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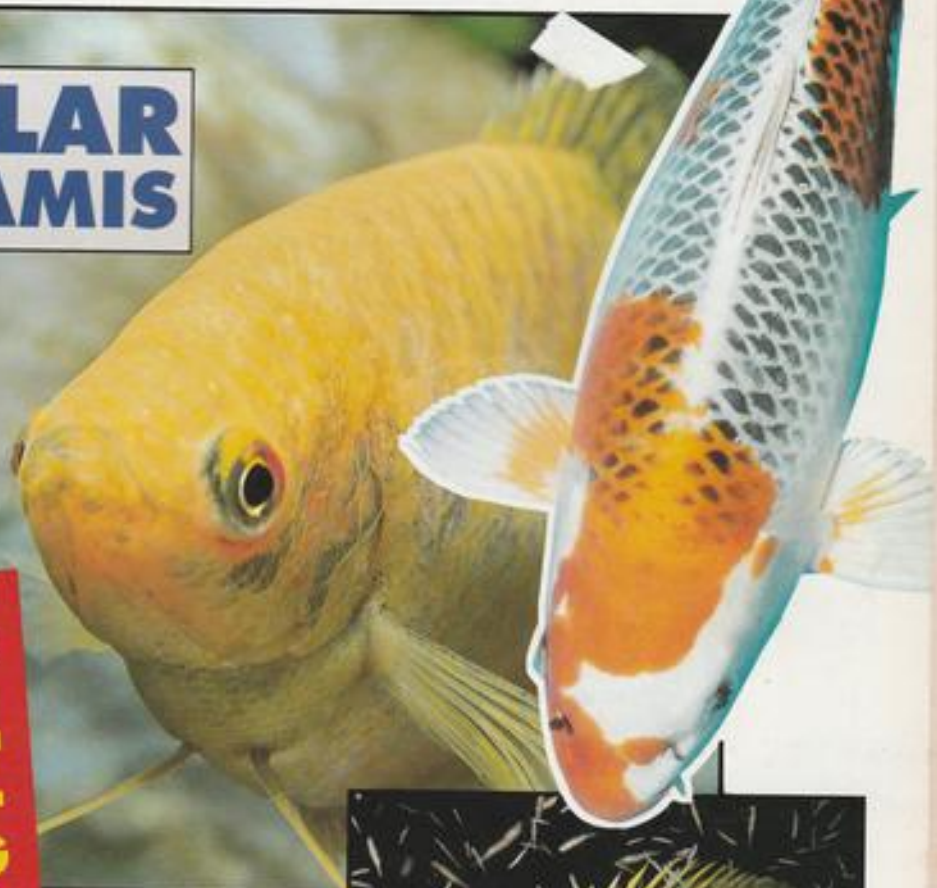
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**SUPPLEMENT:
INSTALLING PONDS**
Full details on page 37

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EDITORIAL PRAISE AND CRITS

As anyone who has ever set up a stand at an aquatic show will tell you, the effort, followed by the intense activity experienced during the show itself, to say nothing of the taking down of the stand and the eventual packing of all the countless bits and pieces after it's all over — leaves you somewhat 'cream crackered'.

Is it all worth it, then? You bet it is! It is at these shows that valuable feedback regarding our magazine is presented to us by the tonload.
Take the recent, highly successful, Yorkshire Aquarist Festival, for example. We received numerous compliments on how well we've developed A&P since we introduced our new format last November. This, of course, is of great encouragement to us all.

Equally vital, from our point of view, is constructive criticism (the destructive type, we can live without!) and, in this respect, I owe a personal vote of thanks to two of our younger readers who came to see me during YAF. They had lots of good things to say about A&P, but they also had some 'bones to pick' with me...

and some suggestions to make regarding possible future features and other items. Thank you both for caring sufficiently to come and see me and put forward your proposals. Your opinions are very important... so are those of all our readers, of whatever age and of whatever level of expertise they may be.

Happily, it seems we are doing most things right in the eyes of the majority of our readers. Constructive criticisms and suggestions will, however, help us produce an even better magazine all-round. So, don't hang back. Do like our two YAF readers did... come and see us at the next show... or drop us a line. We look forward to that.

John Dawes



Tomorrow's Aquarist

BY GINA SANDFORD



Acid or Alkaline

This month I thought I'd take a look at something that's a mystery to many of us — pH. We use the term frequently, but what is it?

It's a term that we use to describe the acidity or alkalinity of water. The pH scale ranges from 0, which is very acid, to 14, which is very alkaline. Thus, when we say, "A neutral pH", we all know that it's 7, ie half way between the two extremes.

Okay, let's break things down a little further. This is where it gets a little technical. The 'H' of pH represents the hydrogen, to be precise, the concentration of hydrogen ions (H+) in the water. There is a second ionised component of water — the hydroxyl ions (OH-) — and the pH scale reflects the numbers of hydrogen ions and hydroxyl ions that are present in any solution. A high concentration of hydrogen ions causes acidity and, conversely, a high percentage of hydroxyl ions, alkalinity.

Oh that things were so simple!

Coldwater Red-bellies... and friends

For those of you who keep coldwater fish, there is now a reasonable selection of native North American fish available. The Darters are particularly attractive and make excellent fish for the cool-water aquarium, as are the Dace.

Red-bellied Dace, *Phoxinus erythrogaster*, are similar to our Minnows in that they come from small streams with clean, clear, relatively fast flowing waters over a gravel bed. They range from western Pennsylvania, south Michigan and southern Minnesota, south to northern Alabama and northern Arkansas.

The males are very attractive a greenish-brown along the upper half of the body and back, with darker spots, and two black stripes along the sides, separated by a cream band. At the rear end of the lower black stripe, there is a black spot in the caudal peduncle (base of the tail fin), and the lower part of the flanks and belly are yellowish. However, in breeding trim, the belly becomes red.

The females, in contrast, are a relatively drab olive-brown, with a few dark speckles and spots — but you need the females if you want to try to breed them and see the males in their full

breeding livery!

Red-bellied Dace need cool, clear water that is well oxygenated, so you will probably need to set up a special tank for them. The fast flow from the spray bar of an external power filter seems to do the trick. Feed them on small live foods to bring them into breeding condition, although they do accept prepared and frozen foods as well.

In the wild, they breed in the spring and early summer in fast flowing riffles (as yet, I've had no luck in breeding them in captivity). They are not long-lived creatures, though, reaching sexual maturity in 12 months, and living for about two or three years.



Left, Darters — the appropriately named Rainbow Darter (*Etheostoma caeruleum*) are becoming more widely available. Right, a relatively recent coldwater introduction: the Red-bellied Dace.

Electrifying facts

1 There are two groups of fish which use electricity; those with weak electrical outputs (a few tenths of a volt, to 25 volts at most) which use the discharges to locate things rather than stun prey; and those with a strong discharge (up to 600 volts) which use it predominantly to stun prey.

2 Weakly electric fish can be divided into two groups: those which produce a long, regular discharge, such as the Gymnotids — or Naked-back



Elephant Noses are 'weakly electric' fish.

Knifefishes (shown as waves on an oscilloscope), an pulse fish which emit an irregular discharge as the Mormyrids (the Elephant Noses and their relatives).

3 The Electric Eel, *Electrophorus electricus*, has three electric organs: a Sachs' organ which produces weak currents, plus its main electric organ, and the Hunter's organ, both of which produce very powerful shocks.

4 Mormyrids use to communicate with each other.

5 After emitting a discharge, strongly electric fish need time to 'recharge their batteries' before they can stun any more prey animals.

Just to complicate matters, the pH scale is logarithmic, not linear, which means that a change of one unit is a ten-fold change in the concentration of hydrogen ions! Therefore, if it were a two-unit change, it would be a 100-fold change. For example, pH 8 is ten times more

alkaline than pH 7, and pH 9, 100 times more alkaline than pH 7.

When you realise this, you can see why it is that a small change in pH can often be disastrous to fish. The majority of the fish we keep will tolerate a broad range of pH from, say, 6.5-8.5 but, if they were moved from water at

the high end, straight into water at the low end of this range, it would still cause them some discomfort. However, if this change were gradual, they would adapt without any problems.

The pH of the water is more critical with some delicate, wild-caught fish, some of which may die because we have not pro-

vided the correct conditions or, if they manage to survive, will not attempt to breed.

So, next time you buy fish, take time to acclimatise them slowly to the new water conditions in your aquarium -- the shop water may be 8.5 and yours 6.5, but the fish are able to cope with a gradual change.

Air and tank health

The factors involved in creating a balanced, healthy environment for aquarium fish are complex and, for many years now, Tetra has made it easier with an extensive range of food and treatments. To complement their existing products, Tetra has now added aquarium air pumps to its range.

Air pumps are extremely important. They can be used for powering air-driven filters (such as the ever-popular undergravel filter) or for powering air stones. This aeration causes the water in the aquarium to circulate freely which, in turn, allows toxic gases to escape and oxygen to be absorbed. Air pumps can also be used to power today's air-driven ornaments.

We must never forget that fish in aquaria are totally dependent on us, their owners, to provide the most natural and acceptable living conditions suited to their particular needs. Not only do they rely on us for food, but also for the maintenance of a satisfactory environment in which they can thrive.

To help you get the most from your

Tetra TA COMPETITION



fishkeeping, 10 lucky winners will each receive a year's free membership to the Tetra Club which provides up-to-date information on all aspects of fishkeeping. To start off, winners will be sent a special welcome pack with samples, literature, badges, pens, etc, and three times a year, they will receive a 20-page colour magazine packed with seasonal advice and special features. Members also have access to a special "Tetra Hotline" for emergency advice.

To win a Tetra Club membership all you have to do is list the three main uses for an air pump. Send you answers with your name and address to Aquarist and Pondkeeper Competition, Tetra, Lambert Court, Chestnut Avenue, Eastleigh, Hants SO5 3ZQ. The closing date for receipt of entries is 30 June and the first ten correct entries to be drawn will each win a year's free membership to the Tetra Club.

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UNIQUE KOI

Nigel Caddock selects some very special Koi reflecting the best of the British 'crop'.

Photographs: Nishikigoi International

A splendid Doitsu Hariwake with deep yellow markings.

In this Kikisui the pigmented areas are orange compared to those of the Hariwake.

A Yamatonishiki is a metallic version of the Sanka. This particular 'red-nosed' specimen has little sumi (black) on its body.

One of the most fascinating aspects of Koi is their snowflake quality which renders each and every individual unique. It is often observed that it is this mythical quality that attracts many hobbyists to Koi in the first place ... and keeps many more fascinated forever. The quality and quantity of Koi imported into the UK has grown enormously since they first appeared over here some twenty years ago. The UK Koi business was recently estimated to be valued at £90m per year. That's a lot of Koi, but what is even more interesting, is not just the development of the quantity of Koi imported, but their quality as well.

A glance at some previous *ACF* Koi features will quickly confirm that the quality of the very top-grade Koi has reached dizzy heights, but in addition to the quality of these top showing fish, some stunning unusual varieties have also emerged to tempt and tantalise even the more hardened Kohaku, Sanka and Showa aficionados.

This feature aspires to offer a brief photographic insight to some of the most unusual varieties of Koi, which also happen to be some of the most beautiful.

Of the thirteen main classifications of Koi, there are four classes which contain the most unusual varieties. Two of the

three metallic — Hikari Moyo and Hikari Utsuri — and two of the ten non-metallic varieties — Koromo and, most notably, the Kawarimono class.

1 Hikari Moyo

This class contains some of the most graceful varieties of Koi, all of which are immensely popular, including especially Hariwake, Kujaku and Yamatonishiki. Incidentally, all Ogin varieties go into a separate classification, along with Matsuba varieties, called Hikari Muji.

Hariwake & Kikusui

Hariwake are white scaled or Doitsu Koi with variations of yellow coloured pattern. Kikusui are always Doitsu and have an orange pattern overlaid onto white skin.

Yamatonishiki

The metallic version of the Sanku comes in many variations and is often confused with both Kujaku and Gin/Kin Showa. The key difference is to remember that this variety of Koi is basically a Sanku, but a metallic one.

Kujaku

Kujaku can be scaled to Doitsu. Perhaps the easiest way to identify this variety is to think of the Kujaku as a

combination of a Hariwake and a Matsuba; indeed, these Koi are often called Hariwake Matsuba.

2 Hikari Utsuri

This class includes all metallic Showa and Utsuri Koi, specifically the Kin and Gin Showa and Gin Shiro Utsuri. Kin Showa are Koi with yellow or orange skin, with white overlaid on black, whereas Gin Showa have overlaid white skin with orange or red. The description is confusing but it becomes much clearer when you see

examples of these Koi.

Included in this class is also Kin Ki Utsuri and Kin Hi Utsuri, along with the metallic version of the Shiro Utsuri, the Gin Shiro.

Metallic varieties are much enthused over by UK hobbyists, which contrasts significantly with attitudes in Japan. At one stage, because the Japanese market demand for metallic varieties was so small, producers simply stopped producing them, and the entire supply almost dried up.

Fortunately, this did not quite occur. Today, the existence of markets throughout the world designed to service the diversity of taste among hobbyists is reflected in Japanese Koi production generally, thus ensuring the availability of most varieties, even some of the less common ones. This is reassuring when we consider just how much pleasure Koi like these bring to thousands of enthusiasts worldwide.

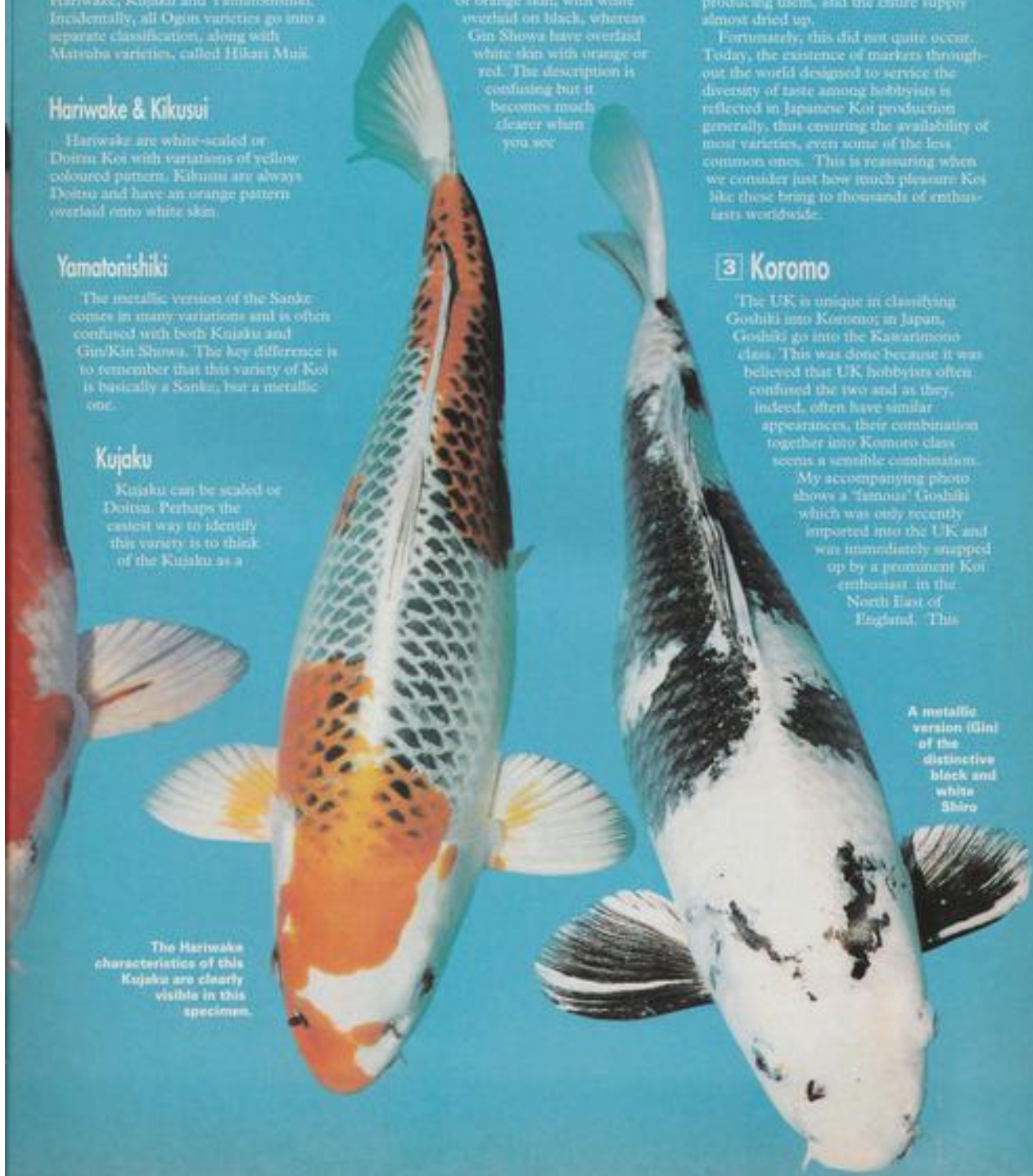
3 Koromo


The UK is unique in classifying Goshiki into Koromo; in Japan, Goshiki go into the Kawarimono class. This was done because it was believed that UK hobbyists often confused the two and as they, indeed, often have similar appearances, their combination together into Komoro class seems a sensible combination.

My accompanying photo shows a 'famous' Goshiki which was only recently imported into the UK and was immediately snapped up by a prominent Koi enthusiast in the North East of England. This

A metallic version (Gin) of the distinctive black and white Shiro

The Hariwake characteristics of this Kujaku are clearly visible in this specimen.





A Koi in 10 million!
This splendid Goshiki
was recently imported
into the UK.



This Israeli Goshiki
with traces of Asagi
lineage visible in the
blue areas, shows
just how good
Israeli fish can
be these days.

stunning male Goshiki is well known in Japan, having taken numerous important awards at major shows over there. It is actually difficult to overstate the quality of this unique Koi, which is literally a Koi in a million. In this case it is probably even more accurate to say this is a Koi in ten million!

The Koromo pattern is more easily recognised on my picture of an Israeli Goshiki, where the Asagi lineage can more easily be recognised. The excellent quality of this fish also goes to indicate just how advanced the Israeli producers have now become.

A comparison between the Goshiki photos and that of the definitive Koromo shows clearly the key difference between Goshiki and Koromo. In Koromo, the reticulation of the noir (black) edged scales is confined to the hi (red) pattern, whereas in Goshiki, the scaling reticulation goes through both hi and white areas.

4 Kawarimono

This is without doubt the richest source of 'Unique Koi'. Kawarimono is the non-metallic class into which all Koi which do not conform to any of the other varieties, are placed into. Into this 'melting pot variety', therefore go all the Koi no one can sensibly allocate any other variety to!

This is only half the story though, because in addition to all the 'odd-halls' which arise from cross breeding, also go other more defined varieties ... specifically, single-coloured non-metallic Koi and all those emanating from the Karasagoi lineage, two examples of which I invite you to enjoy with us in some of the accompanying portraits.

The study of Nishikigoi varieties is one where the complexities and subtleties offer students a never-ending stream of learning opportunities. However, the topic is not as confusing as some experts would have us believe, and with a little practice, everyone can quickly learn to identify the main varieties.

Keep practising and it will get easier. Remember, too, that Koi keeping in general, and Koi variety identification in particular, conform to the old adage

that "the more you practise, the luckier you get."



Two prime examples of the 'catch-all' class Kawarimono: a black and white Dragon Koi (Kumonryu) and an almost-brown-and-grey 'Autumn-leaves-falling-on-running-water' Ochibai Shigure.

PONDERINGS



Amorous frogs, stitched up toads and thieving magpies feature prominently in Pauline Hodgkinson's personal choices of stories for our new pond season series

A hobby which spans over twenty years will still on occasions divulge many surprises. I, for one, have been keeping fish for such a length of time, but I am often enlightened by what I might have first thought was improbable, if not impossible.

Some years ago we decided to replace the sunken pool which had been a feature of our garden for a long time. It was constructed from a cheap liner and was showing need of extensive repairs, so we chose to replace it with a large, pre-shaped fibreglass pond of a more formal design.

The new pond would be built up above ground level, surrounded by coloured stonework; the height was to be some three feet higher than the surrounding walkway.

Poolside spawners

This change could not have been popular with the neighbourhood frog population, since many of them were probably born in the original pond. It appears to have been an ideal location for their courting activities, judging by the number of amphibians that gathered there each breeding season. The replacement pond confronted them with an impossible access situation, because the sides were much too high for them to climb, even for the most agile of the species.

However, needs must win out, when Mother Nature calls, for on three separate occasions that first season, we were confronted by large deposits of spawn actually on the pathway surrounding the pool! This phenomenon took us by surprise because we have never seen it reported that frogs would spawn on dry ground completely out of water.

We gathered as much of the spawn as possible and placed it into large water-filled tubs in the hope that we might save the stranded embryos. Our efforts were later rewarded when it appeared that many of the emerging tadpoles had survived

their rather unconventional beginnings.

At a later date we constructed yet another pond and, like our first pond, it, too, was sunken below ground level and made from a liner. This pond would serve as a growing-on pool for our young adult fish. It was double-netted against would-be predators, a precaution taken only after one or two successful feline angling events had taken place. However, the nets proved to be no problem of access to the mating frogs, and they soon managed to scramble into the nuptial proceedings.

Dangerous squeeze

I have often heard that during spring and mating time, a lone frog will seize a fish in an embrace, usually resulting in the death of the unfortunate fish, it being literally squeezed to death. Up until I witnessed this myself, I had never actually spoken to anyone who had seen this happen.

You can imagine my surprise when I spotted a large frog clasping a female Lionhead, head-first, in what appeared to be a rather passionate embrace. From the

point of view of a fishkeeper, not to mention fair play, what made the situation even worse was the fact that the fish was a particularly good example of its type and not one which could be sacrificed in order to quell the passions and loneliness of a frog!

A desperate swish of a net persuaded the amphibious 'rapist' to release his victim. The culprit was captured and removed to a place of safety (rather more for the other fish than his own): a deep tub where he could cool off before we were able to take him to a nature reserve, where, hopefully, he would meet a more suitable mate.

The poor bewildered fish, who was obviously in some discomfort after her ordeal, was put into the safety of a tank in the fish-house. It was plain to see where the frog's front legs had gripped her, for the scales had been rubbed away just behind the pectoral fins.

Methylene Blue, an old and tested medication, was added to the water and, although the Lionhead remained near the surface for a few days looking very much under the weather, she gradually began to recover and eventually to feed.

Obviously, I must have rescued her just in time before too much damage was done. Had the water not been so clear in the pool, her predicament would not have been apparent and she most likely would not have survived.

I doubt that healthy, fast-moving, slim-bodied types such as the Common Goldfish, Shubunkins etc, would fall victims to amorous frogs but, on another occasion, an old, rather under-

the-weather Common Goldfish was not so fortunate. It was discovered dead with the frog still clinging desperately on to its lifeless body.

Remarkable recoveries

I am often surprised and relieved that even quite serious injuries can heal without having to administer too much in the way of medical treatment. I must admit that I am often reluctant to use some of the cures which many of my peers seem only too keen to add to the pondwater or inject into a fish at the slightest hint of trouble. In my own humble opinion, the latter treatment should only ever be undertaken by a qualified person, in any event.

I well remember finding one of my favourite Lionheads badly wounded after making a miraculous escape from an angling cat. The prowling moggy must have managed to thrust a skillful paw through the netting which was supposed to keep out predators. A claw must have hooked his prize, though he was not able to pull her out because of the net's obstruction and, thus, she made good her escape.

On closer inspection, I discovered, to my horror, that my Lionhead had a nasty gash on her body just behind the gill plate, with a bone protruding from it at the top of her back. At that stage, there was no infection, so I gathered that the attack was very recent.

She was placed into a tank after first smearing her injury with Mircurochrome, then adding Methylene Blue to the water. Partial water changes were made daily, which is, of course, a crucial part of the treatment to maintain water quality at its best. For weeks it was touch-and-go

Over-amorous frogs can pose a threat to round-bodied, slow-moving varieties of Fancy Goldfish.



KEVIN KING



JOHN DAVES

An unlucky cat attack victim. Fortunately, not all fish which are attacked suffer this fate.

between life and death, but being in fine condition before the attack probably helped to overcome such a dreadful assault.

Eventually, the protruding bone turned black and rotted away, the wound healed over and she seemed none the worse for her ordeal.

Stitched-up toad

I also recall one particular incident where a dear friend did find it necessary to administer some extensive first aid treatment to a badly injured toad. He had inadvertently put down his bucket on top of the poor unfortunate creature and, to his horror, discovered a very nasty gash on the toad's side (made by the base rim of the pail) just before the life was squashed out of its body.

The only conclusion he could come up with was that the injury needed a few stitches, and so, with his heart in his mouth, he took out needle and stout thread from his wife's sewing basket and, as carefully as he could, stitched up the gaping gash.

After convalescing in a spare aquarium loaning itself, in this instance, as a vivarium, the toad gradually recovered and was set free to go about its business in my friend's garden, though I bet it gave him and his bucket a very wide berth from then on!

Crafty magpie

I never cease to be surprised at the smart and cunning tricks that some of my garden visitors get up to in order to get themselves a tasty meal... and that isn't even taking the human element into consideration! A couple of seasons ago, when needing extra space to grow on some of my young fish, I lined a few wooden crates with strong polythene, believing that they would make excellent temporary ponds.

All the fish were netted, except for one, though the intention was to net it just as soon as I got the time to visit the garden centre to buy yet another net.

We spent the next few days



away from home, leaving our son on things. On our return, I looked out of the dining room window and saw a busy magpie taking a great interest in the un-netted tub.

The scene didn't cause too much alarm until I saw it swallowing what appeared to be a nice fat fish. In fact, what the

crafty bird had been up to was pecking holes into the polythene further and further down into the depths of the tub so that the water leaked out, reducing its depth and thus bringing the fish within easy reach.

Was it just my imagination, or did I really hear a shriek of bird-like laughter when I gazed in shock at the shallow pool of water left in the tub. There was not a sign of a fish to be seen!

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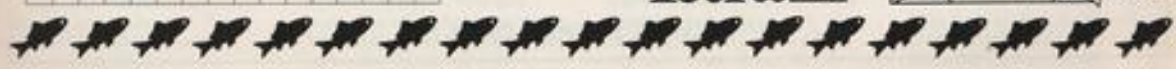
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KOI CALENDAR

BY
DAVID
TWIGG

Jobs for the month

Summer sunshine is now with us and water temperature is probably high enough to make feeding of a higher protein diet possible to ensure the best health and growth of our Koi. A wide variety of food can be given to Koi, so I list just a few of them here: oranges, lettuce, peas and sweetcorn in moderation, boiled wheat, boiled barley, mashed potatoes, cockles and prawns.

Increased feeding brings increased waste and greater loading on filter systems. 'Pulling' bottom drains to waste becomes more important to prevent a build-up of detritus in pipes and filter chambers and to minimise the risk of deteriorating water quality. Some Koi keepers pull their drains two three times a day at this time of the year.

Show precautions

Some readers will be contemplating showing their Koi for the first time this summer. It will be necessary for them to take steps to minimise the associated problems, thus keeping stress factors at bay. One of the most important things that must be done if it is intended to move Koi anywhere, and not only to and from shows, is to stop feeding at least three, but preferably five, days before the event. When Koi are transported in polythene bags, the small volume of water in them is easily polluted by the waste produced by food continuing to pass through the gut.

Furthermore, upon arrival at a show, Koi are placed into a vat where they will remain for several hours (sometimes days at the larger shows) and although the show organisers will do their best to keep the water quality high, it can really only be achieved if Koi are not fed for a time as mentioned.

If anyone has any doubts about the best way to catch, handle and convey Koi, it would be best to have a word with an experienced club member or, if not in a club, give me a ring and I will almost certainly be able to supply a contact number of someone nearby.

I wish you happy and successful showing if that is your plan, and an informative season if just 'looking and talking Koi'. There are some excellent shows on offer this month all around

June shows



There are no fewer than 10 shows being held this month. Visit them and you'll get to see some of the best fish in the country.

4/5 — Yorkshire Section BKKS Open Show
Lotherton Hall Nr. Leeds.
Contact Phil Swallow, 0422 343674.

5 — Middlesex & Surrey Borders Section BKKS Open Show, Staines Rugby Club, Hanworth. Contact Chris Pinchen, 0895 440341.

11/12 — Worthing & District Section BKKS Open Show.
— Northern Section

BKKS Show at Tatton Park. — International KLAN Koi Show. Rhein-Ruhr Halle, Duisberg, Germany.

19 — Crouch Valley Section BKKS Open Show. Barleylands. Contact Ron Parfou, 0227 840883.

23/26 — Baltimore in '94. Seminar organised by the Mid-Atlantic Koi Club. Lectures, How-to Demonstrations, world class speakers, dealers' fair and pond tour. Contact Burt

Ballou or Wayne Orchard in the USA on 0101 714 839 1836 or 0101 703 600 2663, respectively.

25/26 — East Pennine Section BKKS 'English Style' Open Show, Wentworth, South Yorks. Contact John Timmis, 0226 289507.

26 — Plymouth Section BKKS Closed Show. Ludbrook Trout Farm, Errington, Near Ivybridge. Open at 1pm. Contact Trevor Ridley, 0752 690087.

All mod cons these days, computer-assisted judging systems are widely used in shows.



England. I hope you, as I, will get to at least one of them.

Blanketweed

With higher feeding comes more nitrate to feed plant life, and, if you have a high pH (above 7.5) then, unless very lucky, you will probably also have blanketweed. While blanketweed is, I know, the bane of a Koi

keeper's life, in controlled quantities, it does have its plus points.

Apart from being a natural vegetable food, it also harbours a myriad insect life which will supplement the diet of the Koi. There is really nothing I enjoy more than waking on a summer morning, looking out of the bedroom window down upon the pond and seeing my Koi all lined up along the walls of the pond with their noses buried deep in

the blanketweed. I am sure this plays an essential part in not only keeping me happy, but my Koi free of stress as well.

Observation of Koi is probably the most pleasurable side of Koi keeping at this time of year. It is, of course, a must all year round to ensure that signs of damage or disease are caught early, but when it can be done with wine or beer glass in hand, and maybe friends to talk Koi to, then it really is something that any other

hobby will find hard to match!

Shows are an important part of the Koi keeper's way of life at which we can see fish that will almost certainly be out of reach of our own pockets. We therefore have an ideal opportunity to learn more about our hobby by meeting other Koi keepers from various parts of the country, and now, even from overseas. We also get an opportunity to talk to the dealers who attend these shows about not only Koi, but also the products they sell to make keeping Koi an even greater pleasure.

What's on in June

- 1 — **Leicestershire Koi Society.** Monthly meeting, British Shoe Corporation Social Club, Scudamor Road, Leicester. Contact **Pip Ostell**, 0533 609707 or **Kevin Luckman**, 0455 250413.
- 2 — **Middlesex & Surrey Borders Section BKKS.** Pre-show meeting, 8pm, Norbiton CIU Club, Kingston. Contact **Gary Pritchard**, 081 841 2894.
- 5 — **Crouch Valley Section BKKS** entertain members from Chiltern Section BKKS. Contact **Ron Parlour**, 0277 840883.
- 7 — **Yorkshire Section BKKS.** Monthly meeting. Contact

Phil Swallow, 0422 343674.

8 — **Merseyside Section BKKS.** Monthly meeting, Millbrook Manor Restaurant, Knowsley Village. Contact **Robbie**, 051 549 2001.

— **South Hants Section BKKS.** Quiz night, 8pm, Denmead Church Hall, Hambledon Road, Denmead, Hants. Contact **George Rooney**, 0420 473169.

11 — **Leicestershire Koi Society.** Pond visit and Barbecue. Contact **Pip Ostell**, 0533 609707 or **Kevin Luckman**, 0455 250413.

12 — **South Hants Section BKKS** visit the ponds of South Kent Section BKKS. Contact **George Rooney**, 0420 473169.

— **Central Section BKKS** visit to Norwich Section BKKS. Contact **Sue Finney**, 021 747 2733.

— **Northern Koi Club.** Two speakers: **Roland Astin** of M.P. Protective Coatings Ltd, and **Barry Goodwin**. Contact **Tony McCann**, 061 794 1958.

— **Lea Valley & Harlow Section BKKS.** Pre-show meeting, 3pm Halling Hill Common Room, Harlow. Contact **Phil Davis**, 0279 443754.

— **The Potteries & District Section BKKS** entertain Wirral Section BKKS. Contact **Ivan Rwtaschew**, 0782 45864.

— **Mid-Somerset Section BKKS** entertain Mid Staffs Section BKKS. Contact **Alan Purnell**, 0458 72132.

13 — **West Wales Section BKKS.** Monthly meeting, Post Office Club, Swansea. Contact **Andy Tovey**, 0554 82130.

14 — **Nottingham & District Section BKKS.** Speaker is **Gary Pritchard**, Chairman BKKS, The Western Club, Derby Road, Nottingham, 8pm. Contact **Shirley Hind**, 0602 810923.

15 — **Crouch Valley Section BKKS.** Speaking on Koi Ponds is **Eric Duffield**, Laindon, Essex. Contact **Ron Parlour**, 0277 840883.

19 — **Heart of England Koi Society** visit Northern Koi Club ponds. Contact me on 0926 495213.

26 — **Heart of England Koi Society** Annual pondside Barbecue. Contact me on 0926 495213.

— **Mid-Somerset Section BKKS** visit ponds in West Wales. Contact **Alan Purnell**, 0458 72132.

— **Northern Koi Club**, visit Birmingham & District ponds. Contact **Tony McCann**, 061 794 1958.

— **Middlesex & Surrey Borders Section BKKS** visit Avon Section ponds. Contact **Gary Pritchard**, 081 841 2894.

— **South Hants Section BKKS.** Members' pond visits. Contact **George Rooney**, 0420 473169.

Invitation

I would like to invite all Koi club secretaries or PROs to send me their latest calendar for inclusion in my column, and to thank all those who have kept me in touch to date.

Although I do my best to ensure all events are mentioned, it may be that some information, which arrives a little late, misses my deadline. Ideally, I need to have information at least 10 weeks before the date of the event to guarantee publication. You may, of course, ring me direct on 0926 495213, which will allow a little leeway. This request also applies to dealers with special events, auctions, etc. I look forward to hearing from you.

All Koi keepers are welcomed to the events in this Calendar (an entry fee at some events may be payable). Further details can be obtained from the contact telephone number quoted alongside the diary entry. Please write to me at your earliest convenience via the Editor, 9 Tufton Street, Ashford, Kent, TN23 1QN. Thank you.



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COLDWATER JOTTINGS

BY
STEPHEN J. SMITH



SOAPBOX

That was close!

Few hobbyists perhaps realise just how close we were earlier this year to not having imports of Koi and Fancy Goldfish from the Far East and the Middle East (see *News*, A&P May 1994). Great thanks should be extended to Ornamental Fish Industry (UK) — OFI (UK) and Ornamental Fish International (OFI) for their splendid response in helping to avert what would have been a major crisis in the UK aquatic industry.

It seems ludicrous that an industry upon which thousands of jobs depend, and a hobby which gives pleasure to millions, should be subjected to such a 'close shave' at the whim (in my own opinion) of bureaucratic powers-that-be. To bring you 'up to speed' on some of the coldwater aspects of the affair, the situation was that on one Friday in March, the European Commission met to discuss, among other things,

the possibility of banning imports of Koi and related species from non-EU countries for two years, in an attempt to remove the risk of SVC (Spring Viraemia of Carp) being introduced into the UK.

Now, I am all in favour of a constructive approach to ensuring the health of imported stock. However, when organisations such as OFI (UK) and OFI have worked so hard at maintaining the ornamental fish industry's house in order, it seems, perhaps, short-sighted that such organisations were not consulted by the appropriate authorities before such monumental decisions threatened to be made.

Happily, OFI (UK) has developed an excellent association with organisations such as MAFF (Ministry of Agriculture, Fisheries and Food) and was thus helpfully given notice, albeit just a few days beforehand, that the momentous meeting was to take place. In conjunction with OFI, they were able to rally round so that some representation could be made to the European Commission,

despite the painfully short timescale.

As a result we have all benefited from the excellent work of these two organisations.

Happily (again!) the outcome of the meeting was that any decisions have been deferred. It is no secret that I happen to hold the coldwater hobby very close to my heart, and it bleeds when I realise just what a close shave we have just had. So, support our hobby and our industry, and support those who stand up on our behalf.

Useful addresses:
OFI (UK), Bedford Business Centre, Mile Road, Bedford MK42 9TW. Tel: 0234 355315; Fax: 0234 273550.

OFI — Ornamental Fish International Secretariat: PO Box 445, Corsham, Wiltshire SN13 0RD. Tel: 0225 810084; Fax: 0225 811215.

your 'pride and joy'. And, don't forget, when you buy from your aquatic or pet retailer, you are not simply buying a fish or a pump, but with these items comes the 'added value' of the retailer's advice which, effectively, has been supplied for free!

OFA club success

It seems to be a retailer special this month! But, where would the hobby be without the sterling efforts of the men and women in the high street stores and the aquatic centres?

January's *Coldwater Jottings* carried an item about **Ornamental Fish and Aquatics** in Bristol, so I was delighted to hear from them recently with regard to the success of a customer club, which was launched at the end of last year.

Bristol is, possibly, the capital of Goldfish keeping. It was, in fact, members of **Bristol Aquarists Society** who first developed the Bristol Shubunkin. So, I had high hopes that **Virginia and Mark Stevens'** business venture would be a success. It would appear that this is very much the case.

The business launched the OFA Club in December 1993 and by the end of March had in excess of 300 members, from as far afield as Manchester and the Isle of Wight, and even a member in Norway, who returned home from Bristol with a collection of fish!

"We feel that the relationship between customer and retailer is a two-way street, and we wanted to return customer loyalty," explained Virginia Stevens. "Equally, our customers wanted to feel comfortable about coming to us for advice at any time. Our constant aim is to provide an excellent service and the best quality fish, thereby encouraging interest in the hobby and promoting fish welfare."

Membership of the OFA Club is free and applications from long-distance members can be made by telephone. Members receive a regular newsletter and membership is renewable on an annual basis.

For details, contact: **Mark and Virginia Stevens, Ornamental Fish and Aquatics, The Lido, Alcove Road, Fishponds, Bristol. Tel: 0272 585366.**

Praise for Anchor

Unsolicited testimonials are by far the greatest accolade any retailer could wish for, so I am delighted to reflect some of the praise given by a customer of a Stockport retailer.

Anchor Aquatics, Stockport, went to the aid of customer **Keith Kimber** when he and his wife built a double aquarium to house a collection of Fancy Goldfish which had become neglected by a friend.

Keith takes up the story:

"Feeling rather upset by the neglect of the system, and that a beautiful Veiltail was on its 'last legs', I contacted my local aquatic supplier for advice. Charlie, at Anchor Aquatics, told me to bring it to him immediately, and prepared a hospital tank with medicated water and plenty of oxygen. After a week of care, the fish fully recovered and is now happy in its rightful home."

Concluded Keith: "Not only has Charlie gained a new customer, but he has also gained a friend; his new business deserves to be successful."

Fingers and thumbs

Talking of aquatic retailers, I spent a few hours on the other side of the counter recently, helping at an aquatic centre one Sunday afternoon. And what an experience! Hundreds of fishkeepers milling around, admiring the fish displays and dreaming of that Koi pool. Some come just to look, several to buy, and hopefully, some of the 'lookers' on the day will be customers the following weekend.

But, have you tried bagging half-a-dozen Comets with a crowd of two dozen people looking to see how it's done? Not good for the nerves, I can tell you! In the peace and quiet of my own back garden set-up, I can sort fish all day long with nary a slip. But in front of the audience in the aquatic centre, I felt all fingers and thumbs!

So, spare a thought for the retailer when you are picking out

One of Keith Kimber's inherited Fancy Goldfish... in perfect health after helpful advice from a local retailer.

KEITH KIMBER



TRADE TALK

Cyanide testing threatens Philippine marine exports

The supply of ornamental marine fish from the Philippines is threatened by the introduction of cyanide detection testing at Manila airport. This has led to an appeal for training in net capture by **Ocean Voice International** and **Harbor Foundation for Conservation of Natural Resources**.

The Philippines is a major supplier of ornamental marine fish to the world market, and has had a reputation for using sodium cyanide for collecting both food and aquarium fish (a tendency which is now in decline).

The introduction of cyanide testing laboratories to be run where aquarium fish are exported means that shipments with detectable levels of cyanide will not be granted export papers.

According to **Dr. Don McAllister** of Ocean Voice, the answer to providing a steady supply of 'clean' fish is training in the correct net-catching methods. "This is needed to provide the proficiency to catch the variety and number of fish to meet the industry's needs. The training, as well as lessons in improved holding, packing, and shipping methods, can be provided by the Harbor Foundation for the Conservation of Natural Resources and Ocean Voice International."

A video on net capture, and a manual on coral reefs, have been produced by the joint associations, who are also calling for increased funding: "The number of net-training teams needs to be expanded from two to four. This would enable the job to be completed in less than two years."

For information and donations, contact: **Ocean Voice International, PO Box 37026, 3332 McCarthy Road, Ottawa ON, K1V 0W0, Canada.**

Pump production plant for UK

Italian-based pump manufacturer **Lowara** is to build a major pump production plant in the UK to manufacture a new generation of high-tech pumps.

Lowara UK Ltd, the British group operation, will triple the size of its premises in Axminster, Devon to create the new manufacturing facility. Work on the 2,500 square metre production area adjacent to the existing plant is expected to be completed by October, with a new office complex ready by

November and full production anticipated by July 1995.

The pumps are the latest developments to come out of **Lowara's** new design centre in Agrate, Italy, and components will be sourced from around the world.

John Thorne, managing director of Lowara UK, remarked: "We are delighted by the news. Not only will this be one of the group's largest manufacturing sites in Europe, but it will produce models incorporating some of the most exciting new technology available at present."

Full details available from **Lowara (UK) Ltd, Tel: 0297 33374; Fax: 0297 35238.**



Lowara's new plant — scheduled to be fully on-line by July '95.



Part of the Wardley range now distributed by Zentec

UK agency for Zentec

Aquatic supplies company **Zentec** has been appointed as the sole UK agent for the Wardley ranges of fish foods.

"We are excited to be working with Zentec in the United Kingdom," remarked **James Devine**, export manager of Wardley International. "Zentec is a professional company with a superb range of innovative and quality products, together with knowledge and experience throughout the team."

Among the products in the Wardley range are **TEN** (Total Essential Nutrition), **Total Floating Pellets**, **Premium Koi Foods** and **Wardley Pond Stix**.

For further details contact: **Zentec Ltd., 10 Lloyds Court, Manor Royal, Crawley, West Sussex RH10 2QX. Tel: 0293 400128; Fax: 0293 400129.**

OFI (UK) News

1 Gill research

A research bursary has been awarded to **Lance Jepson** and **Bernice Brewster**, to investigate the diseases of Koi gills during and after transportation.

Bacteria and other organisms present on gills of newly-imported and acclimated fish in the UK will be investigated and "...the results of the project will be available to members and should contribute to the development of improved handling and transport techniques."

2 Aquarium testing successes

Glass aquaria manufactured by **Hagen** and **GB Aquariums** have passed the necessary tests required by OFI (UK) to be able to carry the organisation's "approved product" logo to help promote sales of safe glass aquariums.

The two join six companies already approved by OFI (UK) **Tahiti, John Allan, Seabray, Red Sea Aquariums, Merli and Clear-Seal.**

For information contact **Keith Davenport, Chief Executive OFI (UK) Ltd, Bedford Business Centre, 170 Mile Road, Bedford MK42 9TW. Tel: 0234 355315; Fax: 023 273550.**

Tetra whispers

Following the acquisition of **Willinger Bros.** by **Tetra** in USA, distribution of **Whisper** pumps, as well as **Plantastic** has been transferred from **Interpet** to **Tetra**.

Enquiries for **Whisper** and **Plantastic** should now be addressed to: **Tetra, Lambe Court, Chestnut Avenue, Eastleigh, Hants SO5 3ZQ. 0703 620500. Fax: 0703 620500.**

API's UK expansion

Aquarium Pharmaceuticals Inc., of Chalfont, Pennsylvania USA, has expanded its service area to include England, Ireland and Wales. The company manufactures 150 aquarium and pond products for distribution to 25 countries and, in the USA, has the largest share of the market for aquarium test kits, water filtration and water conditioning products.

Demand for API's products is the reason for the company's decision to establish a comprehensive marketing programme and a complete warehouse facility in the UK. The warehouse is operated under the direct UK sales manager **Patrick Durkin**, and the company ensures a turnaround time of hours from the time an order is received to the dispatch of the product.

For further details contact **Patrick Durkin** on 0865 586

BAF'94 NEWS

The Federation of Northern Aquarium Societies (FNAS) is pleased to announce that the 1994 British Aquarist Festival will be held at its usual venue, Bowler's, in Trafford Park, Manchester. The dates for the Festival remain unchanged: 29-30 October '94. For further details, contact Mrs G. Briggs, Hon. Sec. — FNAS, 54 Turner Avenue South, Ilkington, Halifax, HD2 8EQ. Tel: 0422 249872.

Potteries address change

The new address of the secretary (Mrs M. Lawless) of the Potteries and District Catfish and Cichlid Group is 11 Garsdale Crescent, Blunton, Stoke-on-Trent, Staffordshire.

Marine seminar draws the crowds

The INTERNATIONAL MARINE AQUARISTS ASSOCIATION seminar Marine '94 held at Chester Zoo in March proved to be an exciting success, according to the association's Colin Grist.

"There was a very good response for advanced bookings and the committee was very pleasantly surprised with the numbers who turned up on the day," remarked Colin, who was delighted to report that no fewer than 15 new members joined the association, some of whom have shown an interest in being involved with the association's Captive Breeding Group. The event also helped to raise funds to support the association's

SOCIETY WORLD

breeding projects, among other activities.

The trade stands included New Technology, Rocoon, Coral Reef Technology, Lahaina and Interpet, while the Aquarian Advisory Service made a surprise appearance. Dr David Ford having recently become a patron of the IMAA.

"The main features of the event were the lectures," added Colin Grist. "Chick Holland" presented a very interesting talk about the technicalities of filtration and water management for reef systems, and he was subsequently able to support his talk with practical working demonstrations on his trade stand.

"Les Holiday, who is an excellent photographer, gave a fascinating slide presentation which illustrated reef ecology and conservation based upon his expeditions to exotic places as a marine consultant. Les also put up an interesting display about his work with Kenya Diani Marine Reserve Expedition, and Dr Gordon McGregor Reid, curator-in-chief at Chester Zoo, talked about the role of zoos in

aquatic conservation. Gordon's information about conservation and captive breeding was invaluable and obviously helps organisations such as IMAA."

Concluded Colin: "Chester Zoo's aquarium staff were also extremely helpful above the call of duty, by taking many seminar visitors behind the scenes at the Aquarium."

For further IMAA details contact Colin Grist, 41 Redcliffe Street, Cheddar, Somerset BS27 3PA.

Tableaux at Supreme Festival

The addition of tableau features promises to be one of the main attractions at this year's Supreme Festival of Fish-

keeping

(Pontin's Sand Bay Chalet Hotel, Weston-super-Mare, 4-6 November).

Organisers FBAS will also provide free accommodation on the night before the event starts, including evening meal and breakfast, to two members of each society

NOTE TO SHOW SECRETARIES

This column endeavours to bring you the most extensive advance notice of forthcoming society dates, with events listed, where possible, the month prior to their occurrence. To help ensure that your society events are included in this section, please let us know at least eight weeks before the beginning of the month of publication. Please send your details to: **Diary Dates, Aquarist and Pondkeeper, 9 Tuffon Street, Ashford, Kent TN23 1QN.**

Enforced rest for FBAS Chairman

Due to ill-health, FBAS Chairman Joe Netherseil will be taking an enforced leave of absence for the next three months. In order to maintain continuity of operations, particularly regarding major shows and festivals, readers please note that Vice-Chairman Colin Richards will be handling all business previously directed to the Chairman. His address is: Beechwood Cottage, Long Grove Wood Farm, 234 Chartridge Lane, Chesham, Bucks HP5 2SQ Tel: 0494 773094

participating with a tableau. "This will enable those with long journeys plenty of time to set up their exhibit well ahead of the main arrivals of residents on the Friday of the event," explained an FBAS spokesman, who added that, should extra staff be required to erect any tableau, then a special rate of just £15.00 per person would be available for the Thursday night.

FBAS stress that tableaux should be in keeping with aims of the Supreme Festival: information, education and entertainment; individual species of fish forming part of each tableau would not be eligible for the main European Open Show held on the Sunday, but furnished aquaria and aquascapes would be judged as such.

Societies displaying tableaux are expected by the FBAS to ensure that their tableaux is staffed by their members at all times in order that information about both the tableau and their society can be provided.

Details about the event are available by contacting **The Supreme Festival of Fishkeeping, 8 Acacia Avenue, Brentford, Middlesex TW8 8NR.**

June

Sunday 3

North West Cichlid Group — Fourth Annual Open Show, Skelmersdale Labour Club. Auction and refreshments. Details: **Karen Horrocks**, Show Secretary, 70 Morton Street, Middleton, Manchester. Tel: 061 643 2764.

Sunday 19

Loyne AS — Second Annual Open Show, Vale of Lune Rugby Club, Lancaster. Details: **Mrs P. Penswick**, Show Secretary, Tel: 0524 388117 or **Mrs J. Taylor**, Tel: 0524 669962.

Sunday 26

Portsmouth & District AS — Interclub Show, Buckland Community Centre, Malins Road,

Portsmouth. Details: **Vernon Hunt**, 'Caeglas', 20 London Road, Widley, Waterlooville, Hants. PO7 5EW. Tel: 0705 6116148.

Association of Midland Goldfish Keepers — Open Show, Foleshill Community Centre, Foleshill Road, Coventry. Entry forms: SAE to **Mick Smith**, 8A Howard Road, Rising Brook, Stafford ST17 9EW. Closing date: 11 June.

Tongham AS — Open Show. A of A Superbowl round. Details: **A. Pearce**, 4 Newlands Drive, Ash Vale, Aldershot, Hants GU12 5EA.

Workington and District AS —

Open Show and auction, Cumberland Hotel, Belle Isle Street, Workington. Details: **B. O'Neill**, 3 Lower Lane, Seaton Workington, Cumbria CA14 1JF.

July

Saturday 2

Nalaise and District AS — Annual Open Show, Groves Sports Centre, Nalaise. Judging: 1pm; Auction: 1.30pm. Details: **Wally Holland**, Chairman, 47 Woodland Road, Nalaise, Bristol, Avon. Tel: 0275 855950.

Saturday 9

Port Talbot AS — 24th Annual

Open Show, Talbot Youth Centre. Details: **John Egan**, 53 Pentre Atan, Baglan Moor, Port Talbot, West Glam. SA12 7RN. Tel: 0639 821126.

Sunday 17

TV Cats — Open Show, A of A Superbowl round. Details: **Malcolm Goss**, 25 The Gowers, Chestnut Lane, Amersham, Bucks.

Sunday 24

OASIS (Ordinary Aquarists Society in Sunderland) — Auction only at Thompson Park Community Centre, Monkwearmouth, Sunderland. Details: **Mrs Avril Banks**, Secretary, 122 Moor Crescent, Gilesgate Moor, Durham DH1 1DL. Tel: 091 384 1433.

This is the beautifully patterned and appropriately named Marbled Hatchet — *Carnegiella strigata*.



Myer's Hatchet — *C. myersi* — not that often seen in the hobby, has an attractive black edge to its 'keel'.



Two excellent Pectorosus Hatchets — *Thoracocharax securis*.

Hatchetfish Factfile

Common Name: Hatchetfish, sometimes Freshwater Flying Fish.

Scientific Names: *Gasteropelecus*, *Carnegiella* and *Thoracocharax* species.

Distribution: Panama to the Rio Plata in Argentina.

Diet: In the wild, insects that fall on the water.

Special Requirements: Prodigious jumpers; must have a completely covered aquarium.

Habits: Leap out of water and 'aqua-plane' when scared; they don't actually fly.

Flying Hatchets

The Hatchetfish, which are placed in their own family, the Gasteropelecidae, have been called freshwater flying fish because of their habit of leaping from the water to avoid danger.

The name 'hatchet fish' comes from the unusual shape of the belly which is extended downwards to form a thin blade-like keel resembling a curved hatchet. This 'blade' is formed into a large keeled lobe by the expansion of the lower shoulder blades along the lower surface of the thorax to support the enlarged powerful muscles that operate the long pectoral (chest) fins. These muscles are so large that they account for up to a quarter of the weight of the fish.

Flying gear

When swimming, the pectorals, which have thickened leading spiny rays, are held stiffly to the side of the body, but when the fish leaps out of the water, the fins are beaten onto the surface with a powerful downward stroke so that the fish passes across the surface with just its anal fin and

Peter Copon introduces the most popular species of hatchetfish and offers tips on how to keep and breed them.

Photographs: Max Gibbs, the Goldfish Bowl, Oxford

tail in the water and its keel cutting the water surface. This action is more in the nature of aqua-planing than real flying.

Hatchetfish can, and do occasionally leave the water completely. At such times, the pectorals, body shape and beating action will, together, give a fish a certain amount of lift, not sufficient to enable it to fly, but rather to retard the effect of gravity.

In many species, the base of the anal fin is marked by a dark line which, when the fish is aqua-planing, will be level with the water surface.

The lateral line bends down abruptly in the direction of the anal fin so that when the fish is aqua-planing, the end portion of the lateral line will still be in the water and able to function.

The lateral line in most fish is used to detect the movement of other creatures in the water and the closeness of submerged objects, but how sensitive this sense is when the pectorals are rapidly beating the water surface and creating pressure waves of interference, is a matter of conjecture. It is likely, however, that the immersed posterior section of the lateral line is used as an extra sense of balance. This would ensure that when the fish is upright, with its rear end in the water during one of its semi-aerial trips, the sensory cells of the lateral line will indicate that all is well. If the fish is toppling over, the uneven pressure on one side of the lateral line will cause the fish to correct its posture. Of course, in addition, balance is also controlled by the inner ear and by the fact that light naturally always falls on the dorsal surface.

Hatchet selection

The various members of the Gasteropelecidae have a wide natural range which extends from Panama in Central America, to the Rio Plata in Argentina. When pur-

chasing specimens it is always a good idea to enquire as to the source of the import, if this is known to your dealer, for water temperatures and conditions can vary considerably over the family's range.

Argentinian fish will, for instance, be used to cooler water than species from the Amazon basin.

As far as the aquarist is concerned there are three genera in the family Gasteropelecidae — *Gasteropelecus*, *Carnegiella* and *Thoracochanna*. All members of these genera have the same basic deep-keeled hatchet shape and the same habits. Some species lack the small adipose ('second dorsal') fin and there are variations in colour patterns, but generally all species are very similar.

1 Common Hatchefish

The common name given to this fish (known scientifically as *Gasteropelecus sternicla*) is usually, simply, the Hatchefish. It has the keel common to all its group, with a straight back extending almost as far as the caudal peduncle, where there is a slight dip to accommodate the dorsal fin which is set well back, as is usual in surface-dwelling fish. The anal fin is also set well back on the underside, where the curved keel turns back towards the tail.

This species' native habitat is the Amazon and its larger tributaries, where it grows to about 6cm (2.4in). The colour is yellowish to a yellow green, with silver reflecting scales, the colour being darker on the back and paler below. On the flank is a brown-to-black line with pale green lines above and below it. There are also two further less distinct and often variable lines bordering the green lines.

The pelvic fins are almost non-existent and all the fins are clear, except for a dark band on the leading edge of the dorsal.

The Common Hatchefish is a surface feeder and, in the aquarium, is particularly fond of mosquito larvae, although it can be encouraged to take the better quality flake foods.

As far as is known neither this species, nor any of the other species, is bred commercially, so all the specimens seen for sale are wild-caught fish. This is borne out by the fact that those specimens seen in the shops are usually above 5cm (2in) in length.

Reports from the wild indicate that the fish live in shoals, both near the river banks and in open water, so really single fish or pairs are not suitable for the aquar-



The common Hatchet — *Gasteropelecus sternicla*.

A rare sight: the Indian Hatchet — *Chela leubuca*. This species seems to be somewhat less restricted to the upper reaches of the water than some of its relatives.



ium; they are more likely to thrive if kept in groups of at least six fish.

In the wild, the fish leaps and aquaplanes for up to two metres or more when disturbed, and can leap clear of the water when attacked by a predator. With this knowledge, it is only commonsense to cover their aquarium securely. Indeed, in uncovered tanks in shops, Hatchets have been observed to leap from tank to tank, finally ending up in an aquarium far removed from the one that the shop keeper originally placed them in.

Newly acquired Hatchets are often nervous and refuse food, but in a quiet situation without over-boisterous companions, they readily adjust to aquarium conditions. As a word of warning, remember that Hatchets are surface dwellers, so any that continually swim low in the water are best not purchased.

Many species (not just this one) come from softer water areas; this will obviously cause them great stress if they are moved straight into hard water. When I was in the trade, because I only needed to buy the fish in dozens, rather than hundreds, I usually purchased my supplies from a local wholesaler who acclimatised his fish to the local water conditions before releasing to the retail trade.

2 Spotted Hatchefish

Gasteropelecus maculatus grows to 9cm (3.5in) and is rare in the aquarium trade. It is the same basic shape as *G. coronatus* (see below). The ground colour is grey-green to brownish-green, with some specimens showing a bluish sheen.

From the operculum (gill cover) to the caudal peduncle, there is a dark stripe bordered above by a silver line. A small number of individual scales are dark, giving the fish a spotted look. All the fins are colourless, except the dorsal, which has a dark edge.

3 Other species

The Silver Hatchefish (*Gasteropelecus levis*) comes from the lower Amazon and grows to 6cm (2.4in). It has no adipose fin and is very similar in appearance to *G. sternicla*.

It often has a dark blotch at the base of the dorsal and, occasionally, a black streak at the base of the anal fin; otherwise classification is by dentition, fin ray and scale counts. Generally, the behaviour and requirements are the same as for *G. sternicla*. There is another Silver Hatchet (*T. stellatus* — see later on).

Gasteropelecus coronatus — which also grows to 6cm — comes from the Peruvian Amazon and rarely finds its way into the aquarium trade. The only difference from *G. levis* is in the number of teeth, and many authorities believe *G. coronatus* is simply a local race of *G. levis*.

4 Black-winged Hatchefish

Carnegiella marthae is found in Venezuela, Peru, parts of the Amazon, Rio Negro and Orinoco river.

Its existence in the Orinoco and the Amazon poses a question, for the two rivers are not regarded as being connected, although they do have tributaries that arise from opposite sides of the same relatively low water shed. Possibly, in recent geological history, the two river systems were connected, or perhaps occasionally today, at times of flood, fishes are able to make their way from one river to the other.

This species is the smallest of the aquarium Hatchefish, with an adult size of only 3.5cm (1.4in). The middle of the pectoral fins is darkly coloured, hence the common



name of Black-winged Hatchet. From the gill cover to the tail, there is a dark stripe, and above this, a silvery band. The breast and the flanks are edged in black, and there is a row of fine spots on the flanks and two black on the cheeks. This species has no adipose fin.

It was not introduced to European aquarists until 1935.

5 Marbled Hatchetfish

In the 1950's, *Carnegiella strigata* was probably the most popular of the aquarium Hatchetfish but seems, in the intervening period, to have lost a certain amount of popularity, although on a recent trip around the shops, I did notice that it appears to be making a come-back.

It is native to the Amazon and Guyana and grows to 4.5cm (1.8in).

The ground colour is a yellow-green, showing silver by reflected light; the back is dark olive, with darker dots and stripes. There is a dark stripe from the operculum to the caudal peduncle, with a silver margin to the upper side. There are also three irregularly shaped black bars on the keel. The fins are colourless and the adipose fin is absent.

It has been suggested that there are two subspecies, *C. strigata strigata* and *C. strigata vesca* (also referred to as *C. s. fasciata*). Whether this is, indeed, the case or not, this fish was originally introduced

Hatchetfish breeding tips

- 1 Soft water preferred for breeding. Can be adapted to harder water.
- 2 Normal temperature — 75°F (24°C), but prefer low 80's°F (c28°C) for breeding.
- 3 Small transparent eggs laid in fine-leaved plants.
- 4 Eggs hatch in about 30 hours.
- 5 Raise and feed fry as for common tetras.

into Europe in 1912.

Once well established in an aquarium Marbled Hatchets are hardy and greedy eaters.

6 Pectorosus Hatchet

Thoracocharax securis comes from the Amazon and its tributaries. It grows to 9cm (3.5in) and is rarely seen by the fish-keeper, although its first European introduction dates back to 1910.

The ground colour is yellow-brown to pale olive, showing silver by reflected light. As the fish ages, the body deepens until its depth and length are almost the same.

The pectorals on this species are probably the longest possessed by all the species that have been maintained in the aquarium; when held low they stretch back to well below the anal fin.

7 Silver Hatchet

Thoracocharax stellatus is similar to *T. securis* and ranges from Central Brazil to Argentina.

The differences, as far as the aquarist is concerned, are that the pectorals are shorter, there is a black stripe on the leading edge of the dorsal, and the keel is not as deep.

Breeding

Several of the Hatchets have been bred in captivity. *G. levis* — one of the so-called Silver Hatchets — is reported as one success, where the male drives the female into fine-leaved plants to deposit her eggs. In the wild they spawn among the fine roots of plants along the river banks. The male drives the female by swimming alongside her and not by a chasing action, as is com-

mon in many fish.

Although single pairs have been spawned in aquaria, it is to be expected that in the wild, communal spawning is normal. The eggs hatch in about thirty hours and the care and the rearing of fry is the same as you would give to the common tetras.

Tanktips

Hatchetfish are interesting additions to our collections and provided they are given a quiet environment and reasonable water conditions when first introduced, they usually settle in well. Surprisingly, for a fish primarily from the Amazon area, they are not particularly concerned about water hardness, as long as the change-over is not too drastic. I have kept them in both London and Essex tapwater, but for breeding, softer water is probably preferable.

Hatchetfish are peaceful but, like most other fish, if something fits in the mouth, be it mosquito larvae, *Daphnia* or your best livebearer fry, it's all food. They rarely take food from the lower levels of the tank and never, in my experience, pick up food from the bottom of the aquarium, so extra care is needed, with diligent siphoning or the inclusion of suitable scavengers to make sure missed and lost particles of food do not foul the gravel.

One of the most important things to remember about Hatchets is that it is in their nature to jump, particularly when disturbed or startled, so a well fitting cover is a must for any tank. Even the smallest gap in the cover-glass, such as the small triangle where the air-line and heater wire enter, is too much; holes such as these are best plugged with a wad of filter floss. Whatever you do, don't leave your Hatchetfish tank uncovered or all your fish will disappear, only to be found later dried up in the darkest corners of room.

FASCINATING FISH FACTS

Calling all Cardinals

Cacuri set in a jungle creek off the Rio Mamok — a Rio Negro tributary.



Did you know that you can collect Cardinals (*Parachanna axelrodi*) by calling them out of hiding? Unlikely though this may sound, it's absolutely true!

If you are collecting Cardinals in the shallow creeks of the Rio Negro in the Brazilian Amazon, you set traditional — and highly effective — traps known as cacuris. However, cacuris can't be used in deeper areas of flooded forest. What you then do is simply flick the middle finger of your hand on the surface of the water ... and the splashing sound brings the Cardinals out of hiding. If you also drop in a small amount of bait (usually boiled fish), the results are even more dramatic.

What the Cardinals are actually responding to is a bit of a mystery. Mystery or not, though, the caboclos who collect these delightful fish for the ornamental fish trade have somehow learned about this almost incredible characteristic and have therefore become expert 'Cardinal callers'!

Hampton show set for another success



Just one of countless aquatic displays at last year's event.

High summer: thousands of perfect flowers, from old favourites to new varieties; plants of the Third World; garden-friendly 'good bugs'; soaring conservatories and marvellous water spectacles; the mythical Green Man and the Magic Roundabout's Dougal — for sheer exuberance, there can be nothing to match **Hampton Court Palace Show**, the world's largest annual gardening event. The 1994 show, organised for the second year by the Royal Horticultural Society, takes place from **6-10 July** (Preview Day 5 July).

Spread over 25 acres will be eight floral marquees, magnificent show gardens, more than 800 exhibitors, this year's aquatic section (the Aquatic Village) — alongside the Long Water, garden sundries from equipment to original art and a colourful crafts village.

Incredibly, lack of space (such has been the demand for stands this year), has dictated that the overall size of the Aquatic Village will remain, basically, as last year... although this has meant disappointment for some of the additional exhibitors who have applied for space. We will, of course, be there throughout the show. Drop in for a chat at any time.

In addition to the stands themselves — both within and

outside marquees — there will be more than 25 show gardens, the work of established garden designers as well as precocious new talent.

As always, charities will have a high profile, and their themes will include a soil-free garden for the National Meningitis Trust; *Lost in Time* featuring all manner of time pieces, the work of young people from the Prince's Youth Trust; *The Ugly Bug Ball* for Action Research and a garden for all ages for Age Concern, designed by Barbara Hunt, the 1992 and 1993 winner of the Tudor Rose Award. Many of the gardens will have a strong environmental theme, including Christian Aid's *Making the World a Greener Place* and the WWF's garden which uses sound ecological practices and processes.

The RHS Hampton Court Palace Flower Show will be open to the public from **Wednesday, 6 July to Sunday, 10 July from 10.00am to 7.30pm (5.30pm on Sunday)**. Admission is £14 for adults, £11 for RHS members and £4 for children over 5. Tickets can be booked in advance on 071-344 4444 (public) and 071-344 9966 (RHS members). A £2 rail voucher will be given with every ticket booked in advance.

For further information please contact **Sylvia Holder or Lindsay Swan, Holder Swan Public Relations, 70 Chalk Farm Road, London NW1 8AN. Tel: 071-262 6022. Fax: 071-485 1470.**



SEAVIEW

BY GORDON KAY



Nitrate control

When I started to keep coral fishes back in the 70's, nitrate was dismissed almost out of hand by everyone. It was always claimed in books and magazines such as this, that nitrates — as the end product of the nitrogen cycle in the aquarium — were so harmless that they could be ignored. Only authors with the foresight of people like **Stephen Spotte** bothered to mention nitrates, and even fewer actually warned us that they could be harmful.

Happily, things have gradually changed, until now we are much more aware of nitrates and what they can do. I, myself, have been telling you that because nitrate is found in only the minutest quantities in the wild, there is no place for it in the aquarium, especially when keeping anything remotely delicate.

As a result of all this awareness, more and more people are asking me about nitrate filters (sometimes called de-nitrators) and how they work. It's very simple really.

Basically, yer average biological filter will convert ammonia to nitrite, then nitrite to nitrate — then, stop. Nitrate accumulates until diluted by water changes ... or absorbed by plants. Obviously, the more frequent the water changes, the lower will be the concentrations of nitrates in the aquarium.

Well, that's the theory. In reality, it would be more accurate to say that the more frequent the water changes, the slower the rate of nitrate accumulation. Even that assumes that all other components are in place and working properly. It also assumes, of course, that you are replacing old water with water containing NO NITRATE whatever. Most tapwater, though, has considerable quantities of nitrate — among other chemicals — and has to be treated before we even make up our seawater. However, that, as they say, is another story.

Usually, the best we can hope for is to manage to keep the whole thing in equilibrium. A denitrifying filter takes the whole process one step further by utilising anaerobic bacteria — those which like conditions of low oxygen — to convert nitrates to

nitrous oxide and then further to free nitrogen.

Aquarium water is slowly passed over a medium such as coral gravel, in much the same manner as it is in a normal biological filter. There are a couple of significant differences, though. This is the last stage of the filtration process and, as such, is very low on oxygen. Secondly, the water is passed over the filter medium very slowly.

In fact, the water moves through the filter at a critical rate. If the flow is too great, then the wrong type of bacteria will multiply and begin to convert the nitrate back to nitrite. If the flow of water is too slow, on the other hand, then hydrogen sulphide is produced — and you know what that smells like! Personally, I use a combination of a nitrate filter, with plenty of good old water changes.

Dominating sharks

The stereotypical shark is a solitary hunter that ranges the oceans looking for food, right? WRONG! That is true of the

Great White and the Tiger Sharks, but most species live at least part of their lives in groups.

The most spectacular example of this gregarious behaviour is shown by the Scalloped Hammerhead (*Sphyrna lewini*). Daytime groups of more than 100 animals are common near islands and seamounts in the Sea of Cortez.

Unfortunately, little documented evidence exists about the social behaviour of sharks, although dominant/subordinate associations have been reported between different species. Oceanic Whitetip Sharks dominate Silky Sharks of comparable size when both species are feeding. Silvertip Sharks dominate Galapagos Sharks, while both species dominate Blacktip Sharks. Such interactions, however, may actually reflect anti-predatory behaviour on the part of the subordinate species.

Social hierarchies among members of the same species have also been reported and — in Bonehead Sharks, at least — females tend to keep well away from males, regardless of size. The reason for this shyness is

unclear, but the harassment and bites that the males of many species inflict upon females during mating may explain why females give them a wide berth.

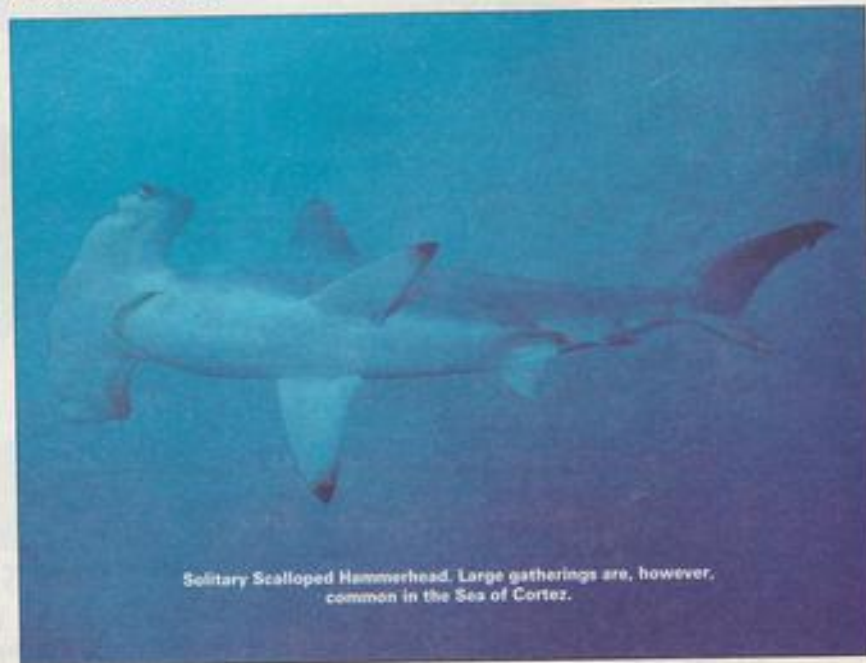
It should be noted, however, that such biting is not the sole domain of the males. Females inflict bites on other females — even during non-feeding periods — and sometimes even males show similar wounds.

Sad loss

It was with great regret that I learned of the death of the actor and conservationist, **Bill Travers** in March. Bill was a lovely man, who did much to bring to the fore the plight of animals in captivity. You will recall his involvement with the *Into the Blue* campaign in '91, when captive dolphins were released successfully into the Caribbean.

He once said "I despise the conceit that the world was made for us". Now, where have I heard that before?

Thank you, Bill, for all you did and everything you stood for. The good wishes of all of us, I'm sure go out to your family.



Solitary Scalloped Hammerhead. Large gatherings are, however, common in the Sea of Cortez.

The rise and rise of the Baltic

At the end of the last Ice Age, 10,000 years or so ago, the Scandinavian ice-cap began to melt. The reduction in the ice's weight led to isostatic uplift of the underlying land and a freshwater lake was formed in the Baltic region, south of the ice-cap. This lake is now referred to as the Baltic Ice Lake.

The vast quantity of water that resulted from the melt caused a rise in sea level which overtook the isostatic rise of the land. The ice-lake was therefore flooded around 500 years later and became the Yoldia Sea.

Isostatic uplift continued at a great rate after the ice-cap had melted and this overtook the rise in sea level approximately 8,000 years ago. The Baltic area then became a freshwater lake again — this time called the Ancylus Lake — and stayed as such for some 4,000 years.

Then, the final rise of sea-water outpaced the slowing isostatic uplift and produced the Littorina Sea — after the periwinkle — which eventually became the Baltic of today.

SNIPPETS

1

In March 1971 — after lying dormant for nearly a year — the Mauna Ulu vent of volcano Kilauea, Hawaii, began to erupt. The entrance into the sea of the hot basaltic lava did not produce the usual clouds of steam. Instead, the surface of the molten rock cooled on contact with the water, forming a brittle tube, within which the lava continued to flow. For the first time, erupting molten lava was photographed underwater by scientists from the University of Hawaii.

2

Dinoflagellate plants can cause a remarkable discoloration of the seawater, known as a red tide, when a combination of favorable conditions produce a massive bloom of a species, resulting in concentrations of over 500,000 cells to every TWO

PINTS of water. Such phenomena can have a disastrous effect on local marine wildlife.

3

The Minke Whale (*Balaenoptera cucubronstrata*) is rarely more than 30 feet long and has a characteristic white patch in the middle of each flipper. Minke live in temperate and polar seas of both hemispheres, those in the northern hemisphere being smaller than those in the south.

4

The Grey Mullet lives in shallow waters over muddy or sandy sediments. Here it feeds — head downwards — grubbing up decomposing animal and vegetable matter from the bottom. The Grey Mullet is well equipped for this

lifestyle, with a thick-tipped mouth fringed with minute teeth. A muscular stomach then grinds the food before it passes to the intestine.

5

The age of a baleen whale can be estimated by counting the number of layers laid down in a horny plug found in the external ear.

6

Salmon spend their entire adult life in the sea, only returning to their native river to spawn. Atlantic Salmon may make two or even three spawning migrations in a lifetime, but the Pacific Salmon spawns only once, dying shortly afterwards. How salmon are able to find their way back to their particular river remains one of the great mysteries of the sea.

Grey Mullet (*Mugil cephalus*)... the perfect 'grubber'.



WILLIAM ROSS

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FIRST STEPS

Gouramis FOR ALL

Most of us have added a pair of gouramis to our community tanks at some time in our fishkeeping career. The bright colours and hardy nature of the more common species make them ideal community fish.

However, those relishing more of a challenge can keep and try to breed the Giant Gourami (*Ophromemus goramy*) growing to over 70cm (over 27in), or the tiny Croaking Gourami (*Trichopsis pomaui*) which reaches a mere 3cm (1.2in) when fully grown. There is, in short, something for everyone within the world of gouramis.

What are gouramis?

Gouramis are labyrinthfish. That is, they have an accessory breathing organ called a 'labyrinth organ', which allows them to breathe air. This is a complex structure, situated behind the gill covers.

In the wild, gouramis often live in small, stagnant pools where the labyrinth organ is essential if the fish are to obtain sufficient oxygen to breathe. In addition, these pools often contain high levels of suspended solids and algae, which choke the gills of 'conventional' fish, but do not affect the air-breathers. Consequently, many such pools are populated only, or predominantly, by labyrinthfish.

The species of gourami available in the hobby are listed in the table. They originate from India and the Malay Peninsula. Today, due to transportation for the ornamental fish trade and, in the case of the Giant Gourami and Kissing Gourami (*Helotoma temminckii*), for food, they are found living wild in places as far afield as Guyana (South America) and Victoria (Australia).

Aquarium suitability

Most gourami species can be kept in aquaria and make excellent additions to the community tank, so long as they are not placed with larger or aggressive species.

Exceptions to this include the small and very shy species such as the Chocolate Gourami (*Sphaerichthys ophromenoides*) and Liqueurice Gourami (*Parosphromenus deineri*), which require a single-species aquarium.

Dr David Pool of the Tetra Information Centre presents the perfect introduction to these popular and beautiful freshwater tropicals

Because of its large size, *Ophromemus goramy* is not suited to anything but the largest accommodation, although it will happily live in a large aquarium with other similarly-sized fish.

Maintenance

For most gouramis, aquarium maintenance presents few problems. Water conditions are not critical, although extremes should be avoided. A pH of 6.5 to 7.2 (on either side of neutral), GH (General Hardness) 6 to 12, and temperature of 75° to 82°F (24-28°C) are ideal. Sudden changes in water quality are more of a problem than the conditions themselves and, if acclimatised slowly, gouramis can adapt to values well outside the above range.

The aquarium itself should be at least 18×12×12in (45×30×30cm) and have a light cover to prevent the occupants escaping. Lighting should be used to encourage algae and plant growth, but shaded areas are important, as these fish do not like bright light.

Abundant plant growth is needed to provide shade, as already mentioned, and to provide refuge for shy species and for the females after spawning. A wide variety of plants are suitable for this, including Cryptocorynes, Amazon Swords and Cabomba. Floating plants should also be added, as they provide strengthening for the bubble-nests. Riccia and Indian Fern (*Ceratopteris*) are commonly used.

Filtration should be employed to maintain good water quality. Gouramis are usually found in slow-flowing, stagnant waters, therefore turn down the power filter (if used) or point the outflow at the side of the tank. Regular water changes are, of course, essential.

Feeding

Gouramis are generally not choosy feeders and, in the wild, feed upon a wide range of invertebrates and algae. In the aquarium, they will readily accept high-quality flake foods and freeze-dried foods. Larger species will eagerly accept stick foods.



One of the most popular of all the variants is the Golden Gourami.



Male Sunset Dwarf Gourami protecting his bubble nest.



Spawning pair of Amethyst Gouramis (a colour variant of the Two-spot Gourami).



This is the delightful and tiny Honey Gourami.



A beautiful Red Sunset Dwarf Gourami male.



The Indian or Striped Gourami is also sometimes misleadingly referred to as the Giant Gourami.

Vegetation is eaten in small quantities by all gouramis, and in larger amounts by Kissing and Giant Gouramis. Kissing Gouramis in the wild consume vast amounts of algae, obtained with their specially adapted mouths. In captivity, they will happily feed on flaked and tablet foods, although the use of a vegetable-based diet and occasional feeds with lettuce leaves or peas will keep them in perfect condition.

Some of the feeding methods employed are worthy of note. The long, thread-like pelvic fins of *Colisa* and *Trichogaster* species are covered in sensory cells which are used to feel and 'smell' for food. Using these fins, the fish can even locate food that is covered in sediment, or in cloudy water.

Dwarf Gouramis (*Colisa lutea*) have a more unusual feeding method. They have the ability to squirt water from their mouths at items of food, in much the same way as the Archerfish. Water can be shot at targets up to 3cm (1.2in) away. However, they are not as accurate as the Archer and several attempts are often required for success.

Breeding

Choosing a male and female is generally straightforward, although there are exceptions, for example with Kissing and Chocolate Gouramis.

Males tend to be brighter coloured, particularly during breeding. In addition, the dorsal, anal and pelvic (ventral) fins are longer and more pointed in the male.

Breeding methods vary from species to species, but for the sake of this article, we can divide the gouramis into four groups:

1 Bubble nest breeders

(*Colisa*, *Trichogaster* and *Osphronemus* species)

These fish build a nest of mucus-covered bubbles on the water surface, usually among floating vegetation. Species like the Dwarf Gourami also use this plant material to strengthen the nest.

Nest size varies with the species, and also depends on the environment. Dwarf Gouramis, for example, may build a nest 20cm (8in) in diameter and 2 to 3cm (1.2in) deep in the centre.

The male builds the bubble nest when a female becomes ripe with eggs. He will then display in order to attract her beneath the nest to breed. If she is ready, she nudges the male, and this is followed by his forming a 'U' shape around his mate's abdomen, with nose and tail pointing downwards.

The female turns on her back so that the genital openings of both fish are very close together, ensuring most of the eggs are fertilised. The eggs are then placed in the bubble nest.

After spawning, the female is chased from the nest and the eggs and fry are guarded by the male. If there are no hiding places, or if the tank is too small, the female can be badly damaged. The male should be left with the fry until they become free swimming.

2 Underwater spawners

(*Parosphronemus* and *Trichopsis* species)

These fish deposit their eggs under caves or large leaves under the water. In some species, such as *Parosphronemus deisoneri*, the eggs will float and are placed singly under the overhang, whereas with *Trichopsis*, a small bubble nest is built to hold the eggs.

Unlike with the surface bubble nest builders, both parents are involved in caring for the eggs and fry.

3 Free spawning

(*Helostoma temminckii*)

The Kissing Gourami does not make a bubble nest but simply releases large quantities of eggs directly into the water. There is no parental care. In fact, the parents will consume huge numbers of their eggs if not removed soon after spawning.

Each egg contains a small oil droplet which makes it float to the surface, where

It will stick to any object it touches. The courtship of the Kissing Gourami involves the well-known mouth-to-mouth contact, but as things progress, the female 'kisses' the body of the male.

4 Mouthbrooders

(*Sphaerichthys* species)
Only *S. ophromenoides*, the Chocolate Gourami, has been spawned regularly in the aquarium. The method appears to vary from individual to individual. In some cases the male makes a rudimentary bubble nest during courtship and the eggs are placed into this before being picked up and incubated in the mouth of the female. In other instances, the female picks up the eggs directly after spawning.

If conditions are ideal (soft, acidic water with a low nitrate level) and the female is not disturbed, the fry are released after 14 days.

Raising the fry

Many gourami fry are lost during their first few days of life, because they starve. They are very small when first hatched and need to be fed on infusoria (a ciliate culture). This contains items small enough for them to eat. Because of the small size of both fry and feed, it is difficult to see if

GOURAMI SPECIES

1 Family Belontiidae

Colisa zota (ichnna) (Honey Gourami)
C. fasciata (Indian Gourami)
C. labiosa (Thick-lipped Gourami)
C. lalia (Dwarf Gourami)
Trichogaster leeri (Pearl Gourami)
T. microlepis (Moonlight Gourami)
T. pectoralis (Snakeskin Gourami)
T. trichopterus (Two-spot, Gold, Platinum, Opaline (Cosby) Gourami)
Sphaerichthys ophromenoides (Chocolate Gourami)
Parosphromenus deissneri (Liquorice Gourami)
P. filamentosus (Threadfin Gourami)
Malpulutta kneri (Pointed-tail Gourami)
Trichopsis pumilus (Croaking Dwarf Gourami)
T. schalleri (Sparkling Gourami)
T. vittatus (Croaking Gourami)

2 Family Helostomidae

Helostoma temminckii (Kissing Gourami)

3 Family Osphronemidae

Osphronemus goramy (Giant Gourami)

the fry are actually taking nourishment. A useful trick is to examine them with a magnifying glass.

The fry need a constant supply of food

(feeding four or five times daily) and, inevitably, some food remains uneaten.

Partial water changes are therefore important to keep the nitrate levels as low as possible. Up to 10% should be renewed every four to six days, but ensure that the replacement water is at exactly the same temperature and is conditioned using a reliable conditioner.

When seven days old, the fry can be offered newly-hatched brine shrimp and, after a further two days, they will be ready for dry fry foods.

During the development of the labyrinth organ, the fry are particularly sensitive to temperature and humidity of the air above. Cool, dry air can lead to a wipe-out, so for the first month, at least, the aquarium hood should be removed as infrequently as possible.

Gouramis, particularly the free-spawners and bubble-nesters, produce large numbers of fry; and if these are to be raised successfully, they require plenty of space to grow, accompanied by good water conditions.

102

The impressive Pearl, Mosaic or Lace Gourami.



BILLY HARTSCHE



JOHN DAVES



MIKE SARGFORD



The Chocolate Gourami can be difficult and is best avoided by beginners.



MIKE SARGFORD

The Croaking Gourami has been around for years, but has never been kept in large numbers by aquarists.

Left, the Marbled Kissing Gourami is one of the latest varieties to appear on the market. Right, The real Giant Gourami.

WANT TO KNOW MORE?

Further information on keeping and breeding gouramis is available in most of the 'encyclopedia' style texts on tropical fish.

Interested hobbyists should also consider joining the Anabantoid Association of Great Britain. Details can be obtained by sending a SAE to: D Armitage, Anabantoid Association of Great Britain, 2 Close End, Robert Road, Hodgerley, Bucks SL2 3XY.

CHRISTOPHER EVANS

NATURALIST'S NOTEBOOK

BY ERIC HARDY



An agile Australian crocodile leaping high for bait.

Dog-eating crocs

Though crocodiles may be endangered in some parts of the world, Saltwater Crocodiles are thriving in the Hell's Gate area of Australia's Gulf of Carpentaria, according to my grandson, living there.

We mostly see photos of lethargic crocs, stretched out on riverbanks, but they are most agile reptiles, leaping high when tempted to bait.

It is the custom to hunt wild pigs with dogs there, but the crocs are said to let the pigs go by and await the dogs, which they prefer to eat!

Low-tide lure

Though nothing like the glamorous rock pools of Anglesey and Cornwall, our most accessible

sea-pools in the Northwest, below the old lifeboat-slip on Hibre Island, lured me at the lowest tide of the year, at dusk in March.

Here, among barnacle-encrusted rocks full of starfish, we found five sorts of sea anemone around Calaber Reef and the Whaleback, Grey Sea Slugs, increasing limpets and predatory whelks. There were Beadlets, the Cave Anemone, Elegans, Dahlia and Plumose, the last of these varying in colour from their diet to white, green, red, brown, orange and apricot. Winkles and sea slugs, likewise, vary with their diet.

Some outer rocks were bored by Piddock-shells. Under over-hanging rocks, draped with Common Wrack, Egg Wrack, Bladder and Twisted Wracks, we found Breadcrumb Sponge with its distinctive smell, and, further away out, the almost black anemone *Sagartia troglodytes*,

as well as elegans.

Laminaria seaweed, first recorded here in 1886, seems to have disappeared from Hibre, and the Australian barnacle *Elminius* came after the war to reach its climax fauna and has now almost gone, as native barnacles regained lost ground. Tubularia's organ-pipes hung like red blobs of jelly under seaward boulders. Many rocks were covered with eggs of Grey Sea Slugs, and of fish. Blennies are common. We even came upon the soft coral, Dead Men's Fingers.

Marine life here has survived the mud and mercury pollution since I wrote of a similar visit in A&P in Nov/Dec 1936! The returning limpets suggest conditions are improving in the Dee estuary here. I wrote then of the zoophyte *Hydractinia echinata* growing on empty whelk-shells used by hermit crabs, and of another zoophyte, *Clava multicornis*, attached to the lowest stones. Also of the abundance of *Sertularia argentea* and the brilliant seaworm with iridescent bristles, called *Nereis pelagica*, hiding under stones.

In those days, we went down to the pools in bare feet, our trousers rolled up; this time we were posh in wellies and thigh-boots.

You can't see all the life under low over-hanging rocks unless you stand with your back to them and bend right down, almost touching your toes. Stooping in front, as most people look at them, misses much. As the year's lowest tide is often late in the day, or early morning, a torch is useful.

Dolphin therapy

Freshwater aquaria have long been used as therapy to calm the minds of potential suicides in mental hospitals.

Now dolphins are being used in speech therapy.

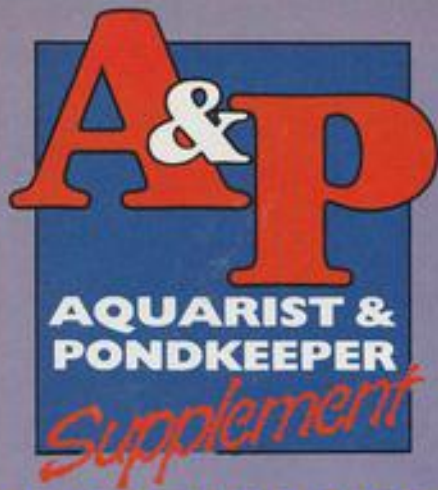
A seven-year-old Anglessey boy who hadn't spoken before said his first word, "cow" when swimming with dolphins just before Christmas, at Florida's dolphin research centre. The boy has suffered since birth from a rare brain disorder. His vocabulary has now developed to four words.

The Florida centre has been

Nature Notes

- 1 Swedish biologists studying Sand Lizards have found that males successfully guard their females by defensive fights with interlopers. They prefer the larger females for mates.
- 2 Without using sun or moon light-guides, Leatherback Sea Turtles have been shown by North Carolina biologists to use magnetic orientation off Hawaii. Leatherbacks also swallow squid bait on long-lines used to catch swordfish, and have a new nesting haunt in the Western Mediterranean.
- 3 Cleveland University biologists have shown that colour-changes in Kenyan Chameleons depend on temperature variations.
- 4 Texan biologists found the South American toad, *Physalaemus pustulosus*, an occasional American captive, produces underwater sounds.
- 5 The Israel Journal of Zoology's announcement disclosing cannibalism among Common Salamander larvae is only to be expected, as even Common Frog tadpoles eat one another when short of food!
- 6 Schenectady (New York) College biologists have shown that lizards can see ultraviolet wavelengths.
- 7 Erythrasm is a colour aberration due to pigment failure, producing yellowish-white plumage in birds, but rarely affecting amphibians. A frog suffering such a genetic effect was found recently at Truro, in Cornwall. It was orange-yellow with red eyes. In 1891, the British Museum received a yellowish-white frog with pink eyes from Wiltshire. Another was taken at Warrington in 1921. Albino eggs and tadpoles often become pigmented later.
- 8 The first albino Diamond-back Water Snake has been found in Memphis, US, and an albino Snapping Turtle in Maryland.
- 9 The surgical department of West Hunan reports curing 102 cases of snake bite by Chinese Copperhead or Sharp-nosed Pit Viper by traditional Chinese medicine.
- 10 Dogs are used by the Anaki Dog Training Unit, Okinawa, Japan, for searching in snake control.

run by David Nathanson, a forensic psychologist, for six years. He says that children in this difficulty respond to three things: music, water and dolphins. They can respond to playing a favourite record, even a family visit. In this case, the child was probably fond of dolphins.



INSTALLING PONDS

- CHOOSING & FITTING LINERS
- RAISED & SUNKEN PREFABRICATED PONDS
- BUILDING A CONCRETE DREAM
- PEBBLE FOUNTAINS, TUBS, JUGS AND OTHER SMALL WATER FEATURES



THE MAXIMUM

FLEXIBILITY POND

If you are not happy with a water feature that looks like something was spilt in the herbaceous border and you want a water garden that is less than extremely modest in proportions... or, if your depth of pocket is less than an oil tycoon's or media mogul's... or if your engineering skills hardly match those of Isambard Kingdom Brunel, then it's only logical to go for a lined pond!

Some of the preformed shapes in plastic and fibreglass on the British market give you less than the recommended minimum size of water surface. This automatically makes such ponds difficult to keep in balance and they quickly become overgrown with both flora and fauna.

The expense of installing a concrete pool may, in some cases, can only be justified if the skills required for its construction are readily available and if the whole scheme is very carefully planned and monitored from beginning to end. Even then, you don't know how good your pond is until it's seen a couple of harsh winters.

With lined pools, the quality and durability of the product is what you pay for, and whatever liner you use, will perform to prescribed specifications. If it doesn't, you can get your money back.

It's a bit of a pain getting the whole thing out and redoing it etc. I know, but

material or combination of materials ... stone, rock, brick, wood or nothing. You can even just leave it to the marginal plants round the edge to disguise the material lining your pool; eventually, this material will acquire its own aquatic 'weathering'.

Liners are also the perfect insurance for the conservation pond where the puddled 'look' is all that's required without all the work and upheaval that is involved in doing it properly. In fact, liners work well for any style of pond; they are 'the' modern materials to use. It's OK if you want to have a puddled, concrete or brick pond with tiled bottom, of course. Go ahead, by all means, but why not put a liner underneath? It's good insurance.

Garden designer Peter May shows just what can be achieved with liners, and throws in some very sensible expert tips in the process.

Illustrations by the author

try doing that with concrete!

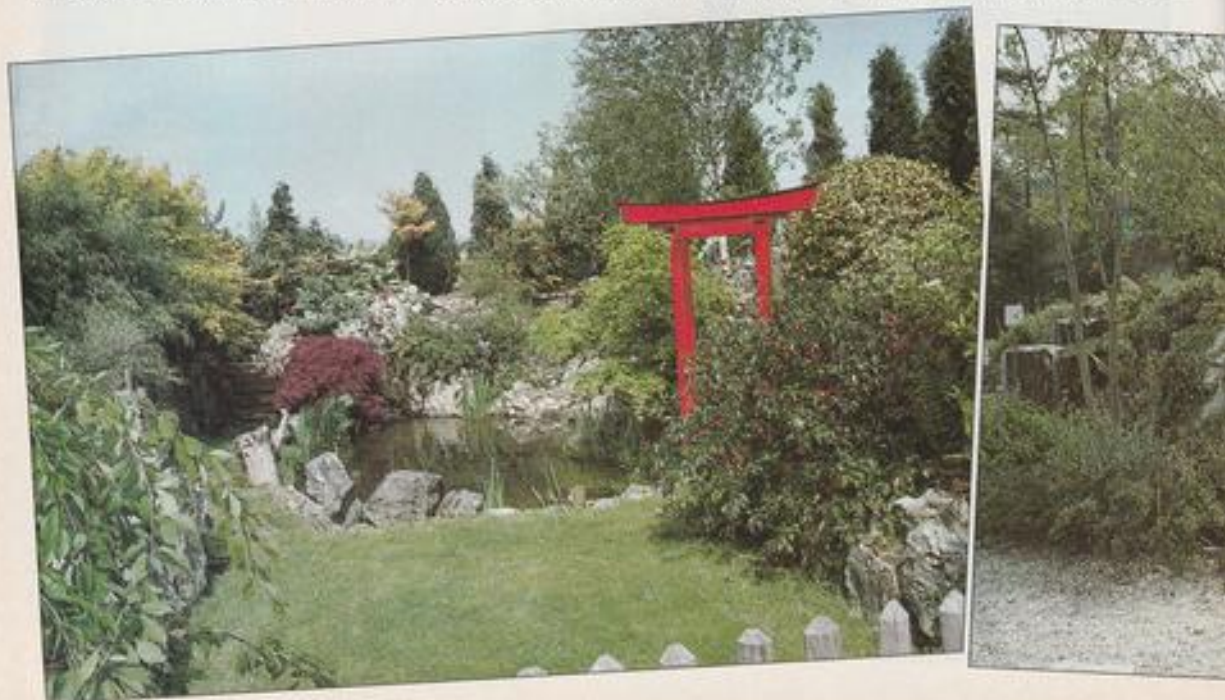
The thing about liners is that the limits of your imagination are the only limitations of the material. With the right amount of planning in advance, you can make any style of feature look as natural or formal as you like. You can make it seem to be constructed or lined with any

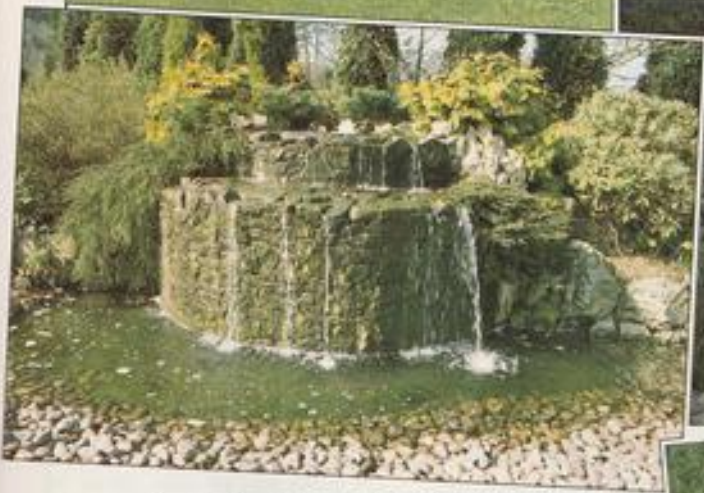
Butyl

Pros

1 Until recently, butyl was the 'Rolls Royce' of materials. It was the only material that was truly stable in the ultra-violet rays from the sun. It has a cosy feel and smell that gives it an air of quality.

2 Heavy competition among butyl liner manufacturers, plus the increasing specifications from the PVC and other plastic liner manufacturers, has kept the





Six very different designs with one thing in common:
they are all lined.





Daunting choice of liners. You get what you pay for.



A 'whacker plate' is a tremendous help when it comes to flattening and compacting loose sods and bits of grit.

price steady for over a decade. Although we are bound to be getting more value for money nowadays, the look and feel of butyl does not seem to be the same as it was over 10 years ago. I feel most butyl sales are made on the reputation this product gained when there was such a huge difference in the reliability of different liners.

3 There is no doubt that butyl is the most pleasant material to use. It folds easily into place and stays folded. And if you need a bit of stretch, butyl has it.

4 Butyl is the most 'sympathetic' material to the accidental bumps and scrapes that are inevitable in the construction of a watergarden.

5 If it does puncture, butyl is the easiest material to repair once it is clean and dry. The patches are just pushed into place straight from the wrapper.

6 What is particularly useful in the construction of watercourses is the grip that cement has when it dries on butyl. This makes it the most suitable material for taking stone or rock facings.

Cons

Cement sticking to butyl can be regarded as a disqualification, since this means everything sticks to butyl, including algae and lime from the water. This is a constant source of irritation for those water gardeners who like their ponds to sparkle like their best cut glass and china when they clean them out.

But apart from that, butyl cons are only the pros of competing materials.

Other rubber liners

These liners are in a price bracket that butyl cannot compete with. They may not have quite the strength of the original butyl, but you get a much thicker liner that more than makes up for this.

However, it must be stressed that these liners must be bought from a reputable source because when this rubber was first introduced, it was being sold as roofing material. It was not long before some bright spark thought that it might make good pool lining material, because it looked and felt just like butyl rubber. The only problem was that it contained some

toxic compound that knocked fish for six. So, not only did it undermine butyl sales, but it also did wonders for the fish trade.

So, always stick with a local reliable supplier. Anyway, the product has now been 'reformulated' especially for pond use and now seems ready to take over where butyl leaves off.

PVCs and ABSAT

The quality, strength, look and feel of the PVC liners is improving all the time. I would avoid any fibre 'reinforced' liners as these seem to scuff easily down to the depth of the reinforcement. These products have evolved from lorry tarpaulin technology.

It is not the strength along the material you are looking for, but impenetrability from small pointed objects, and its ability not to convert to crispy black cornflakes in the sunlight. It is the latter quality that PVC manufacturers have been striving for like alchemists trying to turn lead into gold.

Impenetrability is easy; Absat achieved

that. You could have carpeted the local 'Palais' with Absat for a 6-hour red-hot jive session and still used it to line your pond the next day. Unfortunately, if you did manage to hole it, it was a devil to try to do a permanent repair. (I say 'was' because Absat is sadly becoming increasingly difficult to get hold of because it was relatively expensive to produce in this extremely competitive market).

PVC is as easy to repair as a cycle inner tube, and you can even do it under water with the right repair kit ... and snorkelling gear!

Liner installation

With regards to ease of installation, the PVC materials are a lot lighter than the rubber liners, and this is increasingly significant when you are thinking of ponds 400 square feet and above down in the bottom corner of your plot, 100 yards from the nearest path.

The thicker ones are more difficult to manipulate and to fold into position, particularly in cold weather. In fact, I have seen reinforced liners crack along the reinforcement when being folded into position on really icy days. (This is with looney landscapers working in all weathers, desperate to achieve deadlines).

When the thicker PVCs that are .75mm and above are laid in place and you are filling your new pool with water, you find that little bumps and creases iron themselves out so much more effectively than with the rubber.

Ten tips for the perfect lined pond

- 1** If you have dug the hole and prepared it right up to the point for the liner to go in, measure the hole again by draping a tape through it just to make sure you have got the right size.
- 2** As soon as you can, check the liner, especially the welds, and if it is PVC, the lines along which it was folded.
- 3** In excavating the hole for the pool, start by clearing the site of turf, or whatever, and digging down to the first

SEVEN GOOD REASONS OR CHOOSING LINERS

- 1** No limitations on design or shape.
- 2** No limitations on the site, and the most economical in this respect.
- 3** No toxicity from the materials. The plants can go in straight away and be closely followed by the fish when the water matures.
- 4** In most circumstances, the lining materials are impervious to our extremes of weather.
- 5** They don't hurt if you fall in when the pond is full or empty. You might think that's a daft thing to say, unless you've fallen in!
- 6** Most of the modern pool liners are extremely durable and fairly impenetrable, but if they are punctured, they are easy to repair.
- 7** You can repair a concrete pool with a liner and you can render out a lined pool with cement to make it look as though it's made of concrete. But have you ever heard of anyone repairing a liner pool with concrete? It's a bit like repairing a Ford Mondeo with Model 'T' bits!

level of the proposed marginal shelf — approximately one good spit: 10 inches (25cm).

4 All my ponds have a skeleton of concrete blocks laid level straight onto the consolidated soil that will be the marginal shelf. These not only define the final water level but provide a footing and reinforcement for anything laid around the pond, be it slabs or rocks. It's a full step that can be disguised with sloping soil, marginal plants, stone, brick or rocks. Ponds without this skeleton look very little different to those with ... at first.

These blocks will need a footing themselves if the soil is very light or disturbed, or if the pool will suffer heavy 'traffic' along its edge.

5 Decide how wide you want your marginal shelf i.e. are you going to face the inside of this pool? If so, allow 12 inches (30cm) for your marginal shelf, plus the average width of the stone you are going to use to dress the inside. Then dig down a further 10 inches. You are aiming to make your pool a minimum of 18 inches (45cm) deep. Only Koi enthusiasts need delve deeper than 3ft (150cm).

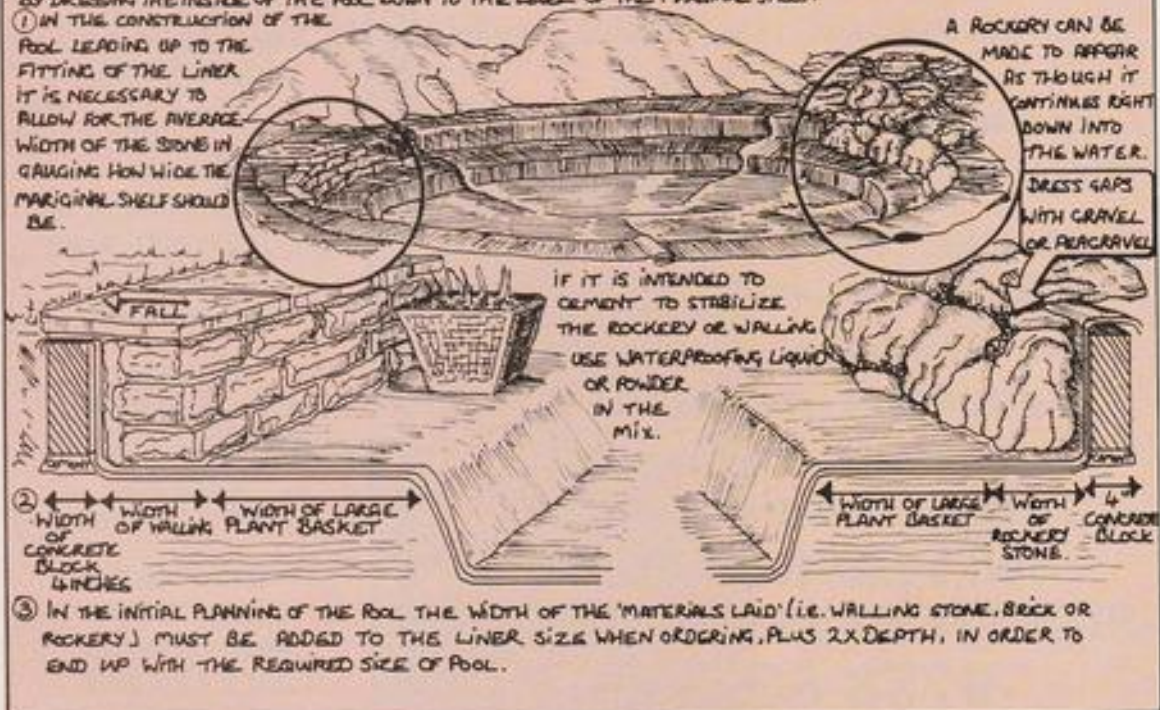
If the soil is particularly crumbly, then this level may need the support of a skeleton as well. But, generally, as you burrow into the subsoil, everything seems pretty compact. Bedrock, old Victorian drainage systems and old buried cast iron cookers have generally caused me more headaches.

10 BUDGET TIPS FOR A SUCCESSFUL LINED POOL

- 1** Plan your pond from start to finish, and estimate how much it will cost. Budget for quality, rather than size. Remember that the liner cost is only going to be a maximum of one third of the cost of even the basics of the overall project. I hope that doesn't shock you.
- 2** What are you going to do with all that soil? It more than doubles in volume as it comes out. Skips work out at about £10 per cubic metre. Save the top soil.
- 3** Site the pond properly, in full sun away from trees, but with not too much exposure to prevailing winds. Avoid boggy ground, bedrock and drains.
- 4** **Consider children and their safety.** Where there is water, they will be in it and at some point, head first!
- 5** If there is to be a watercourse or a fountain, then electricity and its accessibility is a major expense. No expense must be spared in respect to safety, so therefore, it must be properly and professionally installed with all the necessary trip switches and protected cables.
- 6** Keep the shape of the pond simple. Not only do radical indentations make for extra folds, but they use up extra liner as well. If these are absolutely necessary, measure around the contour of the desired/necessary indentation to give an estimate of the extra liner it will use.
- 7** For larger projects, buy the material from 'off the roll'. Also try to build your pond so that in at least one direction (plus twice the depth), it corresponds to a 'standard width' off the roll, it's cheaper and has been less crunched up and man-handled. You can also get the length to fit to the precise inch. If you do find you have been a bit of a skinflint on the liner dimensions and the pool is roughly oval, you can sometimes gain a few valuable inches by installing it diagonally. Better doing that, than trying to stretch the liner.
- 8** I would say 'Underlay' was essential protection for underneath the sloping or upright sides of the pool. The flatter contours of the base of the pool can be lined with a good inch or two of sand.
- 9** Choose a retailer for your liner that has good reputation for quality and service. This may save you more money than you can imagine. You may see a lot of him or her so try to get on!
- 10** Take your time ... there is no rush. Building ponds can be hard, strenuous work, so take it easy and mind your back. Try to get some help and make a social thing of it. Anyone who has a hand in the production of your pond will take an interest in it for ever more. A lot of what I have outlined may seem very simplistic and obvious, but it is amazing what fundamentals we ignore in the excitement of creating such a wonderful thing as a pond or watergarden.

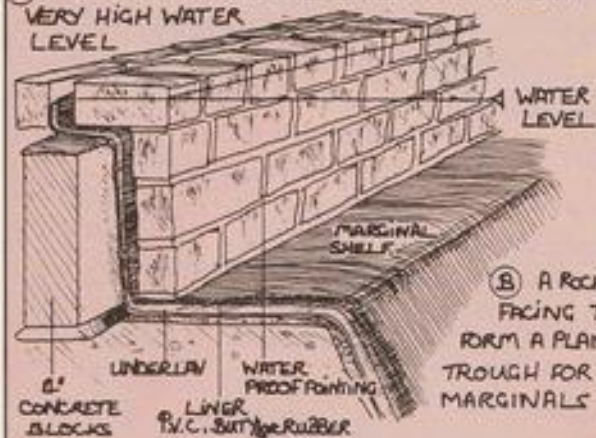
DRESSING THE INSIDE OF THE POOL WITH WALLING OR ROCKERY STONE

TO GIVE THE APPEARANCE THAT THE POOL IS CONSTRUCTED FROM SOLID STONE, EITHER WITH A WALL OR ROCKERY STONE BY DRESSING THE INSIDE OF THE POOL DOWN TO THE LEVEL OF THE MARGINAL SHELF.

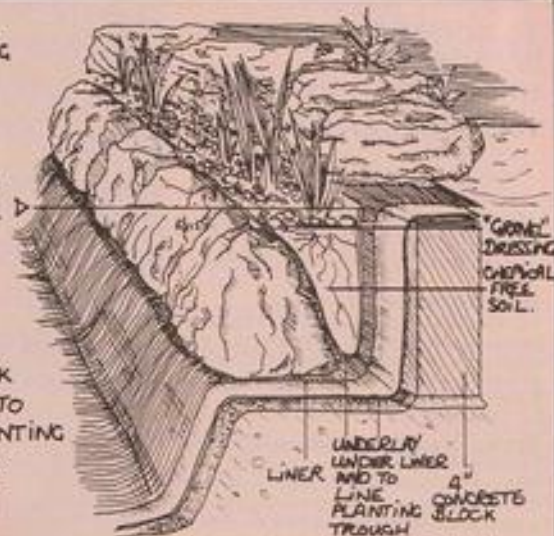


OTHER ALTERNATIVES: USING

(A) BRICK TO DISGUISE THE LINER AND MAKE A VERY HIGH WATER LEVEL.



(B) A ROCK FACING TO FORM A PLANTING TROUGH FOR MARGINALS



(A) BRICK FACING TO THE UPPER SIDE OF THE POOL FROM THE MARGINAL SHELF LEVEL. THIS CAN BE BRICK OR STONE LAID USING A CEMENT MIX WITH A WATER-PROOFING ADDITIVE. BEWARE LARGE QUANTITIES OF CEMENT EXPOSED TO THE WATER NEED TO BE TREATED WITH

'SILGLAZE'. THIS PRODUCT IS PAINTED ONTO CEMENT THAT IS GOING TO BE UNDER-WATER AND THEN WASHED OFF. THIS IS DONE IN PRESCRIBED AMOUNTS AND RINSED OFF AFTER CERTAIN INTERVALS.

(B) HERE FLAT BOTTOMED ROCKERY STONE SITS ON THE MARGINAL SHELF AND IS BUILT UP TO OR JUST BELOW THE WATER LEVEL OF THE POND FORMING A TROUGH WHICH LINED WITH UNDERLAY, PROVIDES THE MARGINAL PLANTING AREA.

6 Check the base of the excavation for small sharp stones. If you think you've been mining a gravel pit, you must protect your liner with underlay. The effect of the weight of water on the liner seems to make stones float up in the soil and through any sand, to rest against the liner. The thin layer of rot-proof fibre of underlay is impenetrable by even the sharpest grit.

For the larger project a 'whacker plate' run over the base of the pool does a lot to flatten out the loose sods and bits of grit.

7 Fitting the liner: The only time I have seen a liner successfully stretched into position using the weight of water filling it to do the work was when Howard Dury from Central TV's *Gardening Time* was doing it for a Time/Life instructional video on watergardens. I told him before he did it it wouldn't work. When it did, I said it was first time lucky.

Normally, one side of the liner gets stretched in more than the other, or the stones holding the liner in a stretched position scrape holes in the liner as they

are dragged along the ground towards the pool edge. Then, as they plop in to gouge the bottom of pool, the bit of liner they were sitting on gets dragged below the water surface anyway. Then you start again with a new bit of liner.

My method is to 'loose-ruck', fold and physically push the liner into position. In this way, you can gather up a lot of folds into one. (Nursing auxiliaries are very

8 Hold the liner in place with flat smooth stones. If the liner is to be faced on the inside, do it now. Work up from the marginal shelf using your skeleton of concrete blocks to guide you to the final pool level. Use good quality water-proofing additives to any cement used and treat any exposed cement surfaces with 'Silglaze' to drag out the line.

It may still be necessary to flush the pool out three or four times to banish any exudes from any hidden cement, or you can live with them. However, check they are not affecting the pH of the water, with a simple water pH test kit. You will probably find that these traces have little effect on the water, but it is just as well to check, since the water might be excessively limey anyway.



Lined pond with stonework built in from the marginal shelf upwards.

good at this!) It is also an essential technique for formal pools that are not faced, because all the folds can be quite effectively gathered into the corners.

9 Cut off the liner, leaving an overlap of 4in (10cm), so that whatever you choose to edge your pool with, has a grip on the liner and a footing in the earth behind the blockwork. The liner is in place; now what are you going to do?

10 Fill it up!



Some of the latest designs — Oriental tongs, taps, boulders, pebbles and taps.

WATER- A LIVING FEATURE

No space for a pond? Have no fear ... Dick Mills is here with a selection of great alternatives ... even for indoors!

Photographs — unless otherwise indicated — by the author

When is a pond not a pond? "When it's a water feature," could be the answer, especially where no space exists to accommodate 'the real thing.' However, having solved that apparent riddle quite easily, we ought to bear in mind that some water features might almost be conceived as a pond in miniature by some people, just to be perverse!

Remaining with ponds proper for the

moment, one attraction often quoted is that of the *sound* of water, and here is the one area where any water feature definitely comes into its own as, almost without exception, moving water is inherent in the design.

For the purposes of this article, water-spouting statuary has not been considered: mythical beasts, mermaids, cherubs, dolphins and the like have not been included, the emphasis, instead, being

concentrated on much smaller, less portentous (pretentious?) items.

A water feature is just as it is described: water forms the major part of the display, with fish and plant cultivation often coming a poor second, of even being conspicuous by their absence.

Because of their often modest proportions, the water content of any feature is quite limited. This, in turn, means a highly unstable (in temperature) environment for fish and, at best, a just about practicable means of growing water plants.

Portable ponds

To start off with, let's move down the scale in size from the pond proper. The so-called 'portable ponds' are indeed a practical means of having a limited-sized pond in very restricted spaces — a corner of a terrace or patio, within a conservatory, or even on a very restricted town flat roof garden.

These designs are easily assembled. The wood supports interlock together (also forming three convenient seats), a tailored liner is literally hung inside, and any extra vertical trellis work, outer planting areas and roof added.

Of course, putting a small fountain in such ponds will preclude the successful culture of water-lilies and only one or two small fish, say, Shubunkins, should be contemplated.

The range of sizes may be from as little as 2-6 feet across the hexagonal 'diameter' (although larger ones are available, they don't qualify for inclusion under our terms of reference!) and, providing that their limitations are fully appreciated and heeded, successful and highly decorative displays are well within even the most modest of means.

The real advantage of these 'ponds' is that they are easily transportable — you simply dis-assemble them when you move to bigger premises. On a really 'down note', you could even drain all the water out and use the structure as a herb garden!

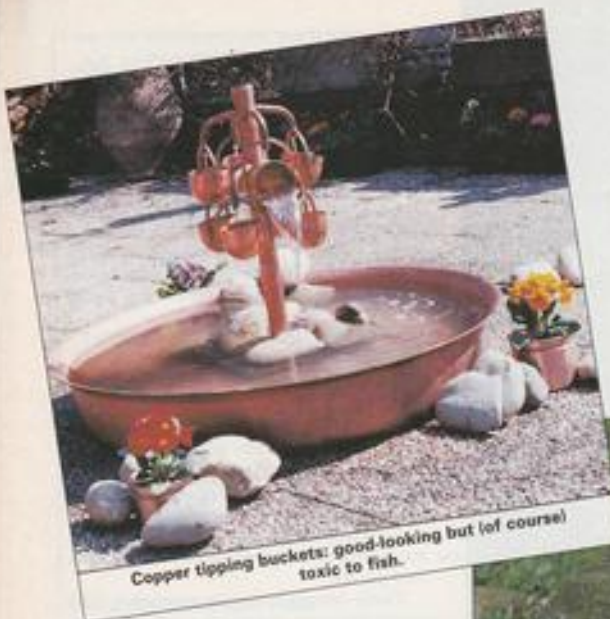
Pebble and rock designs

One very popular feature is the pebble display (quite feasible with the smallest portable pond). This is simply a mound of artistically-arranged cobblestones, down which water cascades or quietly trickles to collect in the reservoir beneath — the whole thing may not even require more than 4 or 5 litres of water.

Pebble systems can form both pleasant audible features and natural humidifiers in a conservatory.

Should the pebbles take on an unsightly patina of algae, no problem. Simply unpack the pebbles and soak them in bleach for a few hours, rinse and replace.

A larger, more dramatic, display can be made from a series of millstones or even a



Copper tipping buckets: good-looking but (of course) toxic to fish.



An unusual and attractive stepped-stone pebble fountain.

large piece of slate or other attractively-formed rock. Any of these can simply be drilled through with the appropriate masonry drill, mounted on a water-containing plinth and supplied with water from a hidden electric pump.

In these instances, the growth of algae may not seem so unsightly as these displays will be mounted out of doors and so at the mercy of the elements, which may (or may not) help to keep the algae growth in check for you.



One of the more traditional millstones.



Old-style water pumps make attractive 'rustic' small features.

Sculptures

How about a water sculpture for even more impact? The type of thing I have in mind is a central 'skeleton' of metal or stone over, through, or around which passes the 'living' water.

It may be no more complicated than tiered, overflowing bowls, but then just think how much more appealing it would become with the addition of some lighting.

Of course, fishkeepers should be wary if these sculptures are to be incorporated into any display with livestock, as contamination from metal structures, usually made of copper, could prove fatal.

Moving water

Water as a moving force should not be overlooked either. The surrounds of a Koi pond often incorporate an Ishi-Odoshi (Deer Scarer, to the less-than-fluent, or even totally Japanese-disadvantaged speakers among us!).

The principle is quite simple — a pivoted bamboo tube fills up with water, overbalances and empties, then the tube swings back to its original position with a resounding 'clack', hence the deer-detering description (I wonder if Koi owners find it deters herons as well?).

Waterwheels are also quite expected additions, but water clocks could be harder to find.

Butts, sinks and castles

Reverting to patio-positioned water features, the rain barrel is widely used as a reservoir from which water is re-cycled through reproduction old-fashioned hand-pumps or endlessly-pouring brass taps. Turn the waterflow off and the same receptacle can house a colourful miniature water-lily without any trouble at all.

Any redundant kitchen sink can just as easily be converted into something more attractive, but again, be careful of using metallic containers such as old galvanised baths.



Endlessly flowing taps are becoming quite popular.

Thanks to the availability of small electric pumps — mains-powered, or safer, low-voltage models, too — table-top water features are gaining ground. Fairy castles

and goblins' grottoes have all become 'liquidised', and there is literally no limit to the number of overturned jugs and amphorae that can be encountered busily emptying themselves into pottery plates these days at Craft Fairs.

Useful tips

As mentioned earlier, small water features are not suitable for livestock and also, if placed in heated rooms or in direct sunlight, water loss through evaporation is quite common.

Thanks to the smallness of the pumps, some of which can 'lift' water from a depth of as little as 3mm in some cases, the display will struggle on until the bitter, slightly damp, end.

It is therefore imperative to guard against the water losses at all times. Make sure the vessel is level and that any watercourses are kept clear of obstruction — any sideways spillage may not result in the water always returning to the base 'reservoir'.

Algae build-up must be avoided and, if miniature plants are grown, make sure that soil is not washed away either; another often unsuspected water 'loser' is capillary action where water can be siphoned out of watercourses by plants.

The majority of the foregoing examples are more decorative than functional, although the green-fingered will no doubt be quick to integrate moisture-loving plants around such displays.



Portable pond... which can be permanent.

It is now even possible to obtain a pre-fabricated vertical 'rockery' with associated small pool at its foot, which you simply lean against a firm vertical surface, fill with water, plug in and enjoy. Again, this can bring the attraction of water within very close confines, but with the added drawback maybe of making you wish you had room for bigger things!

Grange Park Aquatics

12 ACRES OF GROWING PONDS TO VIEW

Large stocks of "Grown On" Japanese and Israeli Koi as well as Ghosts, Orfe, Golden Tench, Shubs, Comets, Mirror Carp etc. Also regular imports of fish all of which are properly quarantined prior to sale.

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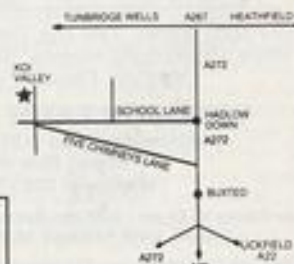
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PREFABR SOLUTI

If concrete or liners are not for you, then, as **David Fletcher** explains, prefabricated ponds offer a number of alternative solutions

Illustrations by the author

Prefabricated ponds are supplied ready-moulded to their final shape. All the pondkeeper has to do is visit a few suppliers, and decide which one is the most suitable for his/her needs. However, before being able to choose, there are a few important factors that are well worth considering.

Advantages of prefabs

- 1** The pond is already well designed, with suitable deep and shallow areas, and shelves for the placement of plants.
- 2** Compared with flexible plastic sheet type liners, prefabricated ponds are far less susceptible to mechanical damage from causes such as sharp stones in the ground under the pond, cats and other animals, and objects which may fall into the pond, or be blown in by high winds.

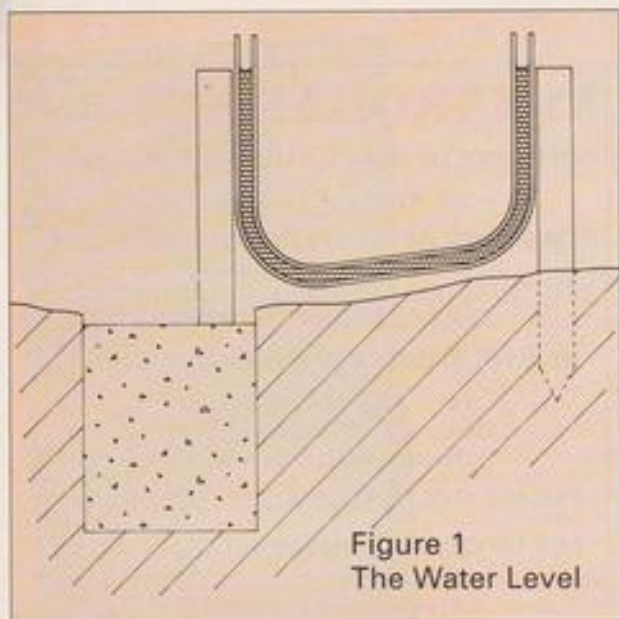


Figure 1
The Water Level

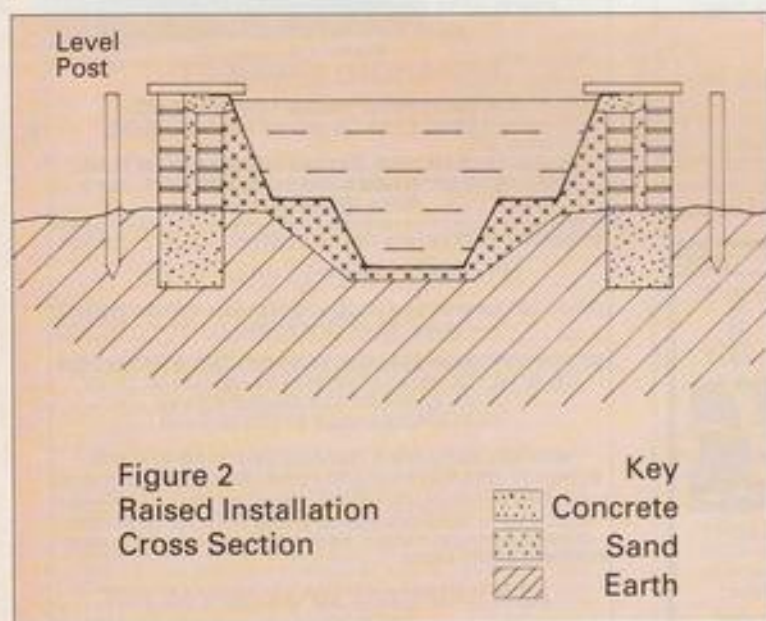


Figure 2
Raised Installation
Cross Section

Key
Concrete
Sand
Earth

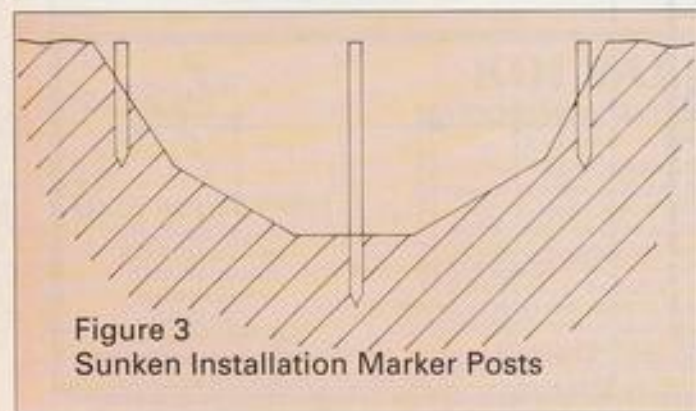


Figure 3
Sunken Installation Marker Posts

Sunken informal prefabricated pond tastefully blended into its surroundings.



PLICATED IONS

Sunken formal design with matching raised flower beds photographed in early spring, hence the lack of flowers.

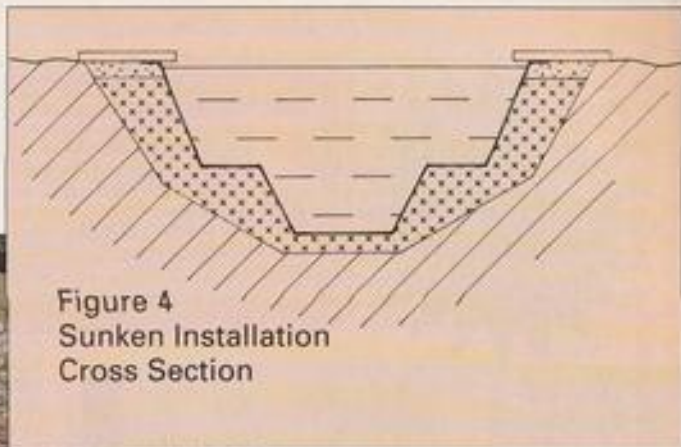


Figure 4
Sunken Installation
Cross Section

3 Unlike concrete, prefabricated ponds can be installed with equal ease during any season of the year, so long as the weather is fit to dig the hole.

4 Digging a hole to a precise shape with planting shelves etc in very light, sandy soils can be next to impossible, because the sides keep falling in, especially when the soil dries out during hot, dry weather. This is not a problem with a prefabricated pond. The only requirement

is to make the hole large enough to take the pond.

5 Less maturing is needed than with concrete. The only requirement is to allow sufficient time for the chlorine and any other contaminating substances to disperse from the raw tapwater.

Disadvantages

1 There is no flexibility in the shape of the pond. The user is therefore limited to the designs already available. Although these are produced in many different shapes and sizes, and in both formal and informal styles, there may be a requirement for a pond to fit a specific area in the corner of a patio which cannot be met by any of the models available.

2 Some models are not very deep. Ponds in which fish will be overwintered must be at least 18 inches (45cm), but preferably two feet (60cm) deep.

Selecting the pond

Ponds are available in two basic types of material, plastic and glass reinforced plastic (GRP), which is built from layers of glass fibre matting bonded together with resin. GRP is more expensive, but being immensely strong (it is also used to build powerboat hulls), ponds made from it are available in larger sizes.

When purchasing any GRP item, check that it has been well laminated. All of the fibre matting must be well wetted with resin during manufacture, and neatly laid before the resin sets.

The fibres should therefore not be sticking up from the surface, and there

should be no air bubbles in the material.

Different qualities of plastic pond are available. For instance, two grades of pond available from Lotus are the "Instant", which has a ten-year guarantee, and the "Toughline", which costs perhaps 70% more than the "Instant" per unit volume, but has a twenty-year guarantee.

You pay your money and take your choice, but taking into consideration the amount of time, effort and expense required to landscape and pave the surrounding area, and install the electrical, filtering and plumbing services, it is well worthwhile spending a little more on the pond to obtain the best quality available.

Also available in GRP are pre-formed waterfall sections. Some are given an attractive surface finish made from crushed rock, to blend in when built into rock gardens.

As with all forms of pond construction, it is vital to give careful consideration to the location and style of the pond, and to make it as large and deep as possible. The more water held by the pond, the more thermally stable it will be, which is good for the inhabitants.

Installation

Ponds can be installed either raised above, or sunken into, the ground, but in either case, they must always be surrounded by well packed material, which, in most cases, will be sand. Soil can be used if suitable. This ensures that the pond itself is well supported, reducing the mechanical stresses on the sides to a minimum and ensuring a long life.

The following methods have proved successful for me, so I offer them for your consideration.

1 Raised ponds

If the pond is a formal shape, the dimensions can be measured and the outline accurately marked on the ground with pegs and string.

If it is an informal shape, place the pond in position and mark its outline on the ground, using a hose or rope. Remove



the pond and, if there is any chance of the outline marker being moved, peg it down in place.

The next job is to dig a foundation for the retaining wall. I prefer to dig this to at least a good spade depth, but always be sure to dig down to soil which is firmly settled and has obviously not been disturbed by building or gardening operations for several years.

To ensure sufficient strength, the wall will need to be two bricks thick, so make the foundation at least 10 inches (25cm)

shops. When the ends are held up and the hose almost filled with water, the water surface at each end will always be at exactly the same level, as shown in the accompanying figure. This is a cheap way to make an instrument which can be made as long as is required without any loss of accuracy.

Cut the measuring stick to a suitable length, and start laying the concrete foundation. At frequent intervals, touch the surface of the wet concrete with the measuring stick and make sure that, using the

water level, the top of the measuring stick is at the same height as the reference level. In this way, the top of the foundation is guaranteed to be level. Leave the concrete to set for a day or two before proceeding further.

Decide on the exact height of the wall above the foundation. Set this level by hammering a few stakes into the ground outside the foundation, so that their tops are at the appropriate height.

Put the pond in place and,

tops of the stakes. Add some water to the pond to help hold it in place, and pack in more wet sand to fill the space under the marginal shelves. Check that the rim of the pond is still exactly level, adjust if necessary and add more water, up to the level of the sand.

Lay the rest of the bricks, omitting the final course of the inner layer, and pour concrete into the gap between, to give more strength. Leave to set for a couple of days, then finish packing sand into the gap, gradually filling the pond at the same time.

Now leave everything to settle properly for perhaps two weeks. Occasionally adding water to the sand to give it a good wetting may help to ensure good settlement. Add the final concrete around the rim, and cement the slabs in place to cap the top of the wall and conceal the edge of the pond.

2 Sunken ponds

The main principle of installing sunken ponds is the same as that of raised ponds, i.e. providing good support for the pond using well packed soil or sand.

Construction proceeds in a different sequence, however. Mark the outline, as for raised ponds, but remember this marks the edge of the hole instead of a foundation. The hole must be large enough for the pondkeeper to reach down underneath the marginal shelves to pack in the supporting sand or soil.

Dig out the hole, and hammer a reference level stake into the middle. Use the principle of the water level described earlier to set several level marker posts around the edge of the hole, as shown.

Remove the reference level and place the pond in the hole on a layer of sand. Use a straight edge across the marker posts to ensure the pond is level, and add some water to help hold it in place.

Continue packing wet sand around the pond and gradually fill the pond with water, until the sand is a few inches below the pond edge. Make a final check that the edge is level, and remove the marker posts.

Leave for a fortnight, wetting the sand to make it settle, as is done with raised ponds. Lay the concrete around the edge, and place paving slabs to complete the installation.

Closing thoughts

Prefabricated designs offer the opportunity to install a pond at a time of the year which may not be suitable for building other types of pond. I do not regard them as a cheap option, but the installation can be performed at a relatively leisurely and stress-free pace.

If ease of installation and a more robust end result than a sheet liner are important, then a prefabricated pond should be given serious consideration.



Left above, part of an impressive display of prefabricated ponds at a garden centre (Whitehall, near Lacock, in Wiltshire)

Left, header pools and other add-ons are now widely available.

wide. Dig the trench for the foundation on the outside of the pond outline marker.

One of the easiest ways to spoil the appearance of a pond is to fail to make the edge exactly level, so give yourself a good start by making the surface of the foundation level.

Hammer a stake into the ground in the centre of the pond area, leaving it two or three feet (60-90cm) above ground. The top of the stake can be used as a reference level, and must not be moved until the concrete foundation has been laid.

Make a water level using a length of the transparent hose sold by water gardening

holding it level, sight across the tops of the stakes to make sure it fits below them by a couple of inches. If not, dig out some soil to lower the pond.

Start building the wall, but only to the height of the marginal shelf. If it is built higher at this stage, it will be difficult to reach underneath the pond to pack the sand properly below the shelves. Make sure the soil under the pond is well compressed, and put a layer of sand in the middle, wetting it well to help it settle quickly. Again, place the pond in the middle, and adjust the thickness of the sand to make the pond rim exactly level with the

BUILDING A CONCRETE DREAM

Stephen Smith shares the challenges, tribulations and satisfaction of building a large concrete pond, from the birth of the idea to its eventual fruition.

Illustrations by the author



Digging is back-breaking work whatever the weather.

In common with many a fishkeeper, I had for years hankered after a fully-fledged Koi pool — complete with a collection of large Koi. But the thought, and the expense, of setting forth on a pond-building project had always meant that, year after year, I had put off the project.

I was beginning to think that 'next' year might never happen. However, there was one corner of the garden which seemed not to lend itself to anything in particular. Except, perhaps ... a Koi pool?

Fortunately, throughout those preceding years, I had sketched, thumbnailed, re-sketched, and revised, several 'ideas' for the design of the pool of my dreams. Happily, I had kept most of those sketches; indeed, the finished article was virtually

already a reality — in my head.

Anyhow, armed with the 'vision' and supplemented by my sketches, I decided that it was now or never.

The plan was this, or so I kept telling myself: I would try to do as much as possible myself. Not only would this save me money (I'll admit straightaway that this is a fallacy), but it would also enable me to become fully familiar with all the problems, trials and tribulations which the average hobbyist is likely to encounter. After all, the books and magazines make it sound so easy, don't they?

But as hobbyists, we are *not* builders, plumbers, plasterers, electricians, engineers, carpenters and fibreglassers (among the many trades required) rolled into one. And the pool project certainly came up



Drain in place in concrete-plugged pool base. The sump excavations can also be seen in this shot.

trumps in presenting me with problems. However, they were all overcome, and all is wonderful. Two and a half years after breaking the first ground, the dream was a reality and the first fish were introduced into their new home. I certainly learned a great deal from the project. I hope you do too. The moral is: by all means have a go, but it will pay you to hire the specialists.

Dream into reality

I must stress that there are several ways of constructing concrete/cement/block ponds. However, here's how mine was (or very nearly wasn't) built. I hope my experiences help you overcome most, if not all, of the many challenges.

1 First digging

The hardest part, really, was getting started. As with all projects of this scale, the average hobbyist has neither the time nor the finances. However, having saved as much of my 'hard-earned' as possible over the preceding years, it was chocks away and first dig.

However, it was August, and the height of summer. In fact, it was the last time we had a real summer, as far as I can recall! The point is this: never dig a pond in the height of summer. Not only will it break your back (at any time of the year), but with the sun beating upon that same back, you are likely to find pores where you didn't know pores could exist!

Undeterred — and with the help of a trusty labourer — the pond was, at last, started with a good old spade and shovel. It is worth noting here, for the benefit of budding pond builders, that the volume of soil removed from the hole is roughly two-and-a-half times that of the 'ole itself! So, make sure you know where it is all going before you start.

If you are going to build a rockery (and

it will be a Dickens of a rockery if you are removing spoil from a large pool!) then make sure that you put the topsoil to one side — it is no use simply piling the spoil into the site of the rockery in the order in which it comes out. And, in the area where I live, just about everything below the topsoil is thick, heavy clay ...

Initially, the finished depth of the pool was to be seven or eight feet, from the top of a raised wall approximately two feet above the ground. Thus, we had intended to dig at least six feet below ground level, plus a bit more to take into account the installation of the bottom drains and the depth of the pool floor itself.

Nature, however, had other plans. Little did I know that, just four feet down, we were to hit shifting sands. The popular term is quicksand, and I had never seen anything like it. Although the clay seemed fairly sturdy, as soon as we broke through, we could sense trouble. We even plunged a couple of concrete fenceposts into the depths, only to see them literally swallowed into the bowels of the earth.

Using a spade as a gauge, I plunged this into the sand and, still holding the spade handle, it went down as far as just above my elbow without resistance. Removing arm and spade, this hobbyist was beginning to wish he'd never started!

Accepting that the pond was not going to be quite so deep, it was a case of plugging the hole with concrete (with the aid of more fence posts and a stiff mix) and



Uprisers in place, with their bases bedded in concrete (see Section 4 of main text).



Standpipes, discharge pipe and associated pipework in place (see Section 5).

tidying up the rest of the base without going any deeper.

2 Bottom drain installation

At the same time, the opportunity was taken to install the bottom drain. A drain gulley, as used in housebuilding, was deemed to be perfectly satisfactory, and a cheaper alternative to proprietary pool drains, and this was set level in position, with the initial length of four-inch sewer pipe, laid horizontally.

The main body takes shape in the hands of our friendly expert bricklayer.



While the hole was excavated, opportunity was taken to install the bottom drain and horizontal pipe for the adjacent rearing pool, so that it, too, could be drained into the same sump as the main pool.

At last, we had stopped going down and were now beginning to install the first of the pool's components. How ironic, though, that we work so hard to create such a large hole which, eventually, is only going to be filled!

3 Floor and sump

Things were really beginning to look like we were getting somewhere — and the weather was on our side — so far. At least, it was dry and the tidying up of the hole could be accomplished with relative ease. Also, work could begin on constructing the sump — the chambers adjacent to the pond which were to house the bottom drain discharge chamber and the pond pump and Ultra-Violet (uv) sterilising unit.

Where possible, the integrity of the ground was retained; there is never any point in removing soil unnecessarily. Removal of spoil was not such a problem here — after all, once the sewer pipe from the bottom drains had been installed, the void was to be refilled. One of the accompanying photographs illustrates perfectly the positioning of the filter system and the sump arrangement adjacent to the site of the pool void.

4 Upriser from drains

As can be seen, the sewer pipe and adjoining bends and uprisers have been installed and bedded in concrete to ensure

that there is no movement underground during use, as such movement could lead to leakage at the pipe joints. Here the top of the pipes shown are actually at the level of the base of the discharge chamber.

5 Standpipe

The base of the discharge chamber was built up to ground level and the collars fitted to accommodate the standpipes. In addition, the discharge pipe, to drain, was also installed while all drainage pipework from the filter was put in place.

6 The main structure

Meanwhile, the main structure itself was really taking shape. Nine-inch concrete blocks were chosen in preference to H-blocks for two reasons: one, that concrete blocks are easier to handle, and it was necessary to transport all materials from my front drive to the pond — a distance approaching 100 yards. Secondly, they were rather less expensive and, as the dimensions of the pool were not excessive, it was felt that the extra power and strength provided by H-blocks was not really necessary.

The whole structure was built up from the concrete base and, of course, backfilled every three courses or so with a stiff mix of concrete. To provide additional strength at the corners — and to eliminate 'dead spots' in the corners of the finished pool — concrete blocks were shaped and fitted into the corners. Stiff concrete was also tamped into the triangular void within the corners as they were constructed.

It has to be said that excitement was beginning to mount as the final courses and the final blocks were laid. The finished pool was emerging right in front of my eyes. But there was still a long way to go — and a few problems to overcome.

7 Skimming

All surfaces inside the pool structure, and both inside the surfaces of the filter system, and the sump chambers, were skimmed with a mix of mortar incorporating Fibromix. The theory is that the glass fibres provide greater strength to the mortar as it sets, forming a mesh within its own structure. Thus, the likelihood of cracking is reduced.

8 Settlement cracks

The onset of winter meant that work was interrupted. But, I thought, a break in progress will give the structure some time to settle and we can then take things from there. Boy, did it settle!

Indeed, with the benefit of hindsight, it would have been far better to have ensured that the fibreglassing had been undertaken as soon as possible and before the structure had settled. After all, fibre-



Incorporating Fibromix. Also in shot in the background, some of my Goldfish rearing ponds.

FILTER SYSTEM

The design of the filter is a simple above-ground 'four-square', with the idea that the water is pumped from the pond to the first bay, which acts as a settlement chamber, before overflowing into the second chamber, installed with brushes.

Water passes beneath the dividing wall between chambers two and three and percolates up through tape medium before overflowing into the final chamber of Canterbury spar.

As the water passes down through the spar, it receives a thorough bacterial filtration (a layer of 'live' medium was introduced near to the top of the spar) before flowing up and over an overflow pipe and back to the pond.

Using the golden rule that the surface area of the filter should be at least 30% of the area of the pond, the filter unit was constructed with generous dimensions. This really was the very beginnings of the project, something like three years or more before the pond was stocked! (Can you imagine waiting that long with only a vision to keep you going ...?)

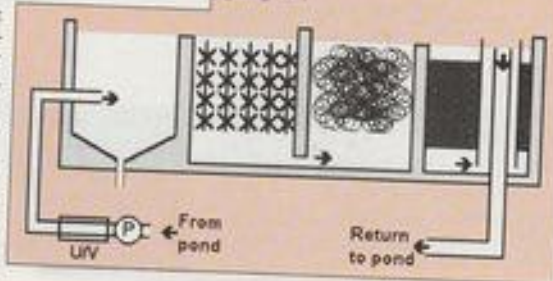
glassing will retain its integrity and, even if cracks appear in the structure itself, no leakage is likely to occur through the fibreglass lining.

However, it was during the few months between breaking off the work schedule and restarting, that the biggest of the problems were to arise.

Hydrostatic pressure is not a force to be reckoned with, and this was proved! During the winter break, I had allowed the pool to collect rainwater, and the level had risen to about half-depth. However, the water table had also risen beneath the pond structure, and some consideration should have been given to this when, in early spring, I decided to empty the rainwater out of the pool in order to make preparations for fibreglassing. That was on a Friday afternoon.

All day Saturday it rained. Sunday, however, proved rather more promising so, donning wellies, I went to inspect the pool.

Have you ever seen the film *Ghostbusters*? Near the end, where the ghosts have been released and *Zuul* makes its appear-





Above, in expert hands, fiberglass can be worked into a smooth professional finish.

Below, settlement cracks can be avoided if precautionary steps are taken (see Section 8).



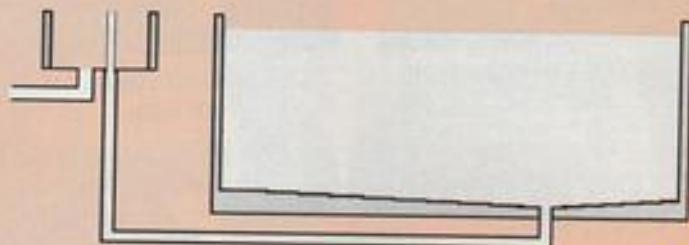
ance, the ground breaks up into huge chunks and even a police car falls into a gaping chasm in the road.

The floor of my pool resembled that scene!

Such had been the rainfall that the water table had risen and had pushed the floor of the pool up, breaking it into large chunks. Ironically, the portion of the floor where we had originally broken through to shifting sands was perfectly sound. The rest, however, was well and truly smashed.

As with all things, especially those to do with fishkeeping, persistence pays off. It was a matter of removing the chunks of concrete, cleaning everything up and starting all over again. This time, I was not in a mood to let the situation arise again.

A. Bottom drain with standpipe in position. Water is retained up to the level of the top of the standpipe and this also acts as an overflow.



BOTTOM DRAINS

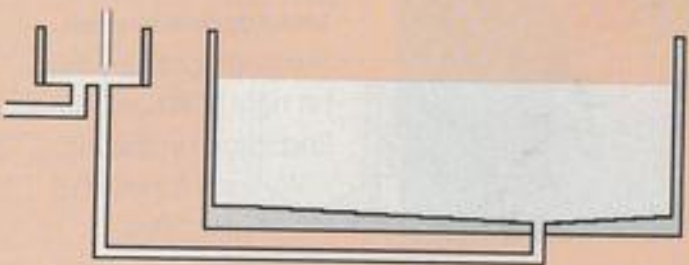
One of the most important elements of pond construction is the bottom drains. Daily (twice a day in the summer) discharge of water from the bottom drains will release an enormous amount of fish waste. In my opinion, it is better for this to go to waste than through the filter system, so, for me, the bottom drain is essential.

Two bottom drains were installed: one for the pool project itself and another for the adjacent rearing tank (while we had dug this far down it seemed appropriate to take full advantage of the situation).

Discharge is simplicity in itself. Initially, it had been thought that it would be a matter of simply removing the standpipe. However, the joints of normal sewage pipe will soon fatigue, so a method of introducing valves at the foot of the standpipe was put into action. Now, all I need to do is turn the valve and the water pressure itself ensures that waste which has settled in the drain sump is carried away to drain.

An additional advantage is that the sump also provides a convenient discharge point when pumping water out of any of my ponds.

B. When standpipe is removed, the level of the pond falls to the level of the base of the sump, the water being drawn from the bottom of the pond.





The finished product — well worth every ounce of effort.

A rough wall was built with brick across the floor of the pond onto the 'sound' part of the base. This was three courses high — and the best brickwork

ELECTRICS

You really cannot take too much care over installation of electric. Suffice it to say that electricity and water DO NOT mix!

Therefore, every opportunity must be made to provide a break in the circuit, whether by means of residual circuit breakers, earth leakage circuit breakers, fused sockets and switches, and/or fused plugs.

Our garden supply has a 'trip switch' on the consumer unit and the cable is buried underground, sheathed in 1.25in plastic pipe. A weatherproof cabinet, as used by housebuilders to install electric meters, is mounted onto the side of the shed box, and the supply first arrives at a double socket protected with an integral ELCB. Sockets are used so that, when ever work is carried out within the cabinet, it is a simple expedient to isolate the supply simply by removing the plug. It works visually, too, because if I can see that the plug is out, then I know that the power is off. No doubts. No danger.

The main water pump and the aeration are controlled by a switch unit, while the lighting, uv steriliser, and auxiliary supply fused in conjunction with a timer for an immersion heater during the winter are controlled by switched sockets.

that this non-bricklayer has ever produced! Before the third course of brick was laid, reinforcing mesh was cut to size so that it overlapped into the thickness of the brickwork, while it was 'keyed' into the walls by positioning drilled holes around the walls.

The final course of bricks having been laid and allowed to set, work started the following weekend on preparing the concrete and pouring it into place. But, as I said, I was in no mood to allow things to get this bad again, so I hired a 'poker' and compressor. Using this as the concrete was poured into place, the vibrations of the poker ensured that any and all air within the concrete mix was expelled and the result was virtually impenetrable concrete. It was even possible to stand on the 'pokered' concrete while it was still fresh — such was its density.

As with the walls previously, the 'new' floor and the 'immaculate' brickwork were to be skimmed with *Fibromix*-strengthened mortar before the final stage of work was started.

First, there was the matter of a number of settlement cracks to deal with. These had to be chiselled out before being filled with a cement mix treated with proprietary water-repellent filler. Such material goes on extremely quickly, so work has to be undertaken in small sections. The result was a (virtual) elimination of any ingress of water, and the inside surfaces of the pond were by now ready for the application of the fibreglass finish.

9 Fibreglassing

One of the most important elements in the application of fibreglass matting is preparation. And it is not a process which is recommended lightly for the 'do-it-yourselfer'.

Fibreglassing is definitely a good reason to bring in a specialist. As with other experts, they make it look so easy that you are led to believe that you could have 'done-it-yourself' after all.

As with the initial stages of pond construction (ie digging out) this is not a job which should be done while the sun is beating down. It must have been the only few days of last year when we had uninterrupted sun that the fibreglasser was able to do the job. Ironically, he really had no choice — it poured with rain the rest of the time.

The first areas to be treated with the ultimate in pond sealant were the walls, followed by the deepest depths. Once the pond had been completely fibreglassed, the filter chambers were also given the ultimate treatment and we were in business ... almost.

Given a day or so to cure, the pond was ready to be filled with water. It was advised that this water should be completely flushed out after a couple of days to ensure that any oils could be washed away. A further flush and a final refill the following week, and the pool was ready to receive its inhabitants. 177

Professional Progress

William Wildgoose, veterinary surgeon in East London, describes the specialist training that vets can undergo these days in order to equip them to tackle the ever-increasing demand for their services from the fishkeeping community.

Photographs by the author.



Injecting a Koi with antibiotics — a common procedure for body ulcers.

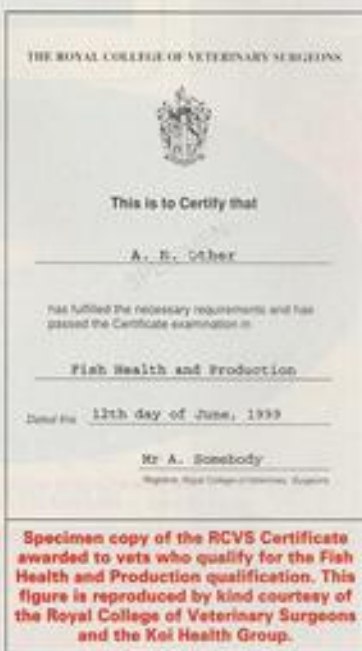
Considering that the veterinary profession evolved from farriers and their art of shoeing horses, fishkeepers understandably, may not feel that vets are the most suited to treat their fish! However, we would like to feel that we have come a long way since then.

Evolving expectations

Ornamental fishkeeping may go back to ancient Chinese times, but it is only recently (in historical terms) that the hobby has become more popular and widespread. With the increase in ownership has come an increase in expectation of fish health. Although there has been a basic understanding of health requirements, it is only in very recent years that there has been a greater involvement of vets and professionals in the research and study of fish disease. There is also a wider appreciation that vets can fill a role beyond the supply of antibiotics and 'prescription-only medicines'.

Veterinary surgeons study at university on a full-time course which lasts for five years, during which their training covers all aspects of animal health and disease. The amount of time spent studying individual species varies, but training in aquatic medicine may be limited to just a few lectures in the whole course. Private study is often the only way that students can further their education in unusual species, such as fish and invertebrates.

As vets, we have been trained with a wide range of skills and abilities, and it is up to us to develop our interests from these first principles.



Specialist v special interest

We have a broad base of knowledge which we can develop to a greater level of understanding, but, like all specialities, it takes time and experience to learn and understand about diseases in fish.

In the veterinary profession, there are strict rules on the use of the terms "specialist" and "special interest". This is to

maintain the high standards of recognition within the profession and to safeguard the interests of the public.

A "specialist" is someone who has been deemed to have met accepted standards laid down by our governing body. A vet with a "special interest" is someone who has just that — an interest in specific aspects of veterinary work, although they may have no more academic qualification or proof, other than their own experience.

The Institute of Aquaculture at Stirling was established in 1971 as an international centre for the research and study of fish disease in all aquatic species. Among the courses offered there, a full-time one-year course for veterinary surgeons leads to a further qualification, a Master of Science degree in aquatic veterinary studies [MSc. (Aqu.Vet.St.)]. The institute also provides a vital diagnostic service to both the ornamental and fish farming industries.

Apart from formal full-time education, vets must build up their knowledge with hands-on experience and home study in their free time. This will also involve going on short courses, attending local fish society meetings and extensive reading through technical books. All this is often for their own scientific interest ... and usually at their own expense.

Major breakthrough

Until now there has been no specific recognition for those with a "special interest". However, a board of the Royal College of Veterinary Surgeons has set up a syllabus for the Certificate and Diploma in Fish Health & Production. These are postgraduate qualifications which require further study, research and examinations.

The Certificate is the first level of achievement and requires vets to compile detailed record books of several case histories. These studies may involve a small-scale project involving importation, breeding or drug trials. It is hoped that by describing new methods and reporting unusual cases, such vets will contribute to the literature by publishing their reports.

A professional diary will also need to be kept, listing attendance at meetings and shows, as well as presentations given. The aim of this is to improve professional

standing and involvement in fish health, and candidates should be seen to be taking an active role in the spread of information.

The Certificate is open to vets who have been qualified for at least three years, and have spent two years at an approved practice, with a minimum of 10% fish work. The syllabus covers all species of fish, both ornamental and farmed, and also includes shellfish, shrimp and aquatic invertebrates. All areas of the aquaculture industry and fish health are covered in considerable depth. Those who successfully pass the exams will be allowed to use the abbreviations CertFHP and may then proceed to the Diploma level.

The Diploma is awarded to those who have a higher standard of achievement and deal with all aspects of aquatic health. They include vets who have worked almost full-time in fish medicine for over four years. As part of their assessment, they will be required to write a 5,000 word dissertation and pass lengthy examinations. These new standards have only recently been announced, and it may be a few years before they appear in practice.

Another group of fish-orientated vets are members of the Fish Veterinary Society. This was formed in 1990 with the idea of exchanging information and to represent vets working in the field of fish health. It now has 60 members, most of whom work exclusively in the fish farm industry, but they have a wide range of basic skills and training which can be used in ornamental fish. The Society holds regular meetings to discuss topical matters and raise important issues.

Changing times

Until now, most fish health work has been carried out by other professions, such as biologists and zoologists, who have made worthy contributions in this field and have provided a valuable service. The complexities of the aquatic environment and disease are, however, now becoming more fully understood and require a wide range of skills, so all professions have an important role to play.

Professional obligations require all vets to provide first aid to all species, whenever necessary. But these are times of increasing specialisation in our profession, just as it is in human medicine. The James Herriot image is one of the past, and no vet can be "all things to all men" (or animals). As a result of greater public awareness, there is a demand for a higher standard of service, and no more so than with fish health.

Finding a vet

So how does the average owner find a vet who will show interest in their fish? From a practical point of view, it is better — as a first step — to contact your local veterinary practice to see if anyone there has a special interest in fish, or if they can

recommend you to another in your area.

If this fails, the **British Veterinary Association (BVA) in London (Tel: 071-636 6541)** maintains a list of veterinary surgeons who will treat fish. Bearing in mind that there are some 8,000 vets in the country, and only about 100 who are members of the FVS, or who are on the BVA list, you may have some distance to travel to find the right person.

Vets may have been a long time in coming to assist fishkeepers, but active steps are now being made to improve the health and welfare of fish, and bring advances in the field of fish care. Certainly, the future looks much brighter than the past has been. **TFB**

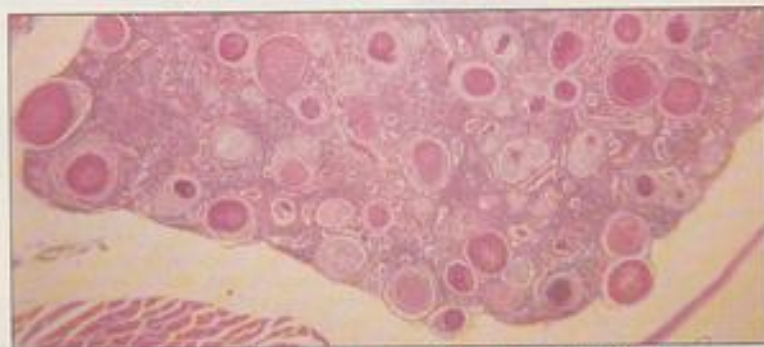
This article is based on **Shoeing Horses' Feet** written by William Wildgoose, and published in the Koi Health Group's publication: **Koi Health Quarterly**. For further details of the KHG, contact **Frank Prince-Jones, 3 Sunningdale Avenue, Brighton, East Sussex BN1 8NR. Tel: 0273 563390.**



An Oscar undergoing an X-ray.



X-ray of young Red-tailed Catfish which had swallowed a large piece of slate (large white object) — successfully removed under general anaesthetic.



Laboratory examination shows severe kidney damage caused by TB (circular dark purple areas).

WRASSE FACTS

Wrasses are members of the predominantly warm-water marine family Labridae. Many species are small and colourful and suitable for marine aquaria. All possess pharyngeal ('throat') bones for crushing prawns and small crabs, and a single long dorsal (back) fin with spiny rays.

Other characteristics include sex changes in many species, sleeping at night, and 'cleaner' fish behaviour.

Problems keeping British species include their predatory disposition towards invertebrate life, the size some species eventually grow to, and fighting among members of the same species. It is also difficult to provide their natural seaweed habitat.

As a warm-water family, wrasses will tolerate high temperatures, so if the tank is kept in a garage or cellar, a heater may be required in the winter to keep the water above 10°C (50°F).

SEX CHANGE

A common trait among many wrasses is that of the dominant fish in the community changing sex. Although not shoaling fish, wrasses tend to congregate in feeding groups.

All the young develop as females, with only the leader of the harem changing sex to become a male. At this stage, this fish will change into heightened coloration and develop hyper aggression which it uses to defend the nest against intruders.

If the fish dies, it is replaced by another fish changing to a male.

Want to Know More?

For further information about British marine life, including the wrasses, please write to:

British Marine Life Study Society (Aq)
Glaucus House
14 Corbyn Crescent
Shoreham-by-Sea
Sussex
BN43 6PO

Please enclose a 19p or 25p stamp for a personal reply.

Warm-water Natives

Andy Horton introduces five beautiful British wrasses for medium-sized and large aquaria

Photographs — unless otherwise indicated — by the author

Top right, a Corkwing Wrasse in swimming livery.

Middle right, close-up of a male Corkwing Wrasse in breeding colours.

Bottom right, Corkwing in resting livery. When caught in a net or asleep at night, the black vertical bars obscure the black spot on the caudal fin base and the Corkwing could be mistaken for another wrasse.

Demonstrating an astonishing ability at concealment, a Corkwing Wrasse vanishes into the kelp at the first inkling of danger. It soon appears at the other side of a dense clump of algae through which it has quickly negotiated a passage, assured that no predator is able to follow.

Lips pursed, it confronts a male of the same species. Rushing parallel with each other for half a metre, they turn to meet head-on, carousing agonistically. With swollen heads threatening, the two fish attack face-to-face, biting at their extensible lips with a distinct audible click. This ritualised battle continues, with each fish spiralling away.

In confined pools, the contest may continue for several minutes, each bout lasting up to ten seconds. During the breeding season, in particular, the loser may suffer serious damage. However, given adequate space and care, all this behaviour ... and much else ... can be observed within home aquaria, and it is with this in mind that I would like to present an introduction to our own native species.

Worldwide range

'Wrasse' is the common name given to the large family of bony (Teleost) fishes known as the Labridae. Worldwide, over 600 different species have been identified. They are mainly found in tropical waters, but five species are known to breed in the



seas surrounding the British Isles.

Prettily coloured and swimming in mid-water, although never far from shelter, their attractive coloration means that they make popular aquarium exhibits in the larger aquaria. However, their aggressive behaviour and intraspecific conflicts (many will attack members of their own species) means that wrasses need special care if they are to be kept for long periods in captivity.

Feeding

British wrasses feed on a diet of hard-shelled crustaceans and molluscs. The size of the prey varies as the fish grows. When young they will eat amphipods, copepods and other smaller crustaceans. Larger fish will readily consume Mysid shrimp and are quickly able to tackle live prawns and small crabs.

This means that they are not suitable for the invertebrate aquarium, where they will attack and kill the other inhabitants. The hard-shelled food is crushed by powerful teeth in the throat. Worms and boiled mussel flesh are also eaten. However, success is only assured if crustaceans are included in the diet.

1 Corkwing

In the deeper pools and shallow seas adjoining the rocky coasts in the south and west of Britain, juvenile Corkwing Wrasse *Symphodus melops* (= *Crenilabrus*) are likely to be very common in the months of July and August.

A long-handled prawn net swept through the seaweed fringes in rock pools at low tide is a practicable method of capture. On an incoming tide, the small fish can often be observed in the clear water near the edges of the fronds of seaweed.

These young fish, from 30mm to 90mm (1.2-3.5cm) long, are often present in hundreds. When captured in the net, their green-scaled body is distinguished by black vertical barring. After they have settled down in the aquarium and have started to swim around and explore their new surroundings, this camouflage is replaced by a hue of green interspersed by brown and two dark brown longitudinal stripes that run the length of their bodies.

Constantly searching for small crustaceans, Corkwing Wrasse are very popular among rockpooler aquarists because they bring active movement in the tank. It is best to collect fish at least 50mm (c 2in) in length because at this size, they will take larger food, which is easier to provide.

Fighting does not start immediately. Five fish collected during August will live happily together for a few months and then the ferocious battles commence. If you are lucky, you may find a pair that will live peacefully together. Otherwise, they will fight until the loser lies in a corner and dies, unless removed to separate quarters.

In the wild, Corkwing Wrasse leave the



The Rock Cook, the rarest of the British wrasse, has a definitive crescent shaped mark preceding the tail fin. Otherwise, it is very close in colour to the Corkwing.



With colours to rival tropical wrasses, the male Cuckoo requires more space than is normally available to home aquarists.



Ballan Wrasse (green specimen). Dark patterned markings appear late in the first year and are more likely to be visible when the fish is resting.



Ballan Wrasse (red specimen).

seashore zone and move into deeper water offshore in late September. They are a common fish throughout their range, from the Mediterranean Sea to the coasts of southern Norway. However, they appear to be absent from most parts of the north-east coast of England.

Growth and breeding

Juveniles can be kept in the smaller 30-gallon (136-litre) aquaria, but within two years, the Corkwing will grow to a length of 10cm (4in) and become a fiercely territorial and aggressive fish requiring tanks of 100 gallons (455 litres) and larger. Corkwing will bite the dorsal fins of other rock pool fish. Their adult size can reach 25cm (10in).

Mature in their third year, the male adopts a spectacular breeding livery; the red fin edges become inspired with purplish-blue, and the crescent spot behind the eye becomes more noticeable. The male builds an algae nest to which the smaller females are attracted.

After an elaborate courtship display, the eggs are attached to the weed in the nest and are protected by the male for about 13 days (at 15°C - 59°F) before they hatch. The nests are usually offshore, but are occasionally located in the larger intertidal pools.

2 Ballan Wrasse

One in every hundred young wrasse caught on the shore is likely to be a Ballan Wrasse, *Labrus bergylla*. In the juveniles, a bright emerald-green, or a pillar-box-red are the normal colours. This is a larger species than the Corkwing, with specimens of 4cm to 8cm (1.6-3.2in) caught between the tides. Adults will attain at

least 60cm (2ft) and are common exhibits in public aquaria that specialise in British marine life.

Juveniles can be kept successfully, though. Growth is variable, but after two years, they will need a large aquarium. Adult Ballan Wrasse will eat mussels, complete with their hard shells.

3 Rock Cook

The Rock Cook, *Ctenolabrus coelestis*, is the smallest of the British wrasse, only reaching 15cm (6in) in length and is therefore the best suited to captivity, where specimens have been kept for over two years by experienced aquarists. Unfortunately, it is also the rarest of the British breeding species.

This species has a small mouth and is not so aggressive as the others; it can



The Goldsinny Wrasse can be successfully maintained in aquaria containing around 100 gallons.

therefore be kept with slightly smaller fish which it will not attack. Temperature tolerance is limited to a high of 22°C (c 72°F), so unless the tank is in a cellar or garage, an aquarium cooler will be necessary in the hotter months.

4 Cuckoo Wrasse

The Cuckoo Wrasse, *Labrus bimaculatus* (= *L. mixtus*), is a splendid example of a British marine fish that graces the better and larger public aquaria. It has not been kept by home aquarists, though, as it requires plenty of room and optimum conditions.

Adult males are yellow, with a brilliant blue head. The blue is more pronounced in the breeding season, at which time it displays a large white spot. In contrast, the females are a deep orange-red.

The Cuckoo Wrasse is a streamlined fish that is kept in tanks of over 1,000 gallons (over 4,500 litres) and often much more, in public aquaria. It is found in deeper water all around the British Isles and in the Mediterranean Sea.

5 Goldsinny Wrasse

Some specimens of the Goldsinny Wrasse, *Ctenolabrus rupestris*, are coloured gold, just like the Common Goldfish, while others are much paler.

This wrasse is more streamlined than the Corkwing, and reaches a similar length of 18cm (c. 7in). It is tolerant of temperatures up to 26°C (79°F) and although not often kept because it is found in water deeper than 10 metres (33ft), a few aquarists who have kept this fish report success in the larger aquaria of over 100 gallons (455 litres).

Taste of the Orient

Your garden pond can become even more of a feature if you add an **ORIENTAL BRIDGE** either over it, or nearby.

Made from seasoned English oak, but using Japanese joinery techniques (joints running through each other), the bridge comes in six sizes, from 4ft — 10ft, with made-to-measure, and/or customised design services available for those requiring it, and is guaranteed for 10 years, but a lifespan of nearer

WATER'S EDGE

BY DICK MILLS

30 years is quite likely. Details from **KILNWOOD FURNITURE**, Unit 18, Gaza

Trading Estate, Hildenborough, Tonbridge, Kent TN11 8PL Tel: 0732 452059.



KILNWOOD FURNITURE

Maintaining life in the water

A pond's 'life' is only as good as the water quality allows it to be, and three main 'yardsticks' to judge water quality by are ammonia, nitrite and pH levels. The first two have 'danger threshold' levels of 5ppm and 10ppm respectively, requiring partial water changes, while pH monitors acidity/alkalinity levels

which should lie between 7.5 and 8 for coldwater pond fish.

HALOEX dechlorinating agent gets the pondwater off to a good start, but parasitic blooms at the beginning and end of each year's coldwater season also bring problems which need to be countered. **WATERLIFE RESEARCH** firmly believes in, and advocates, regular water testing, followed by relevant preventive or remedial treatments as required.

AMMONIA TEST KITS should be used following, say, a treatment with **PONDOSAL**, which sustains the necessary relatively high pH level; the use of **STERAZIN-P** is valuable at each end of the year, while **ALGIZIN-P** provides a reliable and effective back-up treatment in the battle against parasitic attacks and acts as a controlling agent against blanketweed.

Where Sterazin-P cannot be used (if Orle and Rudds are kept then **PARAGON** tonic will be beneficial. **MYKAZIN** not only is a treatment for Fin Rot, bacterial infections and wounds, but is also valuable, when used in solution, as a sterilising agent for nets, equipment and even live foods.

Details from: **WATERLIFE RESEARCH INDUSTRIES LTD.**, Bath Road, Longford, West Drayton, Middlesex UB7 0ED. Tel: 0753 685696/682487; Fax: 0753 685437.

New hi-tech pumps

A new airline has been launched. No, not to fly fish from A to B, but to deliver large quantities of clean air from pump to aquarium. Its name is **AQUA-AIR**, a new range of pumps and associated accessories from **INTERPET**.

The 'AIRLINE' under discussion is kink- and vibration-free and made from silicone-rubber. **AIR VALVES** and **CHECK VALVES** already form part of the Aqua-Air range.

These are four **AIRPUMPS** in the range, all sharing a common design, together with a patented labyrinthine valve chamber and a solid base, both of which contribute to quiet operation; vibration-absorbing feet make sure that any 'rattles' are eliminated, as is the notorious 'pump-walk' of old. Precision-engineered

components, plus the exclusive **Dialife** diaphragms help to provide long pump life.

From the fish consumer end of things, the air reaching the aquarium will have been purified by means of a carbon filter built into the pump body. Each pump comes with clear instructions, including its suitability for relevant tank sizes.

How do you like your plants — long, short, green or brightly coloured? Any, or all, of these requirements can be met by the new range of realistic permanent plastic plants in the **AQUA-GARDEN** and **AQUA-GARDEN NEON** range.

If you keep fish that aren't compatible with real plants, or water conditions won't sustain real plant growth, or you want to create unusual and exotic-

looking decorations for your aquarium, then these replicas are for you. Each specimen is available in 16 varieties, four sizes and in natural green or startling neon colours; a special scooped out base mount makes for easy and permanent 'rooting' in the substrate.

Even if they get a little clogged with algae or mineral deposits, these not uncommon imperfections can easily be removed with **AQUA-GARDEN PLANT CLEANER**.

Then, just switch on an **Interpet BEAUTY LIGHT** and see your newly-designed Aqua-Garden aquascape spring into vivid colours — fish as well as plants!

Details from: **INTERPET LTD.**, Vincent Lane, Dorking, Surrey RH4 3YX. Tel: 0306 881033; Fax 0306 885009.



INTERPET

Feast your eyes!

The new 1994 Catalogue from **OASE (UK)** is something to really get your teeth into — it's a third larger than last year's, and it needs to be, to include such a range of aquatic and garden-suitable products.

To take but one example, there are no fewer than 36 pumps described to suit every conceivable demand! Among these are the new **AQUARIUS 11** and five innovative additions to the **NAUTILUS** range of fountain pumps.

Elsewhere in the catalogue are details of fountain nozzles, floating and underwater lights, pond filters, the new **Europond** filter pool, pool liners, pre-formed pools and so on.

Details from: **OASE (UK)** on Tel: 0284 333225; Fax 0284 333226.

New fish feeder

As more fish are killed by kindness (overfeeding) than by any other causes, taking the feeding schedule out of the hands of us mere mortals seems to be a logical step. No longer

will individual members of families feed the fish without telling each other, as the **NUTRAMATIC AUTOMATIC FISH FEEDER**, from **ROLF C. HAGEN** will do the job for you.

The neat compact unit can be used with any aquarium (a mounting pedestal foot is included for this purpose), but is especially tailored to be incorporated in the new **TROPICQUARIUM 66-68** which have a special mounting aperture already built in.

Operation is simplicity itself: flake or pellet food is placed in the food reservoir which rotates at the appointed time to tip food into the aquarium, amounts being adjusted by a sliding control on the face of the food reservoir. Clogging due to moisture from the tank has been counteracted by the upward facing design of the reservoir. Two feeds a day can be programmed into the timer (extra feeds can be made by a manual over-ride control) and a novel knife, fork and spoon 'cutlery icon' appears on the display panel to show that feeding events have been set correctly.

The **TROPICQUARIUM 68** model (first seen at a Hagen trade preview last September, released to the enthusiastic trade this March) made its debut at a 'consumer-show' at the recent Yorkshire Aquarist Festival.



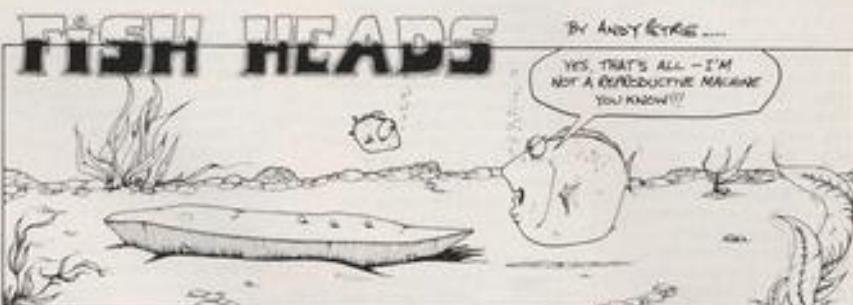
Based around the BioLife 'Wet/Dry' Filter, the '68' features everything a fish (or fishkeeper) could wish for — dual fluorescent lighting (including tubes), programmable light timer/clock and hinged rear entry hood with

feeding aperture, storage space for optional airpump and access point for the Nutramatic fish feeder described above. A special feature is the aquarium rim which provides location fixings, along the back or sides,

for optional positioning of the BioLife filter unit.

Overall dimensions are 85cm (l) x 37cm (w) x 55cm (h), capacity 130 litres. Newcomers need not be daunted by such complete sophistication, for the Owner's Guide Instruction manual (additionally backed up by the included BioLife filter manual) not only gives excellent guidance on practical matters, but also good theoretical coverage of water purification too.

Details of all products from: **ROLF C. HAGEN (U.K.) LTD.**, California Drive, Whitwood Industrial Estate, Castleford, West Yorkshire WF10 5QH. Tel: 0977 556622; Fax: 0248 750558.



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Home-made fry food

Back in the late seventies when colourful Discus were a rare commodity, young fish, thumb nail size, could cost £25-£30 ... very expensive! Popularity of these fish was not particularly great, though, as there was not too much information available; the few Discus fanatics around at the time revealed none of their secrets. This made Discus keeping all the more difficult and a challenge to anyone who cared to try.

I was becoming quite bored with my tropical aquarium and had decided to breed a few Angelfish, Acaras and other types of cichlids. Soon enough, therefore, Discus became an attraction, so I purchased some Hong Kong Blues from the local 'trop-shop', where I used to work. They were expensive, £6 each, and I managed to get hold of eight nice youngsters.

After growing them to 5in (c13cm), they began to pair up, sitting and bowing to each other, just as I thought they would. I felt certain that I would get at least one compatible pair out of the eight. In fact, I was lucky enough to get two breeding pairs.

Spawning occurred every week, but no youngsters were being produced. It became apparent that my Discus preferred to indulge in a little egg eating. This went on for weeks, so I decided to rear the fry away from the parents. It couldn't, after all, be much different than the rearing of Angels or Acaras. Was I ever wrong!

10-page goldmine

Hatching the Discus was a piece of cake, but even after weeks of introducing boiled egg yolk, I progressed no further. After months of investigation, I managed to get hold of a little booklet with not more than ten pages within, but it was the most

informative book I had ever come across. The author was a man called Carrol Friswold. He had included a formula for baby Discus food, along with various other tips, to help those who wished to raise fry without the aid of the parents, especially apt for parents that would not hatch or rear the youngsters willingly.

Today, the majority of fry rearing techniques and food formulae are based on that little text. The basic ingredient for the food is, and was, dried egg yolk powder, used in vast quantities by bakers and caterers. When mixed with a little water until it had the consistency of peanut butter, it would then be smeared all along the inside top 1/2in of an enamelled bowl.

Water was then introduced very gently until it was just under the food. After the fry had been swimming for a few hours, they were introduced into the bowl by carefully sucking them up via the air line and allowing them to flow by gravity into the feeding bowl. This took quite a long time, moving 4-6 fry at a time.

Once all the fry were in the bowl, they began to adhere to the food.

I later found out that they all seemed to congregate at the meniscus, whether there was food present or not; this was quite a discovery.

As days passed, this job was becoming quite tedious, as it involved removing all the fry every two hours from bowl to bowl, something that just had to be done, since the water soon became foul with the use of the egg yolk powder.

I therefore began to experiment with several other additives in an attempt to find a formula that would retain its consistency under water. This was achieved by mixing raw egg yolk, instead of water, to the yolk powder. A great advantage of this mixture was that it could be stored, pre-mixed, in the fridge or freezer.



DISCUS

BY STEVE DUDLEY

Feeding tips

If you would like to use the above method, go for feeding bowls of the enamelled type found in camping shops or your local army and navy stores. They are ideal for size, being 10in in diameter and capable of withstanding oven temperatures.

To administer the food to the bowl, place your clean finger in the food and lightly smear it along the top edge of the bowl until the complete circumference has been covered. While doing this, be sure to keep the food about 1/2in from the top edge. The smear of food should be just like a residue approximately 1/2in in width. Try not to put the 'paste' on too thickly, as it will fall off and pollute the bowl when the water is introduced.

You should end up with an almost transparent residue of food all round the bowl. This can now be placed in a pre-heated oven for just a few minutes to dry off; you could prepare a few bowls at a time, just in case of any mishaps.

When all is done and the feeding bowls have cooled, transfer some water from the tank where the fry are, via an air line, into the feeding bowl to about 1/2in below the food. Place the fry in the bowl in the same manner, and increase the level of water until it meets the bottom part of the food.

Natural feeding. However, not all parents are as accommodating as these.



Discus in well planted aquaria rarely, if ever, suffer from nitrate-related problems

Discus



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Call And See Q.E.D. The Proof!

SIONS



will have white-yellow stomachs if they do! Within a few days, growth will be apparent. Four to five days of this will be sufficient and then brine shrimp can be introduced... a much easier undertaking. While fry are on the egg yolk formula, it is important to feed for at least 10-12 hours per day, with the fry being transferred

to a clean fresh bowl for resting once the tank lights have been switched off. Temperature is important too, of course. To help keep the bowl water at a reasonable temperature, float the bowls on the surface of the water in the aquarium. Alternatively, you could construct a shallow tank that is large enough to accommodate a few bowls and fit it with a low-wattage heater/stat.

The fry will begin to graze and the slow increase in the water level will allow the fry access to more food without polluting the water. You will observe within just a few hours if the fry like your cooking, as they

Nitrate control

I have been asked by numerous hobbyists to write a few words on the subject of nitrates in the Discus aquarium, and to air any problems which may arise from too much exposure to these compounds. Well, here are my thoughts on the subject. Discus that are kept in planted show tanks tend not to suffer greatly from nitrate problems, as most keepers ensure sensible stocking levels and feeding regimes, which reduce nitrate loads. Plants, too, will utilise nitrates as part of their food source. The nitrate problem generally affects breeders, who tend hundreds of youngsters at a time, feeding plenty of food hourly in order for their baby Discus to grow. Breeders often keep higher concentrations of Discus together as one brood, normally in one spacious tank, and this can often cause an overload on the bacterial filter being used. However, most breeders can cope with such high loads, even though they can produce as much as 50mg of nitrate per litre per day. This is why water changes are so badly needed on a

daily basis in breeding establishments. Having said that, soon after completing a change of water, if you re-test for nitrate, it can appear to be just as high! Discus kept for long periods in this kind of environment, tend to have a relatively greater respiratory rate than those kept in more 'normal' conditions and show relatively poor growth. Could this over-extension of the gills be related to poor growth due to the extra energy needed being burned off by the gills? Some of this wasted energy would, after all, have normally been used for the production of body tissue — ie growth. There is also a strong possibility that rapid gill movement in baby Discus could be responsible for distortions in the gill plates. Such distortions become quite evident at the age of six weeks or so. I think most Discus keepers will have encountered such problems with nitrate. In fact, it seems to be impossible to ever keep on top of nitrates, regardless of excessive water changes. I have found that the best remedy — in my own hatchery — is to employ a nitrate-removing resin in a purpose-built filter, alongside frequent water changes.

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Night on a coral reef is a time of change; dusk and dawn are the times of most activity by predators who can rise unseen out of the darkness to take prey made visible against the lighter sky. One can often sit on a boat or jetty watching the water churn as shoals of small fish are attacked by jacks, tuna or barracuda. Often, these small fish jump out of the water in an attempt to escape, only to be snapped up by hovering sea birds.

Night moves

Underwater, parrotfish and butterflyfish hide in crevices in the reef, angelfish hide even deeper, either completely hidden, or with just an eye or snout to be seen. Most of the wrasses bury themselves in the sand, together with some pufferfish, lizardfish, flounders and rays, not a fool-proof strategy, as many sharks have electro-receptors that can detect them there!

Snappers and grunts shoal in closely knit small groups, in caves, in small coral valleys or between gorgonians.

Triggerfish flatten themselves against depressions in the coral, as do the smaller Hawkbill and Green Turtles if they cannot find a cave or large enough gorgonian.

Many diurnal ('daytime') fish change colour at night. Sometimes, this change is small, but in other cases, there is a total change. Occasionally, the colour change is similar to that used by the same fish at a cleaning station to signal that it is ready for cleaning. In some instances, solid colours become blotchy, while in others, bold patterns appear, making these fish more difficult to pick out against a coral background.

Some fish such as squirrelfish, soldierfish, bigeyes and cardinals only feed at night, and many others, worms, snake eels and sea cucumbers can only be found at night.

Crowded nooks

Every nook and cranny in the coral contains something of interest: shrimps, prawns, crabs, lobsters, cuttlefish, worms and octopuses. Nudibranchs, urchins, flat worms, cowrie shells, conch shells, huge tun shells and unusual sea cucumbers graze.

Overhanging roofs are a blaze of colour, from the feeding polyps of *Tubastrea* corals. A Sea Hare grazes sedately and ejects magenta ink if touched. A moray eel dashes from crevice to crevice; clownfish look forlorn, shut out by their closed anemone. Comb jellies, often too transparent to be noticed in daylight, stand out in the light. Young cuttlefish and shellfish hide among the spines of spiny urchins, while small crabs and brittle stars feed among the arms of corals and gorgonians.

The shallows are the realm of basket stars, brittle stars and feather stars, sifting the current for plankton. If your light is too powerful, they will curl up and disappear more quickly than you can look at them, so it is best to use a weak light.

Jack Jackson introduces the magic of the dusk-to-dawn reef community.

Photographs by the author

Mesmerising sights

The reef fishes of the day, either hide in holes in the reef, or behave sleepily on top of it, where they are often mesmerised by lights so you can then get very close to study them. Many will spread out their fins to appear larger and more threatening, and some puffer fish will puff up.

Most interesting are the larger parrotfishes, which have backed into unlikely looking overhangs, holes or branches corals and gone to sleep. Their eyes are still open, of course (fish don't have eyelids), but they ignore lights and can be stroked. If you go late, you will find them enclosed in a cocoon of mucus, which is believed to protect them from predators and parasites.

Larger caves will often contain sleeping turtles, some of them very big. Turtles have to regularly surface for air, so leave them room to get out.

The night aquarium

Most aquarists would not think of stocking their tanks with creatures of the night. The amount of time they are likely to spend looking at them in low light would be minimal, they would not easily be able to monitor their health and extra thought would have to be given to providing daytime hiding places.

Nowadays, there are also some 'night'-type aquarium lights which open up a whole new world for aquarists, and these should be given serious consideration.

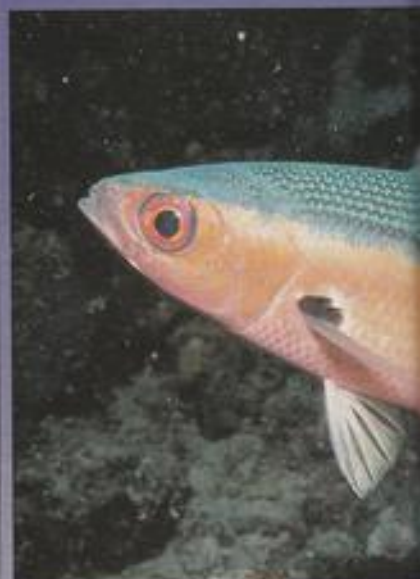
Some commercial aquaria do have artificial night-time displays and the Coral World Group such as the one in Eilat (Israel) also have tanks showing luminous corals and creatures.

Torchlight dives

If you are on holiday in an area of calm water with a point of easy entry and exit to the sea, it really is worth having a look; even snorkelling along a reef edge can be very rewarding with a waterproof torch. On nights around those of a full moon, you will be amazed just how much you can see even without a torch.

One feels a touch of apprehension before jumping into dark water where, a few hours earlier, sharks may have been. Almost inevitably, one will first point one's light into open water to confirm that there are no sharks around.

The Coral at Night



Darkband Fusilier (*Pterocaesio tile*) in its amazing night-time colours on a Pulau Sipadan Island reef.



Basket stars — this is *Astrobra nuda* — extend their feeding tentacles at night.

al Reef ight

However, there is so much life and colour lit up on the reef, that all such fears are soon forgotten. Concentrating on what can be seen within the confines of a waterproof torch, one sees more creatures, in more detail, than one would normally see in daylight.

Dark dangers

The dangers of night diving and snorkelling are not sharks, which are rarely seen at night. While vision is limited to the range and width of torchlight, it is easy to brush against unseen, familiar objects, such as fire coral, lionfish, stinging hydroids, spiny urchins, scorpionfish and stonefish.

Scorpionfish often get their camouflage wrong and are bright red in the beam of a torch, so they are easily seen. Looking around it is surprising to see just how many scorpionfish there are, including many young ones that go unnoticed hidden in the coral during the day. Stonefish are even more difficult

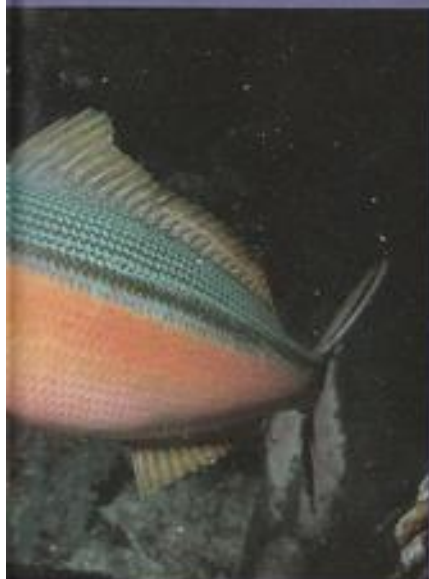
to see at night and often only give themselves away by movement.

If you do not have a wet suit for protection, wear an old pair of trousers and a long-sleeved shirt. Wearing gloves makes most people feel safer, but try not to touch any living creatures, including coral, which is easily killed by touch.

'Flamenco' and flashlights

Many people particularly wish to find a Spanish Dancer, a bright red nudibranch (sea slug) fringed with white, which can grow to more than eight inches long. There are usually plenty of Spanish Dancers around, but they are often hard to pick out, as they blend in so well with red sponges.

Don't forget to check in caves and under overhangs. Look for their waving gills and, occasionally, a shrimp on their back. When disturbed, they will swim through the water with an undulating motion. They are translucent in the torch beam and, thus,



Lionfish abound at night. This is the Zebra Lionfish (*Dendrochirus zebra*) with outspread fins, photographed off Pulau Sipadan.



Cocooned in mucus, a Bridled Parrotfish (*Scarus frenatus*) sleeps away the hours of darkness in the Sudan Red Sea.



'Swarms' of Sea Mosquito irritate a Lined Butterflyfish (*Chaetodon lineolatus*).

Cup Coral (*Tubastrea micranthus*) in full glory.



their white fringe stands out, resembling the twirling skirt of a Flamenco dancer.

Before leaving the water, turn off the light for a few minutes. Initially, you will be surprised by all the noise of various creatures eating and snapping, and reef fish grunting. As your eyes get used to the dark, you will notice many phosphorescent creatures, including *Photoblepharon* (Flashlight Fish).

Three inches long, these interesting fish swim around in small shoals. A pouch below each of their eyes contains bioluminescent bacteria, which glow like a firefly. If you wave your arms about, you will disturb millions of phosphorescent plankton, causing them to glow like a snowstorm.

In seas where predators abound in healthy numbers, such as the Red Sea, urchins, feather stars, lobsters and most starfish are more likely to be seen at night. In other seas, including most of the South Pacific, these creatures may be seen during the day.

Organised activities

In resorts, or on boats where night diving or snorkelling are organised, it is usual to have a light or chemical light stick marking the entry/exit point underwater and often divers or snorkellers have a chemical light stick attached to their cylinder or belt so that they can easily be found if their torches fail.

Underwater torches do fail, either from water leakage or flat batteries, so it is always worth carrying a spare; wrist lanyards keep torches to hand if you drop them or need a free hand for anything.

Some resorts or boats have night floodlights over the water so that clients can watch the antics of fish, octopuses and cuttlefish. These lights also attract swarms of 'sea mosquitoes' that can be uncomfortable to swim through.

There is nothing to be gained by going deep; three to five metres down is deep enough to see most things, and this depth is easy to snorkel to. On top of a reef, or along a shallow drop-off, you will easily see basket stars, feather stars, urchins, crabs, lobsters, shellfish, sea hares, smaller nudibranchs, flatworms and the smaller reef fish.

Time choices

Night dives and 'snorkels' divide naturally into three categories: dusk, when there is still plenty of light above water, is good for feather stars, brittle stars and basket stars, especially on fringing reefs; 7-9 pm, which would be normal; or to be sure of seeing parrotfish in their cocoons, later, at least after ten, or even after midnight.

If you have never been in a warm calm sea with a waterproof torch at night, it's an experience not to be missed. It's a new and different world, with many remarkable creatures to be seen.

Try it sometime!

APP

A Spanish Dancer (*Hexabranchus sanguineus*) 'dancing' in the Sudan Red Sea.



Many crabs, including the Red Crab (*Etisus splendidus*) feel safer feeding between dusk and dawn.

The spectacular colours of some flatworms, such as *Pseudoceros*, show up beautifully under torchlight.



An impressive Partridge Tun Shell (*Tonna perdrix*) glides over corals as it feeds.



TRAVELLER'S TALES

AQUATIC WINDOW CLEANERS

Diver Pierre Benson polishing the tunnel at Under-Sea World, Edinburgh, surrounded by curious fish.



The aquatic cleaner at Sea Life Park, Makapuu, Hawaii — wearing a bikini and weights — polishes their acrylic tube.

Worldwide, there has been a boom in building public aquaria. As zoos close down, underwater displays take their place. Whereas zoos are losing money, public aquaria are making profits that fund ever more units.

The latest in the USA are the Aquarium of the Americas in New Orleans, that broke all records of attendance, and the Tennessee Aquarium in Chattanooga, which claims to be the largest in the world with a 60-foot canyon of cascading water, two living forests and three

galleries of aquariums.

Here in the UK, public aquaria range from the small private aquarium display at Fort Victoria on the Isle of Wight, to the huge seawater aquarium at Deep-Sea World in North Queensferry near Edinburgh, plus the 10 SeaLife Centres, with more planned.

The problem for all the keepers of these public aquaria is that they've got to be kept clean! In the old days, shows like the London Zoo Aquarium had rows of glass tanks that were given a daily spit and polish ... at London Zoo they still do (but watch this space).

However, aquaria have grown ever more complex, with visitors travelling through giant tanks in acrylic tunnels. The famous tunnel at SeaWorld, Orlando, USA, started it all with its tube through the Shark Aquarium, as featured in many TV and cinema films.

Marinescape International in New Zealand developed more sophisticated viewing areas, with 180-degree visible tubes becoming 270-degree ones. Now a 360-degree tube is planned where a moving platform sweeps visitors through a plastic tube with all-round viewing.

The longest tube in the world is Scotland's Deep-Sea World tunnel, which is 112 metres long and has an acrylic sheet 65mm

It's all very well building beautiful underwater tunnels, but how do you keep them clean?

Aquarians' Dr David Ford has been finding out

Photographs by the author



thick. The sheet was cast in Germany and shipped to New Zealand for shaping before arriving in Scotland for installation. The tunnel is so long that a fire exit door had to be installed halfway along and air conditioning fitted to meet health and safety regulations!

Any aquarist knows about the muck, fish faeces and debris that coats every aquarium and pond bottom. So, how do you keep this off the tubes so that visitors are not peering through a film of unmentionable deposits?

You have to have deep sea divers armed with cloths, brushes and plastic scrapers for a daily cleaning chore. These

staff need to be qualified, at least to Part I of the Health & Safety Executive Diving Course. They dive to 'spit & polish' (but without the spit!) for about an hour each time, up to four hours daily.

Although an air bottle can last over two hours, the rubber suit they wear cools and divers can get very cold in a seawater tank, especially in British ones.

Things are different in the tropical waters of places like the Sea Life Park of Hawaii. Here, a bikini is required, rather than a rubber suit! However, all cleaners have the same problem. The body is buoyant and if you rub hard on the acrylic tube surface, the pressure sends you floating off into watery space!

The traditional weights carried by divers are 25lb to give neutral buoyancy, but these have to be increased to about 40lb so you can really scrub without shooting away like an aquatic astronaut ...



The longest underwater 'tube' is at Deep-Sea World in Edinburgh.



ASRA members digging out silt from an old dew pond which no longer held water

Getting involved

In common with several other herpetological societies, the Association for the Study of Reptiles and Amphibians (ASRA) has been actively involved in practical environmental conservation projects. For example, over a number of weekends, ASRA members dug out and restored a silted-up dew pond in a National Nature Reserve on the Wiltshire Downs — part of the North Downs.

The North (and South) Downs are composed of chalk, a rapidly draining sedimentary rock. This property ensures that ponds are not a common feature of downland. Human colonisation of the downs, including the keeping of grazing animals, such as cattle and sheep, dictated that water had to be provided, and dew ponds have been one of the traditional methods by which water has been collected and stored. These man-made ponds (lined with puddled clay to form a water-proof barrier) have also proved to be invaluable havens for amphibians.

These animals need water in which to lay their eggs and for their larvae to develop prior to metamorphosis. In particular, Smooth Newts (*Triturus vulgaris*) and Great Crested Newts (*T. cristatus*) use dew ponds as breeding sites, even if these water bodies are high up on the downs and several miles from any other pond or water body.

ASRA has also helped with practical environmental projects organised by the British Herpetological Society (BHS). This year, these conservation tasks have included the clearance of pine, birch and gorse. Collectively, if left unchecked, the growth of these woody plants can form a dense cover of scrub which can choke sensitive herpetological sites, blocking out sunlight and preventing reptiles like Sand Lizards (*Lacerta agilis*), Smooth Snakes (*Coronella austriaca*) and gravid female Adders (*Vipera berus*) from basking.

If you would like to receive further details about membership of ASRA, including information about the Association's current



practical conservation activities, then write to:
ASRA,
 PO Box 73,
 Banbury,
 Oxon OX15 6RE.

The summer months are an excellent time to get out-of-doors and involved in a whole range of practical herpetological projects, and I have drawn attention to two other positive ventures in recent editions of *Frogs and Friends*; neither involves membership to a club or society.

In March's *A&P*, I provided information about a current survey into the condition of Britain's remaining ponds. Further details, together with recording forms, can be obtained from:

BHS Pond Survey,
 Dr M Swan,
 19, St Judith's Lane,
 Sawtry,
 Huntingdon,
 Cambs PE17 5XE.

In last month's magazine, details were given of two important new recording schemes which will detect any changes in the distribution of the reptiles and amphibians of the British Isles.

The necessary recording forms, together with a twelve-page instruction booklet, can be obtained from:

Henry R Arnold,
 Biological Records Centre,
 Institute of Terrestrial
 Ecology,
 Monks Wood,
 Abbots Ripton,
 Huntingdon,
 Cambs PE17 2LS.



By JULIA

Newt egg hunters

During spring, female newts of the genus *Triturus* lay their eggs over a much longer span of time compared with female Common Frogs (*Rana temporaria*) and Common Toads (*Bufo bufo*) which are found in the same geographical region.

Each female newt can deposit from 10 to more than 500 individual eggs over a period of one to three months. Due to this long spawning season, aquatic newt larvae with leathery external gills can still be found in ponds during the summer months through into the autumn. Newts of the genus *Triturus* do

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Great Diving Beetles mating. Both they and their larvae are voracious predators.

LAURENCE E. FRINGS

not provide any parental care for their eggs or larvae during development. However, immediately after laying, female newts do fold the leaves of underwater plants around individual eggs in an attempt to conceal them from potential predators. The main predators of eggs laid by female Palmate Newts (*Triturus helveticus*) and Alpine Newts (*T. alpestris*) have recently been identified in experiments conducted in France.

During one part of this research potential predation on 753 newt eggs in laboratory aquaria was investigated. 391 eggs were left as they had been laid — wrapped in the leaves of underwater plants. The other 362 eggs were carefully unwrapped so that they were visually obvious. For eggs which remained wrapped, adult Great Diving Beetles (*Dytiscus marginalis*) were the only predators that consumed ALL available eggs. Adult Lesser Diving Beetles (*Acolius sulcatus*), Alpine and Palmate Newts ate very few wrapped eggs.

With the unwrapped eggs, Great Diving Beetles remained the major predator. However, predation by Lesser Diving Beetles and female newts was significantly higher than for wrapped eggs. In contrast, predation by male newts remained very low.

HERP FACT/Skin protection

The skin of amphibians is comparatively thin. Some species of Caecilian have tiny scales imbedded in their skin, but these are an exception, and ALL amphibians lack the thick protective outer scales characteristic of reptilian skin.

Amphibian skin is semi-permeable, and death by dehydration is a real risk, because body fluids from inside these animals can be easily lost to dry surroundings. Thus, most species of amphibian are restricted to living in damp habitats. Due to such a limitation, this group of animals never dominated the earth in the same way as, for example, have the reptiles during the age of the dinosaurs and, currently, the mammals in the form of humans.

Even so, the structure of amphibian skin is remarkable. In fact, it is the key to their survival. In particular, the skin of these animals contains numerous glands. The two main types are: Mucous glands, which keep the skin moist, and Granular (or 'poison') Glands.

Granular glands produce a range of substances, including batrachotoxins which block the movement of nerve impulses. This property of batrachotoxins can cause the jaw muscles of a predator to become paralysed, allowing the amphibian to escape from the mouth of an enemy.

The glandular skin of African Clawed Toads (*Xenopus* sp.) secretes an antibiotic which helps to protect these amphibians from attack by disease-causing bacteria.

Glands in the red skin of the Tomato Frog (*Dryobates antongilii*), a narrow-mouthed toad from Madagascar, secrete a white tenacious 'glue' which can temporarily stick the jaws of a predator together. This prevents the amphibian from being bitten or chewed, and gives it time to escape.

Vertical section through the skin of a toad showing a granular, or poison, gland.



All of these predators can be described as 'chewers', as they have biting mouthparts. Other categories of predator which were investigated included 'suckers' — Water Stick Insects (*Ranatra linearis*) and Saucer Bugs (*Rhyocoris cimicoides*) — as well as 'grazers' — Great Pond Snails (*Limnaea stagnalis*) and tadpoles of the Common Frog (*R. temporaria*).

These species were selected for experimental investigation because they have previously been reported as predators of newt eggs or gilled newt larvae. In this investigation, NO predation on newt eggs (wrapped or unwrapped) was observed by the above sucking and grazing species.

Indeed, the findings of this survey are very conclusive. If you intend to breed species of *Triturus* newts in an aquarium and you collect natural pond water as a source of invertebrate food for the hatching larvae, make sure that the water does not contain Great Diving Beetles. These aquatic insects are voracious predators of newt eggs and will eat all they find in the confines of a tank.

Once the eggs hatch, the moving gilled larvae are still vulnerable to the predators already identified. They also attract others, including Caddis Fly larvae (*Limnephilus vittatus*).

Galápagos fire threat

As this edition of *Frogs and Friends* is going to press, a potential environmental disaster is threatening one of the Galápagos Islands in the Pacific Ocean.

Fire is sweeping across Isabela (formerly called Albemarle), the largest island in the Galápagos Archipelago. Isabela is inhabited by five different subspecies of Giant Tortoise. These subspecies occur nowhere else on earth — not even other islands in the Galápagos group. I will report further on this matter in a future A&P.

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QUESTION TIME

Having problems? Send your queries to our panel of experts who will be pleased to be of service. Each query receives a personal answer and, in addition, we will publish a selection of the most interesting questions and responses each month. Please indicate clearly on the top left hand corner of your envelope the name of the experts to whom your query should be directed.

All letters must be accompanied by an S.A.E. and addressed to: Question Time, Aquarist & Pondkeeper, 9 Tufton Street, Ashford, Kent TN23 1QN. Herpetology, Julian Sims. Kol, John Cuvelier. Tropical, Dr David Ford. Coldwater, Pauline Hodgkinson. Plants, Barry James. Marine, Gordon Kay.

COLDWATER



Collected Crucian

Last year, I collected some pond weed from the nearby canal for my garden pond. Recently, I have discovered that my pond now contains some small fish which I did not knowingly introduce, so I presume that they must have been brought in as eggs on the weed.

I think they might be members of the carp family—similar to rudd or roach, but they appear to have a larger dorsal fin than either of those two. The dorsal fin reaches well down towards the tail, which is rounded at the tips. The fish are of a greenish hue.

Any ideas as to what they might be?

From your brief description, I am suggesting that these fish could be Crucian Carp (*Carassius carassius*). The young do not

have the deep body of the adult; the hump-back develops later.

Unlike some other carps, the Crucian does not have barbels on the mouth and, like the Goldfish (*Carassius auratus*), the dorsal fin grows along the back, almost to the caudal. The colour is an olive-greenish; in adults, it can be reddish-brown along the back, with shades of bronze on the sides, and a lighter belly.

This species is able to live in quite poor conditions, though small, well-vegetated ponds are typical habitats. When fully grown, it can reach a size of 20in (50cm). Spawning takes place from May to July, and the preferred spawning temperature is in the mid-fifties °F (around 13°C).

Taking plants from the wild is rather a risky business. There could quite easily have been some pests or disease which you would have unknowingly introduced into your pond ... along with the Crucians



Crucian Carp: close relative of the Goldfish.

TROPICAL



White sand in aquaria looks good ... but may need more careful management than gravel.

Sandy problem

I have recently changed from gravel to white silica sand, in my 30 x 15 x 12-inch tropical tank. It looks tremendous and the fish seem quite happy. A bonus is that waste products are clearly seen on the white sand (unlike gravel) and can be removed quickly.

Now, four weeks on, green algae are growing on the sand.

To remove the algae, do I vacuum the top layer off and add new clean sand? Or, instead of throwing the old sand away, can this be cleaned and put back?

Just use a wide-bore plastic tube so that, when siphoning, the dirty sand is sucked into a

bucket. Fill the bucket with water from the hot tap and swirl it around. Allow to settle and pour off the dirty water. Repeat until clean, then dribble the sand back into place.

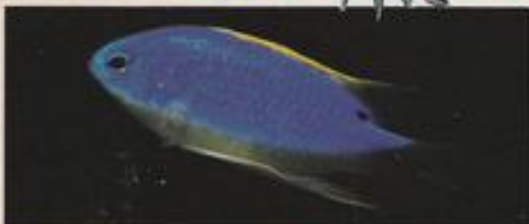
To avoid green algae growing on sand you can use coloured lighting (providing the plants are not real).

Soft options

I want to soften the water in my aquarium (it currently reads 25°, as measured with a conductivity meter).

I have been advised by a chemist to use a resin (Amberlight IR 120) which can be

MARINE



Damselfish are generally regarded as good beginners' fish.



regenerated using sodium chloride (salt), thus removing the calcium and magnesium and making the water softer.

What's your advice?

Yes, your water is hard, by interpolation from conductivity readings.

Do not use a regenerative resin to soften it, though; these compounds exchange (but do not remove) the ions. They work by replacing the calcium by sodium, so traditional soaps (which are sodium compounds) will lather as if the water was soft.

The high-sodium level water is actually dangerous to fish; for example, commercial systems, such as Permutit, recommend that treated water is never used in aquaria or ponds.

The resin you want is an ion-removal type which actually removes chemicals like calcium and magnesium salts dissolved in the water. Aquarium shops do sell these types of resin, but they are not re-usable, and so can be expensive.

The simplest solution to your problem is to boil the water and let it stand before use. This causes the temporary hardness (bicarbonates) to precipitate as insoluble carbonates (the fur in the kettle), often reducing the total hardness value by 25%.

Rainwater can be collected even in industrial areas, by pegging out a polythene sheet with a central hole. Place a collecting bucket under this hole and reject the first half an hour or so of the rain. It is only the initial downpour that is 'acid rain'.

Boiled and rainwater can be kept in a lidded container with a few handfuls of peat as a stock solution for partial water changes ... an ideal water for Amazonian species.

Post-maturity stocks

My aquarium holds 25 gallons of water. How many fishes can I buy, after the filter is matured? Are damselfish good first fish to keep?

For the first six months you can house a total of 6in of fish, not including the tails. After that, the figure can increase to 12in. Don't forget to build up to these figures slowly!

Yes, damselfish are good first fish for a marine aquarium.

Salty choice

For some reason, my dealer can't get the salt I normally use. Is it OK to use another brand?

Absolutely! Just as you would never know the difference between different petrols in your car, there will be no difference whatever between any of the modern, good-quality salts.

Smelly guesses

My aquarium, which holds both fishes and invertebrates, has lately started to smell horribly. I can't describe the smell, but it's awful! The animals look OK though.

There is no doubt that you have problems. The trouble is that I cannot possibly make a diagnosis without:

- (1) more information
- (2) a look at your aquarium, or
- (3) a sniff of it.

Without these I can only make guesses as to what's wrong. These guesses would, predictably, include things like over-feeding or over-stocking.

It would be a good idea to get your animals out of the tank. If you can, ask your dealer if (s)he can house them for you for a week or two.

In any event, do large water changes (max 50%) until the smell disappears. During this period, DO NOT put any more food into the aquarium. Oh ... and just check that all of your animals are alive!

KOI



Spotty Koi

A few weeks after buying some Koi, I noticed that one of the fish had developed a black spot on its body. Soon, the others started following suit.

Apparently, these spots cannot be treated but they eventually fall off. Is this so? I am concerned, since one of my fish now has 18 spots!

I'm sorry to say that there is really no answer to the problem you are experiencing. The black 'spotting' of Koi is a phenomenon which is appearing more and more. Some experts blame it on environmental conditions, while others blame it on genetic inbreeding of varieties.

Personally, I tend to follow the latter theory which, of course, does not help people like us who experience the problem. Several of my own Koi (none of which, I might add, are so-called exhibition quality ... Ugh!) have developed identical spotting, and you simply have to ignore them until someone comes up with a solution.

I have even heard of cases where surgery has been used in an effort to remove the spots, something which I think is utterly appalling. Needless to say, the spots usually return.

All we can do is to continue to enjoy our Koi, as I'm sure you do, and hope that an answer eventually surfaces.

U-V Solution

I have a 4-ft deep Koi pool which holds 300 gals, and in which the fish are in good condition.

My problem is the water. It gets green and, although I used straw last year, it didn't clear. I am now planning to install a 4-watt U-V steriliser. Would this be a good idea?

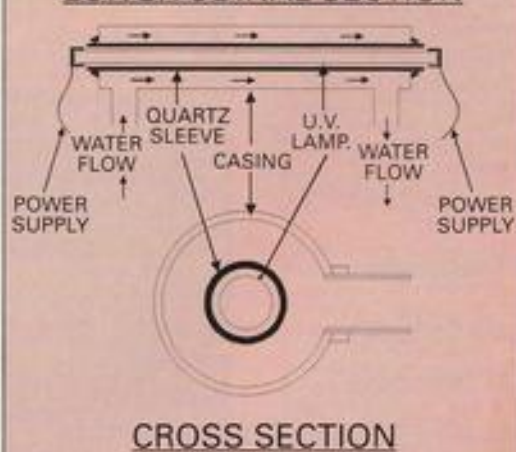
As you are no doubt aware, the problem of green water is one of the most discussed matters in the world of pondkeeping.

Your idea of adding a UV unit is, basically, quite correct, as these devices undoubtedly ease the situation to a degree. However, I would question the advisability of using a 4-Watt size in preference to a 15-Watt version, as the former is certainly on the small side. If you can possibly manage it, I would feel happier if you obtained the larger size.

I am also wondering about the quoted capacity of your Koi pond, as you state that its depth is 4 feet. Unless it has sharply sloping sides, then its size must be well under 4 feet in diameter, assuming it to be circular (?). Without trying to teach you to suck eggs, have you applied the correct formula of L X W X D X 6.23 to obtain the capacity in gallons?

The finest method of controlling green water is, of course, plenty of shade by means of plant life, such as lilies etc., or even by restricting the light by artificial means, such as plastic net shading during the hottest part of the day.

LONGITUDINAL SECTION



Ultra-Violet Sterilisers will certainly help clear green water ... but there are other things to be considered too.

HERPETOLOGY



Moorish Gecko file

Can you supply some information about one of Europe's native geckos — the so-called Moorish Gecko?

Also, are there any herpetological societies which specialise in the study of geckos?

The Moorish Gecko (*Tarentola mauritanica*) is one of four species of gecko which are natural inhabitants of southern Europe. The fact that just four members of the family Gekkonidae are found in this region is an indication that these reptiles are at the edge of their climatic range. In the tropics, there are many more species of gecko.

Moorish Geckos are found in Portugal, Spain and along the coastal regions of Italy and Greece. They are also found on some of the Mediterranean islands, including Corsica, Sardinia, Sicily and Crete, as well as along the North African coast into Egypt.

The Moorish Gecko grows to a length of about 15cm (6in) of which about 8cm (3¼ in) are tail. Adhesive pads extend along the length of all the toes, being widest near their tips. Claws are only present on the third and fourth toe of each foot.

These reptiles inhabit stone walls, piles of rubble and



Moorish Gecko exhibiting one of the characteristic behaviours of many species — eye licking.

boulders, tiled roofs and tree stumps.

Unlike many other species of gecko which are mainly nocturnal, Moorish Geckos can be active by day and night. When basking or hunting for insects and spiders, they tend to stay fairly close to the hole or crevice in which they live so that they

can retreat to safety if disturbed.

Herpetologists interested in the ecology, captive care and reproduction of geckos might well consider joining the **International Gecko Society (I.G.S.)**. This society produces a quarterly journal appropriately named *Dactylus* — a term relating to the variety of toes which have

evolved among the geckos.

The journal, which is published in English, contains information from around the world. Further details about this specialist organisation can be obtained from: **International Gecko Society**
PO Box 370423
San Diego
California 92137-0423, USA

PLANTS

Shallow-water sedge

Would you recommend a plant with attractive foliage for planting in very shallow water at the pond edge?

Carex riparia var. *Bowles Golden*, is a most decorative sedge. It is a sport of a native plant, but grows only 15in (38cm) high, just half the height of the type form.

It has rich golden-yellow foliage which arches gracefully, forming neat clumps.

Safe additions

1 Heater hiders

I am not happy with the appearance of my aquarium. The equipment such as the heater and internal power filter are very intrusive.

I have tried hiding them with

plants but this hasn't been very successful. Any suggestions regarding a safe, but attractive, way of achieving my aim?

Batsford Products make

several Simlwood pieces precisely for this purpose. Therefore you can hide your equipment without fear of damaging your plants or fish through leaching out of harmful compounds.



A great golden sedge for the pond edge.



The relevant model numbers are BW 200, BW 130, BW 300, BW 230. I am enclosing a leaflet showing photographs of the whole range of these items, which I hope you will find useful.

2 3-D backgrounds

I wish to build a three-dimensional background for my tank, including caves etc. The difficulty is in holding the rocks together and filling in the cracks so that the fish cannot get trapped in them. I also need something that does not adversely affect plant growth. Any ideas?

N.T. Laboratories offer a foam aerosol precisely for this purpose.

You simply spray it into the cracks, where the foam hardens and the job is done.

This foam has been tested for aquarium use and is quite harmless, both to fish and plants.

Annual perennials

Among the cries for help that most frequently occur in my postbag, is the aquarist that complains: "I can grow plants alright, but they always stop growing after 6-9 months".

Further enquiries nearly always reveal that the tank is stocked mainly with plants such as *Hygrophila*, *Ludwigia* etc.

Although, strictly speaking, virtually all plants sold for tropic aquaria are perennial, most, for all intents and purposes, may be treated as annuals.

Most of these have an inflexible growing cycle, based on the seasonal variations in climate.

Let us take, for example, *Gynerosia spilanthoides*, often called The Spade-Leaf Plant. This species which is from the jungles of South America, would, in the dry season, grow as a very vigorous herb, often reaching a height of 24in (60cm) or more. In this state, its stems become almost 'woody' at the base.

Towards the end of this growing cycle, it produces its terminal inflorescence of pretty white globular flowers, which, when pollinated, produce copious amounts of seed. These are eventually expelled on to the mud. With the advent of the rainy season, the old parent plants are submerged and die or disintegrate.

The seeds now germinate underwater, and produce ascending masses of soft fleshy stems and lush bright-green leaves. As the water level falls in the dry season, the terminal shoots appear above water, and go through the emersed cycle once again.

In the aquarium with its constant water level, this natural seasonal rhythmical cycle doesn't occur. The plants therefore have to be constantly pruned to keep them from pushing the aquarium canopy off. Eventually, the plants weaken and die.

Emersed form of the spade-leaf plant.



GROWING TIPS

BY BARRY R JAMES

Photographs by the author

Below left, *Anubias* species can grow permanently submerged. Below right, adult *Blyxa*, the Bamboo plant, dies after producing seeds.



Other strategies

Certain groups of plants, particularly those belonging to the family Araceae, which includes the *Cryptocorynes*, *Anubias* and *Acorus*, behave in quite a different manner.

These are capable of growing permanently submerged, either flowering when the water level falls, or throwing up long flowering stems to the surface, when it doesn't.

A third group are entirely adapted to a submerged way of life, their pollen being distributed by water currents. *Vallisneria* is an example of this group.

Some aquatic plants are, of course, true annuals, the adult plants dying after seeding. *Blyxa* is a genus with this habit.

P+N Effects

From the accompanying information, it should be obvious that all plants cannot be treated in the same manner if a well planned aquarium is to be achieved on a permanent basis. Careful selection of species and aquarium husbandry must be practised in order to maintain the plants in pristine condition. Several aquatic writers have remarked over the years on the importance of phosphates and nitrates in the growth of all plants, including aquatics.

However, unlike the situation that applies to terrestrial plants, the amount of these substances in solution is quite critical in aquatic biotopes. In excess, they cause an explosion of growth among the algae, causing the plants to become choked or smothered. This, in turn, leads to their death or an unseemly mess in an aquarium or pond. Algae also produce toxins which can seriously harm or destroy fish and invertebrates.

Phosphates are particularly vital for strong healthy growth. However, opinion among the experts in our field is divided as to the levels of phosphate which should be maintained in order to produce sturdy growth without encouraging excess algae.

A quick scan through aquarium literature reveals that Krause is convinced that 0.5 ppm should not be exceeded. At the other end of the scale, Brunner says that 10 ppm is the optimum concentration for algal growth. Kassebeer and Horst lie somewhere in between.

Recent experiments conducted by Peter L. Pederson of Neumunster, Germany, and published in the German-language magazine *Aqua-Planta* 2/92, indicated that a level of 0.5 ppm would seem to be about right.

Aponogetons, tropical water lilies and *Barclayas* produce tubers which store energy in the form of starch. At the onset of the dry season, the aerial portions of the plant die off. The tubers, however, lie in the mud until the onset of the rainy season, when, aided by their store of energy, they grow at an explosive rate.

Plants from the lower orders, such as ferns and mosses, simply change their growing form when submerged or emersed, and show true perennial characteristics.

SOUTH AMERICAN AQUATIC PLANTS

PART 5

The final puzzle

The last locality of Swordplant (*Echinodorus*) species in Ecuador which we visited gave me the most trouble. I am referring to a locality about 1km before Quevedo. This locality is in a deep valley, situated at the right side of the road, and requires a descent of about eight to ten metres.

The two giant (4 metres!) Swordplants that attracted my attention.



A further 'giant'. Note the low-growing plants in the background.



In the concluding part of his travels in South America, Arie de Graaf encounters some giant, confusing plants.

Photographs by the author

This low-lying plant fitted the description for *E. horizontalis*.



The distinctive red veins of this plant disappeared under cultivation.



The valley in question was overgrown with shrubby vegetation. Close by the road there was a virgin area with a dirty looking pool. My attention was attracted by two gigantic *Echinodorus* plants about four metres high! The general vegetation appeared to involve three *Echinodorus* species:

1 The big plants shown in the accompanying photograph turned out to be *Echinodorus bracteatus* Micheli. See Part A of my series published in the November '93 issue of *A&P* for fuller identification details.

2 The low-lying, smaller Swordplant shown on its own in one of the photographs, and growing behind one of the tall Swords in another photo, fitted the description for *Echinodorus horizontalis* Rataj.

3 A plant which could not be identified at the time, can be distinguished from the others in this biotope by its vivid red veins.

However, in greenhouse culture, the red veins disappeared and all three types of plants developed into one species: *Echinodorus bracteatus* Micheli. The only difference which remained was the presence or absence of pellucid (transparent/ clear) lines or dots in the mesophyll.

The plants to which I gave collection numbers A de Graaf 786, 787 and 790 contained pellucid lines in the mesophyll and belonged to *Echinodorus bracteatus* Micheli var *bracteatus*.

Those with collection numbers A. de Graaf 788, 789 and 791 did not contain pellucid lines and dots in the mesophyll and belonged to *Echinodorus bracteatus* Micheli var *fenestratus* Fasset.

All plants which we collected in this biotope (A. de Graaf 786-791) had counts of $2n=22$ somatic chromosomes. (See Part 4 for description of these terms).

Therefore Swordplants, despite great 'plasticity' in external appearance, can prove very difficult — as I discovered in my travels — to identify. ADP

Part 4 of Arie de Graaf's series was published in November 1993.