

NOVEMBER 1991

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AQUARIST

AND PONDKEEPER

PHILIPPINE REEF
DESTRUCTION

Special features on...
AQUARIUM EQUIPMENT

Free
**BATFISH
POSTER**



Features

Mijn Stokpaardje is Vis may sound like Dutch to you and me... and it is(!), so Jason Endfield assures us 5

Rick Gibson uncovers a disturbing state of affairs on Philippine reefs in Fish Without a Home 12

Everything you ever wanted to know about Snakeheads starts here — courtesy of Stephen Clark 17

Arie de Graaf sets off in search of South American Aquatic Plants 25

The Redfin Priapella — a new livebearer — introduced by Derek Lambert 34

Robert Kirkup takes a close look at the amazing Threadfin Rainbow 42

AQUARIST AND PONDKEEPER

Contents

NOVEMBER 1991 VOL. 56 NO. 8

Spotlight Special: AQUARIUM EQUIPMENT

A&P editor John Dawes takes you through the main items of Basic Aquarium Equipment 50

Cabinet Aquaria reviewed by Gordon Kay 55

Warm illuminating ideas from Dick Mills in Heating and Lighting 61

An indispensable Water Quality Guide from Dave Garratt 65

Dr Robert Goldstein rounds off his two-part report on Freshwater Fishes of the United States 70

Dr Peter Wirtz and Peter Nahke reveal the intriguing secrets of a fish with A Window in the Belly 79

The continuing story of Andy Horton's Aquarium Marines Review 82

Max Anderson dives into chilly waters In Search of the Scottish Eel 85

Regulars

Tomorrow's Aquarist 7
Letters 9
Seaview 30
Coldwater Jottings 32
Your Questions Answered 37
Out & About 47&75
Product Round-up 57
What's Your Opinion? 77
Cover Story 79
Paper Round 87
Books 88
Koi Calendar 91
News from the Societies 93
Diary Dates 93
Herpetology Matters 95
News 97&99
Koi Talk 100
Next Month 115

EDITORIAL

FRENCH NUT CRACKERS

Did you see the story in the *Daily Telegraph* on Friday, 30 August?

'Piranhas put the bite on anglers', it read. And, sure enough, there was a picture of one of the anglers concerned. M Robert Vellard, holding up a very dead specimen for the camera.

According to the report, Robert Vellard, a gamekeeper at Port-Sainte-Marie in the Garonne, France, was enjoying a day's angling with a friend when, to their amazement, they bagged two Piranha. Now, it doesn't take a genius to fathom out that Piranha are South American — not South French — fish. So how did they get to the Garonne in the first place?

The most obvious explanation, of course, is that they were released into the wild by some negligent or misguided (caring?) aquarist who found that they had grown too large for their aquarium. This release must have taken place this summer as well, since Piranha are strictly tropical and wouldn't be able to withstand a European winter, not even a southern one.

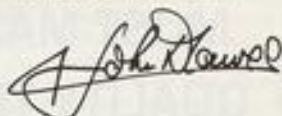
It is, of course, strictly illegal to release alien species (exotics) into native waters, so, unwittingly or otherwise, the 'liberator' was committing a crime when (s)he gave the Piranha their misplaced, so-called freedom.

This problem of introduced species is both complex and serious, and certainly one that needs to be highlighted whenever it occurs. I

wonder, though, if a Guppy or a Neon would have made the same international splash (forgive the pun) if someone with a dip net had caught some in the Garonne. No, of course not; Guppies and Neons are not 'news'.

The only reason the story made the papers was purely and simply because the fish were 'infamous, man-eating' Piranha... except that they weren't! The fish Monsieur Vellard is holding is a Pacu — a 'fruit-and-nut' relative of the Piranha. Sure, they have teeth, too, but these are pointed at the front of the mouth (this allows them to grab the fruits and nuts that make up most of their diet) and more robust at the back, where nuts are cracked and all the food is ground up.

So, after all the contrived bullabuloo, what Robert and his friend caught weren't two voracious predators, but two peaceful 'French Nut Crackers' which couldn't eat you alive even if they tried. Mind you, they could make your eyes water and push the pitch of your voice up by a few octaves! (Think about it!)



John Dawes
Editor

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MIJN STOKPAARDJE IS VIS

(with apologies to Dutch speakers)

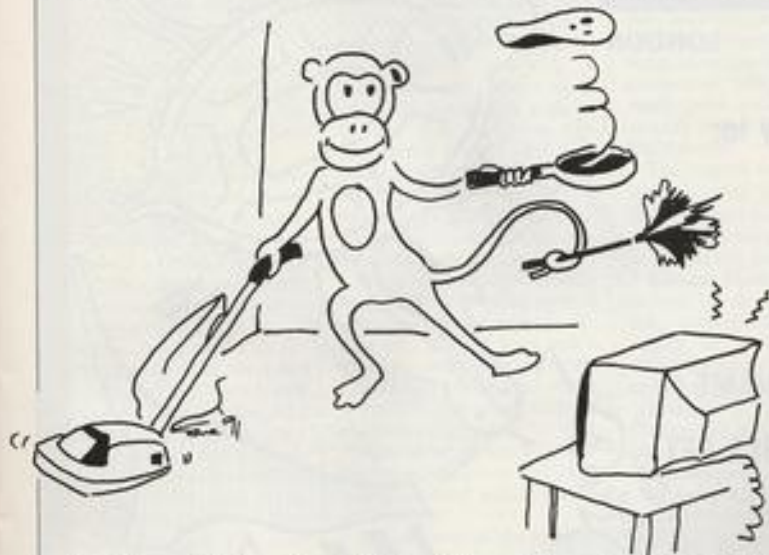
Fishkeeping is a great hobby. It even allows you time to learn a new language . . . or so **Jason Endfield** maintains

Do you know what the Dutch for 'fish' is? No? It's 'vis'. If you say it quickly, then it's virtually indistinguishable from the English. This is just one of the amazing things that I've learned since I took an interest in learning a bit of the language.

Among other things, I now have the ability to tell a Dutch person about my hobbies, that is, I can say, "Ik heb vis", which, for non-Dutch speakers, means "I have fish" (I think). Well, it's a start.

on his television set. That was no doubt the limit to Carmella's talents but such was her keeper's enthusiasm, that I am still left with an image of a monkey vacuuming and cooking dinner.

But I digress. Fish can't even change television channels, though their other attributes are well known, ie, they are intriguing beautiful things, relaxing to watch, come in every colour of the rainbow (and more) and yes, they are easy to keep. Well, if there are any readers who are perhaps thinking about taking up the



I'm telling you this because keeping fish is often thought of as a full-time job, leaving little time to take up anything else, let alone trying to learn a new language, but I think this image of life revolving around fish is something of a myth, because fish, as we know, need take up very little of our time.

Try telling that to a person who has never kept them (officially known as a non-piscine person), and he/she will look at you with doubt in their eyes, convinced that such exotic animals as fish, particularly tropicals, are surely as demanding as, say, monkeys.

I wonder whether monkey-keepers insist that their pets are easy to keep — I once met such a monkey-person and he told me that Carmella (his monkey) switched over channels

hobby and who are daunted by the technical terms, Latin names and peculiar-looking equipment in some other parts of the magazine (and who, in short, don't believe me about easy fishkeeping), then please allow me to give you an example.

I'll take you back to 1974, when I was a mere babe. I had just started out in the exciting world of tropical fishkeeping, having progressed through tadpoles, terrapins and Goldfish. It was a modest set-up, but still quite something to behold. Aquaria are always stunning if the fish and plants are chosen and co-ordinated carefully, and mine, in my eyes at least, was the best, which is why I didn't know what to do or how to react when a rare family holiday was announced.

Amid the cries of "Wow!" and "Great!" was my quiet cry of, "What about the fish?" Of course, I was thrilled with the prospect of a holiday, but, yes indeed, what about the fish?

I consulted my new fishkeeper's manual. There was a short paragraph about holidays. "Ask a friendly neighbour or a reliable relative to come and feed your fish with strictly regulated amounts of food every other day", it said confidently. Well, I had no relatives within five miles or so and that didn't sound too 'reliable' a situation to me. As for 'friendly neighbours', I think they only exist on Australian television, don't they?

In all honesty, we did have a nice elderly couple who were neighbours, or neighbours' neighbours to be exact, as they were two doors down. We were leaving them the house keys anyway, so it looked like they were about to become the guardians of my fish, as recommended by my book. The tank light was on a timer, so all I had to do was to write everything down for them regarding the food and explain briefly, but in detail, what they had to do.

It was to be no easy task. Suffice to say that the elderly couple took some time to grasp what I was telling them, and my confidence in their ability was thin. I had no choice, though. Quite why we entrusted them with our house keys I don't know. What could they have done in an emergency? I think we had little choice in the matter, given our other neighbours — a young couple who were never in — and I mean never — we only ever saw them twice; and on the other side was a highly strung middle-aged lady who frequently could be observed standing in the middle of the road shrieking "Fire! Fire!" but only on a Sunday. There was never any fire as far as I remember.

Anyway, my fish were in the hands of Mr and Mrs Montague, our elderly friends. Less than capable hands they proved to be . . . When we arrived back from a very enjoyable holiday, I tentatively asked the Montagues about my fish as we collected our keys before entering the house.

"The fish!" I shouted as the couple stared at me through half-inch thick spectacles, smiling with confusion.

"Yes, thank you very much", smiled Mrs Montague.

It seemed that there was something not quite right here. My heart sank. I found my fish alive and apparently quite well, though it was obvious that the Montagues had not been near the tank, let alone the food, which was as I had left it — in carefully measured quantities for each day of the holiday, just as my book had suggested. Boy, were those fish hungry! But certainly none the worse for their starvation.

Now the moral of this tale is not that you should starve your fish, but it does highlight the fact that fish can tolerate a lot, though, obviously, I do not condone neglect. The point is that fish are tolerant, undemanding and, yes, really easy to keep. In short, they needn't take up your every spare minute, and fishkeeping will leave you with plenty of free time in which to pursue your other interests, whether it be gardening, or golf, or lazing, or languages, which is what I'm attempting right now.

And I'm improving slowly. Yes, indeed, fishkeeping really is "een sneetje van kook" . . . you might say!

Tomorrow's Aquarist

By David Sands



LOCH NESS MONSTER NAMES

Our fantastic column in this illustrious magazine has excited a brilliant response to August's sneaky picture competition. The aquatic monster in our competition caught on camera slipping across water near to Loch Ness, fooled many of our normally quite astute readers.

Many readers snatched at naming a dinosaur, rather than following the clue of the column which has a distinct Scottish 'feel' to it.

To be honest, many pseudo-scientific likenesses of the Loch Ness Monster shown in literature are loosely based on the Plesiosaur, a known dinosaur. I feel slightly guilty at turning down those readers who named the dinosaur...

Firstly, two readers 'hit the jackpot' by naming the Loch Ness Monster and by providing the correct 'send up' scientific name (which I think was given to it by the late naturalist Sir Peter Scott): *Nessiteras rhombopyteryx*. Paul Scutt, aged seven, from Loughborough and Martyn Hencher, aged nine, from Worcester, both hit the same nail on the head, so I will arrange for them to have the special prizes from Aquarian.

In second place, Chris Stevens, aged 13, from Chertsey, and Ms H A Pollack from Walton on Thames, shared the honours.

I would like to thank the many readers who took time to write in to me through the column. David Fox from Bishops Stortford, not only named *Plesiosaurus*, but gave me some background details, including that it lived 180 million years ago and was built for manoeuvr-

ability (he deserves a prize for spelling) rather than for speed — David says its fish hunting habits would have required precise movements...

Emma Fiona Jewitt, seven and three quarters years old (I think the surname is right) even took the time to draw a *Plesiosaurus*. Emma comes from Ryton in Tyne and Wear and tells me that her daddy came up to her bedroom and saw her reading a dinosaur book... the comparison was made and 'Hey Presto!'... I will send an Aquarian pen to Emma.

PICTURE THIS

A regular reader, Simon Parker, of New Southgate London said he was very pleased to receive "the biggest tub of flake food" he had ever seen. Was it from me, he asked? Of course it was Simon!

Simon sent me some smashing pictures he took at London Zoo Aquarium (an endangered place). After persuading his father to take him to the Zoo, Simon also talked him into buying a 1600 ASA film which was fast enough to capture some great pictures.

Simon tells me: "We spent a couple of hours looking at other animals, then we went to the aquarium. My dad knew that I would like an hour or two in the aquarium, so he and my sister went off to look at parts of the zoo they hadn't seen.

Some of the pictures might be blurred because, even with 1600 ASA, the light wasn't always good enough".

I think some of the pictures



Is it a yawn? Is it a threat? Whatever it is, this large Pike was caught in the act by TA reader/photographer Simon Parker. Great shot, Simon!

are good so I will send them back to Simon, via our editor just in case he wants to print an example.

CLUB CALLS AND PEN PALS

If you recall in an earlier *AGP*, I request any TA reader wanting to receive fish club information to write in.

Paul Fitzpatrick from Blantyre in Scotland wants to know if there are any clubs close to the East Kilbride area near Glasgow. Are there?

Robert Harrison from 28 James Road, Janet's Corner, Castletown on the Isle of Man, is on the look-out for pen pals. He also asks if there are any fish clubs on the Island, or if any other fishkeepers live around the Castletown area. Robert not only has a tropical and a cold-water aquarium, but also a small quarantine tank which currently holds about 20 half-to-an-inch sized Three-spined Sticklebacks.

The tropical tank contains a Banjo Catfish which makes Robert a great reader of TA!

He thinks our column should be at least two pages long...

Richard Martin, from Chelmsford, has an interest in Discus, although he hates the price... he wryly notes that Discus books are also expensive and often contradictory.

The reason Richard, is that fishkeeping is full of opinions rather than facts, and that is why books disagree.

Richard wonders if a club exists near to him. (Do any of the big federations around the

country want to send me a list of clubs affiliated to them?) He finds our column refreshing.

Finally, in this section. Miss I H Legat from 1 The Crescent, Buckler Village, St Austell, PL25 3JW in Cornwall (by pure coincidence where I stayed with Pat and Derek Lambourne earlier this year when I was visiting to lecture to the wonderful Cornish fishkeepers — did you hear me on the radio?) asks if she can have a fishy pen pal. She has a pond in the garden and her interests, not surprisingly, centre around her pondfish.

What are you waiting for, TA readers...? Write to the lovely Miss Legat immediately!

NICE NIECE

Jacqui Hardcastle from Garston in Herts (one of my close friends who collected with me in Brazil lived there... near Watford) has regular visits from her niece, Jacqui's tropical tank and pond interests her niece, so she now has her own coldwater tank.

During a general fish discussion including such marvellous topics like "how fishes breathe", Jacqui explained how fishes use their gills to breathe. Expecting a blank expression, Jacqui was surprised to hear a few deep sniffs and then: "Like we do with our noses Auntie?".

Jacqui thinks there should be books that are simple to read explaining how a fish works etc... I'm writing it right now!

I have a great letter from E Maxwell about a young visitor, called Amy, who visits her/his pond (I think it is a lady) which I will save until next month, along with another letter from our old friend Jacob Cowing, Kirkby fishkeeper Matthew Cranham, and a mention of a letter I received earlier this year from Joe Hardcastle. My mail bag is so big at the moment that I have to hold stuff over (please note, Mr Editor!).

I want to know if any TA readers live on the Isle of Wight because next year there is to be a special class at the famous Isle of Wight show on 13 and 14 June JUST for you. More details next month.

Happy fishkeeping!

Letters

Fishkeeping Laws — a view from Thailand

First of all, I would like to say how much the magazine has improved since you became editor. Keep up the good work. (Thanks a lot for your flattering comment. ED.) I hope the strict laws that are being talked about in Europe do not affect your magazine.

If the powers that be could only realise what good fishkeepers in general are doing by breeding some of the rare fish, as well as the common ones, they would see that the threats that face us do not come from aquarists, but from non-aquatic industries, over-population, uncontrolled developments and destruction of forests and water sources.

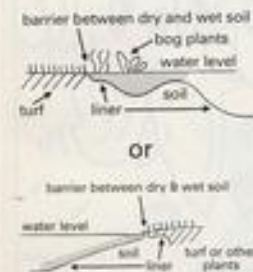
Living in the Third World, it is easy for us to see what the Western policy makers cannot. Why do you think Western and other developed countries move production to countries such as mine (Thailand)? Not only do they obtain a cheap work force, but they can also dump and pollute with waste in a way that would not be possible in their own countries. The Third World does not have efficient laws to stop them, and if there is any problem, then money, the almighty dollar, will solve it.

This is all true; sad but true. The world is being destroyed by greed.

S. Chungnam,
Chiang Mai,
Thailand.

Liner 'wick'

Our article *Pools for Wildlife* (A&P July '91) included a cross-sectional diagram (p59) of



a suggested pool layout. Unfortunately, we made an error regarding the arrangement of the liner.

The diagram of the pool should show the liner acting as a barrier between the soil in the pool and the soil/turf on dry land; otherwise the continuous soil wicks the water out of the pool. The liner can be doubled up to act as a barrier before being buried, or it can be cut off at ground level. Either way, it can be hidden by stones as in a beach effect, or by vegetation.

Alec and Val Scaresbook,
Congleton,
Cheshire.

Dolphinaria (cont.)

I write with reference to Dr J A Collins' letter published in the October issue of this magazine, which replied to a previous letter from me (published in August).

Dr Collins states that dolphinaria deserve a place in the culture of the United Kingdom, and then suggests that improvements to the housing of dolphins would be necessary. Surely, this latter point is the crux of the problem.

The inability of the United Kingdom to provide acceptable accommodation, both to husbandry and public opinion points of view, actually dictates that there is, in fact, no suitable place for dolphinaria in our culture, the result being that the consensus from most sides of the table requires captive dolphins in the UK to be released into the wild after undergoing a rehabilitation programme. To meet the husbandry standards achieved by some establishments in the United States and Japan, for example, would require prohibitive levels of funding.

I have had involvement in designing large-scale dolphinaria, but the schemes have always been axed, owing to the fact that the costings have often matched those required for building an entire theme park. Unfortunately, the UK does not have the levels of population or tourism that could sustain a single attraction requiring this kind of capital investment.

Maybe the Channel Tunnel will change this, but then we will be looking at the emergence of a new culture altogether — whether we like it or not!

On the subject of the environmentalists' effect on animal-keeping, Dr Collins made some sweeping statements about how some legislation has turned sour for some animal-keepers, particularly where birds are involved. I am not an expert on the situation with birds — that is my father's subject, and I am certain he would confirm much of what Dr Collins says. However, there is evidence that the future will bring better continuity between the governing bodies and animal-keepers, along with related trades and hobby. Surely, we must all work towards such a relationship in order to reduce the sort of legislative 'mistakes' that Dr Collins points a finger at.

Dr Collins asked me to reflect on why it is always the animal-keepers that are asked to make compromises and never the extremist opposition. My reply to this is that we, in the fish-keeping hobby, in particular, have sat back too long while the extremists, armed with proof and often rather 'dodgy' information, lobby the legislative bodies. I have to admit that this is born out of the lack of information being made available to the hobby and trade from environmentalists, and, of course, we are guilty of this in reverse.

Until recently no-one has had the weapons to defend us. We now have the likes of the OFI, and we have seen a collaboration between the aquarium trade, hobby and organisations such as the Nature Conservancy Council which has resulted in, for example, the German radicals being slowed down in their tracks. This has been made possible by information being passed more freely in all directions, and, in this particular case, other EC member states have benefited from this new regime.

These radicals have had it too easy so far, and not only where fish, or other animal-keeping are concerned, but across the board in all types of trade and industry. So, it is vitally important that we are a strong and

formidable opposition, and that we are armed with honest and credible information.

At least, we now have suggested negative lists for coral reef fishes being studied that have been drawn up from a combination of information supplied by hobbyists, key members in the trade, conservationists and from valid scientific sources. What we need now is a similar collaboration where freshwater species are concerned. This is an area I am currently working in with the Environ Fish Labelling System.

Happily, Dr Collins and I do touch on some common ground, as we both agree that there should be a mutually beneficial relationship between animal-keepers and the environmentalists. I know that I am not the only one who would welcome information about a conservation problem concerning wild populations of the fishes we keep, and, in turn, I am certain conservation organisations would welcome expertise and help from fishkeepers where this may help a conservation problem. Let's keep the ball rolling!

Colin Grist,
Marineland Aquarium,
Cheddar,
Somerset.

B.V.H. Guyana project

We are a volunteer group of Wildlife Wardens. Our latest project is called Operation Global Warming: Mangrove Planting Project, Guyana.

As our main activity, we will be planting mangroves along the Guyana coastal belt, so as to reduce coastal erosion, serving to dampen storm surges and, to a minor extent, high winds. The mangrove coastal barrier may be battered and damaged in severe storms, but it will grow back naturally, without cost to man. No man-made coastal protection barrier is capable of self-repair.

The mangrove area is a spawning and nursery area for many marine species of fish. Moreover, the particles of vegetation (detritus) and nutrients exported out of the mangrove

ecosystem form the food base of a complex of marine organisms which, in turn, support valuable estuarine and near-shore fisheries.

A Global Warming 'Act Now' campaign pledge form will also be sent to the Global Environment Degradation Conference to be held in Brazil in June 1992. (The U.N. are convening the conference). If implemented, the proposed programme would help to clarify issues, indicate priorities for action, and show how the Amazonian rainforests can be managed in a sustainable manner. It has the potential for providing a significant input into the 1992 conference. Each country present at the conference will receive a copy of our global warming form since these will be delivered from the mangrove project in Guyana, by wildlife wardens and myself.

If any readers would like further details of our activities, we can be contacted at:
Brian Van Herbert Wildlife Research, P.O. Box 4AZ, London W1A 4AZ. Tel: 071 636 9179; Fax: 071 380 0589.

**Brian Van Herbert,
London.**

Hi-Tech stat checks

Check your Hi-Tech thermostats; they may not always be reading the true temperature of your tank. I was extremely concerned to find out that two new thermostats controlling the heating of two of my marine

tanks were way out in reading the actual temperatures.

I became concerned about the high temperatures of my marine tanks during a spell of hot weather. The stats were reading temperatures in the range of 82-85°F. This, I thought, was just about tolerable for the fish. The water felt warmer than 85°F, though, so I checked the tank temperatures using a certified mercury thermometer, at the same positions as the temperature sensors. To my shock one stat was 5°F out and the other was between 2-3°F out.

I re-checked this, using two other thermometers, both again certified to British Standards.

Both the thermostats were reading a temperature lower than that given by the thermometers. This meant that the tank supposed to be at 85°F was actually 90°F. This was dangerous, since all my monthly water changes were measured using the mercury thermometers and must have been up to 5°F different.

I immediately contacted the manufacturer concerned who offered replacements through my retailer (Birstall Aquatics - Leicester). On visiting my retailer, I had the pick of eight 'new production' thermostats from the same company. All were laid out on the shop counter, and all read differently, again showing a difference of up to 5°F. I finally chose the two that were reading closest to each other and went immediately back home to test them. After allowing some time in

order to stabilise the readings, I again found that they were way out, reading approximately 2-4°F difference.

I again contacted the manufacturer, who advised me that I could re-calibrate the two existing units. I decided to do this, as this was a relatively easy job, a quick adjustment of a potentiometer, until both the readings of the thermostats were the same as the mercury thermometer reading.

**Russell Thorpe,
(A Concerned Aquarist),
Leicester.**

Brian Rothwell

On 1 August 1991 my very dear friend and fellow goldfish enthusiast Brian Rothwell suddenly died. It was a great shock. Brian and his wife, Sheila, had been close friends of ours for many years.

I know that my fellow goldfish fanciers, like myself, shared in a great respect for this charming, kind man who had a vast knowledge on the subject of fishkeeping and who, over the thirty or so years which he participated in this hobby, had achieved and contributed so much to its advancement and to goldfish culture.

Enthusiasts throughout the country will be aware of the input Brian made to the quality and high standard of present-day Bristol Shubunkins; his strain was well known for its form, colour and outstanding beauty. Many fishkeepers like myself will have benefitted

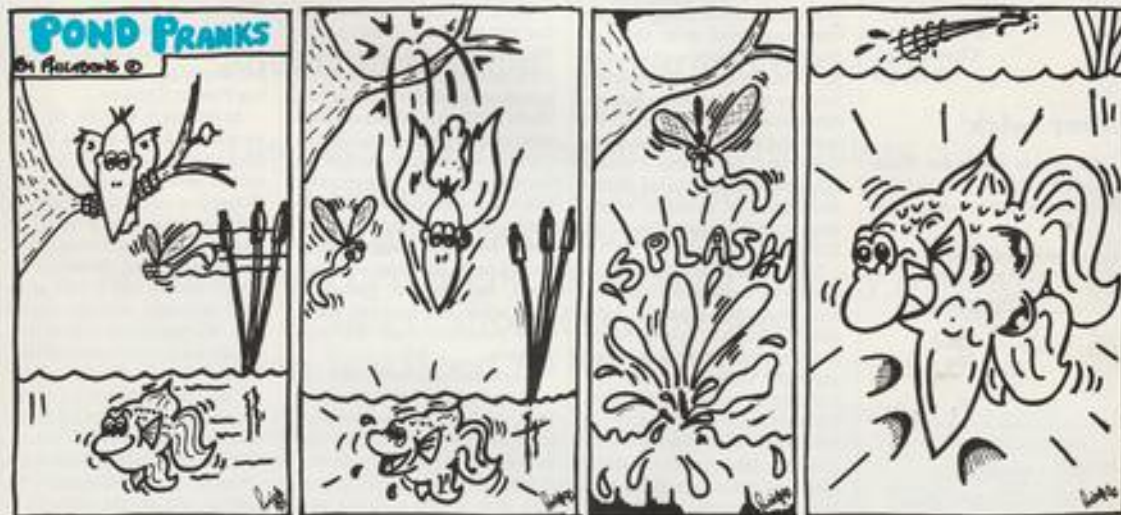
from absorbing many of his techniques; he was always generous with his knowledge.



Without doubt, Brian's death will be a loss to the hobby, but his memory will live on in the hearts of those who knew him.

**Pauline Hodgkinson,
Bolton.**

Correspondence for our Letters page should be addressed to The Editor, *Aquarist & Pondkeeper*, 9 Tufton Street, Ashford, Kent TN23 1QN.



PHILIPPINES

FISH WITHOUT A HOME

Rick Gibson of The Fish World, Tampa, Florida, went to the Philippines to check out reports of reef destruction. Here's what he found . . .

Photographs by the author

I imagine floating on the surface of the ocean with a mask and snorkel on. You are slowly drifting over a South Pacific coral reef. The reef is full of colour and life, from sponges to fish to algae.

In about 15 feet of crystal clear water, the bottom gradually turns to a greyish-white colour. The scenery is now dreary and bleak. Broken coral pieces and rubble litter the bottom. Bare rock remains where coral heads once stood. A small school of Blue Damsel-fish darts from one pile of rubble to another as if they were searching for a home.

This describes how I found most of the Philippine coral reefs. Twenty to 50% of the reefs had been levelled to rubble by dynamiting. More evidence of reef destruction was seen from siltation, fish netting, trawling, shell and coral collecting. I had heard that more than 80% of the Philippine reefs had suffered some type of damage. I found the claim to be true.

The Philippines has one of the richest underwater habitats in the world. For instance, in the Caribbean there are more than 80 varieties of stony corals, while, in the Philippines, over 400 varieties of stony corals are reported. I took my trip to see the Philippine coral reef before it was completely gone. It is rapidly disappearing and there is little left untouched.

DREARY LANDSCAPE

Much of the Philippines can be described as dreary and bleak, even on land. The Philippine people are 'colourful' and full of life, but the landscape is turning grey. A heavy smog covers the capital city of Manila. Trash and rubble line the city streets. Escape from the dreary cities to the countryside is possible, although the scenery remains bleak. Most of the pristine natural habitats

have disappeared. Tropical mahogany forests are being cut down for wood and replaced with rice paddies.

Deforestation and the resulting run-off of silt has turned the rivers to a greyish-brown colour. Where the rivers empty into the sea, the silt is deposited, choking and destroying the coral reef. Even more destructive is the run-off from coastal cities, full of raw sewage and other pollutants.

REEF DESTRUCTION

Overcrowding and poverty are driving the Filipinos away from the cities. In their search for new homes and more food, many have turned to the sea, where the catching of fish for food, not for aquariums, is the main cause of reef destruction. Most Filipinos see nothing wrong with their methods of catching fish, of course.

Dynamiting to kill fish for food is common practice, particularly since, after the coral is levelled, catching more fish is easier by dragging the bottom with nets. Any remaining coral is broken or knocked over by the continued use of seine and trawling nets, methods of over-fishing which leave the reef in rubble.

A sign of over-fishing can be seen in the general size of reef fish; schools of small fish are common, whereas medium or large fish are now rare in the reef areas. Any fish over 4 inches (10cm) is caught and taken to the local fish market, where I saw more varieties of large tropical fish, dead, on market tables than I saw swimming around the reefs.

If the reef fish were being over-collected for the aquarium market, I would have expected small species also to be rare on the reefs. They are not. They are abundant.

Collecting fish with cyanide is now, happily, on the decline. From what I saw, it does not appear to be a common practice (at least,



Top left, Blue Devil Damsels looking for a home among the basket stars (crinoids) on an isolated lump of coral rubble off Pimilacan Island.

Top centre, population explosion of Long-spined Sea Urchins at Bohol Beach.

Top right, Crown of Thorns 'on the prow' at Tambuli Beach following over-collection of their main predator, the Triton Trumpet Shell, for the gift trade.

Above, coral head blown apart by dynamite off Doljo Beach.

Right, shell warehouse at Zamboanga. Removal of molluscs sets up a chain of reactions which unbalances the delicate equilibrium found in 'healthy' reefs.

Far right above, large-scale siltation like this from the Loboc River, is killing off many of the Philippine reefs.

Far right centre, Regal Tangs and Moorish Idols on a fishmonger's slab in Zamboanga.

Far right below, upland deforestation in Zamboanga. Heavy erosion here results in silt-laden water eventually smothering the reefs.





Channa punctata — the Mud Murrel — comes from India and is very attractively marked.

Part 1

SNAKEHEADS

The Species and their Distribution

Stephen Clark begins a three-part series on these large, predatory and highly individual air breathers in probably the most comprehensive account ever published in popular aquarium literature.

Photographs by Kevin Webb

The air-breathing fishes of the order Channiformes are said to have originated from the Oriental region and spread progressively westwards by successive waves of migration to India. Here, fossil relics of Snakeheads (their common English name) have been found from the Pliocene period (2-7 million years ago). The dispersal of fishes to the continent of Africa during the Miocene (60 million years ago) was apparently via a marshy land bridge from Asia.

Snakeheads have a reptilian-shaped head and an elongated, tubular body, although in several of the larger specimens ageing can result in a thicker and deeper torso. The large head and mouth are typical of a predatory fish. They have only soft fleshy rays in both dorsal and anal fins. These long fins, short in depth, cover approximately two-thirds of the standard body length and, coupled with their muscular body, give the acceleration necessary to catch small food fishes. The pelvic (ventral) fins (if present) are located on the underside of the belly, just under the base of the gill covers.

TAXONOMY

There have been several changes to the 20th Century classification of living fishes, which has consequently created further confusion to the already disorganised nomenclature of Snakeheads. A vast amount of literature on these fish is logged in the older type names and, in several countries where these fish are abundant, new material is still

being published in this format. A brief history of the present classification is given to clarify misunderstandings.

Order : Channiformes
Family : Channidae
Genera : *Channa*, *Parachanna*

The Order

In pre-1940 literature, this large group of freshwater fishes all had in common the ability to breathe atmospheric air and were

named Labyrinthici. These were then split further into two sub-orders — namely, Ophiocephaloidei, which possessed a supra-brainial cavity (a simplified organ) but not a labyrinthiform organ (more specialised), unlike the second sub-order, the Anabantoidae of Weber and de Beaufort (1922). The order was revised and renamed Ophiocephaliformes by Berg (1940).

In a radical re-classification of all fishes, Greenwood et al. (1966) decided to move with the modern trends in evolutionary



Known as the Hei-yu in Hunan, China, *C. maculata* is one of the larger species of Snakehead, growing to over 24in (60cm).

COMMON NAMES OF CHANNA AND PARACHANNA SPECIES

SPECIES	DESCRIBER	DATE	COMMON NAME
<i>P. africana</i>	Steindachner	1879	African Snakehead
<i>P. insignis</i>	Sauvage	1884	Dark Brown Snakehead
<i>P. obscura</i>	Gunther	1861	Dark Brown Snakehead
<i>C. argus</i>	Canor	1842	Amur Snakehead (<i>C. argus tsarpachowskii</i>)
<i>C. asiatica</i>	Linnaeus	1758	Northern Green Snakehead
<i>C. bankanensis</i>	Bleeker	1852	Sirko Muda (Sumatra)
<i>C. barca</i>	Hamilton	1822	Bora Cheng (Northern Bengal, India)
<i>C. bistriata</i>	Weber & de Beaufort	1922	Polka-dot Snakehead
<i>C. gachua</i>	Hamilton	1822	Brown Snakehead
<i>C. lucia</i>	Cuvier & Valenciennes	1831	Ubi (Malaysia)
<i>C. maculata</i>	Lacépède	1803	Hei-yu (Hunan, China)
<i>C. maruloides</i>	Bleeker	1851	Jaloi (Malaysia)
<i>C. marulia</i>	Hamilton	1822	River Murrel (India)
<i>C. melanoptera</i>	Bleeker	1855	Toman Jela (Malaysia)
<i>C. melanostoma</i>	Bleeker	1851	Black Snakehead
<i>C. micropeltes</i>	Cuvier & Valenciennes	1831	Red Snakehead
<i>C. orientalis</i>	Bloch & Schneider	1801	Smooth Breasted Snakehead
<i>C. pleurophthalmus</i>	Bleeker	1850	Spotted Snakehead
<i>C. punctata</i>	Bloch	1793	Mud Murrel (India)
<i>C. siamensis</i>	Gunther	1861	Siamese Snakehead
<i>C. steuanni</i>	Playfair	1867	Rainbow Snakehead
<i>C. striata</i>	Bloch	1793	Striped Snakehead

theories and gave the order its present name of Channiformes.

The Family

The Ophicephalidae embraced both the genera *Ophicephalus* and *Channa* (which did not possess pelvic fins). The most important characters shared are an elongate body and a large head covered by shield-like cycloid scales. The fins lack spines and the pectorals are large. There is also a large cavity in the head which, through a mucus membrane, transfers oxygen from atmospheric air to the bloodstream.

Over the years, authors have misspelt the name as Ophi-o-cephalidae. Finally, Berg (1940) followed the natural progression of

Myers and Shapovalov's (1931) judgement on the genus *Channa* and changed the family name to Channidae.

The Genera

The name *Channa* was erected by Scopoli in 1777, although no particular type species was mentioned. Some sixteen years later, Bloch described this fish and gave it the name *Ophicephalus*. This genus, unlike *Channa*, possessed pelvic fins and embraced both Asian and African species.

Many authors have, however, over the years (for unknown reasons) added a further letter, resulting in the incorrect spelling *Ophicephalus*.

Myers and Shapovalov (1931) discussed in

detail the differences between *Ophicephalus* and *Channa* and, following the strict rules of Zoological Nomenclature, they united the two genera (including the African species) as *Channa*.

Finally, to complete the taxonomic history, the French ichthyologists, Teugels and Daget (1984), in a detailed study of the geographically isolated African Snakehead species, replaced their generic name with *Parachanna*.

GEOGRAPHICAL DISTRIBUTION

The present range of the family Channidae covers the continents of Africa and Asia. The genus *Parachanna* is exclusive to Cen-

PRINCIPAL MERISTIC DETAILS OF CHANNA AND PARACHANNA SPECIES

SPECIES	FIN RAY COUNTS			RATIO*	LATERAL LINE SCALES
	Dorsal	Anal	Pelvic		
<i>P. africana</i>	42-49	30-35	present	2.84-3.38	73-83
<i>P. insignis</i>	40-44	27-31	present	3.06-3.53	73-90
<i>P. obscura</i>	40-45	26-32	present	2.97-3.55	62-78
<i>C. argus</i>	48-53	30-38	present	2.9-3.2	60-75
<i>C. asiatica</i>	43-46	28-30	absent	3.3-4.0	52-58
<i>C. bankanensis</i>	39-42	29-31	present	3.4	64-65
<i>C. barca</i>	47-52	34-36	present	4.0-4.5	65-78
<i>C. bistriata</i>	36-41	26-28	present	2.8	55-58
<i>C. gachua</i>	30-37	20-24	present	2.9-3.25	40-45
<i>C. lucia</i>	39-43	27-30	present	3.0-3.5	58-65
<i>C. maculata</i>	43-46	26-30	present	2.6-3.1	55-56
<i>C. maruloides</i>	45-47	30-31	present	3.1-3.5	55-58
<i>C. marulia</i>	45-55	23-36	present	3.1-4.0	56-70
<i>C. melanoptera</i>	44-48	28-31	present	3.5-3.8	54-57
<i>C. melanostoma</i>	37-41	21-25	present	3.1-3.6	50-54
<i>C. micropeltes</i>	42-47	25-28	present	2.6-2.8	82-110
<i>C. orientalis</i>	30-38	20-28	absent	2.6-3.5	36-51
<i>C. pleurophthalmus</i>	40-43	28-31	present	2.8-3.0	50-58
<i>C. punctata</i>	28-32	20-23	present	2.9-3.0	34-40
<i>C. siamensis</i>	42	27	present	3.4	65
<i>C. steuanni</i>	39-40	27	present	4.0	45-50
<i>C. striata</i>	37-46	23-28	present	2.7-3.9	50-62

* Ratio of Total Head Length : Total Body Length

DISTRIBUTION OF CHANNA SPECIES AND SUB-SPECIES

SPECIES	SUB-SPECIES/AUTHOR	DISTRIBUTION
<i>C. argus</i>	<i>Channa argus kimurai</i> (Shih 1936) <i>Channa argus wairpachowskii</i> (Berg 1909)	Sichuan (China) Amur (U.S.S.R.)
<i>C. gachua</i>	—	—
<i>C. maculata</i>	<i>Channa maculata aspilota</i> (Sauvage & de Thiervant 1874)	Southern China
<i>C. marulius</i>	<i>Channa marulius ara</i> (Deraniyagala 1945)	Sri Lanka
<i>C. melanostoma</i>	<i>Channa melanostoma</i> 'Northern Borneo' (Inger & Chin 1955)	Borneo
<i>C. pleurophthalma</i>	<i>Channa pleurophthalma spiralis</i> (Fowler 1904)	Sumatra?
<i>C. punctata</i>	<i>C. punctata</i> 'Guahati North Bank' (Dhar & Chatterjee 1984 & 1986) <i>C. punctata</i> 'Guahati South Bank' (Dhar & Chatterjee 1984 & 1986) <i>C. punctata</i> 'Bengal' (Shaw & Shebbeare 1937)	N/W R. Bramaputra watershed (India) S R. Bramaputra watershed (India) Bengal, (India)
<i>C. steuarti</i>	<i>C. steuarti</i> 'Assam' (Shaw & Shebbeare 1937)	Assam, (India)
<i>C. striata</i>	<i>C. striata</i> 'Malaya' (Cantor 1849) <i>C. striata</i> 'N/E India' (Hamilton 1822) <i>C. striata</i> 'Philippines' (Herre 1924) <i>C. striata</i> 'Sri Lanka' (Deraniyagala 1929)	Malaysia North-East India Philippines Sri Lanka

tral and Western Africa, while the range of the majority of *Channa* is Southern Asia. Owing to their close relationship with human food consumption, however, Snakeheads have been widely introduced into many other areas outside their natural range.

Air-breathing

Snakeheads can be found in ponds, lakes and rivers of varying water chemistry and are known to have a tolerance of brackish water. A typical habitat would be stagnant, polluted water, deficient in oxygen, where their ability to breathe atmospheric air at the surface stands them in good stead.

This ability is directly attributed to an air-breathing organ in the head of the fish.

Above the gills lies a large lung-like cavity, where the supra-brachial air chamber is located. Lining the inside of this chamber is a vascular mucus membrane, which conducts and circulates air via a mucus-secreting tissue. This breaks down the air, into its constituent gases for absorption into the bloodstream, expelling any worthless gases in the form of small bubbles. If prevented from coming to the surface to breathe, Snakeheads will actually asphyxiate.

The beginning of the monsoon rains brings the Snakeheads wriggling out of the ponds in search of fresh water and food.

AQUARIUM MAINTENANCE

Lighting is not an important factor. An average tropical water temperature of

between 24–28°C (75–82°F) is suitable, but sudden rapid cooler changes in the water can cause death.

The small colourful fingerlings of the larger Snakeheads are regularly imported into the aquarium trade. However, unsuspecting aquarists soon realise that their specimens consume nearly all other tank-mates and rapidly outgrow their tank. Therefore, great consideration of acceptable conditions must be taken. Larger species have considerable strength and power and can easily smash through unprotected heaters and even the glass aquarium!

All types of chunky foods are taken and, owing to their predatory nature, a diet of live fish will aid their general condition (though this is something that needs to be given serious thought by the aquarist, of course).

CHANNA AND PARACHANNA SYNONYMS

SPECIES	POPULAR SYNONYMS
<i>P. africana</i>	<i>Ophiocephalus africana</i> , <i>Ophiocephalus africanus</i> , <i>Paraphiocephalus africanus</i> , <i>Channa africana</i> .
<i>P. insignis</i>	<i>Ophiocephalus insignis</i> , <i>Paraphiocephalus insignis</i> , <i>Channa insignis</i> .
<i>P. obscura</i>	<i>Ophiocephalus obscurus</i> , <i>Paraphiocephalus obscurus</i> , <i>Channa obscura</i> .
<i>C. argus</i>	<i>Ophiocephalus argus</i> , <i>Ophiocephalus nigricans</i> , <i>Ophiocephalus pekinensis</i> .
<i>C. asiatica</i>	<i>Gynonotus asiaticus</i> , <i>Sternarchus asiaticus</i> , <i>Channa asiatic</i> , <i>Channa asiaticus</i> , <i>Chana fasciata</i> , <i>Channa formosana</i> , <i>Channa ocellata</i> , <i>Channa sinensis</i> .
<i>C. bantamensis</i>	<i>Ophiocephalus bantamensis</i> .
<i>C. barca</i>	<i>Ophiocephalus barca</i> .
<i>C. bistriata</i>	<i>Ophiocephalus bistriatus</i> , <i>Ophiocephalus bivitatus</i> .
<i>C. gachua</i>	<i>Ophiocephalus aurantiacus</i> , <i>Ophiocephalus cora-mota</i> , <i>Ophiocephalus fusca</i> , <i>Ophiocephalus gachua</i> , <i>Ophiocephalus harcourt butleri</i> , <i>Ophiocephalus kelaarti</i> , <i>Ophiocephalus limbatus</i> , <i>Ophiocephalus marginatus</i> , <i>Ophiocephalus montanus</i> , <i>Ophiocephalus surakartensis</i> .
<i>C. lucia</i>	<i>Ophiocephalus lucius</i> , <i>Ophiocephalus polylepis</i> .
<i>C. maculata</i>	<i>Bostrychus maculatus</i> , <i>Ophiocephalus guentheri</i> , <i>Ophiocephalus aspilota</i> , <i>Ophiocephalus teneatus</i> .
<i>C. maruloides</i>	<i>Ophiocephalus maruloides</i> .
<i>C. marulius</i>	<i>Ophiocephalus aurolineatus</i> , <i>Ophiocephalus leucopunctatus</i> , <i>Ophiocephalus throphasti</i> , <i>Ophiocephalus marulius</i> , <i>Ophiocephalus grandinosus</i> .
<i>C. melanoptera</i>	<i>Ophiocephalus melanoptera</i> .
<i>C. melanostoma</i>	<i>Ophiocephalus melanostoma</i> , <i>Ophiocephalus melanostoma</i> , <i>Ophiocephalus baramensis</i> , <i>Ophiocephalus mystax</i> , <i>Ophiocephalus rhodotarsus</i> .
<i>C. micropeltes</i>	<i>Ophiocephalus micropeltes</i> , <i>Ophiocephalus bivitatus</i> , <i>Ophiocephalus diplogramme</i> , <i>Ophiocephalus serpentinus</i> , <i>Ophiocephalus stevensii</i> , <i>Ophiocephalus studeri</i> .
<i>C. orientalis</i>	None.
<i>C. pleurophthalma</i>	<i>Ophiocephalus pleurophthalma</i> , <i>Ophiocephalus pleurophthalma</i> , <i>Ophiocephalus spiralis</i> , <i>Ophiocephalus strophthalmus</i> .
<i>C. punctata</i>	<i>Ophiocephalus punctatus</i> , <i>Ophiocephalus punctatus</i> , <i>Ophiocephalus affinis</i> , <i>Ophiocephalus indicus</i> , <i>Ophiocephalus lata</i> , <i>Ophiocephalus karrooi</i> , <i>Ophiocephalus karrooi</i> .
<i>C. siamensis</i>	<i>Ophiocephalus siamensis</i> .
<i>C. steuarti</i>	<i>Ophiocephalus steuarti</i> .
<i>C. striata</i>	<i>Ophiocephalus striatus</i> , <i>Ophiocephalus striatus</i> , <i>Ophiocephalus chena</i> , <i>Ophiocephalus cyanopolos</i> , <i>Ophiocephalus planiceps</i> , <i>Ophiocephalus sotawak</i> , <i>Ophiocephalus vagus</i> , <i>Ophiocephalus trahit</i> .



An elongate Asian species, *C. asiatica*, the Northern Green Snakehead.

In many countries, Snakeheads are economically important food fish and, in Sri Lanka, the smaller-sized *C. orientalis* is widely eaten and is said to be a well flavoured fish. Fuller details of aquarium care will appear in the final instalment (Part 3) of this series.

Captive Breeding

Snakeheads, up to a size of 60cm (24in), can be spawned in aquaria. A robust, roomy tank is needed and a diet consisting of live foods will enhance their breeding condition.

When Snakeheads spawn, it is usually in the early morning hours, at or near the surface of the water. Both sexes have increased coloration at spawning time, although there are no significant sexual differences. Near to spawning time, however, females may be apparent by their increased girth. The pair swim slowly round each other, before coming together with the male wrapping around the female, in an embrace similar to that seen in 'normal' Anabantoid courtship.

Snakeheads either scatter their eggs to float free on the surface, or, in the case of some species, they are placed in a constructed nest of grass, roots and twigs. At each spawning embrace (if you are lucky to see it), free-spawners will lay up to several thousand eggs. Each expelled egg has a tiny oil bubble which makes it rise to the surface. Between four hundred and five thousand eggs are produced, depending on species!

The eggs hatch after about three days, the fry possessing a large yolk sac which aids flotation at the water surface. After seven days, the fry begin to reach lower regions of

the water, but have difficulty in avoiding rising to the surface again. It will be impossible to rear all the young fry, as a large amount of tank space and constant feeding is needed for this.

The smallest species in the genus, *C. orientalis* has recently been found to be a mouthbrooder, the male orally incubating the 80-100 fry for a period of 10 days.

In several species, pronounced cannibalism can be observed. In such cases, leaving matters to the 'survival of the fittest' will produce the strongest fish. Snakehead fry are of a reasonable size, so first foods of *Cyclops* or *Artemia* nauplii are adequate. However, growth is rapid and a constant supply of other, larger live foods must be prepared in advance.



Parachanna africana, the African Snakehead, develops very dark pigmentation at times.



Channa gachua, The Brown Snakehead, showing the appropriateness of their common name.

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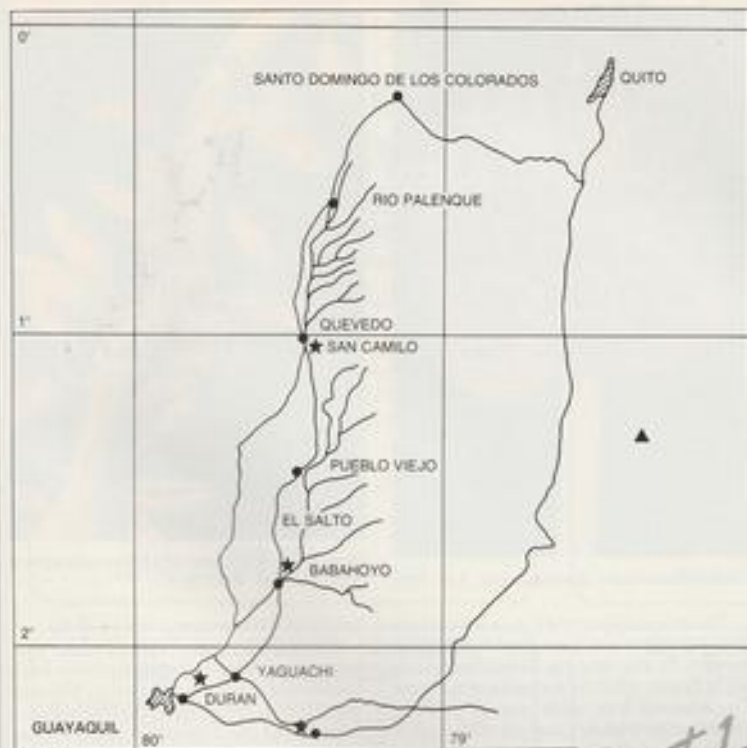
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SOUTH AMERICAN AQUATIC PLANTS

The Broadleaf Amazon Sword in Ecuador)

Dutch aquarist/researcher/explorer Arie de Graaf begins a series of articles on his experiences and views on aquatic plants he's collected in South America.

Illustrations by the author

Following a collecting trip to Brazil, Uruguay and Argentina, we arrived in Guayaquil, Ecuador to continue our collecting activities.

One of our first tasks was to solve the problem of sending the *Echinodorus* plants, collected in Uruguay and Argentina, to the Netherlands so that they would arrive alive and in good condition.

The honorary consulate of the Netherlands in Guayaquil, Mr Nijhuis, assisted us with this problem. Through his interme-

diary, we were able to obtain a phytosanitary certificate from the Ministry of Agriculture within hours. Thus, this problem was solved.

However, before we could collect *Echinodorus* plants in Ecuador, there were some other items on the agenda which were near to my wife's heart. First we visited our adopted Foster Parents Plan-child, Mariuxi Lozano and, finally, the Galápagos Islands, where the genus *Echinodorus* is not distributed.

After the return from the Galápagos

Islands, we made an orientation trip to El Triunfo, where we could collect *Echinodorus bracteatus* Micheli (AdG 777, 778 and 779*).

SWORDPLANT PROBLEMS

Within the genus *Echinodorus* there are some problems, one of them being the problem of heterophylly. Single species show great variability, which can be permanent or temporary depending upon the life cycle. In addition, different culture conditions promote variability. For example, in the leaves of wild plants, the veins can be red, while in greenhouse-cultured specimens, the red colour disappears.

A further problem is that the species hybridise easily.

Finally, there are many *Echinodorus* species whose distribution is not known; for example; the triploid species *E. ovata* Rataj = *E. uruguayensis* Arechavaleta (De Graaf, 1989 b), *E. opacus* Rataj and *E. portulacastris* Rataj.

To solve these problems, vegetation research at the natural localities, as well as the collection of living plants, is very important, since the solutions cannot be found only in a classic taxonomical way. Cytological research in a laboratory with living plants is unavoidable (De Graaf, 1980, 1981, a, b, c and d, 1989 a and b).

LOCAL NAMES

Through the intermediary of the Ministry of Agriculture we contacted Cecilia de Buchwal, an orchid grower in Guayaquil. She showed us her daughter-in-law's aquarium which contained an *Echinodorus* species which I identified as *Echinodorus horizontalis* Rataj. Cecilia de Buchwal told us that this plant was originally from "Oriente" and that the local name is "amaranthus," which translates to "yellow." This probably refers to the yellow stamens.

The Brazilian name of *Echinodorus grandiflorus* (Chamisso et Schlechtendal) Micheli, which is also distributed in Ecuador, is "Chapeu de couro" (R. Reitz, 1959). The *Pequeno Dicionário da língua portuguesa*, by A.B.O. Ferreira (11th edition, 1969) translates this as "leather hat." This name refers to the leather-like skin of the achenes.

The dictionary says in this regard that it concerns medicinal plants of the family Alismataceae and mentions as an example *Echinodorus macrophyllus* (Kunth) Micheli. It would therefore seem highly desirable to investigate the use of these plants by the local people for medical purposes (De Graaf, 1990).

BIOLOGY, VEGETATION AND CLIMATE

Echinodorus species are rheophytes, a term used when referring to plant species which are, in nature, confined to the beds of swift-running streams and rivers, and grow there up to flood-level, but not beyond the reach of regularly occurring flash floods (Van Steenis, 1981).



Complete specimen of *Echinodorus paniculatus* (Specimen No: AdG 782).



Fully mature fruits (Specimen No: AdG 781).



Some of the root tubers of a fully mature plant (Specimen No: AdG 781).



Close-up of an individual flower (Specimen No: AdG 781).



A cluster of unripe fruits (Specimen No: AdG 781).



Two leaves from Specimen No: AdG 781 showing variability of form.

The period of June and July is a dry season and so the river is at a low level during these months. At that time, the *Echinodorus* plants are in flower. After the maturing of the fruits (= achenes: The seeds are, as it were, enveloped by a leather bag) the rainy season comes. Then, the fruits drop into the running water. They may also be transported from the dry bottom by the swelling water of the river which overflows the banks. In this manner, the fruits are distributed.

Species of the genus *Echinodorus* are to be found primarily along rivers and in flooded areas, where the plants only grow in sunny places. At first, the fruits float on the surface of the water, but later sink to the bottom where germination takes place. Long ligulate leaves develop which can reach a

length of 2 to 3 metres (c 6.5 — 10 ft).

When the dry season comes and the water level drops, the new developing leaves begin to resemble the shape of the adult. When the water is at its lowest level, the whole plant is emersed and can survive even under very dry circumstances. The flowering period then sets in and, finally, the life cycle begins again. Hasse (1987) gives the same information for Bolivia concerning *Echinodorus grisebachii* Small and *Sagittaria guayensis*, which are also distributed in Ecuador.

Van Steenis (1981) mentions only *Sagittaria sagittifolia* Linne var. *vallinerifolia* of the family Alismataceae as a rheophyte, but, as the above shows, some *Echinodorus* species should be added.

Dodson and Gentry (1978) distinguish the

next vegetation types:

- pluvial (rain) forest
- wet forest
- moist forest
- dry forest
- desert and semi-desert
- montane forest and alpine vegetation

The Pacific lowland forest is comprised of two floristically dissimilar vegetational units: a moist and a wet forest. These humid regions have a rainy season from December to May, with frequent night rains. From June through to the end of November, there is an almost constant cloud layer.

During the dry cloudy period, night temperatures seldom exceed 24.4°C (c 76°F). The



An individual leaf from Specimen No: AdG 780.

rainy season is warmer, with minimum temperatures usually about 23.3°C (c 74°F) and maximum reaching 31.6°C (c 89°F). The plants I collected are to be found in open areas of the moist forest.

THE TRUE BROADLEAF AMAZON SWORD

In the aquatic literature, the Broadleaf Amazon Sword plant was, until 1970, often identified as *Echinodorus paniculatus* Micheli (De Graaf 1966 a, b and De Wit 1966). However, the Broadleaf Amazon Sword plant was described by Rataj (1970, 1975) as a new species: *Echinodorus bleheri* Rataj. De Wit (1983) retained the name *Echinodorus paniculatus* Micheli and doubted the name "*Echinodorus bleheri* Rataj".

After comparing the living plants I collected in Ecuador with the herbarium sheets of *Echinodorus paniculatus* Micheli (from Paraguay), I concluded that the Broadleaf Amazon Sword plant is not *Echinodorus paniculatus* Micheli and that the name *Echinodorus bleheri* Rataj is correct.

As contrasted with De Wit, Rataj (1975) and Holm-Nielsen & Haynes (1986), did not

discuss the variety described by Fassett (1955) as *Echinodorus paniculatus* Micheli var. *dubius* Fassett from Colombia (Guanabál, Departement El Valle). The leaf shape of this variety can be detected in the plants I collected. I also found that the variety *dubius* could not be distinguished and, therefore, it should be seen as *Echinodorus paniculatus* Micheli. *Echinodorus paniculatus* Micheli var. *brevifolia* Hauman should be seen as a variety of *Echinodorus paniculatus* too.

LOCALITIES

Three plants of *Echinodorus paniculatus* Micheli were collected (AdG 780, 781 and 782) on the road between Durán and Yaguachi — from the Hotel Continental in Guayaquil to a distance of 20 km in the direction of Santo Domingo de los Colorados.

Echinodorus paniculatus can be distinguished from the other *Echinodorus* species by its triangular stem and inflorescence. The leaf shape of AdG 782 resembles *E. paniculatus* Micheli var. *dubius* Fassett the most.

The morphology of the root tubers was discussed elsewhere (De Graaf, 1963, 1980 and 1982). The root tubers of *E. paniculatus*



The somatic chromosomes of *E. paniculatus* (Specimen No: AdG 782).

Micheli do not show significant differences. The somatic chromosome number in AdG 781 and AdG 782 counts is $2n = 22$.

An analysis of the karyotype (chromosome complement) of the different *Echinodorus* species is currently in preparation.

(TO BE CONTINUED)

Note: *These numbers refer to individual specimens as recorded in my research collections.

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Seaview

By Gordon Kay



SALTY MATTERS

I am often asked if keeping coral fishes is difficult. The person posing the question is invariably tempted to start a seawater aquarium but is frightened off by all the stories that still abound of needing to have a degree in chemistry or some God-given gift which allows you to keep these gorgeous creatures.

Absolute rubbish! Of course, marine aquarology isn't difficult. It IS more demanding, but then, if — as I've said many times before — one is not prepared to put in the required effort, one should not be doing it anyway.

The main problem with keeping coral fishes successfully stems from the differences between freshwater and marine environments. It is, therefore, important to understand these differences — and the way in which they affect keeping coral fishes in captivity — if we are to keep marine fishes alive and well over a considerable period of time.

Ask anyone in the street to tell you how seawater differs from freshwater and the answer which invariably comes back is: "It's salty". This, of course, is true, but it is not precise enough. The amount of dissolved salts varies considerably from one area to another, in both marine and freshwater, and while sodium chloride is a major constituent of seawater, it is by no means the only one.

It is therefore more accurate to describe seawater environments as those in which the concentration of dissolved salts exceeds that found within the cells of the organisms living in that environment. Freshwater

habitats are the other way around.

That which we call "life" can only happen within a narrow range of chemical concentrations. Thus, organisms must keep their internal chemical composition within quite precise limits. Because cell membranes are selectively permeable, water has a tendency to migrate from areas of low salinity (or concentration) to those of high salinity (or concentration). This process is known as osmosis.

Freshwater fishes have to encounter the risk of water passing into their bodies until they are 'waterlogged'. Seawater fishes, on the other hand, live in danger of drying out because of water moving from their bodies into the denser surrounding water.

Living cells must be capable of transporting the raw materials of chemicals synthesis and waste products across cell membranes, and so, organisms cannot resolve problems of osmosis by developing impermeable barriers. Any such mechanisms they do evolve must — out of necessity — be active, rather than passive.

Freshwater solutions

Freshwater fishes get around the problem of excess water by 'waterproofing' as much of their body surfaces — both internal and external — as possible and swallowing very little water. In this way, the amount of water absorbed through the intestinal walls is reduced. Unavoidably, there is a large amount of water absorbed over the surface of the gills, but their kidneys are so efficient that they compensate for this by producing lots and

lots of dilute urine.

By this phenomenon, the freshwater fish runs the risk of depleting its reserves of ions essential to normal cellular function — things like potassium and calcium. However, the walls of the fish's bladder can selectively re-absorb these substances. In this way, losses are minimised to the extent that they can easily be made up from the diet.

Marine solutions

Marine fishes have evolved several options to the problems of osmosis. The Elasmobranchs — the Sharks and Rays — osmoregulate by letting the concentration of dissolved salts in their body fluids to exceed slightly that in their environment by retaining urea and other metabolic waste. This puts them into a similar position to the freshwater fishes. They also cope with it in much the same way. However, these Cartilaginous fishes also have to cope with higher salt concentrations in their body fluids than do freshwater fishes, and so, they have not evolved the salt recycling system of the freshwater fishes and excrete a more concentrated urine.

The Bony Fishes, on the other hand, drink constantly to compensate for water loss across their gills. They do, in fact, take in as much as 35% of their body weight every day. The majority of the heavier ions — such as calcium, magnesium and sulphate — remain in the fish's gut, but sodium, potassium and chloride ions pass freely into the body fluids. These excess ions are then excreted through the gills. We do not know the exact nature of

this excretory mechanism, but it needs the presence of both appropriate concentrations of potassium and a great deal of energy to pump these substances against the prevailing gradient in concentration.

As fishes living in seawater face the problem of retaining rather than losing water from their bodies, their kidneys are relatively inefficient and they therefore excrete only small amounts of rather concentrated urine.

Aquarium implications

When we know all of this, we can understand that the implications of this aspect of marine fish physiology with regard to their aquarium well-being, are indeed profound. For a start, it should be abundantly clear now why the Neon Tetra wouldn't do well in a seawater aquarium.

Secondly, the act of salt excretion requires a vast amount of energy to function correctly. It is this fact alone that accounts for coral fishes' enormous appetites and also for the repeated observation that they do much better when fed small amounts frequently. Also, such a function is quite finely tuned to external conditions and is easily upset by abrupt changes in specific gravity.

And, finally, it should be clearer that all that water our coral fishes are drinking needs to be of the highest possible quality. When one also considers that the coral reef is one of earth's most stable environments, meaning that its inhabitants have never had the need to evolve the mechanics for coping with abrupt change on a daily (or even hourly) basis, then it becomes clear that the aquarist has far less of a margin for error.

So, armed with the knowledge of the basic biological difference between freshwater and marine fishes, it is worth keeping this in mind and reading two or three books, twice if necessary, until it all makes sense. Providing you take heed of what these books say — and maybe some of the above — you really shouldn't have too many problems.

Meanwhile, I'll be back with you next month.



Heavy-drinking Angel (see text for details).

Coldwater jottings

By Stephen J. Smith

"The time has come, the Walrus said..." Yes, Christmas is fast approaching and the outdoor season, from a practical point of view, has drawn to a close. Now is the time when we can sit back and muse upon the triumphs and failures of the season just passed.

There were triumphs, weren't there? Just as there must surely have been the odd failure. Remember the joy of the season's first spawning, now developing into a rather nice clutch of Fancies for next year's showbench? Or, on the other hand, that pond project which "was definitely going to be completed this year..." Still, only half-excavated and now overgrown, it does make a perfect haven for frogs.

Inspiration is not too easy to come by — until the glossy photos and colour diagrams of a favourite pond book stir in the imagination once more and, maybe before spring, we (note, we) might just get that pond finished.

Not before we've written our Christmas list, however! And, without further ado, top of my Christmas list for 1991 is *The Interpet Encyclopaedia of Water Gardening*.

The standard of aquatic literature has improved by leaps and bounds over the last decade: the fishkeeping, and the gardening, enthusiast has a plethora of very well-informed

and practical references from which to choose when considering a water garden feature. But this year's pick of the crop has to go to this latest offering from Interpet.

Written by pond enthusiast James Allison and produced in the large format of a series of aquatic encyclopaedias issued by Interpet, you must try every legitimate means to get this volume into your Christmas stocking. And priced at only £16.98, it represents marvellous value for money.

Don't expect the usual "formula" approach adopted by the average pond book. This is something special. OK, so the first chapter covers water garden design — and how!

Supported by splendid colour photographs, James Allison investigates all forms of pond design in some detail, to what your appetite for the practicalities to come. Sections on planning, electricals, and lighting, again with truly breathtaking photographs, lead to foolproof guidance on the different forms of pond construction, and incorporate some very practical and useful ideas (two pages alone are devoted to pond edging).

The use of pumps for the incorporation of moving water, whether fountain, waterfall or cascade, is given similar detailed treatment; but I confess to beaming with delight at the chapter on an aspect of pondkeeping oft taken for granted: bridging water. In James Allison's words, "A water garden can benefit from addi-

tion design elements that can enhance and complement the existing attributes of a pool, and may serve a very useful and practical function."



Top of everyone's Christmas list for 1991 has got to be the Interpet Encyclopaedia of Water Gardening by James Allison — virtually guaranteed to inspire the completion of that half-excavated pond!

He continues, "By extending decking, a bridge or stepping stones over the pool, you will achieve a link between the two elements in the garden — an eye-catching combination of water and landscaping. A bridge may be a practical means of access to the rest of the garden, or to an island, or simply a feature in itself."

The ensuing sections could well be a book in themselves, such is the detail, again supported by the most stunning photography.

Likewise, chapters on water garden plants (incorporating comprehensive references on

water lilies, marginal plants, floating plants, moisture-loving plants, and so-called oxygenators) and pond fish (including Goldfish, Koi and other pond fish) are given detailed and colourful treatment.

My only real criticism is that the photographs of Fancy Goldfish do nothing at all to promote their beauty. OK, so Goldfish are close to my own heart, but why is it that with so many attractive varieties of the species available from importers, breeders and hobbyists, the producers of such a stunning book as this should resort to illustrations of the most emaciated specimens purporting to be Goldfish?

The concluding chapters deal with pond, fish and plant care and, of course, water quality, with some useful advice about filtration.

And, finally, the last chapter in the book is another gem: designing, building and keeping a wildlife pond.

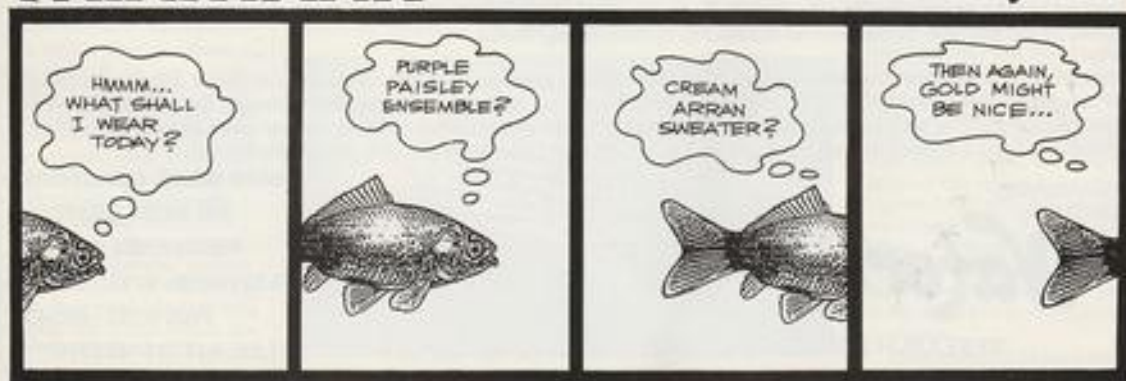
Interpet, together with Salamander and, of course, James Allison, you have my Christmas vote this year, for what is a remarkable volume. If you are a fishkeeper, pondkeeper or a gardener (or know a fishkeeper, pondkeeper or gardener) you will want this book.

And, you never know, that half-excavated pond may get finished yet!

The Interpet Encyclopaedia of Water Gardening by James Allison. Published by Salamander Books (ISBN: 5 01 2922 000285). Price: £16.98.

THINKTANK

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THE RED FIN

A New Livebearer

Derek Lambert of Viviparous — The Livebearer Information Service, introduces a new and very attractive livebearer from a fast-flowing river in Mexico.

In 1990, a new species of *Priapella* was described by Manfred K. Meyer (a German) and Hector Espinosa Pérez (a Mexican). It had originally been found by Hector Espinosa Pérez and P. Fuentes in the Río Agua Fria, 300 metres north of Laguna Escondida, Los Tuxtlas, Veracruz, Mexico. This collection was made on 13 June 1985 and was followed by another made in 1986 (same collectors) in Laguna Escondida itself.

In 1987, the new species was also found by Manfred K. Meyer, together with E. Muller and A. Martinsen who collected in the Río de la Palma, about 10Km NNW of Sontecomapan, 25Km NNE of Lake Catemaco, Veracruz, Mexico. It is from this last collection that the new species was described, with paratypes being drawn from the previous two collections. The species was named after the Olmeca Indians who lived in this area of Veracruz, Mexico before the Spanish came.

ESSENTIAL DETAILS

Nearest relative

Priapella olmecae is most closely related to the very rare *Priapella bonita* which is referred to as its sibling species. The new species has a larger number of dorsal fin rays and a smaller number of gill rakers of the first arch.

Males of *Priapella olmecae* are also very much deeper in the body than *Priapella bonita*. *Priapella bonita* is now thought to be endangered in the wild owing to its limited range, habitat destruction and exotic species introductions. This status is borne out by the fact that *Priapella bonita* has not been collected by aquarists for a number of years now despite regular searches of its known habitats.

The search for this species goes on, though, with another collecting trip by Viviparous members planned for 1992. Since the re-discovery of the Opal Bumble Bee Goodeid — *Allotoca maculata* Smith and Miller 1980 — in 1990, after 10 years of fruitless searching, anything seems possible.

Location

The Río de la Palma is a fairly shallow river averaging approximately 1m (c39in) in depth at the collection site and between 2 to 6m in width (c6.5 – 19.5 ft). It is fast-flowing and has a pH of about 7.8 to 8.0 and a temperature between 21°C and 28°C (c70 – 82°F). The Río Agua Fria is approximately 3 to 5m (9.8 – 16.4ft) wide and 0.3 to 0.7m (1.2in – 27.5in) deep. At both these locations the new species was found with *Heterandria bimaculata* (Two-spot Livebearer), *Xiphophorus helleri* (Swordtail), *Poecilia mexicana*, and *Astyanax* sp.

First live specimens

The 1987 collection also yielded some live specimens for aquarists to work with. The first of these made their way to the UK with Ivan Dibble, the International Species Liaison Officer of Viviparous, in that same year. These proved difficult to adapt to aquarium

conditions, but enough fry were obtained to keep the species going.

Further collections in 1988 (Vernon, Georg and Martinsen) and 1990 (Vernon and Frisby) provided extra stock, but this is still a very rare species within the hobby.

Coloration

The new species of *Priapella* is by far and away the most attractive of the genus so far seen in aquaria. In the wild, the body is a lovely sky blue with an intensely blue iris to the eye.

All the unpaired fins are orange to red and it was this colour that gave rise to the common name of Red Fin *Priapella*.



Above, the collecting site, Río de la Palma, looking upstream.

Right, *Priapella intermedia*, as the name suggests, has a 'shallower' body than *P. compressa*. It also lacks the orange edge to the dorsal fin possessed by the new species.

Below, the new species - the Red Fin *Priapella* (*Priapella olmecae*). Note the orange edge to the dorsal fin.



PRIAPELLA



Top, *Priapella compressa* — note the yellow on the posterior half of the body, plus the deeper body.

Centre, looking downstream, the fast-flowing nature of the Rio de la Palma can be appreciated.

Above, two other species found at the same locality: *Poecilia mexicana* (the largest fish — a Molly) and *Heterandria bimaculata* (the Two-spot Livebearer).

Unfortunately, as so often happens, the wild coloration fades in the aquarium, but the orange is still present in the dorsal and caudal fins to some extent, as is the blue body coloration when the fish is seen in sunlight.

PROBLEM GENUS

The *Priapella* genus as a whole has proven something of a problem to maintain in the aquarium hobby. In general, they require large well-filtered tanks with plenty of swimming room. This mimics the wild habitat of fast-flowing rivers which all members of this genus have so far been found in.

Diet does not seem to present too many difficulties as they will eat just about anything that comes their way, providing it is either at the surface or sinking in the water. Once it gets to the bottom of the tank they lose interest in it.

The real problem seems to stem from trying to save the babies. Females will not suffer being confined in a small trap, or even a small tank with lots of plants in it, for more than a day or two.

Since the females do not have a gravid

spot, it is very difficult to tell when they are ready to drop fry, and if they do drop fry in their colony tank, the other inmates hunt down and eat them as soon as they see them. All in all, this is a difficult problem to solve.

Possible strategies

Several different strategies have been adopted to get over this difficulty. The one which I prefer, but have never had much luck with, is a large tank with very thick plant cover at the surface but clear swimming room below. This only works if the fish are heavily fed with live food and the plant growth at the surface is very dense.

Another method is to watch the female very closely and, when she drops a brood of fry, make a note of the date. About 25 days later, take the female out and place her in a small tank with plenty of plants in it. The babies should be born within five days. This works but puts the female under some stress, which can result in premature birth of the babies or death of the female.

Another method which I have seen work quite well is to suspend a wide-mesh net in a large tank with power filtration. The female lives in the net until the fry are born, after which she is returned to her normal tank. Whichever method is adopted, large-scale production of fry has so far proven very difficult and most breeders have been happy just to keep the species going.

Both *Priapella compressa* and *Priapella intermedia* have proven very successful on the show bench, but they often disappear after just one or two shows. The reason for this is that exhibitors take their fish to and from the show in the show tank.

Both these species have very soft mouthparts and they are damaged by this rough treatment. Fungus sets in and the fish is lost. This can easily be prevented, however, by taking the fish to the show in a polythene bag and then placing it in its show tank. It requires a little more effort and time, but the fish will look better and live longer for it.

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I am grateful to Manfred Meyer for sending me a copy of his latest paper. My thanks also go to Colin Vernon and Arthur Frisby for photographs and information about the natural habitat of this species.

For further information about Viviparous — The Livebearer Information Service contact: Viviparous, "Northside", Spridlington Rd., Faldingworth, Market Rasen, Lincs. LN8 3SQ.

Your questions answered

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:

Your Questions Answered, The Aquarist & Pondkeeper, 9 Tufton Street, Ashford, Kent TN23 1QN.

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

HERPETOLOGY

VIVARIUM LIGHTING AND HEATING

I am setting up a 60 x 18 x 23in (180 x 45 x 60cm) vivarium for lizards and would welcome your advice on lighting and heating.

Natural sunlight is very beneficial to reptiles, especially lizards. Unfortunately, the useful ultra-violet (UV) rays in sunlight, which help to make vitamin D in the skin, are filtered out by the glass in windows and the glass of a vivarium. It is therefore advisable to provide an alternative source of ultra-violet for captive reptiles during the day. 'Sun lamps' (as used by humans to get a sun tan) are too intense and should not be used.

However, suitable sources are certain types of fluorescent tube including True-Lite. These tubes are manufactured in the USA by the Duro-Test Corporation and imported into the United Kingdom by General Acoustics Limited. Further details about these tubes can be obtained from:

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

In the same way that glass filters the UV wavelengths out of natural sunlight, so it will do the same with the UV rays emitted from fluorescent tubes. Thus, fluorescent tubes used to provide ultra-violet must be fitted inside the vivarium to be of practical benefit to the inmates.

Although specific types of fluorescent tube provide UV rays similar to those available from sunlight, such tubes provide very little heat. Sunlight

has a warming effect, and many types of reptile bask in it to increase their body temperature. For example, Bearded Dragons (*Amphibolus barbatus*) would normally rely on sunlight to raise and control their body temperature. Silvered 'spot-lamps', which have a tungsten filament, produce much more heat than fluorescent tubes and can be used to create basking 'hot spots' in a vivarium. However, they must be arranged with care so that agile reptiles cannot climb onto the hot bulbs and burn themselves. In a terrestrial vivarium, or terrarium, used for housing lizards, from the information previously given, it would seem necessary to provide two types of lighting — a UV emitting fluorescent tube and an incandescent 'spot lamp'. Unfortunately, such a combination of lighting is quite intense. Adequate shade areas must be provided if this type of régime is adopted.

A better method would be to replace the spot lamp with a suspended ceramic infra-red source to produce the 'hot spot'. Light for basking will still be provided by the fluorescent

tube. Therefore, using a system such as a heater controlled by a Uno Slik-Stat will be suitable. This could generate a temperature of 80° to 90°F (c 26.5 — 32°C) underneath the ceramic infra-red source. Other parts of the vivarium must be cooler so that the lizards can retreat from the 'hot spot' and cool down. Many types of reptile, especially agile lizards, regulate their body temperature in this way.

The movement of reptiles between hot and cold areas to control body temperature has resulted in such animals being described as 'shuttling heliotherms'. Reptiles do not have sweat glands to help in their thermoregulation! Sweating is one of the methods used by mammals to lose excess body heat.

It is most important that the thermostat senses and controls the true MAXIMUM temperature at the basking 'hot spot'. The glass or the wood used to construct the vivarium can act as an insulator and prevent some of the heat from reaching the thermostat. Thus, it will not detect a true reaching. Therefore the Slik-Stat, must be placed inside the vivarium at

the hottest part.

Alternatively, instead of using a thermostat with a bi-metallic strip, you could use a solid state electronic thermostat with a remote sensor. Such a piece of equipment is the Vivarium Temperature Controller (or VTC) which was reviewed in the January 1990 *Herpetology Matters*. Further details about this product can be obtained from:

**Bio-Pet,
55 Boundary Road,
London E17 8NQ.**

If you use this type, the body of the thermostat should be placed outside the vivarium and the temperature sensor (which is at the end of a long wire) can be placed at the basking 'hot spot'.

Solid state electronic thermostats have the advantage that they are very much more sensitive than bi-metallic thermostats. However, they are also very much more expensive!

I must again emphasise, though, that there is no 'absolute' substitute for natural sunlight. Even if this reaches your lizards through the glass of the vivarium, it will still have an important psychological effect. The missing UV component will be supplemented in part by the output from the True-Lite tube. If the vivarium is placed in direct sunlight, take care to ensure that shade areas are provided for the reptiles and that the vivarium does not overheat.

In order to prevent stress, it is most important to limit the intensity of light in the vivarium, as already described. One 24-inch (60cm) True-Lite tube, especially with a 'power-twist' for the extra output, would be sufficient for your vivarium.



Ceramic infra-red heater with 'solid state' vivarium temperature controller (VTC).

MARINE

PENTAGONAL STOCKING

I have a pentagonal tank which contains about 34 gallons (c 155 litres) of water. The filter bed is manuring. What fish, and how many, should I go for once I'm ready to start introducing them?

Using the maximum stocking ratio for a U/G filtered aquarium of 1 inch of fish to each 4 gallons (18 litres) of water, you therefore have room for $\frac{34}{4} = 8\frac{1}{2}$ inches (c 22cm) of fish overall.

This maximum stocking level of 8½ inches of fish is over and above any invertebrates which you may decide to include in the tank's population once the filter bed has bacterially matured.

When this has occurred, (use

a super-sensitive Nitrite Test Kit to determine this), please don't rush out and buy 8½ inches of marine showfish. Be content to buy a few invertebrates and one or two Damsel-fishes (must be of different species if you buy more than one) and enjoy learning how to keep these successfully for at least a month before buying the more delicate showfishes such

as Angels, Butterflies, Surgeons, Tangs, Wrasse, etc.

REVERSE FLOW RATE

I am thinking of installing reverse flow undergravel filtration in my marine aquarium. What flow rate should I aim for?

The flow rate which you require with reverse flow undergravel filtration (RFUF)

is simply twice the rate required when using air-operated or powerhead-operated undergravel filtration. The reason for this doubling-up in filtration power is the resistance to the external canister filter's flow caused by the coral gravel/coral sand the filter floss inside the canister filter body.

I have always recommended a turnover period of 20 minutes for airlift or powerhead-operated U/G filters. This is to say that all the water in the aquarium passes through the filtered three times in every hour, ie 60 minutes ÷ 20 mins = 3. However, with RFUF, an apparent turnover period of 10 minutes is required, ie all the water in the aquarium should pass through the filter bed six times in every hour.



LAURENCE E PERKINS

Surgeons (this is the Powder Blue Acanthurus leucosternon) must be given a miss until all the basic skills have been developed keeping harder, easier species.

KOI

INHERITED PROBLEMS

I am a complete beginner and have just inherited a pond complete with fish. The pond is about 5x3 metres (c 16½ x 10ft) and is about 1½ metres (c 5ft) deep at its deepest point. It contains approximately 120 gallons (550 litres).

There are 10 fish which, I think, are mostly Koi, although five of them are plain 'Goldfish' colour.

Algae grow very quickly (within 5/6 days of cleaning) so the water goes cloudy. I feed the fish once a day and all the food is eaten quickly.

One of the fish appears to swim only to the right and its tail is curved in that direction. Is this a problem?

Also, two of the fish have a white discoloration over their heads — rather like fungal growth — but not growing above the surface of the skin.

I would be very grateful for your comments.

I'm a little puzzled by the dimensions and capacity you quoted for your inherited pond. As you quoted the size of the pool in metres, this would actually represent almost 4000 gallons (c 18,200 litres), not 120! If the dimensions should have read feet, then the capacity would be 140 gallons (about 640 litres).

The problem you have with algae is one which every pool has at some time. A properly designed filter, plus an ultra-

violet clarifier, would eliminate such problems.

You appear to be uncertain as to whether you have Koi or not. If they are Koi, there will be easily visible barbels sticking out under their chins at each side, otherwise they are probably other members of the carp family ie. Goldfish.

The fish which swims in a circular manner and has a bent

rear end is obviously suffering from a genetic deformity and nothing can be done to correct this. Provided it does not appear to be suffering, you may as well let it live out its life.

The fungus-like growth is a big of a mystery, as this type of ailment is always visible above the skin. Are you certain it is simply not pigmentation which looks like fungus?



LAURENCE E PERKINS

Viewed from the side even small Koi can be distinguished from Goldfish by the possession of barbels.

PLANTS

PLANTS FOR ARCHERS

I have set up a split-level brackish tank for Archer Fish and have run into problems regarding plants. All the books say "use hardy plants"... but which?

I would suggest *Cryptocoryne cilata*, *Sagittaria tubulata* and *Nymphaea maculata*. Archers are not 'rooting' fish so there is really no need to put the plants

in pots.

On bogwood, you could use *Microsorium pteropus* (Java Fern).

DUTCH LIGHT AND WATER

I have a 2 ft aquarium. It has an 'underfloor' heating mat with Pro-temp TCI thermostat, Aqualut neutral gravel and Evertite powder. I also have tablet and liquid plant

foods. The pH of my water is 7.5 and General Hardness is 12', while Carbonate Hardness is 17'.

I would not like to set my tank up as a 'Dutch Aquarium' and would therefore welcome your advice regarding lighting and water make-up.

Do you mean a 2-foot long or 2-foot deep tank? I will assume that you mean 2 foot deep, in which case I would recommend halogen 'A' lamps — one 100

watt lamp for every 2 feet (60cm) of length.

If your tank is 2 feet long (60cm) and of standard depth, ie 15in (38cm), then two 18in (45cm) x 15 watt Tritons would do.

Your tapwater readings are quite typical for southern England. Most plants will tolerate this, but the addition of rainwater would be beneficial. Use 50:50 tap to rainwater.

COLDWATER

'NORMAL' COLOUR CHANGE

On two occasions, Goldfish that I have introduced into my pond have changed from gold to white. Does this have anything to do with the sex of the fish? Also, how does this affect their 'show' qualities?

The fact that two of your fish have changed colour from orange to white has nothing to do with their sex, but rather, a 'normal' loss of pigmentation which is not as uncommon as you might think. This process can happen at any time during a fish's lifetime; unfortunately, the lost colour never returns.

Some strains of goldfish are more prone to this than others. There is nothing you can do to prevent this happening and it in no way indicates that the fish is not in good health.

If you are at all familiar with the British Goldfish Show Standards, you will know that colour plays a very important part in determining the show quality of a fish. In many of the show classes, metallic goldfish — to gain most points — must be self-red without any white scaling. Therefore, those fanciers who breed fish are striving to produce metallic scaled fish



LAURENCE E. PHIBBS

Goldfish can change from their 'traditional' gold colour to silver or white — often, for no apparent reason.

with rich, deep red colour without silver or white scales. I know from my own experience just how disappointing it is to breed some otherwise excellent young fish, only to find that, after a promising start, they begin to lose their colour, either in patches or completely, and change to silver.

SEXUAL 'SKIN FLUKES'

My three-year old Oranda has acquired some sort of Skin Fluke which I have been unable to get rid

of for the past six months.

They appear as tiny separate lumps along the front of the pectoral fins, each lump being no bigger than 1mm. I have tried a vast array of cures to no avail and the fish now frequently scratches along the gravel and sulks in corners.

Can you help?

From your letter it is obvious to me that you are a very caring person but please, please, do not subject your Oranda to any further treatments! I cannot offer you a miracle cure for those lumps which have appeared on his pectoral fins because they are, in fact, an indication of his gender.

As in humans, where the male grows facial hair, many species of fish develop what are known as breeding tubercles. In goldfish they first usually appear on the leading ray of the pectoral fins and can, on older males, continue to increase in numbers until they mass and may increase the thickness of this fin three-fold. At the height of the breeding season they usually grow on the gill plates, occasionally on the head, and sometimes on the leading ray of the pelvic fins. Occasionally, they appear on a female, again

just as in humans, where some women grow facial hair.

I strongly suspect that the reason your fish is skulking away is because he is in fear as to what next he might be subjected to! In fact, to be perfectly honest, I am most surprised that he has survived all those treatments. Of course, I appreciate that you had the very best of intentions and his interest at heart, but like all of us when we first take up this hobby, you probably did not realise the damage continuous treatments of various chemicals can do.

You must remember that your fish is living and breathing in the stuff we add to the water. I am quite sure that many fish who have been subjected to severe and, what might be termed, chemical, cocktails, must suffer internal damage. So, while we are attempting to bring about a cure for external problems, we may cause damage internally.

Of course, all the treatments which you have administered are very effective in their own right, but should not be used on a continual basis, or so many different 'cures' given, in this instance, in such quick succession.

TROPICAL

BENT ANGELS

I have been keeping and breeding Angels for over two years. Initially, all of the first spawning was kept, from which I eventually ended up with 14 mated pairs.

For some time now, I've been losing about two fish per week from the 'non-spawning' stock. All have had curved or bent postures. Why?

Sorry to read of the Angelfish losses . . . without proper postmortem examinations it is impossible to say why the fish are dying. However, I note that you say a spawning has given 14 mated pairs. These will be brother x sister, which results in weak genetic stock.

Perhaps even the parents were from the same brood too. Any third generation from such in-breeding is bound to give weak and sickly fish, scoliosis (bent spine) being a common fault.

Always bring in fresh genes to give vigorous offspring (Far Eastern fish farmers regularly swap breeding pairs); the best combination is an unrelated, oldish, fat female and a smaller, younger male.

LETTUCE POLLUTION

On a recent visit to my local aquatic centre I noticed that lettuce leaves are regularly used as food in some of their tropical freshwater tanks. I therefore started to use lettuce leaves on a daily basis and my fish seemed to like them, particularly my 'Plecostomus'.

However, my tank is now heavily polluted. Is this because of the lettuce and, if so, should I stop using it?

Lettuce leaves are very good food for herbivorous fish. However, note that fish have digestive systems designed for water plants, not land plants.

On the land, the plants have to cope with gravity which they achieve with a high cellulose content. This is difficult to digest (land animals like the cow, are ruminants with complex stomachs to break down the cellulose).

Help the fish obtain the nutrients by 'dissolving' the cellulose with boiling water. In

other words, scald the lettuce leaf before placing it in the tank.

Frozen peas are pre-cooked and so can be digested, but fresh peas need cooking. The same applies to spinach.

Reference your comment about the dirty tank; this is not a problem caused by feeding lettuce etc. The problem is the owner not cleaning the tank!



Plecos and other plant-eating fish welcome being fed on lettuce, but precautions must be taken.

filter hidden in the corner will do these fish nicely with the flow directed over the surface to the front of the tank. Be sure, though, that the intake grill is not larger than the thickness of a £1 coin, as these narrow-bodied fish can take refuge behind the filters, with dire consequences.

I use brown volcanic porous gravel for the aquarium bed. This keeps the water soft and the darker floor brings out the fishes' colour. I also find that my Java Fern (*Microsorium pteropus*) and various *Anubias* plants root into the particles and creep along the aquarium floor, making the transition between floor bed to roots, then to leaves, very natural-looking.

Be careful with the 'Rock-to-glass' decor; flat slate should be avoided, as Rainbows do not know the meaning of "reverse" and, if they get between flat slate and glass, they will become jammed.

A decorative low-lying piece of bogwood to the foreground of the aquarium is a must. This should be draped with a handful of Java Moss (*Vesicularia dubyana*) which will attach itself in time and reach, finger-like, up towards the light.

This will tempt the fish to the front of the aquarium to spawn in view. It works every time for me. Providing all the front of the tank is free of other obstacles, the fish will dart up and down in the knowledge that safety is just below them or to the rear of the set-up. As with all aquaria, and especially with small Rainbows, the tank should be in a remote part of the room, away from banging doors, TVs (image changes are noticed) and walkways.

If you position yourself in front of the aquarium, you will have to be patient. A wait of five to ten minutes will not be unusual for the fish to return to the front of the aquarium, with any sudden movement sending them back into hiding.

Tankmates

The 'Werner' can be quite boisterous and can look after itself even against slightly larger Rainbows. The fishes' colours intensify during displays, when the fins will open and close like a pair of scissors.

In the wild the 'Werner' is found with *Melanotomias* such as *M. trifasciata*, *splendida inornata*, *splendida rubrostrata* and *maculochi*; *Pseudomogil* *gertrudae*, *paludicola inconspicua* and *signifer*.

Ideal tank occupants will be Rainbows which like soft water and grow no larger than 60mm (2½in). Therefore, *Pseudomogil signifer* is a good choice, particularly since there is a multitude of colour varieties: red, yellow, orange, etc. The neon-blue-bodied *P. signifer* from the Townsville area is out, as this is a hardwater species. So, too, will be the two *Popondatta* species (now *Pseudomogil*) and brackish water Blue-eyes like *Pseudomogil cyanocephalus*.

Good *Melanotomias* species are the *maculochi* group, *sexlineata*, *euchamensis*, *pygmaea*, *papua*, *iriazaya*, *misoolensis* and *expansa*.

Other suitable tankmates include *Rhadinocentrus ornatus* (A&P, May 1990) and a

great number of acidophytic *Pseudomogil* species.

CAPTIVE BREEDING

The great thing about the Threadfin is that it is the sole member of the genus *Iriatherina*, so there is little chance of cross-breeding as there is with other Rainbows.

The eggs are considerably smaller than those of the Blue-eyed Rainbows. The 'Werner' is also a lot more prolific, so the eggs can be harvested from the community tank, or the fry removed from the surface.

Tank requirements

Ideally, if you have the space, a five-gallon (22.75 litres) tank is adequate for two or three pairs of Threadfins. Of course, the aquarium should be decorated, and the bottom should be covered, as a reflected surface upsets them. There should be two planted areas for tired females and males to rest up.

The water should be drawn from the community aquarium, with 20% being rain-water or fresh, soft, acid water. Care should be taken in transporting the Threadfins to avoid stress and damage to their delicate snouts. Use a green net and try to catch them in the dark. They tend to lie motionless at such times and can be gently lifted out of the water. A frantic chase in daylight, when the fish are fully alert, will lead to almost certain cardiac arrest.

Sponge filters are great for the breeding set-up and a good light (sunlight falling on the tank would be better) would help, but is not a main factor.

Synthetic nylon wool mops attached to cork, or polystyrene floating in the open areas of the set-up, will attract the spawners. The ideal approach would be to remove the egg-bound mop after about ten days (or every ten days), leaving the breeders to reproduce on a regular basis. This will mean that you will require a bank of several tanks. This would, in turn, ensure success in increasing available Threadfin numbers. However, one breeding aquarium-cum-rearing tank is usually all we can offer.

Breeding behaviour

Breeding will take place at various times throughout a day. The male will chase his chosen female, keeping her in open water, where he will (it seems) try to 'hypnotise' her with the dazzling flashing of his nuptial blaze and scissor-like flashing of the fins. He will, after a few minutes, slow the pace down and, when both fish are close to the chosen site, he will extend his fins fully, almost to stretching point.

This is when the species is at its most beautiful, so sudden movements on the aquarist's part should be minimal. That will go for flashes from a camera, too. Just sit there and soak up the wonderful spectacle.

The male will shimmy up to the female, whose finnage is not as long and whose colours are a lot paler. He will then push her up against the mop or moss where she will

expel a small number of eggs (I have counted eight at a time). At this time it is not unusual for other males to muscle in on the proceedings.

If the fish are well fed with *Daphnia*, Brine Shrimp and flake (which they eat avidly) the eggs should not be molested. They hatch out between the ninth and eleventh day, so I choose the tenth day for my breeding tank to become a rearing aquarium.

Hanging on to those fine Threads!

Each pair of Threadfins may have left up to 100 eggs when they are removed from the set-up. Now is the most troublesome time. I find *Iriatherina* the most difficult of Rainbows when it comes to increasing my stock.

The depth of the aquarium is not important for fry-rearing, as the babies will spend all their time at the surface. Therefore, the shallower the tank, the better — deep tanks are a bit of a waste at this stage.

The eggs will begin to hatch during the first morning, if not while the adults are still in the aquarium (development is very rapid). The tank will already have Infusoria, but it will need a lot more. The fry do not hunt their food so you have to surround them with it.

The water should be circulated to give a flow along the surface, drawing up rotifers and other planktonic organisms. It is beneficial if you have *Paramecium* (see A&P, July '91 — *Culturing Microslippers* by Bill Toney) and Vinegar Eel cultures established, as clouds of these fine foods are needed to get these tiny 'Threads' growing to the Brine Shrimp stage.

Conductivity

As mentioned earlier, the other important factor in fry raising is the amount of ions from the total dissolved solids within the water (measured in micro-Siemens). This plays an important part for the fishes' nervous system. All nervous systems operate by means of minute electrical impulses and fish are so dependent on water for their survival, that it should only be natural that they would also utilise the dissolved solids to help conduct these impulses through their systems.

At the beginning of this article I said that salt should be used in 'Werner' tanks. Salt is a mild conductor, and is, therefore, used to 'fill in' for the deficiency in conductivity of softer water, but without raising the hardness.

Shortlived danger period

If you find your fry dwindling away it will either be the conductivity of the water or empty stomachs because the food is not getting to them. All this said, this most difficult and delicate time lasts for some fourteen days. By the end of this period, the fry will be large enough to take Brine Shrimp and the growth rate will increase. At sixteen weeks the fry will have sexed out, and they will be around 25mm (1in), big enough to add to your miniatures Rainbow aquarium.

OUT AND ABOUT

SWALLOW AQUATICS

by John Dawes

Photographs by the author

I first met Mick Seaby, owner of Swallow Aquatics, in June 1989. We were sharing a taxi queue outside the World Trade Centre in Singapore at the time, having just completed our final exhausting round of Aquarama.

I had been judging fish at the show, while Mick, enterprising man that he is, had flown out to 'gen up' on all the latest information and developments in aquarium hardware, and to see what new species and varieties of fish were making a first appearance.

We met again this June, this time on the plane flying out to Singapore, at Aquarama itself, and on the flight back. Once more, he was on the lookout for new fish and equipment.

I mention these two occasions because they help to emphasise the point that it is thanks to the unflagging efforts of people like Mick Seaby, that we, as aquarists, get the opportunity to see and buy the very latest fish and equipment that come on the market so soon after they make their first public appearances.

For example, those of you who may have read my Aquarama report in last month's *ACP* will have seen the new — and most unusual — Blood Red Parrots that were 'launched' at the event in June. Well, true to form, Swallow Aquatics already

had a pair in stock when I paid them a visit for this article.

They also had a tankful of Albino Oscars, both of the 'normal' type and of the Tiger variety illustrated in our July poster. Then there were the impressive 'Sailfin' *Myxocprina asiatica*, the latest Red Diamond Discus... the list goes on. And these are just a very few of the freshwater tropicals... to say nothing of the catfish... or the livebearers... or the characins and lesser-known cichlids.

On the marine front, there



A dazzling display of Albino Oscars.

Butterflies (*Chaetodon semular-tonus*) and the Red Sea Picasso Trigger (*Rinecanthus asaii*).



A robustly healthy Lemonpeel Butterfly from Swallow Aquatics' 'Red Sea Collection'.

was even a large tank of rarely-seen — but highly desirable — Red Sea fish, including some ridiculously healthy Golden, Red-line, Addis or Lemonpeel

The coldwater section was pretty extensive too, exhibiting an extremely wide range of Fancy Goldfish and Koi (Japanese), plus a substantial selection of other popular and less well known species. I particularly liked the small (two-inch) Green Tench with their distinctive caudal peduncle spots, and the varied selection of Orfes.

By the time we go to press, summer will be just a memory and all of Swallow's outdoor displays of ponds and pond plants will be going into hibernation. Come next spring, though, make sure that you pay them a visit for your pond plants. With a self-contained plant propagation unit and large display ponds for water lilies and marginals, you'll find the offerings hard to beat anywhere.

On the propagation side, I just couldn't believe the sight that greeted me when we went behind the scenes. In all honesty, I haven't seen so many 'home-produced' Platies, Sword-tails, Guppies and Mollies anywhere else in the UK. I'm certain that, in terms of numbers — though not in terms of range of varieties — Swallow could be self-sufficient in these four popular types of livebearers. They could also be more than self-sufficient in Apple Snails. They had so many that I'm sure they could even start exporting them!



At Swallow, the selection of coldwater fish is second to none.

Also behind the scenes are ample quarantine quarters for both aquarium and pond fish, as well as more than ample storage areas for dry goods. One thing seems certain: whether you are after an airline clip or a jumbo drum of pond pellets or sticks, if it's not on the shelves in the



If it's not on the shelves, it's still likely to be in stock — this is just a small part of Swallow's dry goods department.

Spotlight Special: *Aquarium Equipment*

BASIC AQUARIUM EQUIPMENT

A guide to essentials and accessories from *A & P* editor
John Dawes

If you've never kept fish before and find yourself for the first time in a well-stocked aquatic centre, you could be forgiven for thinking that setting up an aquarium is a very complicated affair. Faced with a brain-numbing array of improbable-sounding bits of hardware like 'venturi attachments', or equally improbably-looking equipment such as protein skimmers, how do you make a start?

BASIC REQUIREMENTS

In the first place, if we reduce aquarium keeping to its most basic, an aquarium must provide adequate conditions for the fish, plants and other creatures it will eventually contain. In order to do this, aquaria must be illuminated, aerated, and, in the case of tropical systems (both freshwater and marine), heated. In addition, the water must be kept in good condition and be of appropriate chemical composition.

Nowadays, there is such a range of hardware available to provide for the above that, if there is a problem, it's in making up one's mind as to what to go for.

Articles elsewhere in this Spotlight



Whether you are aiming for a freshwater or, as in this case, a marine system, always go for a larger tank in preference to a small one.

Special will be dealing with topics such as heating, lighting and water treatment equipment in some detail. We hope that the guidelines given within these features will be found helpful in arriving at a decision regarding what is best suited to your own personal requirements and preferences. I will therefore not expand any further on heating, lighting, aeration, filtration, protein skimming, ozonisation and ultra-violet sterilisation here, but would direct you to Dick Mills' and Dave Garratt's articles for the necessary advice and information.

CHOOSING AN AQUARIUM

Aquaria can be bought as individual items or as integral components of a complete 'cabinet' system (reviewed by Gordon Kay in this issue).

Irrespective of whether a tank is being



A hydrometer — whether it incorporates a thermometer, like this model does, or not — is absolutely vital for marine aquarists.

bought separately or not, it is always best to go for the largest size possible. Contrary to popular belief, the larger the aquarium, the easier it is to maintain.

Not only can a large aquarium house more fish than a small one, but the larger volume of water it holds is able to cushion the effects of any temporary imbalance or mishap, such as overfeeding. With small aquaria, the margin of error is correspondingly narrower, so that a single excess feed — something that is very possible during the early stages of fishkeeping — can lead to a total wipe-out of fish.

Traditionally, the advice has always been to go for an aquarium measuring at least 24 x 12 x 12 inches. The metric equivalent of this is 60 x 30 x 30 centimetres. In recent years, though, there's been a sensible move towards recommending larger tanks than this.

Despite this advice, the final choice is a very personal one, depending on a large number of factors such as available space and funds.

Here is a selection of some so-called standard sizes

SOME STANDARD AQUARIUM SIZES

DIMENSIONS

INCHES	CENTIMETRES
18 x 10 x 10	45 x 25 x 25
24 x 12 x 12	60 x 30 x 30
30 x 12 x 15	75 x 30 x 38
36 x 12 x 15	90 x 30 x 38
48 x 15 x 15	120 x 38 x 38
60 x 18 x 18	180 x 45 x 45

ACCESSORIES

While hardware like tanks, heating, lighting, aeration and filtration/water purification equipment are universally regarded as 'essentials', many other items can be regarded as 'accessories', ie as pieces of hardware that will help both in the setting up and successful maintenance of an aquarium.

Some people may regard a particular item as 'essential' or indispensable, while others will regard it as an optional, albeit desirable, 'accessory'. For instance, I would regard hydrometers as absolutely essential if you are setting up a marine aquarium (how else can you determine the correct specific gravity?), yet, I have heard them referred to as useful accessories. The same goes for test kits, where I would deem, at least, pH, ammonia and nitrite test kits as vitally important.

In any case, whatever one's view, I have gathered what I consider to be the most important items together in the accompanying checklist which might prove useful to

carry with you on your first shopping trip as a memory jogger.

Item	Some Uses
Spare inexpensive aerator	Temporary replacement in case of breakdown, particularly in aquaria with undergravel filtration.
Non-return airline valve	Will prevent water siphoning back into aerator when/if this is switched off.
T and Y pieces	Make a variety of airline arrangements possible.
Airline	As addition to, or replacement for, existing arrangement or new aquaria.
Airline clips	Method of controlling rate of airflow through airlines.
Spare diffusers	Those in use can become clogged up under certain water conditions, may lose efficiency or may experience deterioration of the joint between airline and diffuser.
Spare diaphragm	Diaphragm in use may tear without warning. Prompt replacement is essential.
Range of fuses	In case of electrical malfunction, fuses in plugs may blow. The range kept in reserve should match that of the plugs in use.
Spare heater-stat fully wired up	Essential — may never be required but if/when it is, its value becomes self-evident.
Thermometer	If spirit models are used, these can easily break. If liquid crystal, adhesive ones are used, these cannot usually be reused if peeled off. In either case, replacements are necessary.
Range of nets	Should include small, fine nets for transferring/catching fry, and young fish; large fine ones for delicate species, and coarser ones in a variety of sizes for more robust species.
Breeding trap	Method of confining/protecting a pregnant livebearing female and her fry during birth and until appropriate accommodation for the young can be made available. All models provide means of keeping the female (which will often eat her offspring) and the fry apart.
Jam jars	Useful for transferring adult fish and fry, as very

Cable tidy	temporary quarters for fry, as treatment chambers and a multitude of other useful functions.
Insulating/waterproof tape	Method of keeping wiring neat and safe.
Heater-stat clips	Means of protecting electrical connections and aquarists (!).
Siphon tube	Replacement of those in use which can sometimes deteriorate after a time or break during routine maintenance.
Gravel cleaner/dip tube	Used for water changes. Tube should be at least as long as the distance between the rim of the tank and the floor, plus the height/depth of the tank.
Algae cleaner/scraper	Useful for cleaning localised accumulations of debris or uneaten food.
Screwdrivers	Means of keeping sides of tanks free of encrusting algae. Magnetic cleaners allow the job to be done without getting one's hands wet.
Pair of long forceps	Standard and star-tipped types should be kept handy for wiring up plugs and maintaining/cleaning/stripping down electrical equipment (as long as the aquarist is familiar with correct methods of coping with electricity).
Planting sticks	Useful for removing dead fish, plants and objects from an aquarium. Can double up as planting stick.
Waterproof marker pen	Self-explanatory.
Scissors	Writing details of species, treatments administered, spawnings, etc on tanks.
Water testing kits	Useful for cutting airlines, insulating/waterproof tape, etc.
pH adjusters	Essential for monitoring and adjusting water chemistry.
Medicine chest with remedies for common diseases	Useful, quick methods of altering acid-base balance of the water to suit particular species.
Small reserve stock of food	Should be regarded as an essential safeguard but should not be resorted to as a matter of habit. Prevention is better than cure.
Tube of silicone-based sealant	Useful means of overcoming oversights, particularly at weekends.
	Emergency repair of leaks. Useful for attaching bark/bogwood to plastic/glass plates which can then be covered with gravel to prevent them from floating.



An 'essential' accessory — a pH test kit.

VALUE OF SOUND ADVICE

Lists of essentials and accessories are all very well. However, they can only provide the bare minimum in terms of genuine appreciation of what the various products can or cannot do.



It's always extremely useful to have some medicines readily available.

Advice of a more comprehensive kind is always available from books (there are some excellent, inexpensive titles around), from established aquarists and from aquatic centres. It is therefore a very good idea to read round the subject and talk things over with people in the know before you embark on a shopping spree. What you may well find as a result of these deliberations and discussions is that your original plans change, and that even items that may not be mentioned either in the checklist or in the other **Spotlight Special** features, might be just the thing for your own very particular needs.

After all, if there is *one* essential, it's getting things right at the very start. Both you and the animals and plants which you will eventually care for will be the better for taking the most appropriate first steps into the hobby.

Spotlight Special:

Aquarium Equipment



Properly managed, systemised aquaria can house stunning displays (in this case, mostly of anemones).

CABINET AQUARIA

Gordon Kay offers a basic guide to choosing a cabinet aquarium

When I started to keep fish — which was longer ago than I care to own up to — fishkeepers had the choice of an aquarium which stood on either an angle iron stand or on the sideboard (or on some other unsuitable piece of furniture). I've long held the view that an aquarium should be part of the furniture and, as such, blend into the room decor, rather than stand out like a sore thumb.

I am happy to say that over the last few years, as more people are getting into our hobby and (happily) spending more money to attain the perfect set-up, the consensus has grown towards this way of thinking and manufacturers have been happy to oblige. The result is that, in any aquatic retail outlet, there is such a bewildering array of aquariums and cabinets on show that the uninitiated can go bonkers trying to find his/her way through the maze of just what is available. The aim of this article is to guide you through that maze and to help you make a more informed choice.

For the sake of clearer understanding, I shall sub-divide cabinets into two simple

groups. First, there are the 'basic cabinet aquaria' which are simply that: an aquarium with its own cabinet and hood. Then there are the 'systemised cabinet aquaria' which contain all the hardware necessary for the running of the aquarium.



One of the beauties of cabinet aquaria is that they integrate well with 'normal' living room furniture with no pipes or wires showing.

BASIC CABINET AQUARIA

The range of size, shapes and styles of both aquarium and cabinet available today is enormous. For instance, there are aquaria in the usual 'rectangular' shape, as well as cube, hexagonal, bow-fronted (which are starting to make something of a resurgence in popularity of late), trapezoid and even tower aquariums.

The last of these are very striking indeed. However, I can't help but think that maintenance in these tall, narrow tanks would be rather difficult — although a chat with a specialist supplier could well prove me wrong. Most manufacturers offer not only a wide range of standard sizes, but will also make tanks to a customer's particular specification — particularly useful when one has a 'special' space to fill.

Cabinet types

Aquarium cabinets come in three different types:

- (i) Cabinet with integral hood, all in one unit, into which the aquarium simply slots.
- (ii) Separate cabinet base and hood, and
- (iii) Separate cabinet and base and aquarium with integral hood.

The first type is self explanatory, being one unit with a 'gap' for the tank. These are every bit as attractive as other types but — possibly out of logistical necessity — are restricted to the smaller sizes.

Design number (ii) needs no further explanation and is the most commonly seen of all cabinet aquarium types. It has the advantage of being the most flexible in terms of obtaining larger sized aquariums and also obtaining hoods for special purposes, like housing Tunze filtration equipment.

The third design looks very much like the second, except that the hood is actually an extension to the tank, with a laminate which matches the base laid over the glass.

I like this last design best of all, since it makes for much 'cleaner' lines. My own 5ft x 2ft x 2ft (150 x 60 x 60cm) cabinet is made in this way. Hoods can either have sliding lids, hinged lids or — more convenient in terms of access — lids which simply lift off. As I said, getting specials manufactured is usually no problem, but a word of warning — a lift-off lid for a 6ft (180cm) long tank is very difficult to lift. For longer aquaria, it is advisable to have the lid split into two along the length.

Cabinet bases

Cabinet bases could take up an article all of their own, and to come up with your own design would be quite a task. However, the 'standard' cabinet bases usually come in the same basic format. This consists of one or



Some companies manufacture sophisticated complete water treatment systems which can then be installed in an exciting aquarium cabinet.

more cupboards, with the remainder of the space taken up with shelves for books or ornaments.

The cupboard(s), of course, is (are) where all of the equipment which runs out of the aquarium is stored out of sight. Some manufacturers supply the cupboards with holes in the back (for wires and airlines/pipes) and some do not. Others supply either or. Whichever you plump for, is usually reflected in the price.

SYSTEMISED/CUSTOMISED CABINET AQUARIA

These can literally be anything from a cabinet/hood with an aquarium which has a hole pre-drilled into the base for the aquarist to supply his or her own filtration system beneath the tank, to a complete aquarium cabinet and hood with a fully integrated filter system embodying all of the elements required to provide a stable environment for the animals within the aquarium.

The first type is, well, self explanatory, but some of the options of totally customised aquaria are mind-blowing, so I shall look at some of the basic components here. One should remember, however, that different

manufacturers offer varying degrees of sophistication, so one would have to carry out a survey of what is offered and then make an informed choice, based on one's priorities and what is perceived to be the best value for money.

Pre-filter or mechanical filter

This component seems common to all manufacturers. It is a means of filtering detritus from the water before it passes through the biological filter. This process is usually carried out by a 'waterfall', taking water from the top layer of the aquarium and passing it through a coarse, quick-change filter.

Reverse-flow undergravel filter

After the aquarium water has been pre-filtered, most of it usually passes under the substrate, to pass through it and back into the aquarium. This provides basic biological filtration but is more efficient than a normal 'undergravel' because only mechanically clean water passes through it, facilitating a cleaner filter bed with the resultant longer life.

Wet and dry filter (trickle filter)

While the majority of the aquarium water passes straight back into the tank via the reverse flow undergravel filter, a small percentage (around 10% usually) is channelled through a trickle filter which is not immersed in the aquarium but located in a separate dry chamber, and allowed to trickle through the filter medium. Because the bacteria living in the trickle filter obtain their life-giving oxygen from the atmosphere instead of the aquarium water, this

system is many times more effective than conventional filtration. Again, this component seems to be common to most manufacturers.

Denitrifying filter

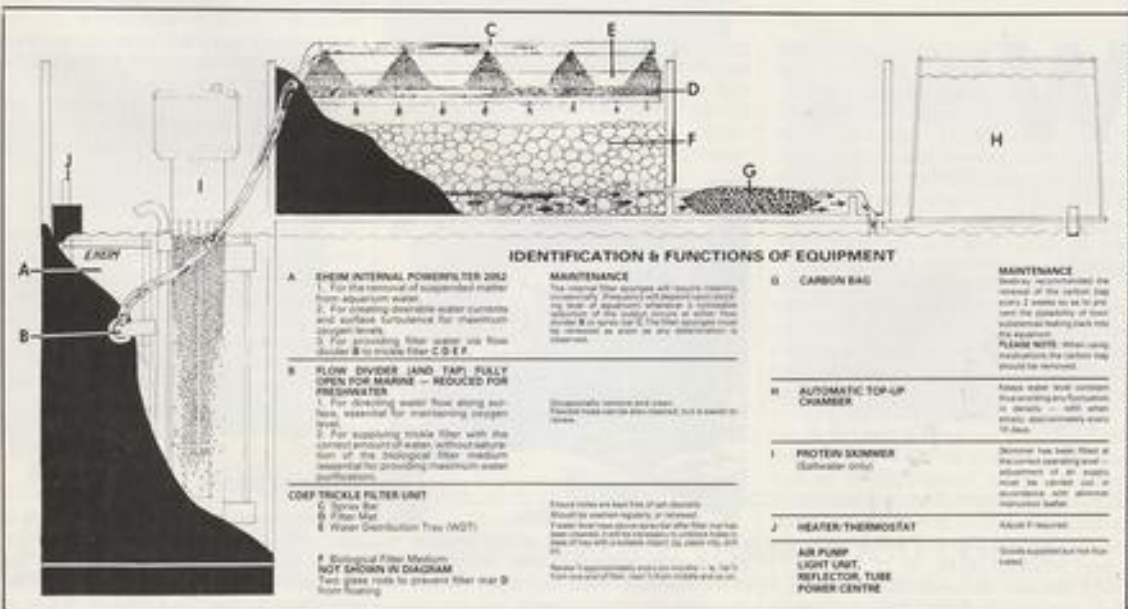
This is sometimes called a nitrate filter and utilises anaerobic bacteria to break down nitrate into nitrous oxide and then on to free nitrogen. These filters are totally submerged and operate on the principle of restricted flow through the medium which encourages anaerobic bacteria due to low oxygen levels. (See also Dave Garratt's article in this Spotlight Special for fuller discussion of water treatment methods.)

Other components

In addition to the above main components, some manufacturers offer things like Automatic Waterlevel Control, which detects evaporation and tops up the aquarium automatically, a Visual Sight Gauge, which is used in conjunction with the Automatic Waterlevel Control and warns when the reservoir should be topped up, and a very sophisticated heater/chiller called a Titanium Temperature Controller. This maintains water at a given temperature, accurate to within one degree Fahrenheit.

Apart from a combination, or indeed all, of the above components, there will be one or two heaters, the necessary pump or pumps to drive water through the filters (although you may well find you pay extra for these) and, usually, the lighting complete with starters. As I said earlier, you will just have to make your own survey of just what is and isn't available and make up your own mind.

Well, I hope that I have convinced you now that this is not really that complicated a subject. One thing is certain: there is some lovely gear about!



PRODUCT ROUND-UP

BY DICK MILLS

Interpet

The start of any of the various aquatic seasons seems to be welcomed by **INTERPET** with a pertinent product. You may remember they greeted the coldwater season with **POND BALANCE** at the Chelsea Flower Show. Well, they've recently heralded the start of the indoor tropical season with a product to keep our fishes well and truly lit in the forthcoming darker months.

Extra light is often needed in the aquarium for better plant growth, but simply adding extra lamps in the hood isn't always practicable; sometimes there isn't room and, even if there is, extra lamps will not only cost you more, but also produce more unwanted heat.

Interpet's answer to the problem has been to develop **LIGHT ENHANCERS** — reflectors that direct off the light where it will do the most good — down into the aquarium. The Enhancer comes in modular units of 43cm (17in) and 58cm (23in) lengths and in diameters of 1in and 1.5in (2.5cm and 3.8cm) to fit most fluorescent tubes. Being of non-toxic and non-corrosive materials, it won't do your fish any harm and won't be harmed by water spray or condensation should you inadvertently allow it to come into contact with either. At £3.74 and £4.73, it's a small price to pay for extra lighting.

Now you can make even your Tritons seem brighter!



Interpet's latest Enhancers make the most of fluorescent lighting.

Have you ever fitted a powerhead (or an internal power-filter), switched on and watched

all your plants lean over? Obviously some tanks are 'over-filtered', with excessive water-flows making the fishes' lives more inconvenient. What's the solution? Interpet Plant-props? No, not quite. Again, the simplest solutions are the best: variable flow powerheads.

Four new model **POWERHEADS** give a flow of between 60-840 litres (13-185 gal) per minute, covering usage in aquariums ranging from 15-490 litres (3.3-108 gal) in volume. In addition to variable flow, each powerhead has vary-directional flow and an aeration feature.

Easy removal for cleaning, together with an air-silencer and air-adjuster, all incorporated into a neat uncluttered design, should make this powerhead very popular. As we approach 1992/3, it's nice to know that the powerheads also meet international standards and specification.



New variable powerheads for all situations, from Interpet.

Pond autumn/winter care

Don't think that Interpet have forgotten the coldwater aspects, just because the nights are drawing in; preparing the pond and fish for winter is much in their thoughts too. Feeding with Interpet **FOOD HOOPS** or **KOI FOOD** for spring and autumn will ensure the fish have enough reserves to see them through the winter. If this is the time of year you clean out the pond, then you will notice the benefit of using **TRIZYME** throughout the season (you did, didn't you?); there will be a lot less sludge for you to dispose of for a start.

After you've trimmed the plants, and emptied and scrubbed the pond, refilling with water treated with **FRESH START** will make sure the water is safe for fishes once more. An addition of **POND GUARD** will ward off stress and disease, while **TRIZYME** will re-establish the biological processes that much more quickly. Then you can safely put away the coldwater fish for the winter until next spring when, no doubt, Interpet will be there with something new once again to greet the new season.

Details of all products from: **INTERPET LTD**, Interpet House, Vincent Lane, Dorking, Surrey RH4 3YX (Tel: 0306 881033; Fax: 0306 885009).

Ruto

The next time you look around the frozen foods counters you may well see a cabinet devoted to foods for fish, rather than of fish, such is the wide range of frozen live foods from **RUTO**.

No less than 25 separate 'flavours' are available for your fishes' delectation and, in addition to satisfying the needs of fish and invertebrates in general, the range now includes foods for Discus in particular.

DISCUS FOOD contains 98% beef-heart and 2% vege-

table matter; the latest additions to the range are **DISCUS BABY** and **DISCUS PROFIL**, two smaller foods for the nurturing of Discus youngsters.

For larger fish, especially marines, the **LANCEFISH** packets contain whole fish, while **GLASSWORM** makes a welcome appearance as another treat in store for any jaded fish palates.

Most foods come in ten minipacks per card, each more than enough for a single feeding, so that the rest of the card remains undisturbed, thus retaining maximum freshness



A selection of 'mini-packs' allows for a varied diet of single feedings.

throughout its frozen life. Various larval life has been frozen, including Bloodworm, Black Mosquito, *Artemia* etc, while regular favourites *Daphnia* and *Cyclops* are accompanied by Krill (two differing-sized species), Micro- and Red Plankton, Mysis, Squid, Cockle (two sizes) and Mussels, Fish Eggs, Fish-Meats, Cichlid Mix and Food for Invertebrates.

Full details and a list of stockists from: **RUTO (U.K.) LTD.**, 278 Wigan Lane, Wigan, Lancashire WN1 2RN (Tel: 0942 821114; Fax: 0942 826396).

Water Display Technology

If you're planning next year's pond, then the WDT/OASE range will be well-worth looking at, from high-quality pumps, nozzles and everything

up to complete fountain kits. WDT is now the sole UK distributors of the Oase 'home and garden' range and, by buying and importing directly from Germany, this will mean significantly reduced prices without sacrificing the qualities long

associated with the name Oase: high-efficiency pumps with stainless-steel housings for long life and lower running costs; generous cable length; 'designed-in' provision for underwater lighting. Add all these together, top off with a three-

year guarantee, and you'll soon be appreciating 'The Pump the Professionals Use.'

Details from: WDT, No 5 Focus 303, Walworth Industrial Estate, Andover, Hampshire SP10 5NY (Tel: 0264 333225; Fax: 0264 333226).

UNO

It can be a bit confusing when the conversation goes something like "What's the name of a good aquarium heater?" "Uno". "Look, I wouldn't be asking if I knew, would I?" "No, not you know, Uno!"... and so on until the proverbial penny drops. Joking aside, UNO have been an established and revered name in aquatic heating for many years now, and must be something of an exception in that their whole range is still manufactured in Nantwich, Cheshire.

The REGAL range of earthed heaters have black protective, stove enamelled coating and come in 25-200 watts sizes. There is a POOL HEATER equivalent (to maintain an ice-free area in the pond), and this is available in full mains voltage and low voltage (24v) models, the latter requiring a suitable transformer; both these 'outdoor' heaters should be used in conjunction with a safety Earth Leakage Current device.

The SUPREME, a thermostatically-controlled version of the Regal, has a polycarbonate plastic upper section around the thermostat and is virtually unbreakable in normal usage (Pacu-proof?). The nylon

temperature-adjuster gives precise control-settings and the unit comes complete with fixing device. It is available in 50-200 watts and is made to comply with any new regulations likely to be agreed in 1992.



Just a few of UNO's highly popular and well represented range.

If you prefer to do things the 'separate way' then the thermostat unit from the Supreme is available as the POPULAR: it has a maximum loading capability of 300 watts and features a neon indicator and a new moulded nylon adjustment control.

Traditional internal glass heater/stat units are still as popular as ever and the RELIANT heater/stat, the

ACCURIST thermostat and REGAL GLASS heater are all similar in design and specification to their earthed equivalent.

For convenient and reliable external heating control (and leaving more swimming space in the tank for the fishes), the SLIK-STAT and NOVA offer two options. The Slik-stat uses the traditional bi-metallic switching action (and needs to be clipped to the aquarium side in order to sense temperature through its sole-plate), while the Nova is all-electronic and can be sited anywhere within the vicinity of the aquarium, temperature-sensing being achieved by a remotely-wired probe hanging in the water. Red and green lights give clear indications of operation — red and green on together means the heater is working, but a red on alone means the heater or some other function has failed. To accommodate new regulations, temperature-adjustment has to be done by means of a small screwdriver.

For complete externally-controlled heating of the aquarium (and vivariums too) UNO are the main distributors for ULTRATHERM MAT HEATERS; there are two types available in six sizes ranging

from 12in to 48in (30-120cm) — remember that these require a thermostat, and while any UNO model will do the job, the Nova is highly recommended for the purpose.

Keep a check on temperatures with either the BLUE-LINE (spirit-filled) or SILVER-LINE (mercury-filled) thermometers. Marine aquarists will find the UNO GLASS HYDROMETER a satisfying tool too: calibrated at 75°F (24°C) (rather than 68°F — 20°C) it cuts out those tricky mathematical calculations when evaluating specific gravity.

The ubiquitous POLYFILTER (another UNO original) is also alive and well, and the modified model still represents true value for money; look for the re-designed packaging.

Add on excellent after-sales services, plus other products, including Breeding Traps, Diffuser Stones, Worm-feeders and Heater Clips, and you'll appreciate why so many aquarists plump for... you know, UNO.

Information pack and price list from: C ELLSON & CO LTD (Uno Products Division), Uno House, Arnold Street, Nantwich, Cheshire CW5 5RB (Tel: 0270 623674; Fax: 0270 628375).

Durapipe

If you're running a public aquarium you can ill-afford to have leaks in pipework caused by temperature fluctuations, physical damage or, in the case of the Northern Ireland Aquarium on the Ards Peninsula, by corrosive sea-water.

That's why manager Billy Reid chose DURAPIPE ABS pipework. The pipe can withstand a temperature range of between -40°C to +80°C. Joints are easily made with cold solvent cement and the leak-free results have a rated life of 30 years. Pipes are pressure rated up to 15 bar at 20°C (imperial

sizes) and 10 bar at 20°C (metric sizes). The company makes pipes and valves in ABS, PVC, polyethylene and polypropylene, together with a specialist compressed air system.

Details from: DURAPIPE, Walsall Road, Norton Canes, Cannock, Staffs WS11 3NS (Tel: 0543 279909).

PRODUCT NEWS: Algarde

ALGARDE have added a few new products to their already extensive range. Details are:

A WATER TREATMENT CAPSULE, which can also be

used as a corner filter; packaged in polybag with header card; RRSP £2.49.

An attractively packaged AQUARIUM STARTER KIT (excluding tank) at a competitively priced RRSP of £49.56.

The following are further additions to the individual

blister-pack range: 4in Air-stone, 6in Airstone, Heater/Thermostat Holder, 20mm Clips and Suction Cups.

Full details from: ALGARDE, Enterprise House, Wharf Road Industrial Estate, Pinxton, Notts NG16 6LE. Tel: 0773 581481; Fax: 0773 581524.

CORRECTION

In my article *Advances in Tropical Aquarium Keeping* (page 61, column 3, paragraph 2 — in last month's issue of *AGP*), I referred to a novel alternative way of substrate heating provided by Dennerle. The product in question is, however, manufactured by another German company — Bio Plast — exclusively distributed in the UK by Gesting Associates who also handle the Dennerle range. We apologise for any inconvenience or confusion caused by the said paragraph.

Spotlight Special: *Aquarium Equipment*

HEATING AND LIGHTING

Apart from the overall importance of keeping water conditions in excellent order, the next two critical factors for success are, for tropical species, heating and lighting (see Dave Garratt's article within this Spotlight Special for a full discussion of filtration, aeration and allied subjects).

HEATING

Unless you are one of those fortunates living between the Tropic of Cancer and Capricorn, where the ambient temperature is high enough to maintain water at the required temperature level too, you will need to heat the aquarium water artificially.

Heating, today, is generally done by means of electricity, either indirectly or directly.

Indirect heating

The most popular indirect method is space heating, usually by fan-heaters (or central heating warm-water pipes using gas or oil to heat the water in the boiler). The use of paraffin (kerosene) heaters seems to be waning, perhaps understandably, as this method also needed ventilation and periodic cleaning off of the water surface to remove the film of oil.

The main advantage of space heating is that any water kept in any container will be at the required temperature, although the higher-positioned tanks will always be slightly warmer than lower ones. This, of

course, is a handy arrangement for encouraging spawnings — just move the 'happy couple' up a row or two and watch them go! The main disadvantage of space heating is that any prolonged work, fish-watching, tank maintenance etc, becomes very tiring at such high temperatures.

Direct heating

By far the most common method of direct heating is by miniature 'immersion heaters' in the tanks themselves, each heater being controlled by a thermostatic device to keep the water temperature within the limits required.

Thermostats

While the principles of heating have remained the same for many years, the most radical changes have occurred in how it is controlled. Originally, separate thermostats and heaters were the norm; thermostats could either be an 'internal' type (immersed in the water), or 'external' clipped on to the side of the tank. Use of either meant extra wiring to the heater was needed. In recent years, the combined unit, having both heater and thermostat, has been the norm, taking up less swimming space in the aquarium. Within this design, the actual thermostat has



Modern external thermostats can be located away from the aquarium or vivarium and can even incorporate an alarm.



Undergravel heating provides a little extra beneficial warmth for plant root growth

also undergone a change, with micro-chip circuitry taking over the bi-metallic strip, electro-magnetic snap-action switching.

With the increase of micro-chip use, external thermostats seem to be making a comeback, not altogether surprising when you consider that their function can be supplemented (electronically-speaking) quite easily to include audible alarms for 'over' or 'under' temperatures (and power failures) and also to provide printed readouts where necessary. Again, these external thermostats can be even further away from the aquarium, as they have no need to be against the glass in order to sense water temperature changes, these being detected by a small remotely wired probe.

Heaters

The majority of aquarium heaters are much the same as they ever were: a heating element enclosed in a watertight tube. There have been changes from fragile glass through



Most heaters and thermostats come combined into a single heater-stat unit. (Also shown — a range of aerators).

aluminium to polycarbonate over the years, but these have not drastically affected overall performance to any marked degree.

Recent innovations in design have included a visible temperature-indicating scale which alters in sympathy with movements of the temperature-control knob on the combined heater unit, thus giving you some idea how far to turn the knob to effect any required temperature change (but still remember to check the thermometer after a while!).

One departure from the usual design is the substrate heating cable. As its name suggests, this is a length of heating cable buried in the gravel, where it supplies warmth to the plant roots (although any sub-gravel water-flow present due to biological filtration will also distribute warmth, but not necessarily assist plant growth.) According to modern thinking, having the substrate a degree or two warmer than the water temperature will benefit plant growth; this extra control is achieved, in some cases, by a dual-circuit thermostat (see *Product News A&P*, October 1991).



The vast majority of aquaria will provide appropriate housing for fluorescent tubes.

A further method of heating is employed in the larger Eheim 'Thermofilters'. Here, a thermostatically-controlled heater is built into the external filter unit, the aquarium water thus being heated as it passes through the filter. This system of heating is only suitable for freshwater applications, as there is a slight danger of metal-contamination of the saltwater if used in marine aquariums.

External heating mats are another way of removing the actual heating equipment from the aquarium itself. The tank sits on these pads and heat is transferred up through the bottom glass. One snag with this system is, of course, that when a pad failure occurs, the whole tank has to be emptied and removed to gain access to the pad for replacement purposes. A tip here would be to use two 'half-size' heater pads under any given tank so that, in the event of one failing, the other one would provide a standby source of heat until a convenient replacement opportunity occurred.

LIGHTING

Lighting the aquarium is necessary for many reasons. Firstly, it lets you see the fish — but more importantly, it stimulates activity of fishes and growth of photosynthesising plants which, in turn, keep the carbon

dioxide and oxygen levels in a more beneficial balance. In marine tanks, light also promotes growth of algae, not only for the benefit of grazing species of fish, but also within the cells of many invertebrates.

Lighting may be divided conveniently into three broad groups: tungsten (light-bulbs) fluorescent tubes and high-intensity types.

Tungsten

Of the three (and all seem to work quite adequately), tungsten lamps are the least suitable; although inexpensive, they give off a lot of unwanted heat (not a good thing in small plastic tanks) and have a short lifespan.

Fluorescents

Fluorescent tubes are now regarded as the standard lighting arrangement. Many complete 'just fit a plug, add water, decorations, livestock and go' type of starter aquarium kits have such lighting fitted already, housed in waterproofed reflectors.



Fluorescent tubes require a separate starter/control unit.

Within the fluorescent tube format there are several specialist lamps. Some of these may be designed to simulate various lighting conditions (eg natural sunlight, northlight, warm white, extra red wavelengths for plant growth or the actinic type for the benefit of marine invertebrate life. Others concentrate on extra power of light per any given length of tube and achieve this by having a 'power twist' spiral shape to the glass envelope itself.

The Triton lamp has a longer, normal performance life than most and, whereas other lamps lose efficiency within six months or so, Triton tubes continue right to the end, when they abruptly stop working altogether.

Although fluorescent tubes come in varying tube diameters and 'wattage lengths', they do give rather a bland spread of even light. I have yet to hear of anyone using the new short, rodlike lamps in an aquarium context, but these would allow areas of shade to permeate into the water between the fixing points of the lamps.

High-intensity lamps

The higher-intensity lamps utilise metal-halogen, pressure sodium and mercury vapour discharge systems to achieve their relative brilliances.



High-intensity overhead lighting needs to be sited some distance above water level.

Because of their physical size (and the necessity to have some starting gear, too) they are unsuitable for normal reflector/hood installation. They are best suspended above open-topped tanks, at least 12 in (30 cm) clear of the cover-glass. Recent designs allow the heat-emitting ballast starting gear to be mounted remotely from the cooler-running lamp assembly itself.

The main virtue of this type of lamp is their ability to punch light down much deeper into the water, a real asset for deep marine tanks where sedentary invertebrates can bask in the well-directed beams of light.

Light requirements

In addition to the type of light you want, you should also investigate the light requirements of the plants and invertebrates in the tank, where applicable.

The usual fittings supplied with the normal reflector will only allow enough light for basic fish-watching; double this amount is generally required for better plant growth, with a further 50%, or even 100% increase again for deeper tanks and marine invertebrate culture.

Remember also that the light intensity is not the only critical factor; lighting duration is important too. The better plant books give intensities and durations for the various species, and the use of a photographer's lightmeter will verify just how much light is actually reaching the floor of your tank.

One way of increasing the amount of light, without putting in more tubes and causing extra heat in the hood, is to make sure the maximum amount of light is reflected downwards into the water. Lining the hood with metal-foil or painting the inside brilliant white are two ways — but fitting one of Interpet's new Light Enhancers is easier (see *Product Round-Up*, this issue). However, it's no use having powerful lamps if the water is murky and you haven't cleaned the cover-glass recently!

Spotlight Special: *Aquarium Equipment*

WATER QUALITY GUIDE

In any article concerning water treatment equipment the prime consideration must be given to the essential process of all aquaria, i.e. filtration. The equipment available for filtration covers a vast range, from the 'humble', costing a few pounds, to the heights of technical expertise costing hundreds.

Filtration can take the form of mechanical, chemical or biological. **Mechanical filtration** removes suspended particulate substances from aquarium water by the use of filter media of differing particle filtering size. **Chemical filtration** uses chemical agents to remove dissolved substances from the water. **Biological filtration** (or purification) employs bacteria to break down the tank's toxic waste products to less harmful substances — a process essential to all aquaria.

FILTRATION EQUIPMENT

① Air operated:

These filters take the form of internal plastic boxes that can be fitted with a suitable medium; there are also foam sleeve types.

Both types work by attaching an airline to them and using the air flow to draw water through the medium. Both are primarily biological filters; the foam sleeve will act as a

Dave Garratt explores the ins and outs of water treatment equipment

suitable medium for the bacterial colony, while the box filter is fitted with a medium, such as filter floss, which acts as the support for the bacteria.

Both types will also act as mechanical filters, of course, and quickly clog up, requiring frequent cleaning and making them less effective biologically. These filters are only really suitable for hospital tanks or small water community tanks.

② Internal Power Filters:

These represent a much more sophisticated version of the box filter mentioned above. They are powered by a submersible electric power head and are capable of a far higher water turnover rate.

③ External Power Filters:

These are situated outside the tank and draw water from it via an inlet pipe. The water then passes through appropriate filter media before returning to the tank. Some very powerful models are available that will provide enough biological filtering capacity for many marine tanks.

However, power filters have another capa-

bility that is often utilised in marine aquarium filtration. They can be used to filter the aquarium water mechanically before it is pumped down the uplifts of an undergravel filter to provide reverse flow undergravel filtration.

In this type of filtration it is essential that the mechanical filtration is sufficient to prevent debris being pumped under the



External power filters allow for the use of a combination of media, turnover rates and aeration attachments.

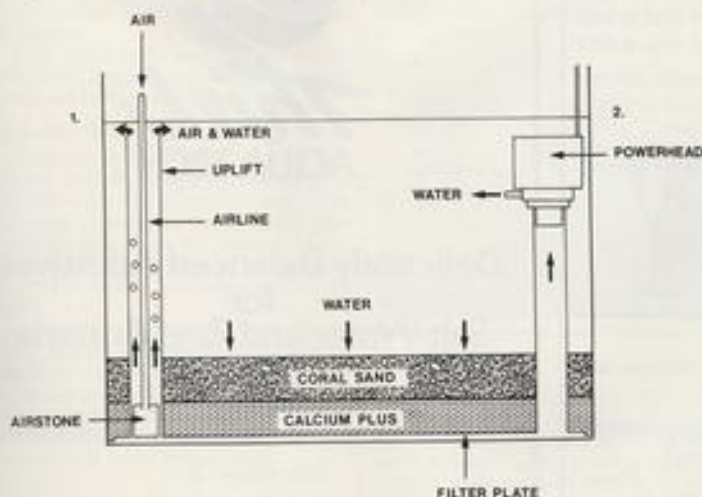


Diagram showing 1. Air Operation or 2. Powerhead Operation

Undergravel filtration is the most popular method used both in freshwater and marine aquaria. The diagram shows two suitable arrangements for a marine aquarium. The same principles apply in freshwater systems (using a different substratum).

undergravel bed. Therefore, it is important to pack the power filter carefully with differing sizes of filter media to provide a gradient effect.

④ Undergravel Filtration:

This is the most widespread filtering system used in fishkeeping and is familiar to all aquarists. I will not, therefore, dwell on the structure or function of such a filter as it should be known to all.

Undergravel filters can be powered by air pumps or, as is seen increasingly nowadays, submersible power heads. These power heads are available at such high turnover rates, that even large marine aquaria can be successfully run on undergravel filtration.

⑤ Trickle Filters:

These filters have been used commercially for many years, but are a fairly recent addition to the hobby, with Tunze leading the way in the early 1980s in this country. Many of the expensive, but highly efficient, complete aquarium systems aimed mainly at the marine market, incorporate a trickle filter into their construction.

In these systems, the aquarium water is trickled over a high surface area medium that is exposed to the air, not submerged

under water. The water collects in a sump, which also contains the filter medium (or media), before returning to the main tank.

The whole system is known as a wet/dry system. The trickle filter is the dry part and allows maximum gaseous interchange and biological filtration, while the sump is the wet part and allows further biological filtration.

6 Reef Systems:

These are purpose-built complete aquarium systems that incorporate filtration and many other aspects of water management. Systems should incorporate biological, chemical and mechanical filtration, plus, when used for a marine system, protein skimming, denitrators and ozonisers.

7 Denitrifying Filters:

Typical biological filtration uses nitrifying bacteria to oxidise ammonia, through nitrite, to less harmful nitrate. However, in some cases such as in invertebrate aquaria, this nitrate can become a problem if it increases despite water changes.

A denitrator could then be tried, but be warned, some denitrifying filters are not for the novice, as they are not easily controlled. Different types of bacteria are cultured under the anaerobic (low oxygen) conditions which exist in these filters. These bacteria will do virtually the reverse of 'normal' biological filters and convert nitrate, through various steps, to nitrogen gas which is harmless and can be expelled by piping away from the filter. Such denitrifying filters are often incorporated into complete 'reef' systems.

8 Diatom Filters:

Mechanical filtration can be taken to a very fine degree in a unit called a diatom filter. These filters use a special powder inside a power filter unit that gives a filtering capacity down to a few microns, thus enabling some disease-causing organisms to be removed.

They cannot really be thought of as disease cures, though, and, in fact, in recent years have fallen out of favour.

9 Algae Filters:

These are designed to encourage a lush growth of algae, usually in shallow trays above the aquarium. Water is circulated over this algal growth and nitrates and other unwanted substances are utilised by the algae and thus removed from the aquarium water. The water is also oxygenated by the algae.

Algae filters require very high illumination and can raise the pH of the water to dangerous levels if mismanaged. Difficulty in construction and housing makes their home use severely restricted, although spectacular results have been achieved in public aquaria using massive algae filters.

Closing Remarks on Filtration

Most of the filters I have talked about have been aimed at biological filtration. External or internal power filters can be used for mechanical or chemical filtration as well. All

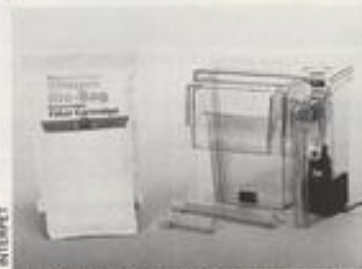


Power heads increase the turnover capacity of undergravel filters and — if they have a venturi facility (as this model has) — can also be used as super-efficient aerators.

that is necessary is carefully to pack the power filter canister with graded sizes of medium to ensure an efficient mechanical filter. In a similar way, carbon or an ion-exchange resin could be placed in the canister to give a chemical filtration unit.

AERATION EQUIPMENT

Aeration is a very important factor in any aquarium. It provides oxygen for both the livestock and the bacteria in the biological filter (unless a trickle filter is employed). Aeration also breaks up the water surface to enable gaseous interchange to occur at the air/water surface.



Nowadays the top external 'box'-type filters are excellent.

By breaking up the surface it also prevents dust and airborne pollution, along with organic matter, from forming a scum on the water surface. Finally, aeration often provides a more complex pattern of water currents and this is especially important in marine invertebrate tanks.

Aeration can be provided by air pumps, power heads with air-bleed connections or venturi attachments on the return pipe of an external power filter.

Air Pump:

Most air pumps available are diaphragm pumps which range from low-output units only suitable for very small tanks, to versions that can provide 6 litres (1.3 gal) air/min and will adequately power undergravel filters in 30-gallon (135-litre) marine tanks (two uplifts are usually used with an air pump for each).

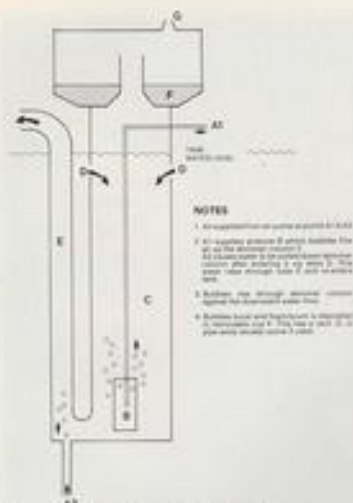
These vibrator-type pumps can, however, be quite noisy, especially if the aquarium is sited in your lounge. Foam pads are available to rest the pumps on to help control this noise and the positioning of air-stones away from the corners of tanks will also help. Noiseless piston pumps are also available, although these are more expensive for an equivalent power.

Maintenance of these pumps is fairly simple and just requires regular cleaning of the air-filter, checking airlines for kinks, and replacing blocked air-stones. Air pumps should be situated above the water level in the tank to prevent back-siphoning in the event of the pump failing. If this is not possible, a longer length of air-line in a large loop may do the trick. Anti-siphon valves are available but put extra pressure on a pump.

PROTEIN SKIMMING

Because of the laws of physics that govern protein skimming, it will only function in salt water; it does not work in fresh water. A protein skimmer will greatly reduce the load on any biological filter, since it will remove complex organic substances before the biological filter has to begin to break them down. It will also remove certain non-biodegradable compounds that the biological filter cannot break down.

Many of these compounds exist in an electrically charged (polarised) form and, in



The principles of protein skimming.

this form, opposite ends of the molecule have differing affinities for air and water. The water-loving part of the molecule is termed *hydrophilic*, while the non-water-loving part is *hydrophobic*. These molecules are thus attracted to an air/water interface.

The basis of a protein skimmer is to produce such an interface. This is achieved by producing a stream of tiny air bubbles inside a column, or reaction chamber, to attract these polarised organic molecules.

For aquariums up to 40 gallons (180 litres), a counter-current skimmer is usually used. This device uses an air pump to introduce a stream of tiny bubbles into a plastic column. The polarised organic molecules adhere, by reversible absorption, to the bubble/water interface and are carried up the skimmer column. Water is also drawn down through the column to increase the contact time between the bubbles and the water. When the bubbles reach the top of the column they burst, leaving behind the organic molecules which are collected as a scum in the cup that sits on top of the column.

Powerful power-skimmers are available, and these are run by a water pump that produces a high-pressure water jet which is mixed with air, using a venturi device. These models can cope with tanks up to hundreds of gallons.

Factors affecting skimming:

Most of these are not under the control of the aquarist. However, certain factors can be controlled or improved: bubble size and consistency of supply; contact time of bubbles with aquarium water; height of column; and bubbling rate. The skimmer should be the correct size for the tanks, so as to ensure maximum column height.

A good-quality wooden air diffuser (usually limewood) should be used to ensure good, even bubbling with a small size bubble. Bubbling rate should be adjusted so that it barely exceeds the rate of foam collapse in the cup. It is also important to clean the

skimmer regularly to prevent the build-up of fatty deposits which seriously hamper the efficiency of skimming.

Other advantages of protein skimming:

Even if most of the organics are biodegradable, skimming will remove them and, in so doing, will greatly lessen the load on the filter bed. This will lead to a more stable pH and a lower build-up of nitrate.

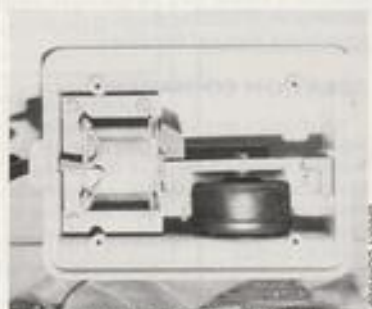
Skimming also prevents a build-up of protein slime on tank walls and in the filter beds, thus helping to prevent colonisation by unwanted bacteria that may thrive in this slime. Finally, skimming would seem to lessen greatly the risk of a wipe-out (ie) the loss of all the tank inhabitants.

Disadvantages

Skimming will remove trace elements and, although in a fish-only tank, normal water changes should overcome this, it may be necessary to use trace element supplements in an invertebrate tank.

OZONE AND ULTRA VIOLET

The two final topics in this article are much more frequently used by marine aquarists and used very little in the world of freshwater aquaria. Pondkeepers are, how-



Most aerators are of the diaphragm type.

ever, using UV increasingly to control unicellular green algae, ie, the cause of 'green' water; they are very effective when used as such.

Ozone

Ozone is a powerful oxidising agent and, therefore, has the ability to destroy micro-organisms such as viruses and bacteria by oxidising their cellular DNA. Ozone may also 'burn off' the cilia and flagella of protozoans, and will thus make them immobile.

However, before we assume that we have found an infallible disease cure, there are three important restrictions on its success:

- (i) success is dose-related;
- (ii) organisms can recover from sub-lethal doses;
- (iii) fish and humans are adversely affected by overdosing.

Ozone is an oxygen molecule possessing an extra oxygen atom, thus giving it the chemical configuration O_3 . This atom is highly unstable and is readily given up to produce the strong oxidation effect of ozone.

Ozone is produced in the aquarium by pumping air through a silent-discharge ozoniser. A transformer produces 1,500 voltage that passes to a pair of electrodes that are separated by a dielectric (insulator). This produces an electrical corona through which air is pumped to produce ozone.



Ozonisers — used appropriately — will prove extremely helpful, particularly in marine set-ups.

Ozone needs to be used carefully, weighing up its pros and cons but, adequately managed, it considerably enhances the performance of protein skimmers. I refer the reader to other sources for more detailed information on this topic.

Ultra-Violet Sterilisers

Ultra-violet light (like ozone) is usually thought of as a disease preventive, or even a cure. Again, this role must not be over-estimated, as UV is rarely capable of totally eradicating a disease. At best it should be thought of as a general control measure.

Ultra-violet sterilisers are used in conjunction with a power filter or some other means of passing the aquarium water through the steriliser. The ultra-violet is capable of destroying the DNA of any free-swimming organisms that pass in close proximity to it.

Again, I refer the reader to the list of references for the advantages and problems associated with these units.

FURTHER READING

For anyone wishing to look further into the use of protein skimming (marines only), ozone or ultra-violet, I would recommend the following:

Keeping Marine Fish, by Graham Lundequard (Blandford). Out of print, but only £3.95 if you can find it.

The Marine Aquarium Reference, Systems and Inverts, by Martin Moe, Int.

Skimmers, Ozone and UV, the Safe Way, which I wrote in *AGP* in October, 1988.

a highly developed suburb of Charlotte, North Carolina.

Among the most highly desired but over-rated minnows is the Bluehead Shiner (*Notropis wolaka*). It's difficult to collect because it usually is out of colour and the males at this time are uninteresting, and it's known from few locales. Many other minnows are far more colourful, more widely distributed, and hold their colours better.

I recently collected brilliant orange Yellowfin Shiners (*Notropis lucipinnis*), in a small stream in the mountains of north Georgia, a mile north of Atlanta. They've held their colour very well more than a month into captivity, but, so far, I've not found any eggs in the gravel or on a spawning mop.

The Greenhead Shiners spawning around the Bluehead Chubs were lipstick red with white fins, but in captivity they quickly turned pastel blue and white. My Redlip Minnows (*Notropis chilincus*), never coloured as pretty as the illustration in Page and Burr's *Peterson Field Guide*, but they're easily nice enough to suit me, and eat everything from frozen brine shrimp to trout chow to boiled zucchini. I guess they're on a 'seafood diet' too!

FAMILY CENTRARCHIDAE — SUNFISHES

There are 30 members of the Sunfish family in North America, ranging from the Smallmouth and Largemouth Bass (*Micropterus*), the most important game fish in the USA, to a myriad species of *Lepomis*, and a few other genera (*Pomoxis*, *Archoplites*, *Ambloplites*, *Centrarchus*, *Acantharchus*). A few are nice aquarium fishes. The best of all are three related species of *Enneacanthus*.

All the *Enneacanthus* are species of darkly stained, quiet waters, in ponds, borrow pits and ditches, and swamps, where they lie in wait for prey in dense soft shoreline vegetation.

The Banded Sunfish (*Enneacanthus obesus*) and the Bluespotted Sunfish (*Enneacanthus gloriosus*) are readily distinguished in fish books, but it's a lot harder in real life. They occur together all along the coastal plain of the United States from New York to Florida. They appear to intergrade here in North Carolina, where I live, and I've often thrown my hands up in desperation when asked to determine which species was in my net. Suffice it to say that a Banded Sunfish can look like a Bluespotted Sunfish, and vice versa.

With about the same range, but highly disjunct, the Blackbanded Sunfish (*Enneacanthus chaetodon*), is the most desirable of the group. Uncommon to rare wherever it occurs, and it doesn't occur in many places, the Blackbanded Sunfish is tolerant of any water quality. Thus, it occurs where many species occur, and also where virtually no other species can tolerate the water conditions.

All the *Enneacanthus* should be started on live foods, preferably *Daphnia*, but can be gradually weaned onto frozen and flake foods in time. They've been spawned in

captivity, but the spawnings were not witnessed and I have no further information on their nesting habits.

The larger sunfishes include relatively small (four inches - 10cm) species of *Lepomis*. The stream species tend to be smaller and more colourful than lake species, and feed on insects rather than fish.

cular examples of *E. zonatum*.

Similar to *E. evergladesi*, but more restricted in range, is the Okefenokee Pigmy Sunfish (*E. okefenokee*), which I've never collected. Recently discovered species include the Carolina Pigmy Sunfish (*E. boehlkei*), the Bluebarred Pigmy Sunfish (*E. okane*), and the Spring Pygmy Sunfish,



The Banded Pigmy Sunfish (*Elassoma zonatum*) is an easy species to keep and breed.

The size of the mouth is a good indicator of food habits. Although New York and New Jersey Pumpkinseeds (*Lepomis gibbosus*) are temperate sunfishes already in the hobby in Europe, I recommend the more beautiful and more southern Redbreast Sunfish (*Lepomis auritus*), from South Carolina and adjacent states.

FAMILY ELASSOMATIDAE — PYGMY SUNFISHES

The Pygmy Sunfishes have finally been taken out of the Centrarchidae (where they never belonged) and given their own long-overdue family. This unique assemblage of six eastern swamp species are tiny fishes, usually an inch (c2.4cm) or less at maturity, with no lateral line. They live in shoreline roots when available, and in shoreline weeds and algae when no roots can be found. Most prefer swamp waters, the blacker the better, and half the species have only been discovered and named in the last few years.

Most widespread is the Banded Pygmy Sunfish (*Elassoma zonatum*). Some populations are absolutely breathtaking, but the fish is often treated as substandard compared with the Everglades Pygmy Sunfish, *E. evergladesi*. That's a misconception, as the intensity of coloration varies within and among populations; I've got one of the ugliest *E. evergladesi* populations I've ever seen in my fish room, and I've had specta-

cular examples of *E. zonatum*, *E. evergladesi*, and *E. boehlkei*, and find them all easy.

Set the fish up one pair to a gallon jar in a window, with lots of dense vegetation, snails, and light aeration (desirable but not required). Feed live baby brine shrimp (*Artemia*) or live *Daphnia*; the fish will also consume baby snails and live tubificid worms. Do not feed dry food, which will pollute the water.

The fish spawn between February and May in the vegetation, but you won't see the nest. The displaying male is a vision of brilliant metallic blue and green spangles on a black body, with flaring fins as he flicks his head and pelvic fins. When you see fry in the jar, remove the parents to an identical set-up, and raise the babies *in situ* on live baby brine shrimp supplemented with infusoria or rotifers if you have them; if not, they'll find food among the vegetation. You won't raise many, as they grow at different rates and are cannibalistic. I get my best production by changing the parents to another jar at frequent intervals.

FUTURE ARTICLE

The next group of fishes I'd like to discuss are the Darters, the subfamily *Etheostomatinae* of the family Percidae. I hope to do this in a future article so, as they say, "Watch this space!"

OUT AND ABOUT

ASHFORD AQUATICS

by Dick Mills

Photographs by the author

Being well-versed in a certain TV science fiction programme, I'm quite accustomed to things not always being what they seem. I now think I've discovered a new law concerning the physical size of the better aquatic outlets — like Dr Who's Tardis, they're always bigger on the inside than the outside! A good example of this is Ashford Aquatics, situated within Vermeulens Garden Centre, Horton Road, Stanwell Moor, Middlesex, and, depending on wind direction, immediately below take-off and landing paths of London's Heathrow Airport (It's also easily reachable from the nearby M25, Junction 14). The low black 'shed', propping up a row of pre-formed pools, didn't give any real indication of what lay inside but, once through the door, what a transformation!

The vestibule has a welcoming tank (just to assure you that you're in the right place) and then you're into the main dry goods and tropical freshwater display section. No less than 132 freshwater tanks of various sizes occupy two back-to-back rows in the centre of the brightly-lit, white-painted areas; three tiers along a side wall contained 20 plus tanks of tropical marines, with further large marine tanks on a section of the entrance's end wall. A tall cabinet houses three tiers of tanks each for aquarium plants in the



Above, part of Ashford's comprehensive dry goods area. Right, plant displays (centre), marines (left), freshwater tropicals (right) and pond room beyond.

now-usual 'cascade-fed' recirculating water system.

Depending on which of the three 'exit' doors you choose to go through leads you into:

- ① the coldwater area (50 plus tanks, plus dry goods, equipment, foods, etc) or
- ② the pond room featuring 18 indoor ponds (Koi, Goldfish, external filters, nets, etc), or
- ③ to a fully air-conditioned 'bird room' (also rabbits, hamsters, gerbils, etc).

The door from this last room leads to the 'tank room' in which there are at least 50 cabinet tanks of all shapes and sizes:



one popular 'double-decker' arrangement would allow, say, the top tank for a main marine fish display, with a bottom invertebrate tank. Within this room, there are just as many bird and parrot cages, too, so you can appreciate the kind of floor area (8,000 sq ft, in fact) we're talking about.

The rear entrance/exit from the tank room leads back into

the rear of the pond room, but you're not quite finished yet; just outside is a small pond plant section, while back inside at the rear end of the coldwater section is a new, soon-to-be-opened reptile section; living-quarters for these animals are already in place and, once the heating and lighting has been installed, this will be yet another attractive feature to enjoy.

Alan Matson's staff were both attentive and knowledgeable when required, but otherwise always unobtrusively busy around the various departments at other times, helping to maintain the excellent conditions for both customers and livestock alike.

With such a large display of quality goods and livestock, it was hard for me to single out any favourites. Among the fish were several not-so-familiar species (killifish were well represented); a pair of 'probably-spawning-soon' Angel-fish also caught my eye, but what really tickled me was the upturned end of a plastic duck in one of the ponds — I waited for hours for it to come up and then Alan told me it was only a rear end anyway and was meant to be permanently like that!

Ashford Aquatics is open 7 days a week, 9.30 am-5.30 pm, and should you get lost on the way, their telephone number is Staines (0784) 463830.

ISLE OF WIGHT EXPERIENCE

By Dick Mills

Take an idyllic setting, a fish show, a weekend and a short sea crossing, and it all certainly adds up to an experience of some sort. Unfortunately, I was not able to undertake the whole sensation, merely making a day of it on the Sunday but, according to sources who were present (and can still remember!), the proceedings were started off at 5 pm on Saturday, 8 June, with a slide

presentation on 'International Aquaria' by Dr David Ford, of the 'Aquarian' Advisory Service.

Following up after this most professional of starts, and a dinner, things then took a decided turn from the sublime to the 'gor blimey' with the inaugural Inter-Club Competition for the 'Thomas Crapper Trophy'. Society teams determined (?) to win the prestigious award

included Bournemouth, Corby, Isle of Wight, Kingston, Romford & Becontree, Salisbury and S.P.A.S.S. After a very entertaining tussle, the wooden Trophy (no prizes for guessing its basic design!) was taken by Wimbledon-based S.P.A.S.S. who will keep it for a year at their convenience (or any other appropriate seat of learning).

Sunday was ushered in on a gale, as if to deter people from

either reaching the Island or leaving it, but those exhibiting aquarists who had not 'overnighted' at Bembridge's White-cliff Bay Holiday Park still managed to get across the Solent in one piece. The journey by Hovercraft was not unlike an inflated bouncing castle at sea at times, but I never envied those in passing yachts once — they seemed to be spending more time leaning out than in.

A nice gesture was the meeting of several arrivals (by whatever means) at Ryde Pier by a courtesy coach for immediate transfer to the show. Return transport to connect with home-going crossings was also well-appreciated.

Entries were up on last year, and the host society had laid on plenty of things to occupy the waiting exhibitors and visitors as judging progressed. Part of the show hall was taken over by various displays, the separating wall being colourfully-covered by the many entries in the Childrens' Painting Competition.

Terry Waller was making all-glass tanks, apparently faster than the glue could cure, with the end-results being carefully-collectable at the end of the day, while I, in addition to being A&P's roving reporter, demonstrated the setting up of a basic aquarium which, thanks to the generosity of the host society, was donated as the prize in a Special Draw. Derek Lambert not only featured a number of specialised livebearers on the Viviparous display stand, but also gave a slide presentation on the breeding and strains of Fancy Guppies. Just before prizegiving, at which he and Joe Nethersell, FBAS Chairman, officiated, David Ford found the time and energy to do another presentation, this time on Fish Nutrition.



Caught in the act while demonstrating how to set up an aquarium.

Some people, of course, were waiting for the results of the fish show which, thanks to efficient judging, weren't slow in coming through. Needless to say, with 'home advantage', the Isle of Wight Society took most honours — Best Lady (Jean Fenn), Highest Pointed Junior (Danny Jones), Best Coldwater Fish (Jeff Lumley), the Highest Pointed Society and FBAS Championship Trophy, Class V (L. Pearce). However, two

invaders from the mainland denied them total victory: Alan Bailey, Romford & Becontree A.S., claimed another Best in Show Trophy for his *Betta splendens*. A Class-winning Trophy (for well-deserved perseverance in my opinion) was gained by an American Flagfish, *Jordanella floridae*; it's not often you see this species beating its more gaudily-coloured opponents on the bench — it quite made my day!

'Top Award for Embarrassment' must go to the poor man from Gosport who, having read the advertisement in A&P, asked for directions to the other fish show taking place that weekend at what he, evidently, thought was nearby — Sandown Park. He saw the funny side even when he realised it was at least another ferry ride away again!

Despite a whole lot of organising and co-ordinating, with ferry crossings and accommodation bookings, in addition to the usual Open Show's demands, I.O.W. are determined to do it again next year. Hospitality was, in keeping with every memory I have of the Island, well over standard.

Make a note of next year's date now (13/14 June 1992: Open Show day, Sunday). 'Aquarian' will again be present; David Sands will be lecturing, other attractions are already being planned (who will

be destined to take Thomas Crapper home?) — to find out you've got to be there!

Just in case any Island-dwelling readers want to know what is going on locally, fishkeeping-wise, details of the I.O.W. Society meetings can be obtained from: Paul Corbett, The Orchard, Gatcombe, Isle of Wight PO30 3EF. (P.S. to any Gosport reader — Gatcombe I.O.W., NOT Gloucestershire).

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What's your opinion?

Billy Whiteside,
BA, ACP

LITTLE BUT OFTEN

Alan O'Brien's home address is 86 Blumfield Crescent, Slough, Berks, SL1 6NJ. In his latest letter he writes: "I read the letter in the July issue from Dave Kershaw.

Over the past months I have seen some curious behaviour in one of my marine fish. My water changes with marines have typically been 25% once per month; however, I noticed that after these changes one of my Angels would refuse food for approximately one week. This happened after every water change, even though the water going in was of the best quality, ie, de-nitrified and of the correct temperature and S.G., etc. I concluded that the fish was becoming stressed by the quantity of the water changed. I liken it to moving the fish to another environment and, after such a move, marine fish are prone to hunger strike for at least a short period of time.

"To test this theory out I altered my routine to 5% water changes but now on a weekly basis. This worked straightaway. The Angel does not seem to mind smaller changes in its environment and carries on feeding quite happily. Little-and-often must be the rule for marine fishes!

PLANT CHALLENGE

"I now wish to discuss an old favourite growing plants in tropical tanks. I have read extensively on this subject and tried many methods to get 'common' plants to grow — without success. I am constantly amazed by the sight of *Hygrophila difformis* (Water Wistaria) growing out of tanks and people having actually to trim their aquatic plants. Oh joy! My attempts to grow this plant all ended the same way with the death of the plant as it rotted away from the base upwards. Other plants have met with similar ends. Thoughts instantly turn to lighting here, but three Triton tubes on a 39in (1m) tank is more than enough! My only success to date has been limited, to say the least, and restricted to the virtually unkillable *Cryptocoryne* species.

"I have been giving some

thought to why this happens and to how to avoid it. It is my belief that (a) the gravel, albeit only 3mm, was inhibiting root growth and in some cases actually crushing the roots; and (b) young plants or cuttings need something to 'key' their roots into to ensure good root growth. With the above in mind I intend to try again with species other than *Cryptocorynes*, but this time in pots with the roots protected by rockwool — filter wool is a good, cheap alternative — with a small amount of Laterite, aquarium peat and plant food added to each pot. If that does not work, I surrender.

"With all the 'specials' in *Aquarist and Pondkeeper*, why not one on plants? It could cover coldwater, pond, tropical and marine algae. I am sure I am not the only one who would like to see such an item."

RETURN VISIT

The accompanying photograph shows Desi Bryans' garden pond as it was when I wrote a little article about it after a visit last year. Although I thought it the perfect garden pond at the time, when I spoke to Desi this summer he told me he was just about to empty the pond to enlarge it quite considerably. He has been working hard since and had to remove a lot of rock from the enlarged hole he was digging in his garden. I look forward to making a return visit to see Desi's improved pond, at Holywood,

County Down, when he gets it running again.

PERSONAL PLANT SECRETS

I am always amazed when I hear that readers cannot grow plants. I find aquarium plants as easy to grow as pot plants, greenhouse plants or garden plants. They all need similar conditions — allowing for the air/aquatic environments. I have six decorative tanks in my home and in one of them the plants grow quite slowly but surely; in the other five they grow quickly and have to be thinned or removed at intervals. They certainly do not get any special treatment: indeed, I had never before heard of Laterite or rockwool.

Years ago I used to place a bed of soaked peat, tied up in the leg of a pair of tights, in the base of the tank before covering with normal gravel. The tank turned an amber colour but the tights kept the peat from clouding the water. The only problem was that which resulted when trying to remove excess plants: when one plant was pulled up the whole peat base and gravel would lift with it because of the root growth. The acidic conditions seemed to be particularly suited to *Cryptocoryne* species — especially *C. affinis*, the easiest to grow and one of the most commonly available. I abandoned the system years ago as it was too complicated — and

unnecessary.

I find that plants do well in 1½-3in (3.8-7.5cm) of calcium-carbonate-free gravel, at a temperature of about 78-82°F (25.5-28°C), in an aquarium containing fish. The aquarium should have an outside filter on for a few hours per day and not be kept too clean. Lighting from a couple of ordinary tungsten bulbs — 40 watt or 60 watt or one of each — for about five hours daily should be adequate. I find it unnecessary to add plant fertiliser, as I do potting of plants. A strip of lead, where appropriate, can be used to keep cuttings on the gravel until the root. Avoid adding anything to the aquarium except sufficient fish food for the fish; and don't change too much water too often.

I consider the calcium-carbonate-free gravel to be important. Calcium carbonate can be found in gravel in the form of sea shell fragments, pieces of white limestone, bits of bone, etc. If you keep your tanks filtered for 24 hours per day and change your tank water so often that the tank is spotless, you'll probably starve your plants to death.

Most of my tanks usually have enough plants to enable me to give some away every so often, so I'll send a selection to Alan O'Brien because he has been my most frequent letter-writer to W.Y.O.? since it returned. Perhaps our Editor, John Dawes, will consider Alan's suggestion and produce a 'special' A & P about aquarium and pond plants (*If it's working on the idea!* Ed.) I'd certainly be happy to contribute some words and pictures and recommend some of my favourite tropical aquatic plants. I must admit I'm a sucker for planted tanks — real plants at that, unless the tank contains plant-eating monsters. A tank without plants is like an unfurnished room in a house.

For next time please send me your opinions on the following (a) home-made fish foods; (b) garden ponds in winter; (c) dealing with algae in aquaria; (d) favourite coldwater fishes for indoor aquaria; (e) aquarium/fish shows; and (f) feeding marines.



Iris and water lilies flourish in Desi Bryans' pond at Holywood, Co. Down, Northern Ireland.

A WINDOW IN THE BELLY

Close to the bottom, in the sunlight-rippled waters of the Caribbean, lives the Scissorfish, otherwise known as the Straight-tail Razorfish, *Xyrichtys martinicensis*. These fishes, which measure barely 15cm (6in), are very timid. If they feel threatened they disappear like lightning, literally swallowed up by the seabed (they dive headfirst into the loose-packed sandy bottom).

The 'window'

The females of *X. martinicensis* are notable for a peculiarity in their body form which is unique among the approximately 30,000 known species of fishes: the ventral wall is transparent over that part of the body cavity containing the ovaries — and only that part.

Thus, the females of this species, which is not uncommon between the Yucatán pen-

Dr Peter Wirtz of the Zoological Institute in Freiberg, Germany, and Peter Nahke, describe an unusual adaptation in a small Caribbean Wrasse.

insula and the West Indies, constantly reveal to the world their state of ripeness. The more the body cavity is filled with ripe eggs, the more the transparent window expands, and the more clearly visible is the reddish pigmentation of the ovaries.

Window role

The American zoologist Troy A Baird, of the Marine Science Centre of Oregon State

University, has advanced the hypothesis that this striking 'Window in the Belly' plays an important role in the breeding ritual of this species. Clearly, the female can inform a male "I am ready to spawn" or "I have already spawned, so your advances are a waste of time".

T A Baird has attempted to investigate whether or not this is the case in 2 metres (c 6.6ft) deep water on the Glover Reef off the coast of Belize. There, using a snorkel, he observed the social behaviour of Scissorfishes. Not only in the 77 matings observed, but also in a total of 298 male-female encounters recorded, the female performed a striking movement in which she turned to display the window to the male.

As several females inhabit the territory of a single male, T A Baird interprets the window as an important optical signal in the reaction of the female to the attentions of the male.



Female Scissorfish, *Xyrichtys martinicensis*, showing her 'Window in the Belly'.



COVER STORY — Congo Tetra (*Phenacogrammus interruptus*)

Photograph: Max Gibbs, *The Goldfish Bowl*, Oxford

The beautiful Congo Tetra is sometimes referred to as the Congo Salmon. It also appears as *Microlesteo interruptus* in many books, this scientific name reflecting its affinity with those other African tetras belonging to the genus *Alestes* or *Brycinus* with which it shares the family Alestidae and subfamily Alestinae.

The Congo Tetra is found in Central Africa, particularly Zaire (formerly the Congo — hence its common name). Males grow to around 3½in (9cm), with the females remaining slightly smaller. The water should be soft, acid and relatively free of nitrates. Temperatures between 24 and 27°C (75–81°F) and a varied diet, which should include a vegetable component, will suit this active fish. To be seen at its best, the Congo Tetra should be kept in a shoal in a large aquarium with a dark substratum, plenty of plant cover in the corners and ample open swimming space along the front.

THE AQUARIUM MARINES REVIEW

Part 4

Cnidaria: Anemones, Jellyfish and friends

Andy Horton discusses a phylum of animals also known as the Coelenterates, including familiar animals, such as the colourful Sea Anemones, poisonous Jellyfish and their relatives.

Like all the phyla of the animal kingdom, the Cnidarians evolved in the ancient oceans, in the Cambrian period about 500 million years ago. They still retain their basic primitive form, none having changed sufficiently to inhabit dry land, although some species have adapted to freshwater, like the *Hydra* of text book and coldwater aquarium fame.

On examination of the basic characteristics, and the alternative phyletic name of Coelenterata (which means no more than a sac containing just one hole for feeding and excretion) almost all the species are found to possess stinging cells, or *cnida*, hence the name of the phylum. Many are soft-bodied, jelly-like animals.

This means that the fossil evidence of their past is incomplete, although, with the hard corals and other species of Anthozoa and a few Hydrozoa, the calcareous rock formations of calcium carbonate (limestone) can be traced back 200 million years to when the first coral reefs were formed.

HYDROIDS (Hydrozoa)

Hydroids resemble plants, as the adult stage of most species forms a sedentary colony attached to rocks or other hard substrates, which at first appearance resembles a collection of underwater ferns, or delicate miniature fir-trees.



Cassiopeia — the Upside-down Jellyfish — is one of the few Scyphozoa occasionally imported.

However, examination under the microscope reveals Hydroids to be part of the animal kingdom. They are carnivorous animals, with each polyp in the colony containing nematocysts (stinging cells) for capturing minute zooplankton. Generally, the polyps adjoin each other on a living stem, or stolon. The Fire Corals, *Millepora*, of tropical seas are hydroids with stinging cells that are painful to humans.

Reproduction is varied and complex. Classically, one stage includes a free-swimming medusa, or miniature jellyfish eg

Obelia, but in other species the medusa remains attached to the colony and produces larvae.

Small colonies of hydroid are found on the shore, but it is offshore that large beds are found, where the tides and currents bring sufficient nourishment.

Several species of hydroid are large animals of the plankton, including the notorious Portuguese Man'o War, *Physalia physalis* and the By-the-wind Sailor, *Velella velella*, a purple jellyfish-type animal that, in some years, is washed up on the beach in the south-west of Britain.

In these animals of the order Siphonophora, different types of both polyps and medusa are arranged with multiple functions, some with a powerful sting, and others associated with reproduction and movement. More indicative of the evolutionary position of hydroids is the hydrozoan medusa of *Gonionemus*, which is a simple jellyfish bell with trailing tentacles, found in the surface waters close to British shores. It contains a muscular velum ('veil'), which contracts and forces water out, propelling the creature and enabling it to swim actively after small planktons.

JELLYFISH (Scyphozoa)

Jellyfish are the largest representatives of the plankton; animals that drift with the ocean currents and have only limited powers of movement, often being phototactic i.e. adjusting their position according to the amount of light. In the life cycle of Scyphozoa, the polyp stage is either absent, or is of only small importance in the larval stage, as in the common Moon Jellyfish, *Aurelia aurita*. This species has a distribution in all the oceans of the world, including British waters.

Of the five other British species, the

Taxa (Groups) of Cnidaria

Classification is largely based on observation on the present-day forms of Cnidaria and can be divided into the following groups:

SUBPHYLUM

Medusozoa

Anthozoa

CLASS

Hydrozoa — hydroids (or sea-firs, *Hydra*)
Scyphozoa — jellyfish
Cubozoa — extremely dangerous tropical medusae
Octocorallia — sea pens, sea-fans, soft corals etc.
Hexacorallia — sea anemones, hard corals.

Notes:

The Medusozoa is reckoned to be the more primitive of the two subphyla, evolving at an earlier date than the Anthozoa. It is only by examination of the methods of reproduction that the Hydroids can be grouped with the Jellyfishes within the Medusozoa.



The Fire Coral (*Millepora*) is perhaps the best known of the tropical marine Hydrozoa.

Compass Jellyfish, *Chrysaera hysoscella*, excites more comment than most. There is no doubt that when seen (it can only be mistaken for a highly-coloured piece of flossam) near the surface of inshore waters, including estuaries, it is a dramatic occurrence. It moves with the tides but, like all true jellyfish, is capable of some movement by gentle pulsating of the bell, the diameter of which can reach 30cm (12in). Occasionally washed up on the shore in the south, the huge *Rhizotoma octopus* is often 90cm (3 feet) across.

Even larger jellyfish are found in the surface waters of the oceans, the Arctic Giant Jellyfish, *Cyanea capillata arctica*, has been reported with a bell diameter of 2.28 metres (7 ft 6in) and a tentacle length of 36.5 m (120 ft). This species is known as the Lion's Mane Jellyfish in British waters, and a specimen from the Shetland Isles has been authentically measured with a bell width of 91 cm (c 36in) and tentacles of 13.7 m (45 ft).

The Stalked Jellyfish, family Lucernariidae, are tiny jellyfish that, in their adult form, are fastened by a sucker to pieces of weed. The orange *Haliclystus auricula* is only 6mm (0.24in) high, and can be found, with great difficulty, on all British rocky coasts.

CUBOZOA

The notorious Box Jellyfish, *Chironex fleckeri*, of the seas north of Townsville off the Great Barrier Reef coast of Australia, belong to the class Cubozoa. Multiple stings are often fatal to man; death can occur in under 5 minutes.

OCTOCORALLIA

1 Soft Corals (Alcyonacea)

Dead Man's Fingers is the gruesome descriptive name for the species of soft coral *Alcyonium digitatum* that is the best known of the class because it is very common in the shallow British seas.

This animal of the order Alcyonacea is permanently fastened in lobed colonies to

rocks and wrecks in areas of strong currents. The feeding polyps that capture plankton are always white, but the body varies from a flesh-colour to white or orange. The animal feels rigid because of calcareous (limy) spicules. The polyps retract in the second half of the year and feeding ceases. Reproduction is by release of eggs and sperm into the sea, where the fertilised eggs develop into planula larvae that can spend only a day in the plankton before changing to the adult form.

Numerous similar species occur in tropical seas. The most commonly available is the Red Cauliflower Coral, *Dendronephthya*, which superficially resembles a sponge when the polyps are retracted.

2 Gorgonian Corals (Gorgonacea)

Gorgonian Sea-Fans and Sea-Whips are also known as Horny Corals, and appear in the sea as miniature bushes, mostly in the tropics. Dried specimens of some species look like lace attached to thicker stems, usually made of a horny material called gorgonin.

The Sea-Whips, as their name indicates, have a different whip-like appearance, without the latticed patterns linking the branches of the Sea-Fans.

Sea-Pens, family Pennatulidae, resemble a quill pen, often found protruding isolated from a muddy seabed at great depths. The pink species *Pennatula phosphorea* is found in Scottish sea lochs. The slender body is supported by a spine of calcium on which are attached the feeding polyps which capture plankton.

HEXACORALLIA

1 Sea Anemones (Actiniaria)

Described as flower-animals (Anthozoa), the sea anemones are beautiful carnivorous animals that appear in a multiple variety of colours, even in the same species. Reds,



Soft corals produce branching colonies which contribute very little, if anything, to the calcareous structure of reefs.



British sea shore hydroids



CORAL WORLD — ELAT

Gorgonians often have the appearance of underwater miniature bushes.

greens, browns, oranges, whites, greys, translucent, cream, black, buff and crimson are all common colours in British species. The Actiniaria are the easiest to study of the Cnidaria, and are widespread and common in temperate and tropical seas.

2 True Corals (Scleractinia)

True stony corals possess a skeleton of calcium carbonate (limestone) that houses the anemone-like polyps. The colonies can appear in bizarre and unusual shapes. Coral reefs are found in the Caribbean and Indo-Pacific in tropical seas, with a regular temperature exceeding 23°C (C 73.5°F).

The Australian Great Barrier Reef comprises many hundreds of different species, with a natural architecture of many

branching forms, of which the most important reef builders are over 200 species of Staghorn and Elkhorn Coral of the genus *Acropora*.

Almost all the sedentary corals contain zooxanthellae (symbiotic algae) and this can be important, providing a direct source of nutrition. Zooxanthellae require strong illumination, and insufficient light will kill certain shallow water species of coral in 2 to 6 months.

AQUARIUM SUITABILITY

Medusozoa are rarely available in the shops. The Upside-down Jellyfish, *Cassiopea andromeda*, can be found in tropical waters with a bell diameter of up to 30 cm (12in). Juveniles are sometimes imported



BECK GIBSON

Bird Nest coral (*Seriopora*) — one of the true reef builders.

and are extremely difficult to keep. Jellyfish contain up to 94% water and should not be caught in a net or exposed to the air.

The majority of species available are Anthozoans with colourful sea anemones and mobile corals favoured for the invertebrate aquaria. Before purchase, the precise species should be identified, with scientific name (if possible), and its feeding habits established.



VOLVOVA ADON

The Plumose Anemone (*Metridium senile*) is a delicate-looking British Anthozoan species.

Anthozoa that will consume dead organic matter are the easiest to cater for. Digested food is emitted as a lump of gelatinous glair, and maintenance involves removing this waste and cleaning around the base of the anemone where dirt collects in a ring.

Feeders on phytoplankton, diatoms (microscopic plant life), dinoflagellates, and zooplankton (animal life) can present problems. Special liquid invertebrate food, live rotifers, and newly-hatched Brine Shrimp, *Artemia*, can provide the answer. Filtration should be turned off when live Brine Shrimp are introduced.

POPULAR SPECIES

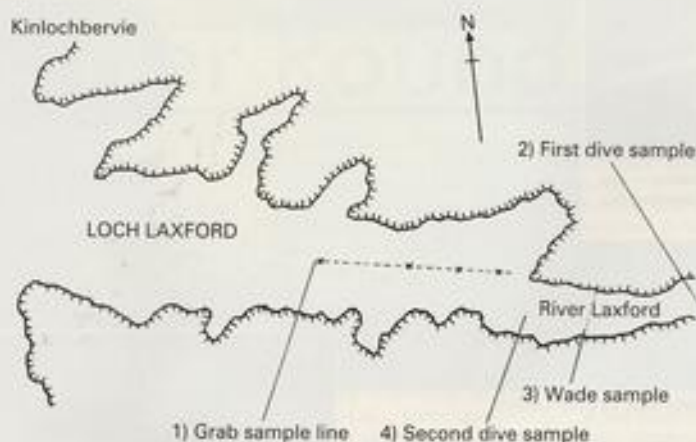
Anemones of the genus *Heteractis* (= *Radianthus*) are particularly attractive because of their symbiotic association with the Clownfish *Amphiprion ocellaris*. The large anemone of the same family, *Stoichactis gigantea*, can provide a home for several Clownfish. These anemones will consume pieces of dead fish and are easy to keep.

The large brown anemone *Anthopsis kuseirov* makes an attractive display. Several species of the large and colourful *Condylactis* are found in all the warmer seas from the Mediterranean to the Great Barrier Reef.

I will be dealing with some of these species in detail in my next article.

Further Reading

The Manual of Marine Invertebrates, by Martyn Haywood and Sue Wells, (Salamanca, 1989).



In Search of the Scottish Eel

Max Anderson recalls his expedition to track down one of nature's most fascinating and elusive fishes



A young Gordon Williamson holding (?) a giant *Anguilla marmorata* during a visit to Hong Kong.

The eel is a universal synonym for a slippery customer. But getting to factual grips with eel migration is a lesson in exactly how evasive this creature really is; there are many things we simply do not know about eel-life.



This shot of elvers shows just why they are also known as glass eels.

In April of this year I was invited to join Dr Gordon Williamson's expedition, to venture out onto the shaley waters of a remote Scottish loch in search of young eels, or elvers.

Epic voyage

The European freshwater eel, *Anguilla anguilla*, common both to European waterways and European palates, begins its life in the Sargasso Sea, a patch of spawning ground the size of France, south of Bermuda. From here, the larval leptocephali embark upon

their tremendous voyage aboard the Gulf Stream, northwards to the European Continental Shelf.

The journey takes about a year, though the larvae are known to reach the shelf in August-September where they metamorphose into elvers, or glass eels. These young transparent eels are approximately 5cm (2in) long and are miniature versions of the pigmented adult form.

Baffling appearance

It is here that eel experts find themselves at odds to explain eel migration. Swarms of elvers are known to reach the North Sea in October-November, but their whereabouts have not been precisely defined. They are not seen in British waters until they make a sudden, and sometimes spectacular, appearance several months later en masse, 'ascending' upriver through the mouths of freshwater rivers and estuaries.

Occasionally they appear as a 'cordon', a huge wrist of swirling fish, often only a metre across but many kilometres long. In the River Severn, about 30 tonnes of glass eels, around 1 billion individuals, are caught each year.

Visitors to the highland rivers on the west coast of Scotland have regularly witnessed this spectacle in mid-May. Dr Williamson, a zoologist whose interest in eels spans many years, has long been intrigued by the question: where exactly are the eels prior to the ascent?

FACT-FINDING EXPEDITION

Together with a team of two divers, two marine biologists and two commercial fishermen, Gordon Williamson took a fifty-foot fishing boat onto Loch Laxford, a remote coastal loch close to the fishing harbour of Kinlochbervie. Laxford runs east-west for 2 kilometres (c 1.2 miles), from the coast, inland to the mouth of the River Laxford.

He had sighted elvers while diving in Laxford during January-February, 1987, searching for clams on the loch bed. On three days only, he had suddenly found himself surrounded by thousands of glass eels, swimming energetically. To his knowledge, however, no similar sighting had been made before. Since eels have been observed to bury themselves in the surface layers of fine sand in laboratory aquariums, Dr Williamson was led to hypothesise that the Laxford eels may lie buried in the loch-bed, waiting for favourable ascent conditions prior to the event.

These conditions are themselves the subject of much speculation and debate, but the hypothesis was directly contending the theory that elvers invade the Scottish coasts at the brunt of a continuous wave-migration, 'smelling land' as they go, reaching the freshwater on the very day of invasion.

Chilly start

There was a chill wind blowing as we chugged out into the black loch waters,



The eel hunters of Loch Laxford — Dr Gordon Williamson — the expedition leader — is standing second from left (wearing the rainbow hat).

surrounded on all sides by snowy mountain flanks and the occasional crumbling crofter's cottage. We spotted seals, puffins, guillemots and Fulmer's petrels, nested, no doubt, on Handa Island, the large bird sanctuary visible to the west.

Even though the wind carried the odd snow flurry, temperature conditions were almost perfect; the water was the lower side of 7°C (44.6°F) — not cold enough to perish the eels, not warm enough to suggest the ascent may be prompted early. The investigation was also necessarily a day-time one, since eels tend to 'hit bottom' in the hours of light.

Sampling

The fishing boat was fitted with a motor winch and a line with a steel grab; this was lowered to the sea floor where it took bucket-sized bites. The first sample was taken at a depth of 52 metres (c 170ft), a kilometre (0.6 miles) from the neck of the loch, close to the oyster beds at Fanagmore bay. A grab full of sand and water was hoisted onto the deck and hosed through a sieve.

We quickly gathered around to see what we had. *Buccinum* shells, Venus Shells and polychaete worms were identified, but not a single eel. The empty grab went clanking back over the side. A total of seven further grabs were made around the 50 metres (164ft) mark, all of which yielded nothing.

The boat then cut a direct line towards the neck of the loch, where sea water merged with the estuarine water of the River Laxford. Along that line samples were taken at depths of 30 metres (98ft), 20 metres (65ft), 13 metres (43ft) and 5 metres (16ft).

At 30 metres the number of polychaete worms escalated; at 20 metres the grab began pulling up fist-sized stones and a large quantity of brittle starfish; on the shallow depths, grabs pulled up a variety of bed inhabitants, including shell fish, starfish and sea urchins. But no eels.

Direct approach

Graham Williamson was clearly disappointed, and reluctantly abandoned ship in order to sample the river waters.

The fresh water was also just under 7°C (44.6°F); it was suggested that snow on the Ben Stack hinterland had yet to melt and flush the river system with ice-water (perhaps a thermotactic [response to temperature] mechanism by which the eels sense the onset of warmer conditions and so trigger the ascent).

It was 4 pm, leaving only four hours of daylight to locate elvers. The divers were



A chilly view of Loch Laxford.

directed to sample the deeper fresh water half a kilometre (c 545 yards) upriver from the loch neck, beyond Laxford bridge. They carefully turned over stones on the river bed and gently disturbed the sand thereabouts. Along 20 metres (65ft) of river bed they found nothing. There was a growing feeling of "so where ARE they?" among the team.

We returned to the lower tidal stretch of the river, a wide rock-strewn bed running with shallow freshwater for approximately 300 metres (330 yards) where it joined the loch. The water was brackish, and shallow enough for the whole team to wade and investigate the bed litter.

Eureka!

"EELS!" The cry was almost instantaneous. Gordon rushed over to where a large flat stone had been hinged open, one metre (39in) away from the north bank; there lay two glass eels, undulating gently on the sandy surface. They were netted. More rocks were overturned and more elvers were claimed, often in groups of two or three. Hundreds were sighted in the stony bed along a single 20 metre (65ft) line from bank to bank — single clear filaments, each with two black eyes and a ventral line of nervous tissues running from flat head to the tail.

The divers, now working around us, reported considerable sightings more as they worked their way back towards the loch neck. One investigator shuffled through a bank of flowing river weed and drove several specimens into his net. As the light began to fail, it was recorded that a stretch of river some 250 metres (c 275 yards) in length had been found to contain glass eels.

Question-posing conclusions

Gordon Williamson conclusively proved the presence of elvers inhabiting the interface waters of Laxford, a whole month prior to the eel ascent. This leads him to suspect that, contrary to the wave migration theory, elvers effectively pile up in the loch area, accumulating in huge numbers over the months preceding May-time.

His findings inevitably spawn many questions of their own. Might the elvers migrate up the loch in periodic hops? If so, would he



Going through the samples at the end of the day.

have found elvers closer to the sea-mouth had he sampled the loch-bed one or two months earlier? And do they actually bury themselves in sand in the natural environment in the absence of stony cover?

Gordon's findings may help to illuminate further the timing and geography of the post-larval eel life-cycle, and have important implications for scientific, commercial and environmental bodies. For instance, if elvers lie dormant in the Severn Estuary beds prior to the ascent, what effects might current dredging activities have upon eel populations?



A dense shoal of elvers (pigmented form).

Gordon intends to return to Loch Laxford from this month onwards, to continue his search for the elusive elver, maintaining a continuous survey through the winter months and into the spring. And with that I wish him all the very best!

Paper Round

By Dr Ian Winfield



A NEW EEL PARASITE IN BRITAIN

In recent years there has been increasing concern about the accidental introduction of non-native fish parasites to British waters. Clive R. Kennedy and Deborah J. Fitch of The University, Exeter, have recently completed a study of one such parasite which may pose serious problems to an important part of our fresh-water fisheries.

Anguillicola crassus is a native parasite of the Japanese Eel, *Anguilla japonica*, but it has been introduced to Europe where it was first found in the European Eel *Anguilla anguilla* in 1980. Immature *A. crassus* were first found in eels in Britain in late 1987, while by late 1988, adults were found in eels from a number of rivers in the east of England.

Laboratory experiments revealed that *A. crassus* is a very hardy parasite, even as eggs or larvae, and has equally impressive reproductive capacities, making it capable of rapid colonisation of new localities.

Kennedy and Fitch suggest that the first arrival of this parasite in Britain was due to accidental introduction by 'contaminated' eel export lorries returning from the continent and by imports of infected eels to Billingsgate market in London. Whatever the means of its arrival, *A. crassus* is now well established in Britain and is likely to spread around the country by natural and human-assisted movement of eels.

As is the case with many species introductions, Kennedy

and Fitch concluded that little, if anything, can be done to restrict this spread, and the full effect of *A. crassus* on our eel populations remains to be seen. (Source: *Journal of Fish Biology* 36, 117-131.)

THE HAZARDS OF MOUTH-BROODING

T. Goldschmidt and F. Witte, of Leiden University in The Netherlands, have recently published an account of reproductive strategies in some of the mouthbrooding haplochromine cichlids in Lake Victoria. The fieldwork for this study was carried out over the period 1979-1985 and so some information was gathered before the well known Nile Perch (*Lates niloticus*) boom.

The degree of similarity of reproductive strategies of the cichlids investigated, which included *Haplochromis pyrrhocephalus*, *H. hesinkveldi*, *H. argus*, *H. laparogramma* and *H. piceatus*, was higher for species which were closer taxonomically.

Goldschmidt and Witte concluded that such differences in fecundity, egg size, breeding period, spawning site, etc., contributed to the partitioning of available resources by this group of fish. However, it may be that mouthbrooding has considerable disadvantages when large predators, such as the Nile Perch, are around, as the mouth offers little protection in such circumstances and the necessarily low fecundity of mouthbrooders means that their potential for recovery is lower

than it would be if they produced lots of unguarded eggs instead.

Studies are continuing to determine if the haplochromines are, indeed, now victims of their own advanced breeding strategy.

(Source: *Oikos* 58, 356-368.)

OUT OF THE FRYING PAN ...

While many fish populations are in danger of extinction, species facing the greatest threats are typically those of small, unique habitats. This description certainly fits the Railroad Valley Springfish (*Crenichthys nevadae*) which is endemic to several thermal springs in Nevada, USA.

Cynthia Deacon Williams, of Sacramento, and Jack E. Williams, of the US Fish and Wildlife Service, USA, have chronicled the trials and tribulations of these unique fish. The native populations of the Springfish, which live in water temperatures of up to 39°C (100.4°F), are threatened by channelisation and diversion of water, and the grazing of surrounding areas by livestock. In addition, introductions of Guppies, *Poecilia reticulata*, and Channel Catfish, *Ictalurus punctatus*, pose further threats to the Springfish through competition and predation, respectively.

In view of these problems, some Springfish were introduced into the nearby Chimney Hot Springs in 1978. Since this time, the introduced population has been wiped out by

springs temporarily drying up due to natural causes, and also by an increase in water temperature due to human influences. Water coming out of these springs can be as hot as 68°C (154.4°F), although this drops quickly in successive ponds from 50-55°C (122-131°F) in the first, to 23-31°C (73.4-87.8°F) in the last.

Following further stocking, the Springfish population of this precarious, but relatively safe, refuge now numbers in excess of 1,000 individuals. Monitoring of the population's abundance will continue in the future, together with an investigation of its genetic structure. (Source: *North American Journal of Fisheries Management* 9, 465-470.)

EARTHQUAKES IN LAKE MALAWI

In March 1989, two earthquakes, measured at 5.7 and 6.5 on the Richter scale, struck south-central Malawi and were felt on Lake Malawi itself.

Denis Tweddle of the Fisheries Research Unit, Malawi, and R. Crossley of Robertsons Research, U.K., have found that these earthquakes had a marked effect on cichlid catches in the lake's commercial fishery. While trawl catches in shallow areas showed no changes following the earthquakes, there was a pronounced drop in the amounts of cichlids, but not catfish, taken in deep water trawls.

Tweddle and Crossley suggest that the drop in catches was the result of the cichlids moving up out of the deep water trawling areas, a movement which was, itself, possibly a response to the release of deoxygenated water from the deep bottom sediments.

Circumstantial evidence for this hypothesis comes from the fact that the catfish, *Syndonis njassae*, which remained in position near the bottom is known to be very tolerant of poor oxygen conditions. The ultimate test should, of course, be carried out by the analysis of water samples taken immediately after the next big earthquake!

(Source: *Journal of Fish Biology* 38, 305-308.)



Pseudotropheus zebra. Could mouthbrooders be at a reproductive disadvantage when there are large predators about?

Books

Livebearing Fishes

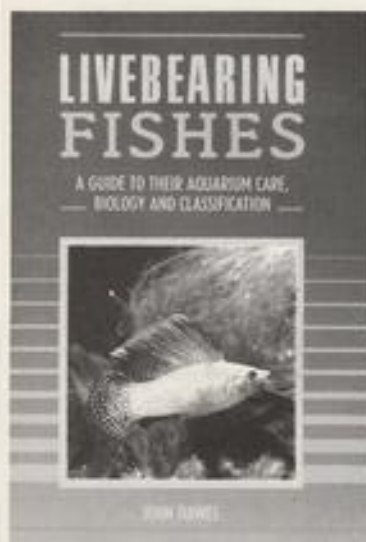
A Guide to their Aquarium Care, Biology and Classification

By: John Dawes
Published by: Blanford
ISBN: 0-7137-2152-9
Price: £25.00

As pointed out in this book's preface, livebearing fishes have been popular with aquarists for some time now. Indeed, many devoted aquarists may have started their interest with some of these delightful fishes. However, the available information on specific topics such as distribution, biology and classification, may not have been easily available to the general public. I was thus most impressed to find such a wide array of topics in an aquarium fish book of this size.

The book is divided into three parts:

- 1) Biology,
- 2) Aquarium care, and
- 3) Selected species and varieties.



Each part, in turn, is analysed in more detail. The great deal of work that the author has put into the book is transparent when looking at the amount of detail presented throughout. Particularly interesting are his discussions on the definition of a livebearing fish, their biology, taxonomic classification and distribution. In addition, the author gives very useful accounts on the original distribution of various species, their status and care in the aquarium.

Throughout the text, clear comments, tables and scientific information are nicely

presented, enhancing the reader's interest. The largest section is devoted to a species by species account in a catalogue of **Selected Species and Varieties**, which correctly follows the latest taxonomic classification. Over 120 colour and black and white photographs, together with detailed anatomical drawings and aquarium layouts, beautifully illustrate this book.

Unfortunately, many fish species are being lost in their natural habitats owing to a variety of factors such as alteration and loss of their natural environments and hybridisation with similar species.

Some of the livebearers listed in this book are already included in international lists of threatened species (*Skiffia francesae*, *Xiphophorus couchianus*, *X. meyeri*, *X. clemenciae*). However, for many of them, little information had been easily available. It is in this respect where I find this book by John Dawes most valuable, as he has summarised important information for this group of fishes which can be used in future analyses of their conservation status.

In addition, it touches on the crucial issue of the use of captive breeding as a tool for conservation of endangered species. This is an idea which is being actively and successfully pursued for other groups such as mammals and birds. If we are to play a part in the conservation of fish biological diversity, we should seriously consider investing some resources (information, expertise, funding, etc) towards existing conservation programmes for fishes.

In this respect, the vast experience of many aquarists would be a valuable asset to the fish conservation community. I thus consider that this book, which I found very enjoyable and easy to digest, should have a place in every library.

Dr Patricia Almada-Villela,
Consultant in Conservation
and Aquatic Biology.

Freshwater Fishes of Sri Lanka

By: Rohan Pethiyagoda.
Published by: The Wildlife Heritage Trust of Sri Lanka.

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ISBN: 955 9114 00 X
Price: £35 (incl p & p)

There's never been a book like it. And there's not going to be another one like it for a long, long time. Such is the excellence of Rohan Pethiyagoda's monumental effort, that I feel it would be unwise for anyone even to contemplate producing a competing book for years to come.

It is therefore a bit of a surprise to find that the author, in his Preface, says:

"I have attempted only to provide a guide, which outlines the state of the art, and could act as a foundation for future work."

While accepting that no work of this nature is ever completed and that "a great deal of elementary knowledge is not yet available", I cannot help but disagree with the author. He has, in my opinion, provided us with much more than an outline. He has given us a masterpiece.

Freshwater fishes of Sri Lanka



After a short Introduction, the text moves to Part 1 proper: Geographical Background. This nine-page section introduces the reader to Sri Lanka, giving details of topography, climate, vegetation, rivers, estuaries, lagoons and so on.

This is followed by the (longer) Part 2 which concentrates on Zoogeography and Conservation. Within this section, there is a most interesting table listing many of Sri Lanka's fish species and giving a wealth of information about them, including their status, i.e. whether endangered, rare, vulnerable, common, etc.

One of the things I found particularly interesting, and comforting, about this table is that species, such as Cuming's Barb (*Barbus cumingi*), traditionally regarded as being under threat by us in the UK, is listed as "common but restricted". The same goes for the Cherry Barb (*B. niseya*), the Combeil (*Belontia signata*) and even that most beautiful of all Sri Lankan species, *Malpulatus kraseri*, the Ornate Paradise Fish.

The heart of the book is represented by Part 3, entitled Fishes Recorded from the Inland Waters of Sri Lanka. This section, which starts on page 37 and runs through to page 295, and is then followed by three appendices, the first of which includes descriptions of three new species, is totally absorbing.

Liberal illustrated with colour photographs, line drawings and distribution maps, Part 3 contains a veritable 'treasurehouseful' of information on habitats, sexual characters, collecting sites, status of the species and much more. Even exotics like Sword-tails, Platies, Guppies, *Gambusia affinis*, salmon and many other such species are featured in detail.

About the only thing that the author and I differ on is the scientific naming of the barbs, where I've long opted for the generic

name of *Barbus* while he goes for *Puntius*. Someone, someday, will sort us all out, but until then, I can't say that I can really tell my *Barbus* from my *Barbodes*, from my *Capota* from my *Puntius*. Can you?

Freshwater Fishes of Sri Lanka marks, in my opinion, an important milestone in the aquatic literature. If you are interested in Sri Lankan fishes in any way and want to know something really worthwhile about them, then I can't see how you can afford to survive without this large, attractive and invaluable publication.

John Dawes

Three Discus Books from TFH

1. Discus — A Reference Book

By: Bernd Degen
ISBN: 086622 545 5
Price: £19.95

2. The Atlas of Discus of the World

By: Dr Herbert R. Axelrod, Dr Warren Burgess and Bernd Degen.
ISBN: 086622 543 9
Price: £62.95

3. The Allure of Discus

By: Dr Herbert R. Axelrod and Bernd Degen
ISBN: 086622 544 7
Price: £39.95

One publication on Discus from a single publisher is usually quite an event, but *three* from the same publisher is 'something else'.

With such an abundance of riches, as it were, where does the Discus fan — existing or potential — turn to? Well, that depends, among other things, on your level of expertise, the number of other Discus books you already have, the level of your interest in these aristocratic fish, the availability of funds, and so on.

If I were a beginner at Discus keeping, then, without doubt, my choice from these three titles would be Bernd Degen's solo effort, the *Reference Book*, despite the author's mention of his own book in the back cover notes as a "wonderful book" and one that is "a must for every Discus lover" (assuming, of course, that he himself wrote these words!).

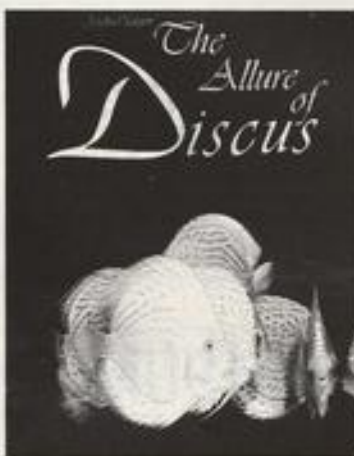
After introductory chapters on the history of Discus keeping, taxonomy, etc., (taking up about 40 pages), this good-looking book then settles down to tackle all the major areas that are of direct relevance to beginners, including, among others, Basics of Maintenance, To Breed or Not to Breed, Compatible Species, Choosing the Right Discus, Filtration and Lighting, Maintaining Water Quality, Preparing the Tank, The Importance of Good Feeding, and Disease Treatment.

As would be expected, the advice and information is generally sound — although I

still can't accept the statement (when referring to compatible species) that "Angels will certainly not do, as these predatory eaters snap up much of the food intended for Discus and also introduce parasites." This firm statement — made as fact — that Angels introduce parasites, is just not on, is it? Some Angels might... but all?

Yet, despite my intense dislike of such blanket, categorical pronouncements, as well as the implications that our great hobby is strictly for males, I have to say that, once I shelved my own personal prejudices, I found this book great, and can therefore warmly recommend it to new Discus keepers.

The Atlas of Discus is a truly beautiful book. Sure, we may have seen some of the pictures before, but with over 340 full-colour photographs on show of virtually every variety there's ever been — but not, understandably, the very latest, the Red Diamond — this book is a feast for the eyes.



There is also an introductory chapter entitled *The Current Status of Discus Systematics* by Dr Warren E. Burgess which makes very interesting reading. Towards the end he says "Rather than becoming clearer, *Symphysodon systematics* seems to have become more complicated." If you belong to the 'splitter' branch of systematics,

where features that could be interpreted by some as being insignificant are given a great deal of weight and lead to ever-more-elaborate subdivisions, then things could become even more confused in the future. For the 'lumpers' though, life is a little easier, since they would probably regard all Discus as belonging either to one or two highly variable species (with no subspecies). I would agree with Dr Burgess, though, that only when/if even more exhaustive collections and studies are made, will we ever come close to resolving the issue once and for all.

Other sections, like the Discus Aquarium and Breeding Discus, are dealt with in a rather novel way, largely consisting of numerous captioned pictures which, while making for very attractive page lay-outs, do, inevitably, lead to a certain lack of information. Nevertheless, the *Atlas* is a highly illuminating publication.

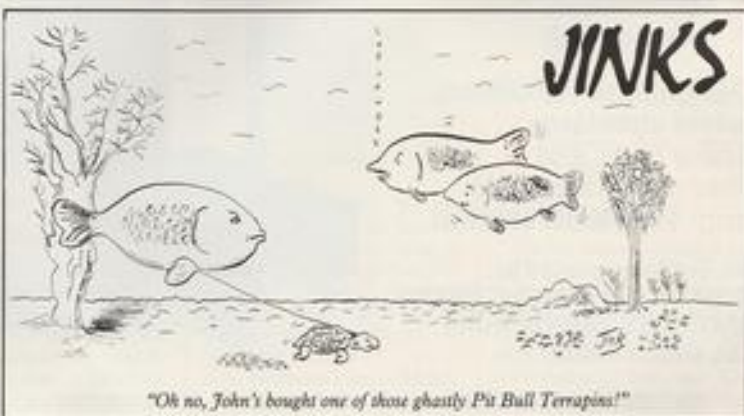
The *Atlas* is quite refreshingly different to all other Discus books that have preceded it, but if you want something really different, then *The Allure of Discus* is certainly the one for you. Some of the photographs (the majority taken by Fumitoshi Mori) are truly amazing, fully living up to the image created by the title.

There isn't a great deal of text in this very large, very colourful book. However, the text that there is, tells an interesting story, as it were, conveying the undoubted enthusiasm which the senior author still feels for Discus after all these years.

On classification — a subject dealt with (yet again) in *The Allure of Discus*, it is very pleasing to find that Herbert Axelrod, while still recognising two nominal species, *Symphysodon discus* and *S. aquifasciata*, is nevertheless sufficiently 'open' of mind to accept the possibility that, in the end, research findings may indicate that all Discus belong to a single species.

As someone who has long felt the allure of Discus — although I have never kept them either in large enough numbers, or for long enough, to regard myself as anything of a Discus specialist — I welcome the 'different' approach adopted by this spectacular book and applaud the publishers for having the courage to take what, to me, is a very bold step indeed.

John Dawes



Koi Calendar

By David Twigg

JOBS FOR THE MONTH

Our Koi should be nicely tucked up about now and well prepared for the onslaught of the long British winter. They may still be feeding and, therefore, cleaning of the pond is still necessary.

If feeding has been stopped, we will have the occasional sunny day when the fish will be looking for food. Please bear in mind that the metabolism of Koi slows right down with temperature. Therefore, your fish cannot process the food they consume as easily, or indeed as quickly, as when water temperature is considerably warmer.

In recent years I have been heating my pond so have had to modify my feeding regime, but if you have no heat, I would suggest you give thought to the weather forecast for the following couple of days before feeding. If a cold spell is predicted, then it would be wise to resist the temptation to feed.

My own view is that your Koi will welcome your daily attention, even when feeding has ceased, and, given that you do not completely shut them off from the outside world, will not be stressed by your attention. As you can see from the photo, the covers I used before heating my pond had opening windows down one side, and morning and evening, I was on hands and knees, with head and shoulders inside. Yes, I was able to talk to them and keep an eye on their well-being very easily that way.



My 'old' pond covers (used before I started to heat my pond in winter) allowed me to examine and 'talk' to my fish... albeit on hands and knees!

'NO-SPAWN' SUMMER

Well, for all my preparation and high expectation, it didn't happen! My Koi have not spawned this year and I have spent many hours pouring over records to try to find a possible reason. Water clarity has suffered recently because of my increased workload, resulting in a reduction of daily tinkering which kept clarity at its best. Quality, on the other hand, has not suffered, and my fish have 'eaten me out of house and home' and grown by amounts that are out of this world.

So what has been the reason for this non-performance by my fish? It has been said that Koi will not spawn if you heat the pool water during the winter months. An interesting point this as I have heated my pond for the last three winters and have had excellent spawning in the three following summers.

I have not maintained 'tropical' temperatures, however, but kept the lowest temperature between 10°C and 12°C (50/52°F). A period of one month without food has also been allowed during the month of February, this being (on average) the coldest month of the British winter.

When referring to my records in the past I have just looked at the temperature at which spawning has occurred and found it to be between 21 and 23°C (71/73°F). This time, a more in-depth look at the figures for the days before spawning took place shows a difference that may be significant.

NOVEMBER 1991						
S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

① June water temperatures were, on average, 2°C lower this year than in the previous three years, brought about, presumably, by the fact that night-time low air temperatures were also 2°C down.

② Night-time water LOW temperatures when spawning took place, had not been below the temperature at which spawning took place for the three preceding nights; the lowest being 19.2°C (66.6°F) and the highest 22.7°C (72.9°F).

The June water temperature being so low, and the criteria in ① not being met, may well be the reasons why my fish have not spawned. However, I am not sure how these facts square with, if at all, the way the professional breeders cause spawning to take place. I know that a change of water quality (moving fish from pond to show vat for instance), cooling the water down (by spraying the surface) and just simply placing the spawning media into the pond at the correct time, can cause spawning to take place. I am now actively investigating these phenomena and will report my findings in a later diary.

WHAT'S ON IN NOVEMBER

- 7 — Middlesex & Surrey Borders Section BKKS. Guest speaker is Dr Helen Bentley on *Identification and Treatment of Parasites and Diseases in Koi*. Contact Steve Gould on 0932 848147.
- 10 — Mid-Somerset Section BKKS. I will be discussing the *Overwintering of Koi*. West Monkton Village Hall, Monkton Heathfield, Nr Taunton. Contact Alan Purnell on 0458 72132.
- 10 — Northern Section BKKS. Monthly meeting at St

James Hall, Pendleton. Contact Tony McCann on 061 794 1958.

- 13 — Merseyside Section BKKS. Monthly meeting at the Hare & Hounds, Maghull. All interested in joining or requiring further information contact Phil Adamson on 051 220 2970 or Tom Hickman on 051 426 3673.
 - 13 — South Hants Section BKKS. Monthly meeting at the Denmead Church Hall, Hambledon Road, Denmead, Hants commencing 8pm. Contact Tony Price on 0705 261085.
 - 14 — East Penine Section BKKS. Monthly meeting in the Fitzwilliam Suite, The Rockingham Arms, Wentworth, South Yorkshire. Contact Dennis Godfrey on 0532 795134.
 - 17 — Yorkshire Koi Society. Monthly meeting at the Penguin Hotel, Wetherby (200 yards off A1), commencing 2.30pm. For further details ring Mrs Rita Thompson on 0484 851433 (B) or 0484 850422 (H).
 - 20 — Mid-Staffs Section BKKS. Monthly meeting at RNA Club, Elmore Green Road, Bloxwich, at 8pm. Contact Joan Rutter on 0534 876699.
 - 20 — Crouch Valley Section BKKS. Monthly meeting at Laidon, Basildon. "Season's Slide Show". Contact Allan Ward on 0268 543600.
- ### **RECENT EVENTS**
- During August I attended the BKKS National Show at Billing Aquadrome. This show attracted a magnificent number of fish (613 — a UK record) and 8010 spectators attended over the weekend. For the Koi enthusiast this must have been

the show of the year. Much time was spent by the BKKS Show committee arranging and organising this, the premier Koi show in the country.

I arrived fairly early on Sunday and headed straight for the Grand Champions vat where I saw the best three Koi in the show. Photo taking of these superb fish (Sanke, Kohaku and Showa — sadly, not of a sufficiently high quality for publication) passed a few minutes away and then I was on the move around the show vats to see the winners in each of the 13 classes.

The show fish were housed in large filtered and aerated vats under the cover of an open-sided marquee with plenty of room between vats to allow good viewing. More photo taking of many of these fish and talking 'Koi' to the many people met en route made for a very busy but enjoyable time.

My disappointment at this stage, if I had one, was that I could not put an owner's name to a fish. I can understand the need for anonymity while judg-

Grand Mature Champion — Sanke — E Sida.

Grand Adult Champion — Kohaku — J Shelton.

Grand Baby Champion — Showa — G Money.

Champion Jumbo — Sanke — J Wilmington.

Champion Novice — Kohaku — P Robinson.

Champion Beginner — Showa — G Money.

Champion Junior — Sanke — R Sida.

Dealer Champion — Kohaku — PWL.

Next I headed for the dealer stands! 40 dealers of all kinds were housed in the marquee surrounding the show site; too many to mention names individually, but I understand that as the space was allocated on a first come, first served, basis, it meant that a couple of the dealers regularly found at the 'National' were missing this year. It's always a shame when this sort of thing happens, but I am sure that it is an indication of the importance dealers are putting on this show as part of their Koi calendar.



The winners' vat at what was an exceptionally successful 'National'.

ing takes place, but feel that once the decisions have been made, the visitor should be allowed to know who has the good fortune to own and care for these lovely fish. It was only because I recognised her fish that I knew a good friend of mine had won a couple of prizes.

The Dealer Champion Koi was a super Kohaku entered by PWL, but I am sure it will be difficult for the average Koi keeper to understand the vagaries of a judging system which made this fish a Champion when it came 2nd in its class to another lovely Kohaku entered by Shirley Aquatics.

The major prize winners were as follows:

Supreme Champion — Sanke — E Sida.

Dealer stands were set up in many ways and placed before the hobbyist everything from Koi, through lanterns, to every conceivable pump, filter and food. Each stand was, just like the Koi, judged and the verdict of **Best Dealer Stand** went to those well known northern Koi suppliers, Ken & Pauline Smith of Clear Water Koi. Well done to them.

Chatting, chatting and more chatting, with dealers and hobbyists alike, as I moved around the displays, meant that, all in all, Lyn and I had a super day out. I look forward to next year's 'National' when I am sure an equally magnificent collection of fish will once again be brought together from around the country by the organisers. Well done the BKKS!



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News from the societies

Hucknall & Bulwell A.S. Silver Jubilee

Hucknall & Bulwell Aquarist Society celebrate their 25th year of being this year. Formed in 1966, the club still meets at the same venue today as it did then, the Half Moon Public House, Hucknall Market Place, Nottingham.

The society has seen both good and bad times, with membership being as high as 65 a few years ago — standing room only on meeting nights which are still held on alternate Wednesday evenings at 8.00 pm. In those days, if you were not there by 7.45 pm you would not get a seat.

Though membership in recent years has not been so high, the enthusiasm is still as strong as it ever was, with regular table shows, guest speakers, slide and video shows, quizzes and trips out to aquatic shops around the country.

Membership details are available from the Secretary Paula Hinton, 45 Wollaton Avenue, Gedling, Notts NG4 4HY. Tel: 0602 876657.

The H & B AS committee require some help from *A & P* readers. They are trying to trace all, or at least some, of the past members over the years so that they can find out more about the history of the society. They have managed to find out that two of the members, back in the early '70's, were featured in a BBC television documentary about hobby pets. They are therefore trying to obtain a copy of the programme, where the interviewer was Dennis McCarthy of BBC Radio Nottingham.

The society is also planning a

reunion 'do' on Saturday 16 November 1991 at the Half Moon pub at Hucknall in the form of a buffet and a "good old fishy chin wag."

Yorkshire Koi Society Harewood: The Sunshine Show

The weather stayed fine and dry as over 2000 people attended the Yorkshire Koi Society Open Show at Harewood House on 11 August.

The 15 dealers present were pleased with the day's business; one even had to return to the shop for more goods after the morning rush.

Many superb Koi were entered in the show. Lady Harewood presented rosettes, trophies, and Aquarian pond food to the winners. The Grand Champions were **Louis Hawksby** (hobbyist) and **Coldstream Koi** (dealers section).

An exhibition of birds of prey, brought along by a society member, provided many people with an opportunity to see these magnificent creatures at close range.

The society would like to thank all those who entered fish and so provided an enjoyable day out for thousands of people.

Details of Y.K.S. may be obtained from Steve Lamb, 24 Patterdale Drive, Rawcliffe, York YO3 6TW. Tel: 0904 626655.

South Inch AS

Aquarist societies meet in a wide variety of venues: members' homes, public houses, community centres, church halls, scout huts, etc, but recently I went to a society that

must be among the most exclusive, yet restrictive, anywhere. **South Inch AS** meets regularly in HM Prison, Perth. Membership is made up solely from inmates and warders and yet, despite all the expected setbacks and limitations, fish-keeping activities are flourishing. No less than 67 aquariums are in action within the barbed-wire walls; on various 'stairs', cells, waiting areas and, in one case, a very high security zone.

So great has fishkeeping taken a hold that there is now a permanent fishkeeper position, filled by Davie, who was our guide. Readers of past issues of *A&P* will remember letters and articles about prison aquariums and may wonder how fishkeeping can possibly be maintained under such conditions. The credit for it being feasible, let alone practicable, must go to enlightened governors and staff who realise that anything that provides occupational activity, coupled with the responsibility for caring for living creatures could (and indeed has been shown to do) relax tensions which otherwise would mount up, bearing in mind the surroundings. Of course, none of this would be possible without, pardon the pun, 'outside' help, which comes in many guises. For example, a number of society-based hobbyists in the area willingly lend a hand with regular visits. Other, more anonymous, donations are simply left at the main reception and a pair of Angelfish currently spawning had only arrived in just such a fashion shortly before my visit.

Future plans include refurbishment of the present six 3-foot tanks in the waiting room, and of the 'fish room'

where the real aquatic action occurs. Livebearers, characins, cichlids and barbs are all bred here, as is the regular supply of brine shrimps for feeding the youngsters.

On 28 October, South Inch AS held its Open Show with entries being invited from local societies. Due to security restrictions only four people from each participating society can be admitted to such shows, but there is no limit on how many fish they can bring with them, the more the merrier, so that as many different species can be seen by the host society members who are, by nature, starved of exposure to all the fishes we take seeing for granted.

A fishkeeping exhibition is tentatively planned for 1992 but a lot depends on how much progress is allowed and on the supply of fishes and equipment in the intervening months.

Much is written about the therapeutic effect of fishkeeping in everyday areas of stress (doctors' and dentists' waiting rooms, children's hospital wards, etc). Now, another area has been added where the aquatic effect is seen to be working to advantage; South Inch is no isolated case either: another 'in' society is Invernettie AS at Peterhead Prison, with a much earlier aquatic interest at Wakefield.

Societies interested in contacting South Inch AS should write to Andrew Hunter, c/o Hall E, C-9, HM Prison, Perth, Tayside. It might also be possible to give other support through letters, exchange articles, magazines, etc, and surplus fish and or equipment would always be welcomed with open arms if permission is granted. **Dick Mills**

Diary dates

F.B.A.S.

Strangely enough, there are some species of fish that are equally familiar to non-fishkeepers, and a good example of this is the Piranha. While *Discus* may not be so widely recognised among the general public,

they are a 'once seen, never forgotten' species too.

Both of these species can be seen at the **Supreme Weekend of Fishkeeping** at Pontins Holiday Chalet Centre, Sand Bay, Weston-super-Mare over the weekend of 8-10 November. Presented by the Federation of

British Aquatic Societies, the weekend will have something of attraction for anyone even remotely interested in fishkeeping and even more so for those thinking of taking up the hobby for the first time.

Weekend tickets cost £57.00 and bookings can be made

through: **Colin Richards, 3 Uplands Avenue, Chesham, Bucks HP5 2EA.** Entries in the **Supreme Championship** to: **Alan Henderson, 5 The Nook, Corby Village, Northants NN17 1XA.** (See also *News elsewhere* in this issue).

Herpetology matters

By Julian Sims



TURTLE CARE

A few years ago at the end of November, I took part in the BBC 2 programme *Inside Information*. The theme of my contribution was the unsuitability of brightly coloured hatchling freshwater turtles as Christmas presents. At the time, turtle bowls were in common use as a relatively cheap, but totally unsuitable method of housing these attractive little reptiles. The main promoters of 'turtle bowls' were the widely available hobbyist publications from North America. These little booklets are extremely thin on factual detail (and original illustrations).

Over the years, I have written numerous articles for herpetological society journals and features for *Aquarist & Pondkeeper* which give advice on a range of suitable conditions for the care of freshwater turtles, both indoors and in the garden.

Against this background of spreading information about the captive care of freshwater turtles, I was interested to receive a copy of an eight page leaflet published by the Universities Federation for Animal Welfare (UFAW) entitled *How to choose a vivarium for your pet Red-eared Terrapins*.

This publication contains a number of sections which describe such important points as vivarium design, heating, filtration, feeding turtles and guidance about the careful handling of these reptiles.

Much of the information

given is useful. For example, the need to feed a varied diet to ensure that these reptiles receive a balance of protein, minerals (especially calcium) and vitamins is emphasised. Dried, flaked food bought in tubs is NOT sufficient. The leaflet identifies that the reason why most captive freshwater turtles die prematurely is because of diseases which result from dietary deficiencies.

However, at least two controversial points are recommended by the UFAW. In a special box highlighted in bold print on the bottom of page 6 is a statement which, although very commendable in theory, is totally impossible in practice.

The statement says, "You should only buy a Red-eared Terrapin which has been captive bred in this country".

Currently, only a few freshwater turtles (of any species) are bred in captivity in Britain per year. These very low numbers are certainly insufficient to satisfy the demands of the many herpetologists who wish to acquire a Red-eared Slider.

Although only buying captive-bred British stock is an excellent recommendation and a goal worth striving for, the sad truth of the matter is that hatchling Red-eareds offered for sale originate from 'turtle farms' in the United States of

America. Neither are they always strictly 'captive-bred'.

Some gravid female turtles are collected from the wild when they leave the water to search out a nesting site. The females are then taken to a farm where they lay their eggs. The eggs are collected and incubated artificially, often at high temperatures to promote rapid development. This results in the majority of hatchlings being female due to the forced and unnatural environmental conditions used for incubation. Few of the adult female turtles are returned to the wild from where they were collected. This fact, together with the loss of their eggs, has contributed to a severe reduction in the size of wild freshwater turtle populations in some areas. Adult turtles which are retained at turtle farms are not always kept in ponds which are particularly suitable.

The second controversial point in the UFAW booklet refers to the recommendation about using a "thick layer of gravel" to cover the floor of a glass tank. This guidance is given for no other reason than to protect the silicone sealant between the glass. The problems of using gravel in a turtle tank were discussed in the October 1989 edition of *Herpetology Matters*. Freshwater

turtles are capable of swallowing even large pieces of gravel with their food, and this might cause a blockage in their gut.

Gravel on the floor of the aquarium also traps 'organic debris' — flakes of skin, faecal waste and fragments of uneaten food. Thorough cleaning of the tank then becomes very difficult. In a gravel-free aquarium, this debris collects on the floor of the tank and can be more easily removed each day by using a simple siphon tube. The dirty water which is removed should be replaced with clean water.

I feel that two other matters mentioned in the leaflet also need clarification. Attention is drawn to the point that freshwater turtles are often cited as a potential source of *Salmonella* bacteria which can be transmitted to humans, especially children. However, the UFAW do not emphasise that it is important to prevent freshwater turtles from becoming infected with these bacteria in the first place. If turtles are carriers of *Salmonella*, they first have to be infected with these bacteria — usually from poor quality food, being kept in unclean conditions or being lifted out of the water with unwashed hands!

Secondly, throughout the leaflet, *Trachemys scripta elegans*, is used as the correct Latin name to describe the most commonly kept type of freshwater turtle. However, the popular name of Red-eared Terrapin does not follow the accepted Standard Common Names as recommended by the Society for the Study of Amphibians and Reptiles (SSAR). The standardised common name should be Red-eared Slider, a name which is only mentioned in passing.

Copies of the UFAW leaflet can be obtained free of charge on receipt of a large stamped addressed envelope, from:

Universities Federation for Animal Welfare, 8 Hamilton Close, South Mimms, Potters Bar, Hertfordshire EN6 3QD.

The UFAW is a registered charity, number 207996, and further details about membership subscriptions (and donations) can be obtained from the above address.



During the summer, large freshwater turtles benefit from the extra space and basking facilities offered by a garden pond.

DIAMONDBACK SUCCESS STORY

In the December 1988 edition of *Herpetology Matters*, an account was given of one of the first herpetological conservation projects undertaken to save an endangered species. This was the North American Diamondback Terrapin, *Malaclemys terrapin*. At the turn of the century, this reptile had been virtually wiped out through much of its range owing to over-collection by humans, in this case as a food item sold in restaurants.

In 1902, a captive breeding project was set up at Beaufort, North Carolina. Between 1909 and 1946, more than 241,000 individuals were liberated into the wild. The young Diamondback Terrapins were released from Chesapeake Bay, Virginia in the north, to the coastal waters of Florida in the south.

Today, the Diamondback is actually increasing in numbers in the coastal areas of New York City. A recent survey conducted by the New York City Department of Parks and Recreation has confirmed that this species is thriving on the coastline of the city. This positive trend is unlike that for most other species of aquatic chelonians found in the New York area. Generally, freshwater turtles are in decline.

This is a remarkable success story for the Diamondback, considering that it was once threatened with extinction. The increase in population size is thought to be due to the type of habitat colonised by this species.

Diamondbacks live in sheltered brackish or salt water, for example, in the lagoons which form behind a shingle beach and in the salt marshes at river estuaries. Such coastal habitats are relatively secure, compared with inland freshwater sites which are being lost through urban development.

FRESH OR DEEP FROZEN

There are, basically, two methods by which a regular supply of small mammals (and birds) can be provided as food items for snakes: either, supply the food freshly killed, perhaps from a captive colony or, keep a supply of frozen animals in the

deep freeze and thaw them out as required.

Feeding freshly killed mammals to reptiles has, at least, one major advantage. Vitamins, together with other nutrients present in the gut of the prey animal, can be absorbed into the bloodstream of the snake and used to maintain the health of the reptile. For example, vitamins A and C obtained from the diet help to maintain the skin and the epithelial linings of the lungs and mouth in good condition. This reduces the probability of infection by the bacterium *Aeromonas hydrophila* — the pathogen which is thought to cause Infectious Stomatitis. This disease is more commonly known as Mouthrot.

With this in mind, it is well worth supplementing the diet of potential food animals with an additional source of vitamins, especially A, B complex and C.

Unfortunately, prey which has previously been stored deep frozen for some time, will contain fewer vitamins, but this method of ensuring a supply of food does have some advantages. Prey animals can be obtained, humanely killed and frozen when they are available from a local supplier, or when there are excess animals in the home-grown colony. Fluctuations in supply then cease to be a problem. Prey animals of the correct size can be stored and thawed out as required. Thus, a supply is always readily available.

Clearly, either method of ensuring the necessary supply of food has advantages, but on balance, the availability of vitamins A, B complex and C from freshly killed animals would favour this source, if at all possible.

VIDEO NEWS

A selection of videos on reptiles and amphibians, produced by ASPC Petvision, is available by post from *Aquarist and Pondkeeper* 9 Tufton Street, Ashford, Kent TN23 1QN. Tel: 0233 621877; Fax: 0223 645669. Access and Visa cards accepted. Please quote your card number and expiry date. The cost of each video is £17.99, including postage and packing. Allow 28 days for delivery.

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News

Ornamentals — no threat

In an *Angling Times* 'News' page article published during July, headlined **Pet Fish in Carp Threat**, an unreasonably alarming picture of the ornamental fish industry was given. We sent a copy of the article to Keith Davenport, the executive co-ordinator of OFI (UK). He, in turn, discussed the matter with his directors. This is the OFI reply: "It is clear that the further introduction and spread of Spring Viraemia of Carp (SVC) into the United Kingdom would potentially be disastrous. If this were to occur, the livelihoods of many in both the ornamental and the coarse angling industries would be put at grave risk. The hobbies of many millions would be similarly threatened (it may be of interest that 3.5 million households in Britain keep ornamental fish).

Several points must be borne in mind when considering this matter:

(a) The overwhelming majority of ornamental fish imported into this country are kept in enclosed systems i.e. aquaria and garden ponds from which there is no outflow of water. These fish can pose no real threat to the health of native stocks.

(b) The vast majority of cold-water (eg Koi and Goldfish) ornamental species come from Japan, Singapore, Israel and America. SVC is found in Europe, and MAFF sources have no evidence that the Far East is a source of this disease. Only 4.7% (by value) of ornamental fish imported into the UK during 1990 came from Europe. Once again, the risk of disease introduction is negligible. SVC has appeared in the UK on six occasions, most notably during 1988, and once again this year. The article published in July states that "The last (presumably 1988) outbreak of SVC was traced back to imported fish."

Were these fish imported from Europe legally? If they were imported from elsewhere, then the occurrence of SVC in that country has gone unreported. If they came from Europe

legitimately, then the disease testing and certification system failed.

A more probable source of SVC, and a greater and very real threat to both industries, is surely posed by the illegal import to and/or movement within the UK of indigenous species for coarse fisheries. As the value of native coarse species rises, so does the temptation to the unscrupulous. Two prosecutions for this offence have occurred; one must have suspicions that these constitute the tip of a large and murky iceberg.

Illegal imports may come from areas where SVC is present and, thus, no Health Certificate would be issued. If a disease outbreak then occurs, MAFF meet resistance in tracing the destination of fish from such consignments and thus isolating the affected business by issuing movement orders.

SVC is a disease affecting cyprinid species, though the pike and Wels catfish are also susceptible to some degree. Therefore, all these species could carry the disease. To move fish and stock them into native waters required, by law, the consent of the NRA (National Rivers Authority). Irresponsible, illegal movements of fish do occur, but if the rules are adhered to by all, then disease is unlikely to enter this country. If it does, then its spread, and hence its impact, can be minimised. This is in the best interests of both industries.

It is important that all responsible elements of both industries combine against those who, for their own personal gain, flout the law, seriously threatening the livelihood of many and the enjoyment of millions of anglers and aquarists and pondkeepers."

Ornamental Fish Industry (UK)

New York Beluga births

At 2:31 am, on Wednesday, 7 August, 1991, a Beluga Whale was born at the New York Aquarium in Coney Island. The calf swam to the surface and took its first breath seconds after delivery. Beluga births in



Moments before birth, the baby Beluga Whale's fluke begins to emerge.



Shortly after its birth, the Beluga calf swims with its mother.

captivity are extremely rare, and of the seven previous births, no calf has survived longer than four months. The calf began to nurse late on Thursday evening, with the nursing periods lasting from a few seconds to as many as fifteen seconds, and occurring every thirty to forty minutes.

The first Beluga Whale bred in captivity was born at the New York Aquarium on 22 July, 1972. The Aquarium had two additional births in 1981, and presently has a total of five Belugas: Newfy, the father of the calf, Winston, a male, and three females: Kathi, Natasha and Marina. The New York Aquarium was the first marine facility to exhibit Belugas in 1897.

The mother and calf, which has yet to be named, will be monitored around the clock by the Aquarium's marine mam-

mal and veterinary staff. Natasha is believed to have conceived the calf between May and July of 1990. The Beluga Whale gestation period is approximately 14 months. Beluga calves will nurse for as long as two years.

Aquarium biologists paired Natasha and Newfy as part of its long-term cetacean breeding programme. The Aquarium and the Woods Hole Oceanographic Institution are also cooperating on a research project studying the social behaviour and communications of Beluga Whales. The birth has provided a unique opportunity to study these fascinating marine mammals from birth to adulthood.

Less than a week after the excitement of this first happy event, Kathi also gave birth to a 5½ft long calf.

To date, both mothers and calves are doing well.

Koi Talk

By John Cuvelier



LLANSOY BLUNDER

We start this month's offering by opening up my 'Blunderbox'. In the September issue, I described my visit to the Koi Shelter situated near Usk, in Gwent, and went on to praise the high quality of the Israeli Koi stocked by this trader. In fact, the Koi Shelter does not stock any Israeli Koi at all! How my mistake arose is a complete mystery and I can only offer my apologies to those concerned.

As if that mistake wasn't enough, a typing error in the shape of an unwanted 'V' appeared in the name of the hamlet, which should have read 'Llansoy'. So, Japanese Koi only are on sale at The Koi Shelter, 4 Church Lane, Llansoy, Usk, Gwent, NP5 1HL. Let's hope I've got it right this time!

CONFUSING FIBRES

I have been informed from several sources about fibre additives for adding to cement and concrete for pool construction which are being marketed by some aquatic outlets. Although similar to the REIN fibres produced by Fibromix Ltd, they are, in fact, quite different and have been the cause of much confusion, mainly because of the misleading instructions which have been given.

These fibres are apparently being sold in packs containing 100 grammes, and one prospective builder was informed that one pack was sufficient for

1 cubic metre of concrete! I would have guessed that this quantity would give something like 200 fibres per cubic inch of concrete, which is completely ridiculous!

In addition, the cement to sand mixing ratios which have been variously quoted as either 3 or 4 of sand to one of cement completely negate the purpose of adding fibres in the first place. If sand is added at more than a ratio of 2 to 1 of cement, then the finished render loses its impermeability and will be porous.

The whole idea of adding fibres is to use a cement-rich render which, once hardened, is completely waterproof, the fibres being added to prevent the hairline cracking which would otherwise occur with the use of so much cement. These quoted ratios will, indeed, make a very strong render for general use, but will be utterly useless as a waterproofing render coat for pool building.

I understand that the purchase cost of these 100 gramme packs of fibres is very high and I feel very sorry for those pool builders who have been misled into attempting to build their pools after following incorrect advice, even if it was given in good faith.

My only interest in these matters stems from the fact that, as the individual who introduced Fibromix to the Koi keeper back in '82 and have never ceased praising its qualities, I do feel a certain responsibility to those intending to use this method of pool building. I can only suggest that anyone with any doubts at all regarding the use of this undoubtedly superior method of pool building, should contact me through the *Aquarist & Pondkeeper*.

'WATERCRESS' CATERPILLARS

Writing a column such as Koi Talk inevitably leads to the writer receiving much correspondence and many questions. Usually, the questions can be answered quite easily, but a recent example was certainly different.

A reader rang to say that his watercress bed had spawned an

incredible crop of caterpillars of the Green-veined White Butterfly variety and he was worried as to whether or not these would be toxic to his Koi if eaten. Off the cuff, I simply couldn't say, as I know that some caterpillars are rejected by birds because they give off an unpleasant odour or taste, but would this factor make them toxic to fish?

I could only suggest to this reader that, as Koi have more sense than we credit them with, I felt they wouldn't feed on any caterpillars if they were not safe to eat!

LEGGY WATERCRESS MYSTERY

I did admit to feeling envious, though, because, for the past three years, I have been unable to grow watercress in the quantities I have managed in previous years. Instead of bunching out in luxurious clumps, it has merely grown 'leggy' and gone to seed.

It's a complete mystery which I can only put down to some alteration, as yet undetected, in the make-up of water in our watercourse. Just another of those puzzles which seem to bedevil Koi keepers.

'BAITINGS' KOI FRY SAGA

The saga of the 'Baitings' Koi fry goes on as ever (I promise that this will be the final mention of fry until '92)! The initial crop of more than a thousand, sadly, was very quickly whittled down by an incredibly high mortality rate, simply because the nitrite level could not be held down owing to late installation of the hatching pool and filter system, thanks to in-

clement weather.

In sheer desperation, and by paying an overnight delivery premium, I was able to obtain 20 kilos of Zeolite and placed it into some netting bags. Within three days, the level of nitrite had fallen to below measurable levels and the mortality rate had dwindled to the point at which only the obviously weaker members succumbed.

The 150 or so fry which are left number among them some exceedingly pretty Koi which, at the moment, are averaging approximately an inch and a half (3.8cm) in length and, oh boy, do they get through some grub! Diet is now frozen Brine Shrimp and *Daphnia*, interspersed with crumbled Tetra sticks, a diet which they appear to appreciate more than my pocket does! Never mind, it's more than worth it just to watch them grow... especially since they'll even come to suck a dangling finger end.

The final picture (for this year anyway) shows the results of my efforts and, even if you don't agree, I think they're smashing.

SPHAGNUM HARVEST

By way of a winding up paragraph, here's another unusual event in my main pool this year. I've had a tremendous growth of Sphagnum Moss, something which has never happened before. Harvesting needs to be carried out about every two weeks and there is already enough drying out to supply my needs for next year's hanging baskets, as well as several neighbours'.

Why has this moss suddenly made an appearance? Your guess is as good as mine!



News

AQUARIAN NEWS

1 Aquarian at Stoneleigh

The Town & Country Festival at the Royal Agricultural Society Show Ground, Stoneleigh, Wors, is held every August Bank Holiday weekend. With over 200,000 visitors it is one of the largest shows in the country.

Among the hundreds of stalls and displays, from Gulf War Rocket Launchers to Rock & Roll Bands, there is a whole section devoted to pets. This included a giant aviary with many pet birds, prize-winning pedigree cats, dog obedience trials, a rabbit run, mouse town, tortoises, chinchillas and so on.

Pet fish were displayed by 'Aquarian' with a 5-foot aquarium of Fancy Goldfish on the Pedigree Petfoods stand. The Aquarian Advisory Service manned by Dr David Ford was also on the stand with booklets and information for beginners to the hobby... all 200,000 of them!

2 Pond Competition

A competition for a free pond was recently held by 'Aquarian' in a Garden News magazine.

From over 2,000 entries, the winner was Mark Lawrence of Grimsby who answered the questions correctly. His slogan was: "If Aquarian's expertise, no need to ponder, their splashing

out, guarantees my waterside wonder!"

The competition questions were: How many households in Britain have a pond? The correct answer is 1 million... or thereabouts. Two species of pond fish had to be named as well: Goldfish and Koi were the most common answers.

The pond was installed by a local firm: Well Farm Water Gardens, Church Lane, Tetney, Near Grimsby. It is a formal square design 3 feet deep and approximately 7 ft by 13 ft, with a surrounding path and low wall. Butyl lined, with a shelf for marginals, the water is pumped through an ultraviolet unit to kill algae and is bio-filtered in a separate polybox hidden behind shrubbery.

The pond was stocked with marginals, lilies, Shubunkins, Goldfish and Koi to Mark's choice.

The photograph shows the garden pond finished and handed over to the winner, Mark Lawrence, by Aquarian's Dr David Ford.

Third Sparsholt Conference

Held on 15 and 16 July 1991 at Sparsholt College, near Winchester, this Trade Conference is now a regular feature in the aquatic trade calendar. Over 30 delegates representing manufacturers, wholesale and retail outlets, and researchers attended the College with the option of overnight stay in the new student quarters.

The two-day programme

included lectures on Marketing and Sales in the Aquatic Trade, Diseases of Marine Fish and 1992 Legislation.

Visits were also included to aquatic places such as the Sea Life Centre, Portsmouth, Longstock Water Garden and the Southern Sciences Water Quality Laboratory. A barbecue (courtesy of Interpet) was given on the Sunday evening, with a conference dinner and cabaret on the Monday.

The lecturers included Mike Clarke of Interpet, Janet Cruise of JMC Aquatics, Eric Hudson of MAFF, Fish Consultant Dr Keith Banister, Fenella McCarthy, Editor of Leisure Intelligence (Mintel), Richard Harrison of British Trout Assn, Peter Burgess of South West Polytechnic, and Sparsholt staff.

From overseas came Claus Christensen of Tropics Aquarium Plants, Denmark, and Nancy Cowell, Pet Sales Manager, Mardel Labs, USA.

Claus showed slides of the production unit in Denmark where aquatic plants are grown and shipped all around the world.

Nancy and Ralph Cowell are a husband and wife sales team for Mardel Labs, selling pet products in most of the southern USA states. This includes 'Aquarian', who sponsored their visit to the conference. Nancy showed slides of USA pet and aquatic stores and discussed the American methods of marketing and merchandising.

The next Sparsholt conference will be from Sunday 28 June to Tuesday 30 June 1992. Details from Conference Director, Jane Lloyd, Sparsholt College, Sparsholt, Winchester SO21 2NF.

A day at the seaside

If you think the idea of a day at the seaside in November sounds a bit fishy, then you're quite right!

The Federation of British Aquatic Societies invites you to its Supreme Weekend of Fishkeeping at Pontin's Holiday Chalet Centre, Sand Bay, Weston-super-Mare, over the

period 8-10 November, 1991. Just look at the line-up of attractions:

Two days of well-planned, informative talks on such diverse subjects as marines, cichlids, characins, fish nutrition, Koi, and water quality; special displays to suit a wide range of interest: International Guppy show, specialist Catfish display, coldwater and Koi displays, marines, characins, piranhas and Discus; inaugural meeting of the Rainbow and Goby Society; Mid-Sussex AS 25th anniversary photographic display; Interpet's 'On the Spot' FREE water analysis on your pond or aquarium water (bring a sample in a clean container).

Come and see 'how to do it' with trade displays and setting up displays all setting you on the right way to do things, right from the start. You can buy specialist show tanks and even win Airport Aquaria's fabulous cabinet aquarium in a FREE DRAW.

Competitions? There's the final of the FBAS Supreme Championship to round off the 1991 season; the final of Aquachamp - fishkeeping's own version of Mastermind, sponsored by Aquarian; see how the trade do a 'Furnished Aquarium' - there's a special competition just for them.

All too much? Then how about relaxing with friends in the comfort of the Holiday Centre's café and bar; if you've still got any energy left, there is the swimming pool and sports facilities to finish you off (open to weekenders only).

It all starts from 4 pm Friday 8 November, when Weekender Break visitors check in. On both the Friday and Saturday evenings there will be evening entertainments (dinner is included on the Saturday, breakfasts on Saturday and Sunday). If you can manage the whole weekend then tickets are available at £57 per person. Day visitors will be welcome on Saturday and Sunday (£1.50) - just follow the AA signs from M5, Junction 21.

You've just got enough time to get last-minute details and tickets from: Colin Richards, 3 Uplands Avenue, Chesham, Bucks HP5 2EA (Tel: 0494 772552).

