over-wintered outdoors) may not have been quite as outstanding as in other years, but then, one is comparing them to what have always been superlative fish in every sense. So, while it may be true to say that, for example, some of the livebearers were not quite as exceptional this time round, it would be equally true to say that those that were on

show, would have given any livebearers bred anywhere else in the world a good run for their money... and would have very probably won!

The fact is that the best tropicals that Florida can produce are of such a high quality that it is difficult to see anybody surpassing them, at least, not over the whole range of species that they produce in such large numbers.

Value for money

Away from the 'winter-hit' fish, the standards were every bit as high as we've now come to expect, so those UK importers who already regularly bring in fish from Florida, plus all those others who (I know) are thinking of doing so, should have as wide a seletion to choose from as ever, with one or two special 'extras'.

From the hobbyists' point of view, of course, this is great news. Florida fish are becoming much sought after by discerning aquarists, an ever-growing number of whom are perfectly happy to pay the slightly higher prices that these fish command. And, while we are on this subject, it might be worthwhile considering why it is that Florida fish can cost slightly more than some tropicals imported from elsewhere — a question that is sometimes raised by UK aquarists.

I think that there are several reasons: labour costs, freight charges and other factors, all, obviously, play a part in the eventual price, but, perhaps, the most important single factor is that the Florida industry is largely geared up to meet the needs of US hobbyists.

These have traditionally demanded, expected, and got, big fish, particularly when it comes to livebearers. Now, anyone can produce big fish — not just Floridians — but, in order to do so, you've got to hang on to your stocks longer. This, in turn, means that you need more ponds, more food, more staff... and so on. The result, of course, is higher prices — but, you get a lot of your money. So, as they say, you pays your money and you takes your choice. At least, you know that when you buy a 'large' Florida-bred fish, you are really getting a large fish, be that a Guppy or an Angel.

New fish

In addition to size, Florida also specialises in innovations, particularly — but by means exclusively — among livebearers.

In this category, Gold Tux Wag Swords (Northside Tropicals) took the top award at this year's FTFFA show, followed by Ruskin Tropicals' Red Tail Gold Variatus and, in third place, by a shoal of Sunset Lyretail Mollies from Blackwater Fishery. For me, personally, about the best livebearers in the show were the Marble Swords from Imperial Tropical Fish Farm, deserved winners of the Swordtails Category. This variety also came second in the Best in Show (Livebearers), with top spot going to some exceptionally good Sunset Variatus Platies produced by Ed Parker Tropical Fish.

On the egglayer front, there were a few surprises, the top two of which were both 'created' by the enterprising team from Ekkwill Tropical Fish Farm. Top of the list was their Rainbow Fox — a most attractive hybrid between a Rainbow Shark and a Flying Fox (sadly, I don't have any publishable shots of this fish), followed by another hybrid — this time between a Long-nosed and a Short-nosed Gar! Florida Exotic Fish Sales took a well-deserved third place with their *Pseudotropheus macrophthalmus* OB.

The innovations continued in the Breeders Class (the highly-coveted Edward Levy Award) as well. For about ten years, I have been waiting for someone, somewhere, to come up with a way of breeding Sucking Loaches (better known in the US as Algae Eaters) commercially. Well, this year, I was not to be disappointed. Ekkwill (again!) have now managed this and, not surprisingly, walked away with the trophy. They also took second place with their Bala Sharks, while A. Cobnb & Son won third place with *Corydoras panda*.

A new fish in everyway — the second placed hybrid Gar produced by Ekk-will Tropical fish farm.

The Aequidens and Geophagus Cichlid section was hotly contested, with this *Aequidens awani* from Pataky Inc. coming out on top.

Satisfied customers

As usual, the Florida Tropical Fish Farms Association show attracted thousands of visitors, most of them from the US, but also some from overseas. What they saw, especially if they knew beforehand just how difficult the preceeding few months had been, can have left them in little doubt that Elwyn Segrest, the retiring FTFFA president, is very probably right when he says in his own, inimitable, and very Floridian way, that Florida fish are the best in the world.

Perhaps this time round we should add that the fish farmers of Florida also appear to be invincible. Thanks to their Herculean efforts, we are likely to enjoy as exciting a crop of tropical freshwater fish this year as that which we've been enjoying in the recent past — and this, in spite of the fact that they are now having to call on their resilience yet again to meet the next great challenge... drought!

★★★★★★★★★★★★★★★★★★★★★★★★

Lake Tanganyika is a large freshwater 'sea', complete with its own pelagic community, including jellyfish.

FISHES OF BURUNDI

Dr Chris Andrews of London Zoo Aquarium reports on his recent visit to one of the all-time greats of the aquatic world, Pierre Brichard.
(Photographs by the author)

As the aircraft dropped through the clouds, I saw my first glimpse of the rolling, close-clad forested hills of Central Africa — "Gorillas in the Mist" country. Gradually, as we slowly descended towards the airport, individual huts gave way to larger and larger villages, and small clearings were replaced with more obviously-cultivated land. Well, I had been warned that Burundi was one of the most densely populated of African countries.

The night flight from London via Brussels to Bujumbura had been uneventful. I was flying in to attend an International Symposium on the African Great Lakes at the University of Burundi (full report to be published in *A&P* soon). Having arrived at 10.30 am, my paper on "Zoos and Fish Conservation" was due at 2 pm, so I left my bags at the hotel and made straight for the University.

The speaker immediately before me was Pierre Brichard. I wanted to meet him and, if possible, arrange to look around his **Fishes of Burundi** holding and breeding facility for Lake Tanganyikan cichlids.

No stock depletion

Brichard, whose masterful update entitled **Cichlids and all other Fishes of Lake Tanganyika** has recently been published by T.F.H. Publications (see March '90 issue of *A&P* for full review) presented a fascinating paper on his fish-catching, breeding and exporting business in and around Lake Tanganyika.

Pierre Brichard (originally from Belgium) has been catching and exporting fish from Africa since 1954, and from Lake Tanganyika in particular since 1971. With over 170 species of endemic cichlids in Lake Tanganyika, as well as over 100 species of other fish, there is considerable interest in the Lake as a source of fish for the ornamental trade. Brichard has fished the same 20 kilometres of lake shore by scuba diving, seine net and hand net for over 20 years, and although he has increased the number of fish removed over that period, he has not seen any signs of stock depletion as a result. In fact, during 20 years of diving in the Lake, he has seen only two dead fish, although some years ago, a pesticide spillage did cause a mass fish-kill in a nearby harbour area.

Family business

Fishes of Burundi is very much a family business, involving Brichard's daughter and son-in-law. Every year they export about 200,000 fish to Europe and North America, with roughly equal amounts of wild-caught and captive-bred specimens. *Tropheus* and *Cyphotilapia* are the most popular species, although a range of other cichlids and non-cichlid species are also exported.

Wild-caught fish are quarantined for three to four weeks and may be treated with standard disease prophylactics to control any parasites. Fish which appear unwell are never exported but maintained in quarantine for a longer period. Brichard is a great advocate of *quality* fish and believes that the ornamental trade realises that it is better to pay slightly more for a top quality fish than to take the all-too-easy cheaper option.

At his facility, carbon-filtered tap water is used as a water source for his holding and breeding tanks, but since the water orginates from Lake Tanganyika, it proves ideal for most species.

Looking every bit like a small trout farm with rows of earth ponds, much of his fish breeding is done outdoors. These shallow ponds, with abundant plant growth, algae and plankton, ensure that the fish which are produced have better, brighter colours than equivalent tank-bred specimens. Each of the 100 or so ponds contains anywhere between 40 and 200 fish, usually with at least two species of fish in each.

Pierre Brichard pictured alongside some of his outdoor rearing and breeding ponds.

When required, the fish are removed by trap or seine net, and each pond is drained and thoroughly dried every two years to maintain its fertility and help prevent the build-up of disease organisms. Herons, kingfishers and algal blooms are all problems which link Brichard with pondkeepers the world over. Although his ponds generally contain plenty of natural food, some supplemental feeding in the form of flaked and/or pellet food is also provided.

Undying enthusiasm

In addition to breeding fish from Lake Tanganyika, some Malawi cichlids are also bred at his facility and while I was there, Brichard proudly showed me what he believed to be a new genus of mouthbrooding deep-water cichlid.

He may have been involved in the business for over three decades, but his enthusiasm continues undiminished. He is a strong supporter of the need to conserve Lake Tanganyika and all of Africa's lakes, but is worried that the needs of an ever-growing population and a country eager for economic growth, may destroy one of nature's living laboratories.

A full report of the African Great Lakes Symposium will feature in a forthcoming issue of *A&P*. I gratefully acknowledge the generous financial support of **Tetra**, the **British Council** and the **Royal Society**, without whose assistance, my participation in this meeting would not have been possible.

A wild-caught *Cyphotilapia frontosa*, one of the most popular aquarium fishes from Lake Tanganyika.

Letters

SAVE OUR FISH

Much has been said in the aquatic press recently about the new laws being drafted by the European Community, but at present, most aquarists seem totally complacent about what effect these new laws will have on their hobby.

So, just to put things in perspective, may I ask you ALL a question? Which *Corydoras* are you going to keep? There are only two to choose from after the new laws get passed! Specialist Societies, may I ask YOU a question? What are you going to do with your funds? Well, there won't be any point to existing if your members can't keep any of the fish which you have made your specialisation.

These new laws won't just affect new fish coming into the country, but those we already have. All the Species Maintenance Programmes set up to maintain Endangered Species will also be illegal.

Since these laws are aimed at protecting fish from over-exploitation, it seems totally ridiculous that the only effect they will have is actually to drive some species into extinction and deprive a lot of people a great deal of pleasure. Habitat destruction is the biggest factor in extinctions. If the European Community really wants to help save species, they should, perhaps, write off Third World Debt but, at the same time, insist that the rain forests are protected and the habitats of endangered species maintained.

As aquarists what can WE do? Join the O.F.I. (U.K.)! This organisation needs money to fight these laws. Another thing we can do is write to our Member of European Parliament and Member of Parliament. Express your grave concern about this infringement of civil liberties. Point out that aquarists are in the forefront of species conservation. Underline the fact that Zoos and Public Aquaria can't cope with the number or diversity of species which are becoming threatened.

Only the millions of aquarists around the world who *really* care about these fish can prevent them going the way of the Dodo.

Derek Lambert
Viviparous — Livebearer Information Service

ENDANGERED SUGGESTIONS

I have always enjoyed your magazine and was interested to read the items on the conservation measures taken by a number of Amazonian fish exporters, and on the rediscovery by Derek Lambert and his mother of the once considered extinct Turner's Sailfin Goodeid (*A & P* April).

This led me to wondering if we aquarists are devoting enough attention to conservation of endangered fish species.

Would it, for example, be possible to run an article on endangered species? Perhaps there could be a discussion of those species which responsible aquarists shouldn't purchase because of the depleted nature of wild stocks; or a consideration of those species that aquarist could/should be breeding in greater numbers to ease the pressure on wild stocks; or — on an upbeat note — a review of those species that have been saved, or only now exist, because of captive breeding.

Terence John Holmes
Leystonstone, London

Editor's Note:
Thank you for your letter, Terence. I'm pleased to learn that you enjoy A & P *and, in particular, our conservation-based features. As you know, we regularly carry articles which include details of, or are totally dedicated to, conservation issues, including endangered species. I will nevertheless take up your suggestions and hope that we can produce the type of article you request before too long.*

No doubt, you will also be interested in the letter from Derek Lambert which we are publishing along with yours.

John Dawes

AQUARIAN FISH FOODS

***Skiffia francesae* is one of a number of species that exist solely because of the efforts of dedicated aquarists.**

SOUTH INCH SEEKS SUPPORT

Just a few lines to inform you, and *A & P* readers, that I have recently been appointed Chairman of South Inch A.S., and generally to say a few 'Thank-yous' to those people and societies who regularly support us.

Everyone I have spoken to has nothing but the highest praise and admiration for your very informative magazine. I, for one, am proud to admit that I was converted by *A & P* and it is one of the highlights I look forward to each month.

There is no doubt that fishkeeping is really picking up in my hall at Perth Prison. I have been here six months and, in that time, have seen the amount of fellow inmates taking an interest tripling at least. Sad to say, although the amount of inmates looking after fish in their own rooms has tripled, we are moving very slowly towards getting them to come to our meetings. I can be pretty persuasive, however, and I won't give up until I have achieved a climb in the numbers.

Bruce Budge (my predecessor) is going to be a tough act to follow, owing to my relative inexperience. But, then again, I would not have taken the Chair if I didn't think I had something worthwhile to contribute to the growing success of our club. I know I'll make mistakes but, as long as they are not major ones, then, I know I can count on the considerable help and encouragement that is on tap from some of the most experienced fishkeepers in Scotland, i.e. Peter Symington, Bill Stephen, Walter Renton, Joe Brown, and so many more who give up their valuable time to come and talk to us on their own experiences in fishkeeping, something that is so very much appreciated by us all.

In the last few weeks, there have been visits from members of Montrose A.S., Peterhead A.S. and Fair City A.S. (Perth). In the weeks to follow, we have Kirkcaldy A.S., Aberdeen A.S. and Forfar A.S., all lined up, plus all our regular stalwarts. So, at the moment, it's exciting times at South Inch.

We are also just entering the preliminary stages of planning for our own Open Show in which, this year, we hope to have up to 30 classes — as opposed to 22 last year — so, no doubt, the workload will increase. The Show will be held on **Sunday 28 October.**

I feel our club can only benefit by an increase in correspondence with other interested parties. I know we have friends within Birtly A.S. and a couple of other societies in England, but, generally speaking, our support is mainly from Scottish societies and individuals. We would, of course, wish to widen our contacts within the UK and abroad, and can assure anyone who writes to us that they will receive a prompt reply.

With thanks for any assistance you may be able to give us,

David Kennedy
Chairman — South Inch A.S.
H.M. Prison, Perth

Editor's note
We, are pleased to be able to contribute in some small measure to your success, and will be happy to pass on any correspondence that we receive from any of our readers.

John Dawes

Half-Black Yellow Veiltail male. This strain has been inbred to produce a fish of consistently good quality. However, sterility is now a problem, with a high proportion of females never producing fry. An outcross is now desperately needed.

STARTING WITH FANCY GUPPIES

There are Guppies . . . and there are Guppies. If you want to know how to go about producing top-quality specimens, **Derek Lambert** may have just the information you are looking for.

(Photographs by the author)

First STEPS

The art of Fancy Guppy breeding has been with us for over eighty years now, and the fish we see in our tanks today are as remote from wild Guppies as poodles are from wolves. If you want to take up Fancy Guppy breeding seriously, then you are going to have to do some planning before you even obtain a fish.

Basic essentials

Firstly, you are going to need a lot of tanks — a minimum of seven for each strain you are planning to breed. Secondly, you are going to need to contact other breeders, both for stock and advice. Thirdly, you are going to need to put aside one day a week for tank maintenance and at least two hours a day for feeding and observing the fish. Finally, you are going to need the patience of a saint, as well as the luck of the devil!

The first step to take is to buy the tanks and find somewhere to house them. Three of these must be at least two feet (60 cm) long, while the other four can be quite small, say about 12 x 8in (30 x 20cm). These should be set up so that the temperature is approximately 75°F (24°C). Filters, gravel and plants can be included if desired, but the essential requirement, as far as the fish are concerned, is **VERY CLEAN WATER.**

Obtaining stock

Now comes the most important stage of all, obtaining the stock. The quality of the initial stock is going to determine how long it will take you to achieve half-way decent results. If you go to the local pet shop and buy a pair of Guppies, then you can expect to take the next five years just to get back to the same sort of fish you bought in the first place.

Many females imported from the Far East have been mated with a male of a different strain (sometimes a wild type) so that they will produce hybrids. Since a female Guppy can store sperm for many months, this effectively makes them useless for any serious breeder to work with. Another practice indulged in is the use of hormones on females, thereby heightening their colours, but also making them sterile. Taken to its extreme, the female becomes a 'male'. Since males are more in demand than females, this may explain why so few female Guppies are seen in the shops today.

Ideally, you want to make contact with another Guppy breeder. This gives you a two-fold advantage. Firstly, you will be able to select a pair of fish from an established strain and known parentage. Secondly, you will make contact with a person who will give you help and advice on all aspects of Guppy breeding.

Good Guppy breeders are as rare as good Guppies, so you may have to travel a long distance to find one, but the effort will be worth it. Fish can be sent direct to your house, but if you want the best, then you must go and select the fish yourself. The very best will also cost the most. A good pair of line-bred Guppies may set you back £10 or more.

Stock maintenance

Once home with your purchases, place them in one of the two-foot (60cm) aquaria. A clump of Java Moss, or some other plant material, will make them feel a little more secure, but a feed of livefood does an even better job.

Aim to feed the fish little and often. My usual routine is a feed of newly-hatched Brine Shrimp first thing in the morning. This is followed by two feeds of flake food or liquidised beef-heart, another feed of Brine Shrimp and one final feed of flake food just before I go to bed. If you don't have time for as many feeds as this, then cut out the two mid-day feeds but still feed two feeds of Brine Shrimp or other livefood per day.

Guppies have a short gut and, while they will gorge on all the food you put in the tank, they will only digest the same amount at each

feed. Therefore, feed little and as often as possible. Any food uneaten at the end of five minutes will rot in the tank and can set up problems with Fin Rot or bacterial infectious, so any excess must be removed.

With such a heavy feeding regime, waste products are going to mount up at an alarming rate. These have to be removed as soon as possible and, while I won't decry the use of filters, of course, I feel that a large water change does the fish far more good.

The more water the fish are in contact with, the larger and faster the fish are going to grow. I aim to change at least 50% of the water in all my tanks every week. With 120 tanks this takes a very long time, but the fish that this system produces are far superior to any produced in a tank which is just filtered.

Breeding schedule

Stock, equipment and basic maintenance sorted out, we can now concentrate on the breeding of Guppies and why seven tanks are needed instead of just one or two. If the female fish you purchased are virgins, then you are going to have to wait at least a month for your first brood. If not, then fry will appear within a few weeks.

As the fry are born, they are placed in the small tanks until they are sexable. This should be within a couple of months. Careful observation of the youngsters' anal fins will allow you to spot the males before the gonopodium is fully formed and the fish are sexually active. The females' puberty spot can be seen within the first few weeks of life. This can be difficult to see in gold or albino strains, but grey females are very easy to sex by this method.

The males are placed in one of the two empty large tanks and the females are placed in the other. A close watch must be kept on the virgin females' tank so, that no late-developing males have a chance to fertilise the females and ruin your breeding programme.

When you have twenty young of each sex, stop saving any more babies. Your large tanks must not be allowed to become overstocked or the fish will never achieve the size and quality we are looking for.

At about five or six months old, the next generation of breeders can be selected. If the old male is still alive, he should be compared with each of his male offspring. Are any of the young as good as, or better than, the old one? If not, then breed the father back to his daughters. If there are any better males than the old one, then select the best and mate him to his sisters.

The selection of the females is just as important as the selection of the males. Only the largest and most robust females should be used. Any fish showing signs of a thin weedy body must be culled out. Since you will only need two females to breed from for your next generation, you can afford to be choosy. Once your first broods have been born from these females, your backup virgin stock can be sold off.

After a number of generations, some decrease in size or vigour of the line may be seen. If this happens, then you will need to introduce some 'new blood'. The way to do this is to obtain a fish from a closely related strain. What many breeders do is run two strains in parallel and cross them every fourth or fifth generation. This, of course, means they need double the number of tanks.

New strains

If you wish to create a new coloured strain all of your own, then a completely unrelated fish can be mated in, but this jumbling of the genes may ruin other factors such as fin shape. Also, you will have to back up any outcross with many generations of inbreeding (as described above) to fix the new desired characteristics in the strain. Such experimentation is great fun to do, but it must be backed up by the inbreeding.

I acquired a pair of 'line-bred' Guppies which produced fry of many different colours and fin types. Talking with the original breeder, it turned out that they were first-generation young from a cross with a Singapore fish. It also happened that the line had been crossed many times prior to this whenever the breeder saw a fish with 'nice' colour. In the end, the line degenerated into total rubbish, as all such mongrels will. One cross, followed by many generations of inbreeding, produces the best results — in the end.

Further information

During this article I haven't discussed the many different fin shapes or colour patterns that Guppies come in. There are just too many to detail them all. *Guppies, Fancy Strains and how to produce them*, published by **T.F.H.** shows many of the varieties available today.

Viviparous — the Livebearer Information Servive has published a booklet on Fancy Guppies which contains a great deal of useful information for prospective Guppy breeders. Contact with other Guppy breeders can also be made through this organisation. For further details contact **Nigel Hunter, 60, Barry Way, Brighton Hill, Basingstoke, Hants. Tel: 0256 471568.**

Note from the Editor

Fancy Guppy Book, a collection of very interesting articles, has recently been published by **Viviparous**. Price: £3.50, plus 50p (p & p) to non-members, and £3, plus 50p (p & p) to members. To get your copy of this useful publication, apply to **Viviparous — The Livebearer Information Service** at the above address.

John Dawes

An excellent Green Bottom Sword male.

Gold Double Sword male. At 3 months old, this fish is beginning to show the sword extensions. When selecting your best male for breeding, try to use one with equal sword extensions.

Red Half-Black Delta male. This is a very popular strain which is imported from Singapore on a regular basis.

PRODUCT ROUND-UP
BY DICK MILLS

AQUARIUM SYSTEMS INC

Just as you get used to one innovative idea from **AQUARIUM SYSTEMS,** they neatly switch it to yet another 'why didn't I think of that?' application. Readers won't need too long memories to remember the introduction of the new VISI-JET POWERHEAD (**Product Round-up,** *A & P* June and November, 1989). Now guess what they've done? They've mounted the very same powerhead on to a filter capsule to produce the VISI-JET IF Internal Filter.

Two models — VJ 100 IF and VJ 200 IF — are now available, turning over 90 and 140 Imperial gallons per hour (100/200 US gallons/hour, 400/800 litres/hour). Two different mountings (screw clamp or suction cups) allow adaptation to every aquarium need. The flow adjuster is simple to use and an added aeration/air/mixing feature is standard.

The foam cartridge supplies mechanical and biological filtration and is housed inside a separate container to prevent loss of dirty water during cleaning: the inner supporting core can be filled with carbon for extra chemical filtration if required. The bottom of the main housing has a special adapter to allow fixing to an undergravel filterplate system, thus allowing secondary filtration media to be used in the filter, while the main biological filtration occurs in the substrate.

Finally, the flowmeter in the powerhead itself not only allows you to set the waterflow accuratrely to suit the size of the tank (or the sensitivities of its inmates) but also displays any falling off of performance — indicating that the filter needs cleaning, although you can see the dirt accumulating on the foam through the transparent housing. Clever guys at Aquarium Systems; what will they think of next? Too late — they've probably already done it! Details of products from:

UNDERWORLD, Units 1 & 2, Belton Road West, Loughborough, Leicestershire LE11 0TR

AQUARIUM SYSTEMS, 8141 Tyler Boulevard, Mentor, Ohio, 44060 U.S.A.

Aquarium Systems' latest creation, the Visi-jet JF internal filter, makes excellent use of a previously-tested successful product, with a new plant.

ALGARDE

Among the products causing extra interest at the recent Pet '90 Trade Show at the NEC was **ALGARDE's** range of plastic BLACK LEATHER-GRAINED AQUARIUM HOODS.

Available in four sizes, 18, 24, 30 and 36in (all by 12in front to back) each unit features a unique fitting arrangement for the lighting — the lighting clip slips neatly into the bracket without any need to use a screw. Details of Algarde products from:

ALGARDE LTD, Enterprise House, Cranes Close, Basildon, Essex SS14 3JB (Tel: 0268 289200)

BLAGDON WATER GARDENS

There's something quite delightful about sitting poolside and leafing through a water garden brochure, even if it leaves you feeling that your own pool is ever-so-slightly inferior to those depicted within the glossy pages (all part of the selling plan, I suppose). **BLAGDON WATER GARDENS' 1990 BOOK,** the sunshine and Gin & Tonic, all turned up at the same time, and a good time was had by all!

Following the successful launch of the ABSAT liner material last year, and in order to cope with the expected heavier demand this year, Blagdon have introduced an '**Express Service**' on non-stock-sized liners: place an order at your aquatic dealer and Blagdon guarantee to have your liner there in 5 days — how's that for satisfying any impatient pool-builders?

Environment-friendly and containing no PVC, ABSAT Liners have excellent puncture resistance and stretching qualities, are UV and frost resistant too, carrying no less than a 20-year guarantee. Look for the embossed word **Absat** on each liner to avoid confusion with 'lookalike' liners.

New products for 1990 include four new NATURE POOLS, a whole family of BUDGET PUMPS, a circular CHAMBER PUMP and sophisticatedly-designed INDOOR TABLE FOUNTAINS, and much more.

At 24in, the new Nature Pools are much deeper than the 15 in deep originals; ranging from 65-250 gallons, they carry a 15-year guarantee.

The tremendous popularity of Budget 180 Pump has led to a complete Budget range. These can cope with all pool requirements (85-250gph), from the very smallest up to the size where Blagdon's AMPHIBIOUS range takes over. Two of the Budget range are low-voltage models; all Budget pumps come with fountain jet, flow adjuster/waterfall connector (half-inch hose), foam strainer and 3-metre cable. 12

★★★★★★★★★★★★★★★★

Elegance and usefulness — Blagdon's Indoor Table Fountains.

Blagdon's range of Budget Pumps can cope with flows between 85 and 250 gallons per hour.

volts transformers are included with low voltage pumps.

The three Chamber Pumps are powerful beasts indeed, capable of moving 2,100-10,000 gallons of water up to 24.5-32.5 feet in height. Their circular design allows an all-round intake chamber to lessen clogging problems where large capacity water flows are needed. Needless to say, these pumps are for ambitious water displays, and a wide range of dedicated waterfall/fountain/ornament kits are available.

The soothing effect of moving water sounds from the enlarged range of HENRI STUDIO STATUARY needn't cease at dusk; the compeehensive range of KFS SCULPTURES, LIGHTING and FOUNTAIN RINGS will extend the attraction of the poolside long after the barbecue's gone out.

You needn't leave these effects outside at the end of a perfect day's fish-viewing either: a range of elegant Indoor Table Fountains will add charm and character to any interior decor, and act as humidifiers too.

Lest you thought they'd forgotten the fish and plants, there's Blagdon's own brands of FISH FUN Foods (Flake and 'Stick' formulations for Goldfish and Koi) and POND SOIL for providing the aquatic plants with the very best of rooting conditions.

Finally, if you want to raise a smile around the pool, Blagdon have even got OTTO, an in-pool or poolside Garden Gnome fountain ornament! All products can be seen at Blagdon Water Gardens, Bath Road, Upper Langford, Avon. Details of all Blagdon Water Garden Products from:

Blagdon Water Garden Products Ltd, Unit 6 & 7, Commerce Way, Walrow Industrial Estate, Highbridge, Somerset TA9 4AG (Tel: 0278 781556; Fax: 0278 782079)

NOTE: In the face of all this productive activity, aquarists will surely take a little time out to mourn the recent passing of **Mike Chivers,** Chairman and Founder of Blagdon Water Gardens. The Company's progress to market-leader as probably the largest manufacturer of water garden products in the world, is a fitting tribute to Mike, who would be glad to be remembered in the tranquility and pleasure that his products bring to us all.

REMANOID

Aquarists many not really want a green pond, but none will object to having a pond made from materials that maintain 'green' safety.

REMANOID's HIGHLASTIC is a new concept in pool-lining materials: made from low-density polyethylene, it is free from softening agents which may damage the atmosphere or pollute the water and may be re-processed if necessary.

Environment-friendly Highlastic liners from Remanoid Ltd.

Safe to fish and plants, the strong material is root-resistant, moulds easily around corners, is UV stabilised (no damage by sunlight) and responded well to temperature-tolerance tests. As if this wasn't enough, it's guaranteed for 20 years too. Details from:

REMANOID LTD, Sales Department, Consett, Co Durham. (Tel: 0207 591089)

PRODUCT NEWS UPDATE

SPEEDY BRUSH COMPANY

'If, at first, the exact product isn't available, then use something like it' is an adapted version of a well-known proverb which fits exactly a recent experience desctribed by a very satisfied **SPEEDY BRUSH COMPANY** customer.

Dismayed at his Koi's premature spawning activity before he had installed sufficient spawning mats, the Guernsey fishkeeper turned in desperation to some 8ft 6in Speedy Black Knight Filter Brushes he had left over from installing a filter system. Not only did they do the trick, but he feels that the slightly stiffer bristles (as opposed to the softer, specially-designed Black Knight Spawning Barrier) has added benefits too: better egg adhesion and separation (less chance of fungus to spread); the bristles deterred the parents from egg-eating; they (the brushes) were easy to remove and proved a wonderful sanctuary for the subsequent fry.

Only slightly-miffed that Koi are less product-discerning than the manufacturer, **Bob Lomax** of Speedy Brush Co points out that, whatever the need, high-quality Speedy Brushes will fit the bill every time — even with slight modifications that the fish themselves might make! Full details of the uses of Black Knight Brushes from:

SPEEDY BRUSH COMPANY, Mercury Works, Kingswood Avenue, Swanley, Kent BR8 8AW (Tel: 0322 62480)

Diary dates

Newtown Aquarist Society

The 1990 Open Show of the above society will be held in the Community Wing at Toronto Primary School, Howden, Livingston on 5 **August.** For further information, contact Beryl Stalker, 51 Nelson Avenue, Howden, Livingston, West Lothian, Scotland EH54 6BZ. Tel 0506 36915.

Viviparous — The Livebearer Information Service

A Livebearer Show will be held on **15 July** at the Penguin Hotel, Wetherby, West Yorkshire (junction A1/A58). Guest speaker: **Manfred K Meyer** from West Germany. Benching: 11.30 am-1.30 pm; Auction: 1 pm; Judging: 1.45 pm; Lecture: 3 pm; Prizegiving and raffle: 5 pm. Full details from Mrs Angela Moore (Show Secretary), 43 Lamb Lane, Monk Bretton, Barnsley. Tel 0226 202233.

Billingham Aquarist Society

The 1990 BAS Open Show will take place on **1 July** at the Billingham Community Centre. Details available from S King, 59 Tollesby Bridge, Coulby Newham, Middlesbrough, Cleveland, TS8 0SE.

International Characin Association

The first I.C.A. Open Show will be held on **Sunday 16 September** at the Library Theatre, School Street, Darwen. Benching: 11 am-1 pm; Judging: 1.15 pm; Show open to the public: 1 pm. There will also be a lecture, sales stands and refreshments, plus ample free parking. For further information, contact Dave Sidebottom, 18 Harry Street, Werneth, Oldham, Lancs, OL9 7TA.

Cleethorpes Aquarist Society

The C.A.S. annual Open Show is to be held on **12 August** at the Territorial Army Barracks in Grimsby. Further details from Denis McLaughlin (Show Secretary), 12 Healing House, Immingham, South Humberside, DN40 2DG.

Dunstable and District Aquarist Society

The visiting lecturer for the meeting on **12 September** will be *Aquarist & Pondkeeper* editor **John Dawes** who will talk about his recent expedition to Brazil, including a return visit to the Rio Negro. Venue: Queensway Hall, Vernon Place, Dunstable, Beds. Time: 8 pm. Admission by ticket only (but these are free). Further details: Kevin Scott, 17 Carterways, Dunstable, Beds LU5 4RB.

Sandgrounders Aquarist Society

The Sandgrounders annual Open Show and Grand Auction will be held on **Sunday 29 July.** Venue: Meols Cop High School, Meols Cop Road, Southport, Lancashire. Benching: 11 am-1.15 pm; Open to the public: 1.30 pm; Grand auction: 1.30 pm. Further details and schedules available from B Baldwin (Show Secretary), 10 Olive Grove, Southport, Lancs. Tel 0704 43384.

Lancaster and Morecambe Aquarist Society

The second Open Show of the L. & M.A.S. will take place on **23 September.** The Society meets at Morecambe Cricket Clubhouse on the first Tuesday of every month. Meetings start at 7.30 and everyone is welcome. For further information of the Open Show and the Society, contact Ann Blundell (Show Secretary), 19 Berwick Way, Heysham, Morecambe, Lancs, LA3 2UB. Tel 0524 53424.

Portsmouth Aquarist Society

The P.A.B. will be holding an Exhibition of Coldwater, Marine and Tropical Fishes at the Mountbatten Gallery, Guildhall Square, Portsmouth, from **Monday 20 August** to **Saturday 25 August.** Opening times: 9 am-9 pm (Monday to Friday); 9 am-6 pm (Saturday). Entry charges: £1 for adults; 50p for OAPs and children. The exhibition will also include a display of shells, a stand devoted to the local water life and various other items. Full information from V B Hunt (Show Manager), "Caeglas", 120 London Road, Widley, Nr Portsmouth, Hants, PO7 5EW.

North East Federation of Aquarist Societies

The 1990 N.E.F.A.S. show will take place in Thornaby on **23 September.** For full details, contact the Secretary, Ken Coates, 21 Ann's Terrace, Darlington. Tel 0325 350245.

Scarborough District Aquarist Society

The 21st annual Open Show of Scarborough District A.S. will be held at Friarage School, Longwestgate, Scarborough on **Sunday 1 July.** Free car parking available within the school grounds. Details from: S Barker (Show Secretary), 11 Linden Road, Newby, Scarborough, West Yorkshire, YO12 5SN.

Yorkshire Koi Society

On **Monday 27 August** the Society will be privileged to hold the 14th Summer Show in the grounds of Harewood House, the home of the Earl and Countess of Harewood.

The magnificent Harewood House stands in acres of landscaped gardens, ideal for family picnics and walks. There is also a world-famous Bird Garden at Harewood House which is home to many rare and colourful birds.

The Koi show will take place **on Monday only,** and will be held oppposite the House, the home of the Y.K.S. president, Lady Harewood. In addition to the Koi show, there will be a large marquee containing the trade stands, as well as a raffle and tombola. The Y.K.S. stand will feature videos of pond construction, a hands-on computer program with lots of information about Koi, a small display pond and some of the society's experienced Koi-keepers willing to pass on their knowledge or to just chat about Koi.

The Show promises to be an exciting day out for all the family; as well as the Koi Show, there will be a Steam Traction Engine Rally taking place in the grounds, while the magnificent House is open to the public, as is the Bird Garden. So there will be lots for everyone to do and see on August Bank Holiday.

Further details: (trade stands), Steve Lamb, 24 Patterdale Drive, Rawcliffe, York, YO3 6TW; (fish entries), Ian Wallage, 5 Victoria Rise, Pudsey, Leeds, LS28 7SU.

Membership details: Mrs M Buck, 38 Brook Park, Briggswath, Sleights, Whitby, YO21 1RT.

IMPORTANT NOTE TO SOCIETY SECRETARIES

We are always pleased to announce shows and other important events, as well as publish brief reports on other activities, as part of our free service to societies. However, in order to meet our publishing deadlines, we need to receive all the relevant details about **EIGHT** weeks prior to publication of the *A & P* issue in which the announcement is desired. We would therefore be grateful if you would help us to help you by sending us your announcements in good time. Thank you.

John Dawes, Editor

Male Oriental Fire-bellied Toad.

BREEDING THE ORIENTAL FIRE-BELLIED TOAD

If you are looking for a toad that is attractive, easy to keep and breed, then **Susan Brewer** has the perfect choice for you.
(Photographs — unless indicated otherwise — by the author)

Fire-bellied Toads are colourful, easy to keep and readily available throughout the year. They are members of a small, Old World family of amphibians called the Discoglossidae, which also includes the Painted Frogs and Midwife Toads. The Discoglossids have a disc-shaped tongue which cannot be extended as in other toads and frogs. Instead, they lunge at their food and then cram it into their mouths using their forelimbs.

Species

There are four main species of Fire-bellied Toads (*Bombina*) and several subspecies. The European Fire-bellied Toad (*Bombina bombina*) grows to around 5cm (2in). It has a green-spotted brown back and an orange belly with black blotches. It is found in Eastern Europe and parts of Asia and tends to congregate in pools and ditches. The males call quite loudly in spring with a short mournful note.

The Asian Oriental Fire-Bellied Toad (*Bombina orientalis*) is slightly larger than the above species, reaching up to 7cm (c2.8in). Its back is bright green, blotched black, and it has a flame-red belly with black markings.

The Yellow-bellied Toad (*Bombina variegata*) can be found in Central and Southern Europe. It grows to 5cm (2in) and usually has a dark grey-green back, though sometimes, it tends towards a sandy brown. Its belly is black-spotted yellow, and it has a much more warty back than the above two species, with minute spines growing from the warts.

The 'fire belly' that gives these toads their common name.

The fourth species is The Giant Fire-bellied Toad (*Bombina maxima*) which can grow up to 9cm (3.5ins). It comes from South-east Asia and is very similar to the Oriental Fire-bellied Toad, but more heavily built, with a very warty back.

Of the four species, the Oriental Fire-bellied Toad seems to be the most popular in captivity, probably because of its vivid colouring and relative ease of breeding.

The bright coloration of Bombinas is a warning to predators that they are highly poisonous. Consequently, hands should always be washed after touching these toads as they can secrete a fluid which will intensely irritate human eyes. In the wild, when provoked, they demonstrate a response known as the 'Ukenreflex', in which they assume a defence posture by arching the back and raising the limbs in order to display the warning colours of the underparts. However, in captivity, they quickly lose this habit.

Accommodation

My Oriental Fire-bellied Toads are kept in a 90cm (3ft) tank which is divided into two by a 10cm (4in) high perspex wall, thus creating a shallow pond. Aquarium sealant has been used to hold the perspex in place. The pond area is filled with water and planted with *Elodea*, while the other section contains a mixture of peat and gravel topped with moss. Various indoor plants grow well in these conditions, especially *Tradescantia*, African Violet and *Begonia rex*. The last of these does particularly well and the toads are often to be found on its lower leaves and branches. The tank is lit for 12 hours each day by a 20 watt neon tube and is kept in a living room, but is otherwise unheated. The temperature fluctuates between 60-77°F (15.5-25°C).

Fire-bellied Toads spend much of their time in the water, and it is therefore possible to keep them in totally aquatic conditions, with just a few rocks or pieces of floating cork for them to climb onto. However, I prefer the afore-mentioned set-up, feeling it is more of a natural habitat. It also looks very attractive.

The upkeep is minimal — just a weekly change of water and a spraying of the plants. Once a month, the plants are pruned, as the warmth from the lamp encourages rapid growth. The moss is replaced periodically.

It is also possible to keep the *Bombina* species in an outdoor enclosure, where they will live and breed very successfully, although *B. orientalis* and *B. maxima* must be brought indoors before the onset of winter. The other two species will hibernate if a deep, frost-free chamber lined with moss is provided. In fact, the hibernation period seems to ensure better breeding results.

Feeding and breeding

Adult Fire-bellied Toads should be fed a varied diet consisting of small crickets, mealworms, hedgerow sweepings and earthworms. They quickly learn where the food dish is placed and will excitedly congregate around it (and in it!) at feeding time. In their haste, they will lunge at anything that moves — including their neighbours' limbs and feet — but, fortunately, always seem to recognise their mistake in time!

The eggs are laid singly, rather than in masses or 'strings'.

Fire-bellied Toads are a community species and should be kept in small colonies. The adult male *Bombina* toad is more slender and slightly smaller than the female, and his head is broader. His fore-limbs tend to be thicker and his back more warty.

The call of the male is a soft yapping sound. He grasps the female tightly around the middle, and, if she is not willing to mate, she vibrates her body, emitting a trilling noise which causes the male to let go. Otherwise, egglaying will follow after the toads have been in amplexus (mating clasp) for twelve hours or so.

An adult pair in amplexus (mating clasp).

Two-day-old Fire-bellied tadpoles.

Summer seems to be the optimum time for mating, though the males call for most of the year, floating on the water with their eyes protruding above the surface. Breeding can often be induced by raising the water level and spraying the vegetation to increase humidity, or transferring a pair of toads to an aquatic tank placed in a sunny spot (but out of direct sunlight). A piece of cork should be provided for an island.

Rearing the tadpoles

Last year, one of my females laid about 30 eggs which were scattered on the stones in the tank pond and attached to the *Elodea*. Each egg was about 2mm (0.07in) in diameter, light grey in colour and surrounded by jelly. The eggs were laid singly, not in a mass as in the familiar frog's spawn. I carefully transferred the eggs to a planted 45cm (18in) aquarium two thirds full of water.

After two days the 7mm (0.3in) putty-coloured tadpoles emerged. At first, they lay motionless, digesting the remains of the eggs but, after a day or so, they began to browse on the algae which were growing on the *Elodea*. As the tadpoles grew bigger, I fed them on *Daphnia*, *Tubifex*, flake fish food and boiled lettuce. It is important to part-change the water regularly and to siphon up debris during this time. After a month, the tadpoles began to metamorphose and I divided them between four small tanks to allow more room for growth. I tilted the tanks so that the toadlets could crawl onto land.

Once their tails had shrivelled, I put the young toads into a larger tank which was lined on the base with wet tissue. I discovered that the best type of tank to use was one of the lidded plastic kind with a central feeding flap. The toads can climb well at this stage, though they lose the ability later, and this type of design minimises the danger of escape. I fed the young toads with aphids and hatchling crickets, as well as *Tubifex* which I placed in a shallow tin lid so that they could easily reach them.

Soon, the toads started to change from light brown to the bright colours of the adults, and by the age of six months, were ready to be placed into their permanent quarters furnished as for the adult toads. Hopefully, after a year or so they will be ready to breed, themselves, thus starting the interesting cycle all over again.

Reflections

by David Sands

Show talk

My weekend attendance on the 'Aquarian' stand at the Yorkshire Aquarist Festival — after almost a year away from the 'show scene' — helped me renew old acquaintances and review this side of the fishkeeping world.

It worries me that society 'display ideologies' haven't changed in thirty odd years. If a fish club doesn't have good carpenters/model makers, electricians *and* fishkeepers, then the chances of putting up a good show are greatly reduced. I'm not sure that the 'Michael Bentine' models don't totally detract from the fishes.

I wonder what newcomers think when they see fish cramped in small show tanks. Is that *really* what fishkeeping is all about?? I would like to read letters from anyone involved in the shows (trade or otherwise) and people who visit shows. What do you think??

Ten years ago I was elected British Aquarist Festival organiser at one of the best attended FNAS, AGM's. I had argued fiercely for a change of venue and change of attitude and got overwhelming support.

My short-lived appointment was promptly upturned a month or two later when a faction of the Yorkshire 'trade' objected to my 'startling' proposal to move the oldest fish show to Blackpool where 'all the family' could feasibly have a good day out.

I was quietly pleased to have my election reversed. I had put my beliefs *and* candidacy on the line and the committee had given their answer by stating 'no to Blackpool, no to me'.

Readers may wonder why I wanted to take on such a task. **Not for money!!** I wanted to give something back to a hobby that has given me *so* much. Those friends closest to me knew that well at the time. My business would have suffered but I was willing to promote the hobby. In my opinion, fishkeeping is grossly underestimated as a wonderful, relaxing and rewarding hobby.

JOHN DAVIES

W.Y.M.A.G.'s exhibit — winner of the free standing Furnished Aquaria (Hobbyist) Award at Y.A.F.

I wish fish breeding was a greater commercial priority, then wild-caught losses would be reduced, but that is a *small* grumble on my part.

The YAF show was sprinkled with die-hard fishkeepers and full of newcomers, as well as some great furnished aquaria (entered in a separate competition), but 'my moment' came when I managed to buy a juvenile *Megalodoras* from the Belton Fish Farm stand.

Pain and responsibility

On a beautiful Palm Sunday afternoon, my fifteen month-old boxer dog suffered a massive heart attack while playing football with my wife and oldest son.

I was devastated, and the painful memory of burying a outwardly perfect animal, truly one of the family, will live with me forever.

Remembering our 'pal' Jasper, or Gee Whiz of Hambleton, was to recall my introduction to Volume One of **Catfishes of The World** in which I stated the following:

"We do not own the animals under our care and protection, but have taken them from Nature. Therefore, it is our duty to provide the best conditions for all animals in our keep." How true that is of fishes.

In a strange week, in which I had heard that the final part of the sponsorship needed to enable me to collect fishes 10,000 feet high in the Andes had been confirmed, *and* had seen my 'important' publication (within new supplements to **Catfishes of The World**), of two new species of *Corydoras*, *Corydoras nijsseni* and *Corydoras araguaiaensis*, the simple overshadowing fact was that I had lost a friend, one that I had taken for granted.

I believed that Jasper would live ten years or more (my previous Boxer, Edward G Robinson, had lived to twelve). I wanted to go back in time to *spoil him* in the hindsight knowledge that his life was to be so short.

Well, it's not possible to go back!

I know the vast majority of fishkeepers are dedicated animal lovers and will not mind me reminding them that life is so short and that, while they can, they should love the people and animal friends they have — they won't be around forever!

In the meantime, happy fishkeeping and goodbye, my pal.

Vet list

I have received a letter from **Mr Jepson** who is a veterinary surgeon with an Essex practice in South Ockendon and Romford. He states that the British Small Animal Veterinary Association's first European congress at Harrogate in April devoted a whole afternoon to fish as a subject and that a manual is being prepared to aid vets who are not so familiar with fish diseases and conditions and treatment.

I think this is very good news for fishkeepers.

I am still waiting for readers to advise me which vets they have received successful help from. I believe the future should see more and more reference to professional veterinary assistance and less reliance on the many broad treatments that are not quite effective against serious infections.

Dr David Ford has informed me that one vet association has prepared a list of practices that can provide someone who is capable of dealing with fish problems. I am in the process of obtaining this list and will communicate wih readers shortly. Happy fishkeeping.

DAVID SANDS

Jasper, enthralled — as usual — by my Tanganyikan Cichlid tank.

'Other' Aquarium Inhabitants

Aquaria, even the cleanest ones, are home to a whole host of organisms — some harmful, most totally harmless but often misunderstood. **Dr David Pool,** Head of the Tetra Information Centre, takes a closer-than-usual look at a few of these 'other' tank residents.

Aquaria are usually established with a view to keeping fish and/or plants in the best possible condition. In the process of doing this we also create an environment in which a range of other animals can survive and, in some cases, thrive.

These animals are more common than one might believe, and several of those described in the following paragraphs are probably found in all aquaria. In most cases, they are present in small numbers and are often overlooked. However, when conditions are favourable, the population can increase dramatically, often reaching 'pest' proportions. In this article, some of these 'other aquarium inhabitants will be described, and, methods of controlling them will be given.

SNAILS

There is a range of different species of snails which will survive in coldwater or tropical aquaria. In many cases, the snails are introduced by accident with livefoods, or more commonly, attached to the leaves and roots of aquatic plants. Some of the larger snails may also be added to the aquarium on purpose to control algae or to provide added interest.

In general, snails do little harm in the aquarium when present in small numbers. However, they are capable of breeding rapidly and can damage plants or become unsightly when they occur in large numbers.

Snails primarily feed on algae, but they will also consume new plant growth. Most of the damage done to the plants occurs as the snails rasp off the algae encrusted on the leaves, rather than from them actually eating the plant. Where possible, snails should be kept out of breeding aquaria, since they will also consume fish eggs and (if they can catch them) newly-hatched fry.

Snails can act as intermediate hosts for several species of fish parasites. These parasites are found in their adult form in fish-eating birds, with snails, followed by fish, acting as hosts for the larvae. Because of this complex life cycle, snails which have not come into contact with fish-eating birds cannot be parasitised and therefore pose no threat to fish. However, snails collected from the wild may well be parasitised and could act as a 'reservoir' for parasite larvae which could subsequently infect aquarium fish.

Control

Snails are not essential in the aquarium and, by far, the best method of controlling them is to prevent their introduction. This can be achieved by carefully examining any new plant before adding them to the aquarium. Any snails or eggs (clear jelly, sausage-shaped structures) should, obviosuly, be removed.

To ensure no snails are present you could also place the plants into a container (eg quarantine aquarium) with water at the same temperature as that in the aquarium, which has been treated with a commercially available snail killer. Such products will kill both snails and snail eggs within a short period of time (30-60 minutes).

Rinsing plants under the tap will help to remove snails, but will have little effect on the eggs, and if cold water is used, may reduce future plant growth. There are a number of methods of controlling snail populations in the aquarium.

Snails, even large species like *Ampullaria* (the Apple or Mystery Snail), are not usually the pests that some people make them out to be.

1 ***Chemical snail eradicators***

These chemicals will help to control snails in the aquarium, although great care must be taken to remove any dead snails to prevent water pollution problems. In most cases it is advisable to remove as many snails as possible using the methods outlined below, treat with the chemical and, 6-12 hours later, conduct a partial water change using a gravel cleaner to remove any remaining dead snails.

Ostracods don't do any harm, but some aquarists find them worrying and unsightly.

2 ***Fish***

Several species of fish can be used to control snail numbers. In most cases, the larger snails will not be eaten, but can easily be removed by hand or as outlined below.

Snail-eating fish for the tropical aquarium include Clown Loach, other *Botia* species, Opaline Gouramis, Convict Cichlids and Puffer-fish (*Tetraodon* sp). Your choice will, obviously, depend on the other fish species in the aquarium. Take care when introducing Pufferfish as they tend to nip the fins of other fish. In the coldwater aquarium Goldfish, Koi and Tench will all eat snails.

3 ***Trapping***

Snail numbers can be greatly reduced using a trapping method. One such method is to place a lettuce leaf in the aquarium when the lights have been switched off for the night. The following morning the lettuce leaf should be removed before switching on the lights and the snails washed away. This may be repeated for several nights, using the same lettuce leaf in order to be more effective.

Alternatively, 1-2 food tablets should be placed under an upturned saucer on the aquarium bottom. The following morning many snails will be found on the saucer and can be removed. Take care not to pollute the aquarium by using too many tablets.

HYDRA

The freshwater *Hydra* which occur occasionally in aquaria are members of the coelenterata, a phylum which also includes the corals and jelly fish.

Their body consists of a single tube with an opening at one end which is surrounded by up to 10 tentacles. Each tentacle has numerous stinging cells which are used to capture and immobilise prey such as *Daphnia*, small fish and insect larvae. The *Hydra*, which may be up to 15mm (0.6in) in length, attach themselves to underwater objects by means of a sucker. They are mobile, and move in a caterpillar-like fashion, using the sucker and tentacles. If disturbed, the tentacles are quickly retracted and the body contracts to resemble a small blob of jelly.

Hydra may be introduced into the aquarium together with livefood, or on plants. In a tank containing large fish, they do little harm, and will be eaten by certain species (eg, Three-spot-Gourami — *Trichogaster trichopterus*). However, given favourable conditions, they can rapidly increase in numbers, coating all available surfaces.

Hydra can reproduce sexually or asexually. Under good conditions they reproduce asexually, by budding, with each bud forming a new *Hydra*. They also have very good regeneration capabilities, and if a *Hydra* is cut into pieces, each will form a new individual. *Hydra* are more of a problem in a breeding aquarium, where they will feed on large numbers of fry, often as big as they are.

Control

Control measures are often quite severe and include:

1 ***Fish***

Three-spot Gouramis (*Trichogaster trichopchopterus*) and Paradisefish (*Macropodus opercularis*) will consume large numbers of *Hydra*, particularly if they are not fed up for several days.

2 ***Temperature***

Remove the fish to a separate aquarium and raise the water temperature to 40°C (104°F) for 2-3 hours. Most plants will survive this temperature for a short period. After treatment, carefully hoover the tank floor to remove any dead *Hydra*.

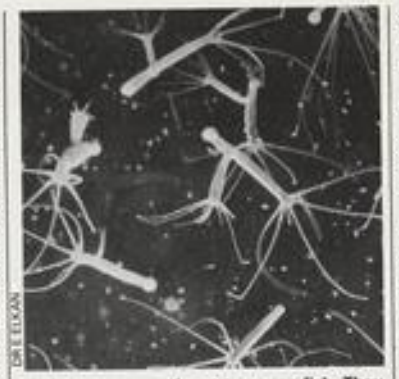
3 ***Copper***

At a concentration of 0.03g per 100 litres (22gals) of water, copper will be effective at controlling *Hydra*. Before treatment, the fish should be removed and, afterwards, the aquarium gravel should be carefully hoovered and a water change undertaken.

Alternatively, two pieces of copper wire can be connected to a 6-volt battery, one to each terminal. The bare wires should be suspended in the aquarium for 3-6 hours to kill the *Hydra* via the copper ions released.

4 ***Ammonium nitrate***

The fish should be removed and 0.6 — 2.0g of ammonium nitrate added for each 10 litres (2.2 gal) of water. The exact amount depends upon the pH of the water which affects the ammonia/ammonium balance. (at pH 7.1 — 8.5 use 0.6g ammonium nitrate; at pH 6.5 — 7.5 use 1.0g; at pH less than 6.5 use 2.0g). After 3-4 hours the *Hydra* will be dead, and should be removed by siphoning. A 50% water change and effective filtration (using active charcoal) will quickly reduce the ammonium nitrate levels.



DR E ETKIN

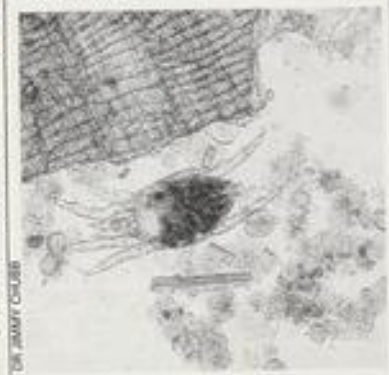
***Hydra* can pose a threat to young fish. They can also reproduce at a fantastic rate, both by budding (as some of these specimens are doing) and sexually.**

OSTRACODS

These small (2mm — 0.08in diameter) seed-like animals are closely related to *Daphnia* and copepods. Their hard outer shell is divided into two halves and provides a very good method of defence. In fact, when the outer shell is clamped shut, ostracods can withstand freezing and will pass through the intestine of a fish without harm.

They move in the water by means of legs which protrude from the dark-coloured shell, or, in some species, by beating the antennae.

Ostracods are very common and are found in most freshwater and marine environments. They are usually introduced into the aquarium with plants, livefoods, or in the intestine of fishes. In most cases, they are only present in small numbers in an aquarium, but in a poorly kept tank which is rich in organic debris, they can occur in massive numbers.



DR JENNY CHUBB

Water mites go about their business in the detritus that inevitably accumulates in aquaria — out of sight and (usually) out of mind of the vast majority of aquarium keepers.

Control

Ostracods do no harm to the fish or plants in the aquarium, but when present in large numbers, may become unsightly.

They can be easily controlled by improving tank hygiene. Undertaking a 25% partial water change at 2-3 weekly intervals, together with the removal of excess debris from the aquarium and gravel (using a gravel cleaner) will remove their source of food and greatly reduce numbers. When present in low numbers, the ostracods will rarely be seen in the aquarium.

SPRINGTAILS

The Springtails (*Collembola* species) are a group of primitive wingless insects which are very common, being found in soil, decomposing debris, wood etc. They are not aquatic, and live on the surface of aquaria and ponds because of the damp, relatively warm environment found there.

When conditions are favourable, they may be present in large numbers, forming dense mats on the water surface. Most aquarists will have seen springtails on the water surface of their aquaria. They are small insects with a maximum size of only 2mm (0.08in) and may be white, grey, brown or blue-black in colour.

Attention is often drawn to these insects owing to their ability to jump several centimetres when disturbed. This is achieved by means of their tail which is folded under the body, and, when straightened, can quickly propel them forwards.

Springtails are in no way harmful to the fishkeeper or the fish and plants. However, when present in large numbers, they may become unsightly. In fact, in the past, springtails were cultured and added to the aquarium to feed small fish and fry.

Control

Springtails feed on the algae, soft moulds and bacteria found on decaying organic material. By far the best way to control them is to reduce this food source by improving tank hygiene (regular partial water changes, avoiding overfeeding, good filtration etc)

Accumulations of debris in the aquarium or pond should be avoided and dead leaves, particularly from floating plants, should be removed. Allowing fish food to remain uneaten, for example, on the leaves of floating plants, will encourage a rapid population increase, and should therefore be avoided.

In addition to the above measures, not feeding the fish for 3-4 days will help. Most of the fast-swimming species such as tetras and danios will eat large numbers of springtails if other food is not available.

NEMATODES

Nematodes, also known as round or hair-worms, are found in varying numbers in

most aquaria and ponds. They can be distinguished from the other 'worms' found in the water because the body is not segmented and is pointed at both ends. When viewed with a magnifying glass they resemble a 2-10mm (0.08—0.4in) piece of hair, often being cream or grey in colour.

Although nematodes are usually found in the substrate or filter, in favourable (dirty) aquaria they may be seen on the aquarium glass or swimming with a whiplash action.

Free-living nematodes pose no threat to fish or plants, feeding instead on algae and organic debris. There are parasite nematodes which infect fish, of which the most common is *Camallanus*, a parasite often found in the intestine of livebearers and gouramis.

Control

In common with the springtails, free-living nematodes thrive in 'dirty' aquaria and ponds. The most successful method of control is therefore to improve aquarium or pond hygiene.

FLATWORMS (PLANARIANS)

The flatworms can broadly be divided into two groups, both of which may be found in ponds and aquaria. The larger species tend to live in, or on, the substrate and plants, or under any stones. They feed on smaller aquatic organisms and will only be found on fish which have died for other reasons.

DR. JOHN COLES

The vast majority of freshwater nematodes are completely harmless to fish and plants.

The larger flatworms (eg *Planaria, Polycelis*) are from 5-35mm (0.2-1.4in) in length and may be white, grey or brown in colour. They have an unsegmented body which is flattened and often have 2 or more eyespots at the anterior end of the body. Movement is by numerous hairs (cilia) on the body which allow them to move without any flexing of the body.

The small flatworms (or Microturbellaria) are more common in aquaria and are often seen on the glass of 'dirty' tanks. These animals are usually pale in colour and less than 5mm (0.2in) in length. They feed on algae and plant debris and often accumulate on the glass near the water surface if there is any uneaten fish food present. As with the larger species, they dislike bright light and will tend to move into shaded areas or under cover during the day, or when the aquarium lights are switched on.

Control

The flatworms pose no great threat to fish or plants, although the larger species may consume small amounts of fish eggs. In common with the other animals mentioned in this article, they are more of a problem because they appear unsighhtly when present in large numbers.

Control is best achieved by improving general aquarium or pond hygiene. The larger species can be trapped by placing a small amount of washed meat in a gauze bag, or under a saucer during darkness. The bag or saucer should be removed 1-2 hours later and will have the flatworms attached to it. Take care that the meat does not pollute the water.

CLOSING REMARKS

The 'other' forms of life found in our aquaria are usually not harmful either to the fish or the plants which we strive to keep.

In most cases they will only reach troublesome numbers when the aquarium conditions are deteriorating, thereby acting as an indication that tank hygiene needs to be improved before the fish are affected.

Any fishkeepers wishing to know more, or identify the animals found in freshwaters should consult *Collins Guide to Freshwater Life* by R. Fitter and R. Manuel, published by **Collins.**

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NEWS

Continued from page 68

PRICE BONUS FOR SIPORAX USERS

Schott — manufacturers of **Siporax** — have asked us to extend a sincere vote of thanks to all the wholesalers, retailers and consumers who have bought and supported the product over the past year or so.

Demand for Siporax is now so high that a new production facility has had to be installed. The combination of high demand and increased production capacity has now allowed the company to take a fresh look at its prices and this has resulted in substantial price reductions effective from 1 July 1990.

The new recommended retail prices for Siporax are:
15 × 15 rings — £13.49 per litre, inclusive of VAT (old price £15.08); 25 × 25 rings — £10.32 per litre, inclusive of VAT (old price £11.46). Also effective from 1 July, the sole distributor for Siporax for the UK is:
Peter Oakes, Al Garden Aquaria Ltd., Cross Lane, Winterley, Sandbach, Cheshire, CW11 0RW Tel 0270 761282/ 882733; Fax 0270 760907

All enquiries regarding Siporax should be sent to the sole distributor or to **Schott Glass Ltd, Drummond Road, Stafford ST16 3EL. Attention General Industrial Department.**

NOTE: Siporax is a a Registered Trademark of **Schott Glaswerke, Mainz, West Germany.**

LETTERS

Continued from page 76

WELCOME BACK-SLAP

All of a sudden, it dawned on me a few months ago that *A & P* had changed . . . and done so for the better.

As a minor (very minor) contributor to the magazine over the past couple of years, and as long-time 'off the shelf' purchaser, I was heartened to see that, over the past number of months, a very steady improvement in both the content and quality of *A & P* had been actioned.

I made comment on this when I last saw the editor, John Dawes. He graciously accepted my comments and I assumed, rightly or wrongly, that someone else might have also seen this improvement.

No such luck! As with most paid and unpaid jobs within the aquatic industry, life just trundles on. The aquatic hobbyist, eyes to the floor, cars blocked, and brain out of gear, just doesn't seem to notice such things. And, when they do notice, suffering (as most do) from the 'British Syndrome', they don't say anything.

Once, just once in a while, it would be nice to be told you are doing a good job. So, *A & P* keep up the good work! A bit of back slapping never did anybody any harm.

We must, of course, congratulate all the editorial staff, not just the guy at the sharp end, for bringing to their readers a newer, brighter, better magazine — a magazine for everyone, not just the odd clique, but also the aquatic trade as a whole. Yes, please, please keep it up; there are some out here who have noticed.

John Ferguson
Halifax

Note from the Editor
What can I say? Thanks a million for your generous compliments, John. We are all working extremely hard to bring the very best articles and writers to A & P *(including contributors such as yourself), and it's nice to see that our efforts are being appreciated. In fact, you will, no doubt, be pleased to learn, that we are receiving exceedingly encouraging feedback from our readers over the 'phone, at shows, lectures, in writing . . . and in increased sales. So, we must be doing something right!*

John Dawes

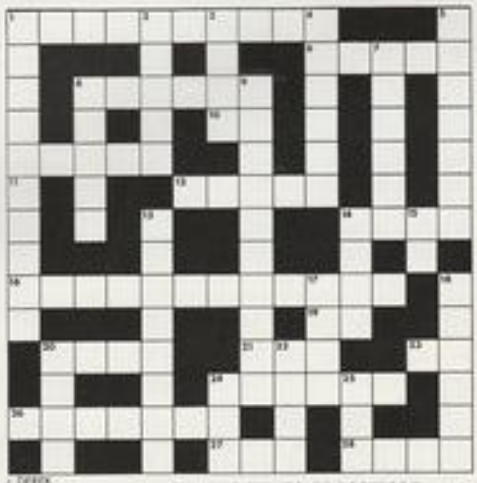
Crossword

Across

1. Aquatic sandwich filler
6. Tarka the – – – – –
8. Always weeding
10. Thank you very much
11. Used in clarinets
12. Bird-type watchdogs
14. Fishing weights
16. Flower that swings in the trees
19. Your ego
20. Scum on the surface
21. Another word for fur
23. Opposite of down
24. Flowing water
26. The water jewel beetle
27. Peas come in it!
28. Watery emission

Down

1. Aquatic watch plant
2. Small streams
3. The plant's foundation
4. A river's root
5. Croaking floating plant
7. A deep trench
8. A gardener's nightmare
9. General name for pond foliage
13. Typha or bulrush
14. A plant's egg
15. Opposite of off
17. Clean that tank's glass!!
18. Bobbing water bird
20. A mature tadpole
22. A plant's blood!
25. Its eggs make fish food



c. DEFEX

AQUATIC TIMES CROSSWORD

Aquarist & Pondkeeper Crossword fans — and we know there are many — will, no doubt, be delighted to see the return of their favourite brain-twisting feature.

Just to 'top up' those uncontrollable waves of emotion(!), we've even got a rather special prize: a great accessory that is already making headlines.

It's a **GRASSLIN RONDOMATIC** automatic fish-feeder to get you through those difficult periods when you are forced to be away from home, whether willingly (as at a Fish Show) or unwillingly (as when you have to put up with sun-drenched, golden beaches, and crystal-clear ripples lapping round your feet, in some foreign land . . .!)

Selling at **£49.83**, the **Grasslin Rondomatic** is the perfect way to tackle such eventualities, making it possible to administer no less than 28 separate feeds at pre-determined times.

Just complete the **Crossword** and send it in to reach us by 31 July at the latest. The first correct entry drawn from the magic hat will win the prize. And, if you miss out this time round, fear not, we've got two more **Grasslin Rondomatic** automatic fish-feeders to give away in coming months.

Send your completed entry — enclosing your FULL name and address in BLOCK LETTERS to:

Aquarist & Pondkeeper,
Grasslin Rondomatic Crossword,
9 Tufton Street,
Ashford,
Kent, TN23 1QN

'STRIPEY' HITS BACK

(Further confessions of a Coolie Loach)

Life through the eyes of a loach is rather different to that seen through the eyes of the enthusiastic, but uninformed aquarist. 'Stripey' — alias **David Franklin** — should know, having experienced the end results of numerous ill-conceived, good intentions.

'Stripey' is, of course, the wonderfully - imaginative name that my human has given me, and everytime I make an appearance he'll annoyingly squeal, "Ooh! Look, there's Stripey!" as if I'm the eighth wonder of the world or something.

He still hasn't bought me a mate, so most of the day I spend watching T.V. or the other fish. Since the last time I spoke to you (see note at the end of this article), much has happened — and most of it detrimental to my welfare. Some days I think that my human will simply get the message that he just is not cut out for the subtle art of successful fishkeeping, but much to my disbelief, his enthusiasm never wavers.

All change

I had been in my new home for about nine months, and was just getting used to my surroundings (except for those snobby Angelfish) when the human decided he had had enough of the existing set-up and it was time for a change. Actually, the decision was not a complete surprise, as I had studied his habits 'beforefin'. He would look at his tank from all angles, and then sadly glance at the beautiful submerged tropical gardens displayed in his book, muttering, "I know I can get it right this time."

It's a pity, really, that humans don't plan their actions out a little more carefully before they do anything, and then perhaps they would save themselves and we fish a lot of trouble, later. I refer, of course, to the rock formation that was supposed to resemble Mount Everest. Although it very probably was a "pretty impressive replica" (his words) I'm sure that the real thing was just a touch more stable and, hence, would not have collapsed if the family labrador had knocked into it. The 'balanced' aquarium that he was striving towards had seemingly 'over-balanced'.

So, after all the hassle of being violently moved from my previous garden centre home, I had to endure the process all over again. As usual, I showed my defiance in refusing to be quickly captured. We were all unceremoniously dumped in a smaller tank, directly facing the old one. To his credit, he worked very hard, deligently stripping down the old tank and methodically cleaning it until it positively sparkled. Perhaps this impressive display of dedication signalled a fresh start in his mind, and that from now on, all his previous problems were firmly behind him.

However, my hopeful illusion did not last long. On attempting to refit the undergravel filter he made one minor mistake: that of putting the gravel in first. Obviously, the most intelligent life form on the planet had yet to find his niche in life. Filling the tank he managed to accomplish without further incident, except the water was not quite as crystal-clear as he had hoped for. In fact, I've seen more translucent Black Holes! He set about aquascaping the underwater terrain, but maybe this would have been a trifle easier if the aquarium had not been full of murky, freezing-cold water. But, at least, his enthusiasm had to be admired, even if his blue arms weren't to be.

I watched in disbelief as he rearranged my home. I thought it would have been nigh on impossible for him to make a bigger botch of the interior design than before, but somehow he managed it.

Rude re-introduction

Eventually, the time came to be transferred back to our underwater Utopia. The human had sneakily left out gravel from our temporary accommodation and caught me a lot easier. Perhaps he's slowly learning after all. However, he did not seem to give the new tank much time to settle down and quickly put us in. It appeared he wasn't too keen looking at an empty tank, and wanted as much colour and movement in there in the shortest possible time.

Well, the water conditions were not exactly inducive to taking long strolls along the gravel bed, but I've known worse. The first couple of nights I spent exploring. I swam up to the little plastic diver carrying a spear gun and then on to study the submerged part of a brick wall down the right end of the tank. Now I'm no expert, but I'm pretty sure cement is not a naturally occuring substance in your average Borneo river.

Withering plants

The human did not quite achieve the standard of lush foliage he was banking on either. He bought a pile of differing plants and stuck them in all at once. He apparently failed to notice the prolific population of hungry snails with them. To put it kindly, he did not exactly have green fingers; they were still a bit blue from before. It's a shame, really, as we fish adore plants. They make us feel so much more secure, so it was with deep regret that I watched them all slowly wither away.

The human would despairingly stare at the brown leaves, and shout, "It's not fair! I spend all that good money on plants and all they do is die!" To be fair to the plants, their annoying habit (namely, that of dying) was not totally their fault as they were not really provided with optimum conditions for rampant growth. Some humans don't realize that plants are living organisms as well, and that if you want them to do well, you have to give them as much attention as we fish. You can't just ram them in three inches of gravel, and

always expect them to look nice. Often, we fish are just as upset as you humans when the vegetation turns straggly and dies, as their gradual disappearance makes us recognise the fact that we're in an even more artificial environment than we previously supposed. The average fishkeeper is probably the most effective herbicide on the market today.

Withering fish

I wasn't sure if the conditions that adversely affected the plants were having a similar effect on we fish too, but after about the tenth day, we all began to feel off-colour. It's curious how the Neons are always the first fishes to suffer from the human's oversights, whether they are forming the staple diet of an appreciative Oscar, or just succumbing to the prevailing water conditions. Painfully, his shoal of six dwindled away to three, and then two, and he fished out each corpse with increasing frustration.

By now I felt decidedly ill, and most of the inmates were skulking away in corners, fins closed and persistently ignoring attempts to entice them out into the open i.e. the human dropping some flake in and saying in a silly, high-pitched voice, "Ooh! Fishey-wisheys, nice food!" Even this heart-warming piece of encouragement failed to re-activate the male Sword suitably into the pursuit of his favourite pastime . . . Swordtail females.

Pioneering medical approach

The human, in his infinite wisdom, instead of seeking advice, firmly decided that his beloved fish were afflicted with an outbreak of disease. His expert diagnosis informed him, as he studied his libidoless Sword and his rather unregal Angels, that there must be a dastardly bacterial disease in the tank. To my knowledge, none of us were suffering from ulcers or sores, but nevertheless, the human dived into his medicine chest (which consisted of a few ancient-looking, dust-covered bottles and a tin of epsom salts) and painstakingly selected the one that seemed to treat most ailments, before tipping in its contents. He sat down to observe his pioneering medical approach, which was an achievement in itself, given the combination of murky water and bright-green medicine.

Instead of curing our condition, we all felt a lot worse; I really thought that the great big aquarium in the sky was starting to polish the bit of bogwood especially reserved for me. It was a pity that the Talking Catfish was no longer here to bellow his disapproval of the piscine Dr. Kildare's veterinary skills. After waiting for an enormous amount of time of approximately four and a half hours to elapse, he decided that his miracle cure had somehow failed, and it was therefore time to try a different remedy.

It's extremely difficult trying to explain what colour the water turned, but at a rough guess, the eighth colour of the rainbow was likely to be a close match. It was all too much for the last remaining Neon and he joined the mounting list of casualties. The Angels were left gasping at the surface, and the Guppies seemed to be growing another set of pectoral fins.

However, this traumatic chapter of my life was mercifully brought to a close when the human suddenly had a brainwave. He changed some of the water! Simple, but effective, and we all immediately felt better. An existing benefit of water changes is that they're amusing to watch as the human gives the impression that he's determined to drown the carpet. Things settled down after this, and the relief on our faces was twice as evident as that on the human's. He regarded his unintentional, semi-successful attempt at genocide, and resolved it was time to buy some new fish.

New arrivals

Perhaps now I might get some tankmates that I actually like. The first fish he introduced added fuel to my hopes. It was a dark-brown catfish with massive sucker-lips that looked somewhat like a fishy Mick Jagger. The first thing that I asked of him was if he could sing 'Nineteenth Nervous Breakdown' in memory of all the traumas I had endured since my move from the relative safety of the garden centre. He declined though, as there weren't any other Rolling Stones in the tank — just a few algae-engulfed pebbles.

But, as much as I liked ol' Rubber-Lips, I disliked the next set of fish introduced. There was a pair of Glassfish, but they were poseurs, and I saw right through them(!). Along with them came a shoal of infuriating Zebra Danios, which have since been driving me up the aquarium side. They give me such a headache the way they zoom about. I'll have to get a zebra crossing in here, as on the few times I venture out, they swarm around me, poking fun at my slowness, while those flipping Angelfish just glide past, not lifting a fin to help.

But I had my revenge a little later when, into the tank, came a solitary Tiger Barb. Apparently, the human could only afford one at a time, and didn't have the will power to save up and buy some more. Well, this poor Tiger Barb, on his own and with no mates, soon got bored swimming around the plastic diver. He wanted some action and soon found it in the form of annoying the Angels. He'd swim behind them casually nipping their fins, or if he was in a really bad mood, he'd make their lives hell. The human watched all this with mounting frustration and tried everything possible to prevent his prized pair of Angels becoming two ragged wrecks.

Measures taken included partitioning the tank, temporarily netting the offending fish and, in one ineffective but highly amusing episode, the wagging of a finger at the Barb with accompanying stern words. The Barb just turned to me and said, "Silly ***! With no mates in here, what else am I supposed to do?" and gleefully set off after the Angels again. The eventual solution to this problem was to remove him (much to my disappointment) but, at least, his flagrant disregard for class barriers in the aquarium brought the Angels down a peg or two. Yesterday, one actually swam within six inches of me!

Violent tankmates

However, the violence in the tank reached epidemic proportions a few days later when the human bought a lovely red male Siamese Fighter, and liked it so much that he went and bought another! Well, I just took one look at the pair of them as they squared up to each other, and decided that the best course of action was to get right out of harm's way, and I quickly slithered under my slate. As I was there, I wondered if the human had actually thought about the names of the fish he had purchased.

Perhaps he was confused by the description 'Fighting Fish'. Now, I don't know any fish with a marked masochistic tendency to beat themselves up, so it's somewhat more likely that the fish is going to have a go at another fish, isn't it? But I suppose even if the fish in question was called the 'Lesser-spotted - I'll - kill - everything - in - sight - but - boy - do - I - look - pretty' fish, then he'd still buy it. The expected mayhem started as soon as the other was released, and it quickly found itself on the way back to the shop to join the Tiger Barb.

These incidents all occurred a fair while ago, and since he returned the above couple of fish, he bought his second-ever book. (The only other piece of relevant literature he owned was entitled 'Let's Keep Fish' and was apparently aimed at the under twelve age group.).

The importance of books can never be overstated. A book represents the concentrated experiences of previous fishkeepers and hence, is supposed to prevent the mistakes that they undoubtedly made from happening all over again. Unfortunately, fishkeeping seems to be a hobby where you have to make some mistakes to get on. But, unless these errors are acknowledged and understood, there is no point continuing with the activity, as it would be both senseless and cruel. Though, of course, if all you humans took the advice of a humble Coolie Loach, then you wouldn't be human, now, would you?

Confessions of a Coolie Leach

by David Franklin, was published in the March, 1990 issue of *Aquarist & Pondkeeper*

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The Farallon Islands are situated about 25 miles west of San Francisco's Golden Gate Bridge and they are noted for their bird life and marine mammals. The twelve species of birds that are known to nest on the Farallons include: Pigeon, Guillemot, Tufted Puffin, Common Murre, Cassin's Auklet and three species of Cormorant. Birds are easily disturbed by humans when nesting, so those on excursions are not allowed to land on the islands.

Harbour Seals, Elephant Seals, California and Stellar Sea-lions use the island as a refuge, while more than ten species of Cetaceans have been seen in the waters round the islands, including: Orcas, Dall's and Harbour Porpoises, and Fin, Blue, Humpback, Grey and Minke Whales. (The Cetacea is the order to which whales, dolphins, porpoises, etc belong.)

The big day

The departure time was 9 am and I was told to be there 45 minutes early. Having had only a few days in San Francisco prior to the trip made me rise about 5 am that day and breakfast on a bun and a glass of water. It was still dark when I departed from Chinatown and boarded a bus through the North Beach area down to sea level and the harbour. I was well aware that if I arrived late the party would not wait for me and that there were no refunds for lateness or no-show. Hence, I was there in very good time at SF's Yacht Harbour, at the north end of Scott Street, next to Marina Green Park, outside the Harbour Master's office. (I was subsequently glad that my trip had been in August and not some weeks later when Chinatown, the Marina area and Oakland Bay Bridge, which I had crossed the previous day, were badly affected by the largest earthquake for decades!)

My early arrival that morning enabled me to get a shot or two of Golden Gate Bridge in the dull light of dawn, complete with mist. Indeed, the mist remained for the whole day, as did the grey light, and I was glad I'd worn plenty of warm clothing. Fortunately, the sea remained calm and my sea-sickness pills seemed to work for me — which was more than could be said for a few other members of the party!

Eventually, just before 8.30 am, a roll was called and we were given our briefing for the day. We were accompanied by three scientists who were to point out any sightings of mammals or birds.

Off we set around 9 am, sailing under Golden Gate Bridge — a great thrill for me because the previous day I had walked across the bridge in both directions, over the Pacific Ocean, in bright sunlight, and had considered it, with Alcatraz Island in the background, as one of the most beautiful sights I have ever seen anywhere. The bridge was just as impressive from below, but much less spectacular without the sun to heighten the red colour of its paint.

The sea remained quite calm but, unfortunately, neither insect repellent nor suntan oil was required because the day remained dull, cool and sunless. We did see lots of birds and seals on the island — and we smelt them too — but they were quite far away. I expected to be able to get nearer.

Bob Talbot, eat your heart out! Well, no, not exactly! My best efforts at photographing a Blue Whale tail fluke gave me a tremendous thrill but couldn't quite match the quality of the world's master whale photographer.

However, I had booked the trip to see whales — and whales I saw. They appeared occasionally, singly and in pairs, and were usually first sighted by a scientist perched up on the bridge. When he saw a whale's spout he'd shout and point and everyone on board would rush to one side of the boat, making it tilt somewhat! Immediately, dozens of cameras started to click — with the frequent exception of my own. I was often so overwhelmed at seeing a whale, that it had gone before I got my camera focused; or, perhaps I was just being more realistic than the other happy snappers.

After the first couple of sightings of Blue Whales, I realised that I would not be getting any shots like Bob Talbot's splendid ones.

You are not likely to see much more than a tail fluke or the long 'slaty' back of a Blue Whale on a whale-watching trip, but even this is awe-inspriing when you realise that the 'owner' could be more than 30 metres long and weigh nearly 200 tonnes!

To get those he had to go in a little boat down at whale-level. I was much higher up and farther away; and, quite honestly, most of the sightings that we made lasted only a second or two and consisted of a spout of water, or a back breaking the surface of the water, or a giant tail or fluke appearing and disappearing in a second or two.

Perhaps I expected something more spectacular — possibly in the line of photographs. I certainly enjoyed the trip immensely and was thrilled actually to see a dozen or so appearances of whales. Perhaps the Society should inform trippers that a good shot of a fluke, from afar, is probably as good as can be got from a vessel the size of the Ranger '85. Things would have been better in a smaller, faster craft — but the thought of slipping into the Pacific 25 miles from land would have kept my feet firmly on dry land!

Apparently, the scientists on the excursions simply want photographs of each whale's fluke. Each fluke has a distinctive pattern, usually formed by barnacles, and sighted whales that are photographed can be identified on other occasions by the pattern of the fluke. Such information, in the form of black-and-white prints, can easily be transmitted to other people in other parts of the country or of the world, and, thus, records of the movement of whales can be kept. This is vital in the interests of conservation.

Gentle giants

Whales are the largest living animals in the world. In April 1926, a Blue Whale, *Balaenoptera musculus*, caught near the South Shetland Islands, had reached a length of 32.3 metres. It was a female and was measured from the snout to the notch in the flukes. One of the highest weights recorded for a whale was 193 tonnes. It is interesting to compare this with the approximate weight of a bull African Elephant, which weighs in at around 6 tonnes — and African Elephants are the largest land animals in the world. Just try to visualise an animal that may weigh as much as about 30 elephants! Incidentally, a new word that I learned on my trip was 'pod', used to describe a small school of whales. Unfortunately, I did not see a pod of whales or porpoises; only single animals and pairs of animals.

If you are interested in aquarium fishes you'll certainly be interested in the gigantic, gentle mammals that share their lives with the fishes of the world. You can certainly see whales in captivity — Belugas at New York Aquarium, and Killer Whales elsewhere — but nothing can match the thrill of seeing them in their natural environment.