

JULY 1988 £1.10p

# AQUARIST

## AND PONDKEEPER

**Koi pool  
on a budget**

**Breeding  
Corydoras**

**SPECIAL FEATURES ON**  
**1. Marine Invertebrates**  
**2. Herptiles**

**The Florida  
Experience (Part 2)**

# AQUARIST AND PONDKEEPER

JULY 1988  
VOL. 53 NO. 4

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## PUBLISHED BY

Dog World, 9 Tufton Street,  
Ashford, Kent TN23 1QN.

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ADVERTISING AND  
PRODUCTION  
(0233 621877)

## SUBSCRIPTIONS

£17 per annum (UK only)  
including postage, overseas  
and airmail rates on  
application. All subscriptions  
are payable in advance.  
Cheques or International  
Money Order should be made  
payable to Aquarist and  
sent to: Aquarist  
Subscriptions, Subscriptions  
International Ltd, 92  
Queensway, Bletchley, Milton  
Keynes MK2 2QV. Telephone:  
0908 70761. Printed by  
Hastings Printing Company  
Ltd.

## COVER STORY

Photograph: Arend van den  
Nieuwenhuizen

*Corydoras paleatus*, the Peppered Catfish, is a hardy, attractive South American species which has been around for a long time. Despite this, it is not bred by hobbyists as often as one would have thought. Incidents such as the one depicted in our cover photograph (and described by Arend van den Nieuwenhuizen in this issue), are therefore relatively rare sights in aquaria. *C. paleatus* is a peaceful, but active, shoaler which occurs in a number of wild-type colour patterns, as well as in a "commercial" albino form, this last type being considerably more difficult to find than the corresponding *C. aeneus* one.

## AQUARIST AND PONDKEEPER CHANGES HANDS

The *Aquarist and Pondkeeper* has a change of ownership. The title has been acquired by DOG WORLD LTD, based in Ashford, Kent. The company's aim is to maintain the high standard of editorial content and presentation to which readers are accustomed.

DOG WORLD LTD also publish Britain's top selling dog paper — *Dog World* — plus the *Dog Directory*, *Dog World Annual* and the trade monthly *Pet Business World*. The company also organises two major national pet industry exhibitions.

DOG WORLD's policy has always been that their publications should be edited by specialists in their field, so they are delighted that **John Dawes**, renowned authority in the world of aquatics, is to continue to edit the *Aquarist and Pondkeeper*.

**John Young** and **Hazel Payne** will continue to head the magazine's advertisement department. Enquiries will be welcomed by them at 9 Tufton Street, Ashford, Kent TN23 1QN — Telephone 0233 621877, Fax 0233 45669.

## WELCOME TO THE 'NEW' A & P

A very warm welcome to the first issue of the *Aquarist and Pondkeeper* under our new owners, **Dog World Limited**.

This latest, and extremely important development in the *A and P* story represents a major step forward in our efforts to produce an even-better, bigger magazine aimed at meeting the needs of every aquarist, pondkeeper and (as from this month) lover of reptiles and amphibians.

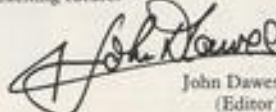
More editorial pages mean more scope to explore the exciting world of aquatics and related areas that form such an important part of our lives. See, for example, our three major features for herpetologists in this issue: On turtles, terrapins, and toads.

On the same subject look out also for a brand new informative monthly series, due to start in September, under the expert eye of biologist, author, broadcaster and reptile and amphibian specialist, **Julian Sims**. If you are a newcomer to aquatics (or a newcomer to a particular branch of the hobby), then you, too, will find your needs admirably met by our forthcoming regular features from the UK's top writers. One month we may be talking about filtration, and another about beginning with catfish... but whatever the subject, these articles will be written with beginners very firmly in mind.

Thought-provoking features on conservation, ecology, biology and "areas of concern" have always formed an important ingredient in our editorial mix. As the publication of **Lindsay Complin's** article on the potential threat posed by the escape of the Swamp Stone Crop in this issue demonstrates, we fully intend to maintain and strengthen this aspect of our activities.

On a lighter note we will, of course, still be Tanked Up, follow the adventures (and misadventures) of **Derek** our crisis-prone cartoon character and **Fred the Piranha** without a conscience!

In addition, competitions, regular book reviews, readers' letters, monthly product round-ups, news from the aquatic world, society news and diary dates, plus our other popular regulars will all contribute towards making the latest *Aquarist and Pondkeeper* package the best one yet. Join us as we look forward to a highly promising and exciting future.

  
John Dawes  
(Editor)



## CONTENTS

**LAKE SUPERIOR!**  
Amanda Grimes takes the  
plunge and installs a pond **5**

## KOI POOL ON A BUDGET

Huge sums of money and  
extremely sophisticated  
equipment are not absolute  
essentials, as **Andrew  
Tovey** demonstrates **16**

## BREEDING CORYDORAS

Common and rare species  
**Arend van den  
Nieuwenhuizen** has reared  
most of them **46**

## THE SWAMP STONE CROP THREAT

A small plant, but a big  
threat. **Lindsay Complin**  
reports **59**

## THE FLORIDA EXPERIENCE PART 2

Join **John Dawes** as he  
completes his colourful visit  
to Manatee land **62**

## FOCUS ON MARINE INVERTEBRATES

### PRODUCT ROUND-UP

**Dick Mills** reviews what's  
on offer for marine  
invertebrate keepers along  
with a round-up of the  
latest products **6**

### THE HAIRY LOBSTER

This month's spotlight  
feature from **Dave Garratt**  
focuses on this peaceful and  
colourful invertebrate.

### The Sea Cucumber

**Peter Elphick** reveals the  
extraordinary secrets of  
this ordinary looking  
invertebrate **36**

### FOCUS ON REPTILES AND AMPHIBIANS THE TURTLE REVIEW

A comprehensive guide by  
**Dr Robert Goldstein** **22**

### KEEPING TERRAPINS

Interested in keeping  
terrapins? **Dr David Pool**  
shows you how **27**

### TRUE TOADS

What's a Toad... and how  
do you look after it. **Kevin  
Dunster** provides the  
answers **30**

News, 10. Letters, 12.  
Coldwater Jottings, 21.  
Books, 40. Your Questions  
answered, 48. Seaview,  
54. Diary Dates, 57. News  
From the Societies, 57.  
Out and About (featuring  
show reports), 52.  
Cartoons: Tanked Up.



Not Lake Superior granted. But a haven nevertheless — wrested back from the grips of the wilderness that passed for my garden!

# LAKE SUPERIOR!

If you've ever installed a pond, you'll know exactly how Amanda Grimes felt when she, and her volunteers(?!), took the plunge.

**T**hose of you who have read my features from the start might remember that I am housebound. This simply means that I cannot travel great distances or go out by myself further than the local library or postbox — I am not constantly stuck within four walls (like my fish!).

My garden is therefore a great pleasure to me, as it is the only real holiday I get — and I have long looked forward to the time when I could have a pond. Well, being the sort of mental person I am, I hadn't really envisaged a pond — more a series of small lakes on different levels with a large waterfall . . .

I live in rented accommodation and have gradually, over the last four years, discovered quite a pleasant garden under about 50 feet of head-high blackberries. There is now some semblance of rough lawn, two shrubberies and a vegetable plot.

My neighbours have watched me, bill-hook and secateurs in hand, discover the wall at the end of the garden. My progress was noted with interest and no small amount of amusement. So, when one of them had moved into a new house in Kent and found — and not wanted — a fibre-glass, kidney-shaped pond in her new garden, she asked me if I could use it. Not exactly Lake Superior, I grant you, but gift horses and little acorns played a large part in my saying yes . . .

She brought the pond over on the roof of her car — and by her expression, I was left with the strong feeling that her only regret was in not having the time to stay and watch the fun . . .

I walked round and round this strange,

new object — and then round and round the garden, looking for a good site. I finally settled on a piece of recently-reclaimed ground in the L-shape of a bed and the vegetable patch. It was well away from trees and would give me plenty of scope for planting around as well as in it. I came back in for a fork and spade.

Have you ever noticed how the most trivial things become absorbing when there's a large, heavy job to be done? The magazine that was being idly flicked through becomes suddenly very interesting; the T.V. page of the paper is hurriedly consulted; and forgotten trips to anywhere but the garden are instantly recalled and acted upon. So I went back out, armed with tools, without willing help . . .

I was about a foot into the earth when the sarcasm of my sister and a general sense of shame brought me my first helper. The second followed at a more leisurely pace, my sister bringing up the rear — like a sheepdog! The fourth helper unwisely put his head over the wall to see what was going on — he soon found out.

Within half an hour, a large hole had appeared in the lawn and a large pile of earth had materialised on the path. We stopped for a consultation and tea. Do we need sand? The ground is very stoney. No, we'll sieve the earth and use that. Okay, I'll fetch a sieve from a neighbour. I did. And returned to find my sister pulling up some weeds — she was alone.

"Where've they all gone?" I asked.

"To have lunch and collect the level from their place."

Have you ever passed a building site year after year and wondered what the hold-up

was?

We had lunch and returned to the garden. No level. We sieved the earth and filled the wheelbarrow. No level. We sieved the earth and heaped it on my canvas bike cover. No level. We admired the shape of the pond. No level. We inspected the shape of the hole; we had tea; we weeded the garden. We were halfway through re-writing 'War and Peace' when the men appeared with the level.

They got down to work. Earth was carted and packed into the hole. The pond was lowered in — and out. Old bricks were raised around the rim and more earth packed in. The pond was lowered in. The level showed it to be out of true. The pond was taken out. And so on and so forth until, finally, the pond was bedded in and level. The pond was ready. It was level. It was about 8in above the surrounding garden. My sister and I politely pointed this out. The pond was taken out . . .

Bricks were removed. Earth was removed. Everything but the level was removed. The pond went in. It was level. It was 2in above the surrounding garden. Fine, that will do. We had cups of tea and then I filled the pond — with buckets and watercans brought from the house. I don't have a hose or garden tap. As the water poured in — as much as it can without a hose — I grew more and more excited. We all grew excited.

As I walked back and forth with the water, I cast a speculative eye round the garden and took my mind off the weight I carried with plans for a bank here, another pond there, a waterfall between the two. True, we'd have to run a cable out from the house for the pump, but the garden was still so young and full of potential. I poured the last of the water in and we stood back to admire our day's work.

The pond wasn't level . . .

## NEW PRODUCTS

The season of Trade Shows is now fully underway and the recent Pet Trade '88 at Birmingham's National Exhibition Centre threw up some interesting new products to go with those referred to us directly.

### Algarde's revolutionary algae cleaner

Readers all too familiar with commercials for alcoholic products which 'reach parts that others cannot', will be pleased to learn that the aquatic trade has not been slow to take up the challenge. The FLIPPER AQUARIUM CLEANER/PLANTER has taken the design of aquarium scraper/planting stick just that little bit further. The detachable, swivel-mounted head has two pads: the abrasive side makes light work of algae removal, even up under the reinforcing glass ledges found in most good all-glass aquariums these days. The other, a sponge, then gives the glass a good finishing polish. Simply reversing the implement brings into play a pronged planting stick. The Flipper is available from your dealer at £1.89 (inc VAT). Details from: ALGARDE LTD, Enterprise House, Cranes Close, Basildon, Essex (Tel: 0268 26853).

### MMR — new Algid claims

Since we reported the new ALGARID MAGNETIC WATER STABILISER (A&P, March 1988) more evidence has come to light as to their efficiency: filter-life can be doubled by using Algid as a pre-filter, sedimentation is increased (thus encouraging particle formation that filters can remove), and, by its descaling and scaling-prevention action, any clogging by blanket grass or weed (normally 'resident' in scale) is further reduced. Testimonials received from various parts of the world (Australia where 38 units are installed in the fountain system in the Victoria Arts Centre, Melbourne, and in Salam Colour Laboratories, Doha) all lend weight to the increasing benefits claimed for using this type of algae-riding system. You can obtain further details from: MMR LTD., Unit C7, 426 Long Drive, Greenford, Middlesex UB6 8UH (Tel: 01-575 6713).

### Aquabrite — the under-sink answer

Possible scaremongering headlines such as "Water — is it driving us mad?", "The chemical cocktail in your tapwater" and "Water probe poison shock" have drawn the public's attention to water quality.

As more chemicals are found, more are looked for. The AQUABRITE DOMESTIC UNIT WATER FILTER is an 'under-sink' unit which supplies a separate tap. The filter will need replacing only once every two years for an average sized family's uses. Each unit contains the equivalent of 600 acres of filtering surface, plus four additional Micro-fine filters built in, and comes with a five year guarantee. Price is £142.00. For further information write (or call): AQUABRITE, 184 Watford Road, St Albans, Hertfordshire AL2 3EB. (Tel: 0727 66971).

### Fritz and Aqua-Labs... and Aquamate

Despite (or perhaps because of) its unlikely name, 'Fritz' Products are likely to be making an increasing impact in aquarium technology. Limited space can do no more than draw your attention to FRITZ pH HIGHER, FRITZ pH LOWER, FRITZ pH BLOCK 7.5, FRITZ SLUDGE REMOVER and FRITZ CHLORINE REMOVER.

Away from water treatments, Fritz have turned their attention to beautifying the aquarium with a range of coloured corals. The artificial but nonetheless vibrant colours are sealed in making them totally safe for use in any aquarium, fresh or saltwater. There's even one that, being light-retentive, glows in the dark!

If you think you have left it too late to clean out that pond (or are just about getting around to it) then the AQUAMATE suction pump may be just the incentive you need. It will shift water at around 1000gph and comes with 4 metres of hose,

## PRODUCTS

BY DIET

## INVERTEBRATE

Small is beautiful and none more so than the exquisite jewels in the marine invertebrate world. For the hobbyist wishing to combine invertebrate culture simultaneously with fish life there will always be a precarious and compromising line to be followed; for those willing to set aside an aquarium devoted to invertebrate life alone, things may be slightly easier.

There are several sources of invertebrate foods available (listed below) but if you want to make up your own using a blender/liquidiser be sure that the 'ingredients' you use are quite safe. Fresh fish or shellfish meat from the local fishmonger's will not have been exposed to gamma rays as are the quality marine foods now on the market. Frozen foods specially packed for marine aquarium use, such as Lancefish, Cockleshell meat, Crab and Shrimp, while still too large for filter-feeding species can be easily rendered down to provide a no-risk diet.

Finally, the feeding of a further section of marine aquatic life should not be ignored either. This is the increasing number of marine algae, now a common sight in well-lit aquariums. It is important that these are 'fed' regularly and that any trace elements which may have been depleted are replaced. A cross-section of invertebrate and larger foods include:

**Coralife** (Reviewed in A&P in May).

**Invertebrate Appetite Stimulant** — £5.95.

**Invertebrate Smorgasbord** — £7.95.

**Invertebrate Gourmet Gumbo** — £7.95.

**Invertebrate Target Food** — £7.95.

**Invertebrate Vitamin Formula** — £5.95.

**Invertebrate Calcium Supplement** — £5.95.

**Aquatic Plant Food** — £5.95.

**Macroalgae Iron Supplement** — £5.95.

**Macroalgae Micronutrient Supplement** — £5.95.

Details of all these products



Sea Green, Sea Vita and Sea-Trace additions from Waterlife Research Industries part of their range of algae support products.

from: LAHAINA, School Lane, Udimore, Rye, East Sussex (Tel: 0797 224237).

### Interpet

**Liquify Marine** — A liquid food especially formulated for use in the marine aquarium for feeding filter-feeders. Available in 110ml and 5 litre sizes.

Details from: INTERPET, Interpet House, Vincent Lane, Dorking, Surrey (Tel: 0306 881033).

### Nutrafin

**Hermit Crab Food** is just one of Nutrafin's wide range of freeze-dried foods; others that may be used with some success with invertebrates (depending on species size) are PD Zooplankton and Krill. Nutrafin Products are marketed by ROLF C. HAGEN, 275 Kirkstall Road, Leeds LS4 2BZ (Tel: 0532 796566).

### Underworld

A number of invertebrate-suitable foods include Seagarden Algae Nutrient from SeaTest, Liquizell Invertebrate Diet from Hobby Products and Cockle Meat Liquid Food from DEL Products. The complete Resting Rotifers culture kit (from Florida Fish Farms) include a starting supply of Resting Rotifers which, together with Algae Disk, Algagrow and Rotirich, should ensure

# ROUND-UP

## WATERMILLS

# WATER CULTURE



literally millions of Rotifers on which to feed your inverts. The latest release is the Plankton Collector, details of which will be included in a future issue. Information on all these products from: **UNDERWORLD PRODUCTS LTD.**, Unit 8, Windmill Trading Estate, Loughborough, Leicestershire (Tel: 0509 214618).

### Sera

Marinovit is a nutrient supplement for live corals, anemones, crustacea and other invertebrates to encourage growth and development. It also provides replacement minerals, trace elements and vitamins, and growths of algae for corals and other algae-dependent invertebrates. Usual dosage is 5ml per 20 litres (10ml per 10 gallons). It is not necessary to turn off filtration. Details from: **BETTER WATER GARDEN PRODUCTS LTD.**, Bath Road, Upper Langford, Avon BS18 7DN (Tel: 0934 852973).

### Waterlife

Like their names suggest, Seavita, Seatrace and Seagreen are all additives to maintain minerals, trace elements and food for algae in the otherwise precariously-balanced water conditions of the marine aquarium. Each costs £2.28. Invertebrate Food is a liquidised blend of molluscs and crustaceans. Turn off filters for ten minutes or so while feeding. Price is £2.16 for 4 fluid ozs.

The range of Frozen Foods also includes an Invert Diet as well as Lancefish, Cockeye, Whole Shrimp, Krill, *Artemia* and *Mysis*. Each sachet costs £1.49. **WATERLIFE RESEARCH INDUSTRIES LTD.**, Bath Road, Colnbrook, Middlesex (Tel: 01-964 2487).

### New technology

NT Invertebrate Food is a well-balanced diet in liquid form suitable for all filter-feeders including Flame Scallops and *Cerianthus* Anemones. Easy to use, a capful per every four invertebrates every other day; can be usefully supplemented twice monthly with feedings of NT *Artemia* Revolution Decapsulated Brine Shrimps, straight from the bottle. NT Marine Multiplus is a weekly 'one-shot' additive to provide replenishment of vital trace elements, a boost to the buffer complex as well as essential nutrients for marine algae. While not strictly a food, by maintaining the water at optimum conditions invertebrates and algae will benefit considerably.

Details from: **NEW TECHNOLOGY LABORATORIES**, East Peckham, Tonbridge, Kent TN12 5HF (Tel: 0622 871387).



NT laboratories' New Technology range of brine shrimp hatchers and shrimp food.

all connections and a year long guarantee. Details from: **AQUALABS**, Red Lyons Farm, Burnham Road, Latchingdon, Essex (Tel: 0621 741966).

### Attractive units from Aquarium Design & Manufacturing Ltd

If you're looking for something stylish and want to make your aquarium even more of a feature in the lounge than it already is (!), then the full-colour brochure from **Aquarium Design and Manufacturing Ltd** will provide you with plenty of ideas. The normal range consists of seven models all available in either Mahogany, Teak or four shades of Ash finishes. Most are 51 inches overall in height and range from the 18-inch Cube Unit (for use where space is limited) to the 4 foot 7-panel Bow Cabinet. From Corner Unit to Hexagonal and Octagonal free-standing units, all have multi-sided viewing panels, many with a central column for hiding the aquarium 'hardware'. Matching hoods and standard bases in various sizes are available. Details from **AQUARIUM DESIGN AND MANUFACTURING LTD.**, Block 1, Unit 1, Huntershill Way, (off Crowhill Road), Bishopbriggs, Glasgow G64 1RD. (Tel: 041-762 1152).

### Better Water Garden Products go into the video age

In addition to their full-colour catalogue 'The Better Water Garden Book' (see *A&P* June 1988), **Better Water Gardens** now bring the 'how to do it right' information on water gardening right up to date with a video cassette. Produced in association with the Horticultural Trades Association's Let's Go Gardening, Gardening Video Series, the video is entitled **HOW TO CONSTRUCT A GARDEN POND**. It makes good use of B.W.G's Indestructa Pools and Pondalene Liners and also guides the first-time water gardener through the introduction of aquatic plants and fish, the installation of Amphibious pumps, water falls and Henri ornaments. Retail price is £9.99 and it should be available from garden centres. Write for details to: **BETTER**

**WATER GARDEN PRODUCTS LTD.**, Bath Road, Upper Langford, Avon BS18 7DN. (Tel: 0934 852973).

### Thomas Elliott's safe weedkillers

The dangers of weedkillers to pets is well-known and wind-blown or rain-washed chemicals entering into the pond is no laughing matter. The **POCKET TOUCH-WEEDER** is a safe way to kill weeds on lawns, flower-beds and rockeries without risking your fishes. As its name implies it is a touch-on weedkiller which is impervious to water, and will not spray or drift. Available from garden centres and superstores; in event of difficulty, a list of stockists is available from: **THOMAS ELLIOTT LTD.**, Hast Hill, Hayes, Bromley, Kent BR2 7AJ. (Tel: 01-462 2271).

### Everglades - Buddhas; Rockies & "Friends"

Some time ago, we made a mention of **AQUASCAPE ROCKIES**, the sculptured fibreglass rocklike planters for aquarium use. The latest development has been to add biological filtration capabilities to these by the simple expedient of integrating an airlift to them and perforating the base. The plant 'planting pocket' (a feature of the original design) means that specimen plants can be used and these will not be adversely affected by the filtration system. A further refinement has been to add a small 'anti-stagnation' hole at the top of each structure. Now, although the u/g filter is not quite so invisible, it can even beautify the aquarium.

Moving outside the aquarium, Koi-keepers will be interested to learn of an increasing availability of ornaments for around the Koi pool. **FUJI ORIENTAL STATUARY** will help give your Koi pool that authentic look. Among the designs are **TACHI-GATA**, **IKEKOMI-GATA** and **YUMIKI-GATA** **STONE LANTERNS**, all in various sizes and styles. Other statuary include Buddhas, Goddesses, Pagodas, Warlords, Princesses, Mandarins, Alligators, Oriental Lions and Leopards, Bridges, Towers, etc. Further details from: **EVERGLADES AQUATIC NURSERIES**, Baunton, nr Cirencester, Gloucestershire. (Tel: 0285 4656).

## Quick-Filter from Rolf C. Hagen

Should you not be a devotee of sub-gravel filtration systems, but still have an Aquaclear Powerhead in your possession, then the latest release from Hagen will be of more than just an interest. The addition of a simple and relatively inexpensive QUICK FILTER CARTRIDGE will provide a complete internal filtration system (or you can incorporate it into the powerhead/under-gravel system as an extra clean-



ing device should you so wish). Designed to clip on to the base of the powerhead, it contains a high-quality filter wool capable of extracting even the finest particles of dirt. Two sizes are available — Cartridge for the Powerhead 200 Models sells at £8.99; for the 400 and 800 Powerheads, £10.99. A replacement filter wool pack for both cartridges retail at 99p. Full details from: ROLF C. HAGEN, 275 Kirkstall Road, Leeds LS4 2BZ. (Tel: 0532 796566).

## Interpet's latest filters

Interpet have produced two new undergravel filters. In sizes 29in x 11in (£5.99) and 35in x 11in (£6.49) they also feature Interpet's 'constant velocity' waterflow over the entire filter plate area. Their strong rigid construction with large diameter lift tubes and high-circulation rates, make these filters some of the most effective currently available. For details of these products (and for your free copy of the INTERPET & PETLOVE PRODUCT GUIDE) write to: INTERPET, Interpet House, Vincent Lane, Dorking, Surrey. (Tel: 0306 881033).

## PRODUCT NEWS

### JMC Aquatics — Best Pet '88 Aquatic Product — and Foods

Capturing the Best Aquatic Product Award at any Trade Show is always nice, and this year JMC came up with a winner. At first glance, their CRYSTAL FLOWERS (like fish out of water) seem pretty but quite ineffective: that is, until you put them in an aquarium where their delicate structures and iridescent colours take on a life of their own. Having had some samples of these flowers on a bookcase shelf for several days, there have been enough changes in the climate (and patterns of daylight) to show them up in many different and delicate hues.

It has to be said that these artificial flowers (there's little attempt to simulate real plants) may be out of place in a more naturally-furnished tank but, with the more 'artificial' varieties of fishes coming along, coupled with equally unnatural coloured gravels, then these flowers will appear most "appropriate" in such company.

Still believing in that customers should see what they're getting, JMC's SAMURAI FLAKE FOODS and FREEZE-DRIED FOODS are presented in Superview containers and see-through tubs. CATFISH PELLETS are quick-sinking pellets for tropical and coldwater bottom feeders. At the opposite extreme, SAMURAI FLOATING PELLETS float for a long time and come in two types — Green, a staple diet pellet and Red, a colour enhancer pellet particularly favoured by Koi. Both types

are available in different sizes to suit differing sizes of fishes. SAMURAI FLAKE is a traditional-type flake food and is available from 45 gram size upwards. The HIGH PROTEIN small-size particle food is ideal for conditioning fishes for breeding and for ultra-high growth rates in any young that result from such pairings. FREEZE-DRIED FOODS include Tubifex, Bloodworms, River Shrimp, White Shrimp, Brine Shrimp, Krill and Daphnia. In addition to feeding fishes, try the F-D foods on your reptiles and amphibians. For details of all products write to: JMC AQUATICS, 59 Stables Lane, Dronfield, Sheffield S18 6PG. (Tel: 0246 415275/410412).

### King British — Buyers' Guide & Much More

From Fish Bags to Fish foods, Ponds to Filters (sorry, I couldn't find another 'P!'), King British have it all. Their new BUYERS' GUIDE outlines it in living colour and, like that television journal, you'll be surprised to find "there's so much in it." Two newest products are POND CHIPS and a ROWING BOAT! POND CHIPS are a multicoloured, fully-expanded floating pond food made to a highly-advanced formula. Of 29.5% protein, they are easily digested and may be reduced in size (for smaller fishes) by simply rolling through your fingers. This superbly nutritious food makes an excellent complement to the existing range of KB POND PELLETS.

The ROWING BOAT? No, not for that lake but an ornamental addition to your pond with a practical use too. The

brown tough and durable plastic boat not only gives the illusion that your pond is bigger than it really is, it makes a most effective ice-breaker (or anti-ice former) in winter. (Now, just suppose they fitted a pool heater to its underside . . .) THE BUYERS' GUIDE is available price 95p from: KING BRITISH, Haycliff Lane, Bradford BD5 9ET, West Yorkshire (Tel: 0274 573551).

### Koi-Vital from Tetra

Even when kept in a well-maintained aquarium or pond and given the best of diets, some fish never quite reach their full health potential. Research by Tetra has shown that deficiency of iodine and essential vitamins are often to blame. Although present in fish foods they are also released into the water by algae, plants and bacteria and greatly enhance the colour of the fishes (see the difference in fishes in green compared to clear water).

Of course, to the hobbyist, the more colourful the fish are, the better, and TETRAPOND KOI-VITAL helps to replace the necessary iodine and vitamins and reproduce natural conditions, thus preventing problems caused by their absence. After only one week of treatment, an improvement in the fishes' condition should be seen, and regular use of KOI VITAL in the water will benefit all pond fishes that may be suffering from this deficiency problem. KOI-VITAL retails at £4.50 per bottle, enough to treat 1250 gallons of water.



Details from: TETRA (UK) LTD, Mitchell House, Southampton Road, Eastleigh, Hants SO5 5RY. (Tel: 0703 619791).

See August's instalment for other new products which we could not fit in this month owing to lack of space.

Janet and John Cruise of JMC receiving their Best Aquatic Product award (donated by Aquarist & Pondkeeper) for their Crystal Flowers from judge Ron White of Polypets and his grandson Darran.



# News

## Anabantoid Association of Great Britain Members' Weekend



“The Fourth A.A.G.B. Members' Weekend was held on 9 and 10 April 1988. Once again, the excellent Rammoor House, Sheffield University, provided the venue, the meals and accommodation facilities.

On Saturday, the A.A.G.B. members' day started with a lecture by **Heinz Saddey**, President of the Rhein-Main-Nekar Group of the International Anabantoid Association (IGL) about the growing partnership between English and West German aquarists' groups studying air-breathing freshwater fish, with some slides of earlier meetings. Later, **Arthur Frisby** gave an interesting illustrated talk introducing the often misunderstood family, 'Channidae', commonly known as 'Snakeheads'

(initiated into the association last year). Finally, **Allan Brown** maintained his exceptionally high standard of lectures by literally transporting his audience into the forests and rivers of Sarawak on the island of Borneo. Here, many new interesting and colourful Anabantoid species were to be found and recorded.

A members' auction of Anabantoids followed with several new varieties of Bettas sold, along with other *Parosphromus* species (Liquorice Gouramis), *Macropodus opercularis concolor* (the Black Paradise Fish) and *Channa orientalis* (a small Snakehead). Apart from the rarities, all the old favourites, including *Betta splendens*, (the Fighting Fish) were present.

The trophies for the

'A.A.G.B. Members Show' were presented by **Otto Roth** (President of the IGL) and **Mick Jordan** won the 'Best Fish in Show' with a *Ctenopoma kingleyae* which competed with 60 other Anabantoid entries. The day ended with an informal get-together; where else, but the bar!

At Sunday's Annual General Meeting, **Tim Groom** (44 Springwell Gardens, Balby, Doncaster, South Yorkshire) was elected the new A.A.G.B. Secretary and thanks were given to the retiring Secretary, **Ron Wright**. Several other officers were elected and we all look forward to a positive new term.

Subscriptions for the year 1989 were set at Family: £10.50; Single: £8, OAP's and Juniors: £3.50.

Then, the 1st Yorkshire Group A.A.G.B. Open Show commenced in a large, spacious room within the same complex. There were over 300 entries judged to Yorkshire Association of Aquarists' Show Rules. Among the 42 classes of tropical freshwater fish were 11 devoted entirely to air-breathers and the 'Best Anabantoid' in the show was again judged to be the fish exhibited by **Mick Jordan** the previous day. The attractive first, second and third prizes (each displaying an insert of the A.A.G.B. members' badge) were presented by **Heinz Saddey**.

” **Stephen Clark**  
(A.A.G.B.)

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Dr Chris Andrews showing David and Helen behind the scenes.

## Tetra winners enjoy superb London visit

Winners of the "Tetra Food For Thought Competition" (*A & P*, November '87), David and Helen Weaver of Dudley, have just enjoyed a marvellous weekend in London, courtesy of Tetra.

As winners they were given a luxury weekend break at The Strand Palace Hotel, plus £100 in spending money. Also, Jackie King (Tetra Marketing Assistant) acted as their chaperone as they visited one of London's most exclusive fish restaurants. Then followed a personal tour with Dr Chris Andrews of the Aquarium at London Zoo. Dr Andrews also arranged an extensive tour of the Zoo, includ-

ing many behind the scenes areas usually out of bounds to the public.

A very busy Saturday culminated with a visit to the musical *Starlight Express*.

David and Helen commented that they had enjoyed every minute of a marvellous weekend and were very appreciative of how Tetra, had organised such an interesting and enjoyable weekend of fishkeeping and fun.

Certainly, the prize provided by Tetra lived up to the excellent competition. Look out later in the year for a similar Tetra Competition which we hope to run.

## T.A.P. winner receives his prize

Following our highly successful Aquamerck competition sponsored by Technical Aquatic Products (*A & P*, February 1988), James Clarke, the top winner, chose to receive his prize at his local shop.

James is seen receiving his Aquamerck Compact Laboratory from Tom Young

of Technical Aquatic Products outside Aqualand in Crayford, Kent (proprietor Alan Spokes).

Twelve runners up also received smaller prizes consisting of three Aquamerck Test Kits, again, courtesy of Technical Aquatic Products, to whom we extend sincere thanks for their sponsorship.



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# Letters

## White Clouds — even harder than we thought

I recently read the article by Jack Hems on *Tanichthys albonotata* in the March 1988 issue of your magazine (p. 35-36). I've enclosed some xerox copies of the first aquarium article to appear on the Garnet (mentioned in Jack's article) and also, in another article, the original scientific description of this fish. This later article also contains the review of the history of the two White Cloud Minnow forms that have reached aquarists' hands.\*

The comments by Jack Hems on the hardiness of *Tanichthys* are interesting. Both the Hong Kong form and the Cantonese form appear quite hardy. Over 30 years ago I kept the Hong Kong form outdoors all year long in small ponds just north of San Francisco, California. There, in February, outdoor air temperatures may go down to about -5°C, or somewhat lower. The Hong Kong form survived well in winters there with a few millimeters of ice on the water's surface in small pools. Large pools and streams would only have ice along their edges.

Over the last few years, 20 miles north of Washington, D.C., I've kept the Cantonese form of *Tanichthys albonotata* for ornamental purposes at home. Every year I breed some individuals outdoors in a small pond (about 2 metres by 1 metre by 50cm deep). Breeders are placed in the pond at the end of April or early May, and adults and young are brought indoors at the end of October or early November. In January or February, temperatures here commonly dip to -18°C and 4 to 6 inches of ice may cover this small pond (it very rarely freezes to the bottom). A year ago in the spring I cleaned the pond before placing breeders in it and found a few young had survived the winter. That year there had been four inches of ice on the pond in January-February.

Thus, it seems that both the "Hong Kong" and "Cantonese" forms of *Tanichthys albonotata* can survive for lengthy



The White Cloud Mountain Minnow appears to be even harder than most people think.

periods in water near freezing. I have heard that in the White Cloud Mountains in China where the Cantonese form lives, ice forms on small ponds and small creeks in winter. Thus, it would appear that White Cloud Mountain Minnows are harder than most aquarists realise. All this, plus the fact that they are beautiful, easy to breed and extremely "peaceful", even when in courtship display, make them an ideal aquarium fish for the lazy aquarist such as myself.

Stanley H. Weitzman (Ph.D.)  
Curator of Fishes  
Smithsonian Institution  
Washington D.C.

\*Editor's Note: The two articles in question are: 1. The "Garnet" — a New Import from Asia, Maurice Rakonitz and Stanley Weitzman, *The Aquarium Journal*, Vol. XXII, No. 11, Nov. 1951. 2. Identification and Relationships of *Tanichthys albonotata* and *Aphyocypris pooki*, Two Cyprinid Fishes from South China and Hong Kong, Stanley H. Weitzman and Lai Lee Chan, *Copeia*, 1966, No. 2.

## Storm in a bowl

Being in the process of returning to the hobby, I was horrified to read in *A & P* (March) Dick Mills proclaiming that there are "bowls and bowls" for goldfish and that Ampthill Aquatics "retail a 17 litre, 14in diameter bowl giving a reasonable water surface area."

What absolute and disgraceful nonsense. Anyone with a modicum of understanding of a fish's requirements for a decent life, must surely realise that, to

attempt to maintain an animal whose potential for growth is considerably greater than a small bowl permits, in such an environment is, at best, ignorant and, at worst, incredibly cruel.

Yet, supposedly reputable retailers persist in consigning these animals to inevitable premature death by insisting on supporting the sale of "bowls" to an unknowledgeable market.

It is time that goldfish bowls are banned from sale and for *A & P* to take the lead in campaigning to prevent the unnecessary cruelty and premature deaths of these beautiful creatures.

J. B. Taylor  
Penicuik, Midlothian

## Dick Mills replies

Thank you for your recent letter. I am sorry you took such an extreme attitude to my comments in respect of goldfish accommodation in *Product Round-up* (*A & P*, March 1988).

Unfortunately, we do not live in an ideal world; if we did then there may not even be the need for such a column as *Product Round-up* and all our fishes would be housed in the most perfect of conditions. Regrettably, everyone has to start somewhere and serve some sort of fishkeeping apprenticeship before enlightenment finally dawns.

While it is very encouraging that many youngsters are entering the hobby, they usually have to begin modestly, and this usually means a small tank to start with.

Happily, the drawbacks of the original goldfish bowl are well-known and reputable dealers do not sell them for use

with unsuitable fishes. But small containers do have their practical uses for small fishes, providing they are used intelligently. The "bowls" in question have been designed to give more swimming space (and increased surface area) than that provided by the usual design, by means of extra "bulging". Additionally, elsewhere in the same report, were details of "ecological" systems specially-designed for bowl use which enhance the quality of the water conditions even more. We do try to keep the fishes' interests in mind first and foremost, but it is not always possible, given the limitations of editorial space allowed, to underline the dangers on every occasion.

As you may appreciate, many products are brought to our notice and all deserve a fair consideration. Wherever possible, each is reviewed for the purpose for which it is designed. Obviously, there are always events where a product's use is abused or over-extended, and we can do no more than hope these instances are the exception rather than the rule. If you recall a recent "Out & About" report (on a retail outlet in Oxford), you will see that I commented on the fact that "here was one 'Goldfish Bowl' you could recommend to a friend" which, I feel, shows my feelings on goldfish bowls in a clearer light than your letter seems to imply.

Thank you for your comments, we always welcome readers' reactions (even criticisms), and we hope that through such interchange of constructive communications we can continue to bring to you the very best in fishkeeping information.

Dick Mills

## Spotlight

# THE HAIRY LOBSTER

(*Enoplometopus debelius*)

Dave Garratt, of the West Midlands Marine Aquarists Group, introduces a colourful, peaceful and retiring candidate for the invertebrate or mixed marine community aquarium.

Photograph: Arend van den Nieuwenhuizen

**T**he mention of lobsters to many aquarists conjures up thoughts of large predatory animals totally unsuitable for the home aquarium. It is true that the large lobsters of the genus *Homarus* are equipped with large pincers and, as such, are fearsome predators. The *Palaemon* genus of crayfish or Spiny Lobsters, although not possessing such pincers, grow far too large for the home aquarium.

However, the beautiful specimen pictured opposite belongs to a group of lobsters eminently suitable for the marine aquarium. This group are the *Enoplometopus* lobsters often known as Hairy, Rock or Reef Lobsters. They form a group of invertebrates that have long been overlooked by the aquarium trade but which, in fact, make excellent additions to invertebrate tanks and will even settle peacefully in a type of tank that is currently in vogue: the natural aquarium.

Classification and taxonomy of these lobsters is open to much debate, further complicated by the fact that some of the species have only been scientifically recorded quite recently. Such considerations are of minor interest to most aquarists and, suffice to say, that the *Enoplometopus* are crustaceans and are related to crabs, lobsters, crayfish and shrimps. Being crustaceans, they can be considered as fairly hardy subjects that should not make undue demands on the skills of a competent hobbyist.

### Species available and aquarium requirements

Four species are imported for the aquarium trade, including our featured species *E. debelius*; the others being *E. occidentalis*, *E. holthuisi* and *E. daumi*.

They all have the same basic requirements for their successful upkeep in a marine aquarium. They are shy, retiring, nocturnal creatures and it is essential to provide them with many nooks and crannies that can be used as cover as they scuttle about the

aquarium floor. They will often construct their own hollows under pieces of coral and will reinforce the entrance with whatever coral debris they can find.

These lobsters possess sensory hairs on their pincers as well as sensory antennae but, added to this, they have extremely good eyesight. Their eyesight makes them very prone to disturbances outside the tank and, because of this, they may not adapt from their nocturnal existence and may rarely be seen once in the aquarium. They forage at night for food and will usually dart out to take food that is left just outside their adopted cave.

Feeding presents no problems and squid, lancefish and mussel are readily taken; the smaller species will even accept brine shrimp and bloodworm.

Hairy lobsters are peaceful animals that will raise their large pincers in defence but are rarely seen to use them for attack. This peaceful nature even extends to soft-bodied invertebrates as they show no interest in tube-worms, corals or anemones and, as such, are excellent invertebrate community inhabitants. One should perhaps exercise caution where the two larger species, *E. occidentalis* and *holthuisi* are concerned. These two may grow up to 6in (15cm) and may be quite destructive in their excavations; occasionally there could be a problem with very small fish. The two smaller species, *E. debelius* and *daumi*, which only grow to 4in (10cm) may be better alternatives for some aquaria. Obviously they should not be stocked alongside fish that may make a meal of them e.g. large triggers, wrasse or pufferfish. Further, their peaceful nature does not extend to one another and only one specimen should be stocked per tank.

### *E. debelius*

As can be seen in the photograph this species has a beautiful purple/lilac hue with deep violet markings on the carapace and abdomen. The source of this lobster is usually the Philippines. This lobster is one

of the smallest in the genus, only growing to about 4in (10cm). It also has a shy retiring nature and is extremely peaceable, except to its own kind.

### *E. daumi*

This species is similar in size and behaviour to *E. debelius* and is also usually imported from the Philippines. The coloration is not quite as beautiful as *E. debelius*, with the abdomen a brownish-red colour.

### *E. occidentalis*

This is the most common Reef Lobster seen in the aquarium trade. The coloration is deep red with white spots and bands. Although the species occurs in the Indian Ocean and the Red Sea, it is most often imported from Hawaii and, as such, is often sold as the Hawaiian Reef Lobster. This, one of the larger reef lobsters, can attain a length of 8in (c. 20cm).

### *E. holthuisi*

Similar to *E. occidentalis*, except for being slimmer and less intense in its coloration, and having bull's eye markings on the side of the carapace. Imported from the Indian Ocean and Hawaii.

Commercial interest, which has been accused of damaging the population of the crayfish and larger lobsters, has no concern with these species due to their small size. This means that the only source for hobbyists consists of specimens caught specifically for the trade. However, these lobsters are not very common and are extremely difficult to catch, necessitating hand-collecting techniques. This tends to make them rather expensive at £20-£40. Also, their nocturnal, shy, retiring nature, and susceptibility to disturbances outside the tank, have not endeared them to many marine hobbyists. Balanced against this is their general hardiness, beautiful coloration and peaceful nature, enabling them to co-exist in an invertebrate or a fish/invertebrate community and making an outstanding addition to such an aquarium.



# KOI POOL ON A BUDGET

A Koi pool doesn't have to be a 9,000 gallon affair with a highly complex filter system and £1,000 jumbo Koi swimming in it. Photographer **Andrew Tovey** shows that it need not cost a fortune either, especially if you're handy with a trowel and spirit level. (Photographs by the author — see text for full details).

In February 1987 I started work on a 2,000 gallon formal pond, which was completed and stocked with a few fish by the middle of May that year. Here are the details of how I tackled the job in the hope this may inspire you to build your own Koi pool.

Preparation is nine tenths of any job, so I carefully first drew a plan of the intended pond (Fig. 1). The pond would be situated in the slabbed patio area at the left side of our garden, which served little other purpose as it stood. (Fig. 2). Dimensions would be approximately 12ft x 8ft x 4ft deep, so, with designs complete, and winter's worst behind me, I made a start.

The first job was to take up the required number of slabs and put them to one side. At a later date they would be cut in half and used as coping stones around the top of the pond. Next came the task of digging down to a depth of 2ft., followed by digging a 6 inch deep trench all the way around for the concrete footings (Fig. 3).

I hired a mixer for the week, which saved a lot of time and effort when concrete was needed. Once the footings had cured I made a start on the blockwork. Five courses of ordinary concrete blocks gave me the 2ft height above ground level I required. (Fig. 4).

Once the blockwork was finished I dug an 18 inch slope down to the centre of the pond, where the bottom drain would be sited. This done, I dug two trenches, one from the bottom drain to the discharge chamber, and one from the discharge cham-

ber to the sewer, which was conveniently sited just outside the pond wall (lucky me!).

Next came the first of two visits to "In-Filtration", to purchase high-pressure pipe, three elbows, one bottom drain and special adhesive. Other items, such as filter feed, filter plate standpipe and venturi, I made myself (more details further on), which is just as well, as the pipework and fittings cost £150.

Once back on the site I installed the pipework which was bedded in concrete and covered with tamped down soil (Fig. 5). Next I perfected the shape of the slope to the drain, tamped it down well and laid 1 inch of concrete over it all for strength (Fig. 6).

As can be seen in the pictures, I built a shelf in one corner of the pond, which would hold one large plant pot, containing some reeds and one large lily.

Next, a hole was made in the wall between pond and filter chamber, about two-thirds of the way down, and a piece of 4-inch pressure pipe was cemented in to create a filter feed. A drain cover was then cemented over the hole to act as a grill to prevent fish swimming into the filter chamber. Also, a piece of 1½ inch waste pipe was cemented into a hole between the pond and discharge chamber, at water level, to act as an overflow.

Things were going well and the pond was ready to be lined. Having a friend in the Kit car business made direct fibreglassing the

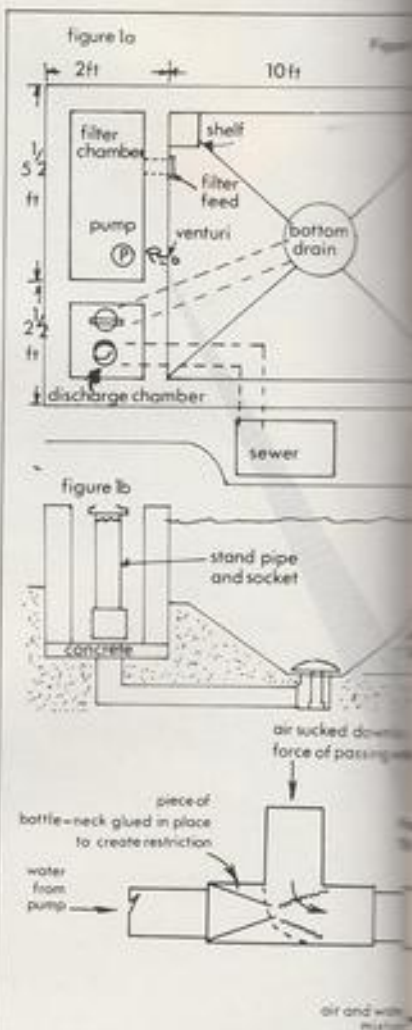


Figure 2



Figure 3





Figure 4



Figure 5



Figure 6



Figure 7



Figure 8



Figure 9

Figure 11 ▼



Figure 10  
The Venturi



obvious choice for me. So, for the only time during construction, there would be two of us working on the pond.

Direct fibreglassing is a messy and smelly job, and heavily reliant on good weather. But the Gods were with us for those two days in the middle of April (remember them??) and the task was completed in good time (Fig. 7).

Two layers of heavy fibreglass mat were used, and the resin was applied using 4-inch brushes. All traces of air were removed using special steel rollers. When dry, the pond was given two coats of black gel coat for a professional finish. (Fig. 8).

The pond was left to cure for a week or so while I turned my attention to the filter and discharges. I decided not to fibreglass them, due to their awkward size and shape. Instead, I "cement-rendered" them (with waterproofer added) and painted on three coats of Aquaseal 44.

Next, a 1½ inch wastepipe was inserted between the two chambers at low level, with a gate valve fitted at the discharge chamber end to allow removal of bottom water from the filter chamber. A stand pipe and socket was made using ordinary 4-inch sewer pipe, and a piece of overflow pipe drilled through the top made a solid handle. I used milk crates (cut to suit) to support the filter plate in the filter chamber. These were ideally strong to support the 5cwt of Canterbury Spa gravel.

With the garage nearby, finding an electricity supply was no problem. An armoured

cable was run underground to the rear wall of the pond where it was terminated in a double socket housed in a P.V.C. box, similar to a meter cupboard.

After a couple of rest days, I made a start on the facing blocks. I chose 18 inch x 6 inch yellow sandstone blocks (rock-face) to match the surrounding patio. Four courses brought me level with the concrete blocks, and I topped it all off with the aforementioned coping stones (Fig. 9).

At last, it was time for the second and final visit to "In-Filtration" to purchase Canterbury Spa gravel, filter brushes, a 1000 g.p.h. pump and, of course, a few fish to give the filter something to feed on.

With the fish housed temporarily in a small ornamental pond, I set to filling and emptying the pond three times. Once refilled I washed the gravel and layered it into the filter plate in the chamber and suspended the filter brushes above (this is unorthodox to say the least — but it works!).

I next sat the pump in position and attached the Venturi, which was made using 1½-inch wastepipe and fittings (Fig. 10). The pump was switched on and the pond left to settle for a couple of days.

That weekend I did a pH test ... 7.2 — perfect! So, with help from my wife, we transferred the fish to their new home, and dosed the pond with Malachite Green and Formalin as a safety measure.

Two weeks passed and the water began to turn green, and remained so for a further three weeks, before beginning to turn clear.

Soon the water was crystal clear, the fish growing rapidly, and me ... ?

Well, I found myself in the living room with pen and paper in hand, designing the Pergola I would be building over the pond in spring. There's no peace for the wicked ... eh!

Seriously though, I hope this article has, perhaps given some prospective Koi-keepers encouragement to build their own Koi pond (fig. 11).

Obviously, no two ponds are the same, but here is a breakdown of costs for my pond (at 1987 prices):

Item	Approx cost
200 concrete blocks	£60
Sand and cement	£50
Chippings	£10
Mixer (one week's hire)	£12
High pressure gauge, three elbows, one drain	£150
Glassfibre materials	£100
Cement waterproofer	£10
Aquaseal 44	£25
5cwt Canterbury Spa	£35
Venturi	£6
Stand pipe and socket	£2
Sandstone faceblocks	£100
Having slabs cut (for coping stones)	£10
<b>Total</b>	<b>£570</b>

Happy Digging!

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# Coldwater jottings



Stephen J. Smith

## Watch the oxygen

Following a superb, if changeable, spring, the signs, hopefully, point to a splendid summer.

But, although the majority of us enjoy basking in the glory of summer days, for coldwater fish summer nights provide an unseen peril: oxygen deficiency.

During daylight hours, plants in the pond absorb carbon dioxide and give off oxygen through a process called photosynthesis — good for the fish. (They also "breathe", i.e. use up oxygen and give off carbon dioxide, of course).

But, during darkness, photosynthesis stops and no more oxygen is given off. Respiration, however, continues sapping life-giving oxygen from the pond and causing the fish population to gasp at the surface.

This phenomenon can often be seen in the small hours of hot and sultry summer mornings and, unless preventative measures are undertaken swiftly, will result in fatalities.

A pond fountain, running continuously, will assist in restoring the balance but is not a solution in itself. Myself, I prefer few or no plants in my own ponds, thus alleviating the problem in the first place.

When low oxygen levels do occur, emergency measures should be taken. After all, we ourselves find it difficult to settle during hot sultry nights,

so get outside and spray the pond with the garden hose.

Both your fish (and yourself), will be far more comfortable for the rest of the night!

## Shade

Although my own preference is for few plants in the pond, it is advisable to ensure that fish are shaded from direct sunlight, and for this purpose there is none better than the lily.

Not only do the large flat leaves provide ample shade, but a new dimension is provided in the ornamental pond by the number and variety of colourful blooms which are produced year after year.

Some of my Goldfish-breeding colleagues do not tolerate any plants whatsoever in the pond. Shade is provided using either fine netting stretched over a wooden frame across an area of the pond, or polystyrene ceiling tiles floated on the pond will perform the same task as any lily pad.

## Take it easy

Despite the temptation to lay back and enjoy what summer sun we can, some dedicated pondkeepers cannot resist the lure of pond construction!

Whether it is starting a new project, finishing last year's interrupted construction, or even extending an existing pond, the masochistic streak for natural labour tends to overcome sensibility at this time of the year.

My advice is — don't. Why not wait until the autumn to lay your foundations; completing the job in early spring? Temperatures at those times of the year are far more conducive to hard labour and, after all, I'm sure you would not wish to spend the rest of the summer in traction...!

Most native species, such as Bream (*Abramis brama*), make unsuitable tank occupants.



## Don't disturb the natives

While the interest of the vast majority of coldwater fishkeepers is mainly directed towards Goldfish, Koi, and other popular pond species, there would appear to be a steadily growing fascination for native species of coldwater fish.

Most of the native freshwater species are unsuited to life in the aquarium; while life in a large pond may be an acceptable compromise.

If you really must pursue this aspect of the hobby — please tread warily.

Never bring home any of your catch from a fishing trip. Apart from the legalities of such an action, river fish are highly likely to be infested with some of the nastier of "nasties", which WILL wipe out any existing stock you already have.

Collection of eggs from natural spawning beds is not to be encouraged, in my opinion; but undoubtedly the safest method is to arrange to purchase eggs or fry from a commercial fish hatchery, where all manner of native species are raised to stock rivers and lakes for anglers.

As with other forms of fish-keeping, raising fry is by far the most enjoyable aspect of the hobby, and this method virtually guarantees freedom from infestation.

Before you start, though, ensure that you can provide appropriate accommodation and conditions in which the fish will thrive. This may mean provision of running water using high-power pumps in long troughs, as used on trout farms, for example; or well-aerated water with a muddy layer rich with plentiful supplies

of live food (and I don't mean the odd bag of *Daphnia*!).

Do let me know if you keep, have kept, or intend to keep, native coldwater species. Your experiences and aspirations could provide inspiration for a whole new area of coldwater fishkeeping.

But please, don't disturb the natives...

## Flowrates in pond filtration

Put two Koi-keepers together in the same room and you can be sure that within moments — if not seconds — their conversation will be assessing the merits, advantages and disadvantages of different types of pond filtration.

We all have our own pet methods of ensuring that our fish live in as clear an environment as we can provide — mainly so that we can see them (fish will live quite happily in water which is not crystal clear).

One of the most repeated questions at this time of year is one which concerns, not the types of filter media, construction of filter chambers, etc, but: "What is the optimum rate of water flow through the filter?"

As with most matters to do with fishkeeping, there are really no hard-and-fast rules. Generally speaking, what suits one particular situation may not work well in another, and vice-versa.

My own rule-of-thumb — for a multi-chamber filter of roughly one-quarter to one-third of the pond's surface area — is to turn over the volume of the pond approximately every four hours.

For off-the-shelf box filters I would suggest that the flowrate could be doubled. To make sure, seek the advice of a specialist retailer of pond filters. Alternatively, the larger Koi establishments are usually more than willing to help and advise.

Or, as I have often stated in these columns, join a society. There are a number of Koi-keeping and coldwater societies around the country, whose members are only too pleased to pass on the benefit of their own experience.



Above left, *Terrapene carolina*, the Eastern Box Turtle, amid the litter of a grape vine. Top right, This Loggerhead Sea Turtle entered the cooling canal of a Florida power plant and was blocked by a gill net. It was removed and is being measured and tagged. Above right, *Trionyx spinifer*, the Eastern Soft Shell Turtle of the United States.

# TURTLE REVIEW

Turtles, terrapins and tortoises — comprehensively reviewed by Dr. Robert Goldstein.

**N**ot many years ago, turtles (terrapins) were an important part of the pet hobby. Baby turtles, their backs sometimes painted in garish colours and designs, were as common in homes as goldfish, and there is probably not an American who did not at one time have a turtle in a bowl and a tin can of dried ant eggs to supplement the daily feedings of lettuce. Between the poor diet and cold drafts, the mortality of baby turtles was enormous.

Because most of the supply was produced on turtle farms rather than collected from the wild, the public was unconcerned and southern turtles continued to be shipped north to die in polluted bowls or, if lucky enough to survive and grow, to be released into northern ponds and lakes to die of cold that same winter.

In recent years, baby turtles were found to be significant sources of *Salmonella*

infections in young children, and the sale of turtles in the U.S.A. under four inches in carapace length was banned. The market disappeared and so did many of the suppliers. But clubs continue to survive, and that is the source of much of today's information.

One such organisation is the San Diego Turtle and Tortoise Society (SDTTS), with 3,000 members around the world. You can write to them for free literature and membership information at 13963 Lyons Valley Road, Jamul, California 92035-9607 U.S.A.

The SDTTS recommends different conditions for different types of turtles. For all turtles, they recommend warmth, cleanliness, and a varied diet. For land tortoises, they suggest paper or synthetic grass, and warn against using sand, gravel or cat litter, which the tortoises might eat. Box turtles should be offered snails, slugs, cat or dog food, and fresh fruit, and should not be subjected to dampness or drafts. For aquatic turtles, they suggest trout chow, crickets,

chopped fish, snails, and plants, plus vitamins for diamond back terrapins.

The turtles were around before the dinosaurs, arising sometime during the Triassic Period between 200 and 250 million years ago. The bones of their ancestors, the cotylosaurs, have been found in Germany and Thailand, and resemble those of *Eumeces africanus*, a South African reptile with an expanded rib cage.

Turtles today make up the reptilian order Chelonia (=Testudinata). Just as reptiles evolved from amphibians that developed a shell around the embryo to create a portable pond, so turtles are reptiles with a shell that provides a portable cave. Above, the shell is called a carapace and is fixed, while the lower section is known as the plastron, and may be hinged. The carapace and plastron are usually covered by horny plates resembling enlarged scales, and are joined at the sides by a bridge. The carapace actually consists of expanded rib bones.

Turtles are toothless, but their horny bills are capable of tearing fruits, vegetables or meat with ease. The way that turtles withdraw their heads (as best they can) into their portable cave is, in part, a major basis of classification. The Cryptodira withdraw their heads by forming an S-shaped curve, and contain virtually all the families of living turtles today. The Pleurodira bend their necks sideways to fit into the shell and are represented by only two families, the Chelidae and the Pelomedusidae. Turtles are also classified by other modifications. For example, the Galapagos tortoises have thick toes on elephant-like feet, many aquatic turtles have clawed toes with webbing to



between, and sea turtles have lost both obvious toes and webbing and have gone all the way to flippers.

There are about 220 species of turtles around the world, and despite their variety, this makes them a very small group. The terms turtle, tortoise and terrapin are laymen's words, not biological terms. Turtles generally refers to the aquatic forms, tortoises to land forms, and terrapins to freshwater or brackish species sometimes used for food.

### Chelidae

The Pleurodiran family Chelidae includes 15 species in South America and 18 species in Australia and New Guinea. In South America, the family is represented by the sideneck turtles of the genera *Platemys* and *Phrynops*. *Platemys* includes *P. radiolata*, *P. spixii*, *P. macrocephala* (the best known and most widely distributed), *P. platycephala*, and *P. pallidipectoris*. *Phrynops* is quite different, and includes *P. gibbsii*, *P. dahl*, *P. nanutus*, *P. goeffroyana* and the rare *P. rufipes*. Two other South American chelids are *Chelus fimbriatus* and *Hydromedusa testifera*.

In Australia, the species are *Chelodina expansa*, *C. longicollis*, *C. oblonga*, *C. rugosa*, *C. steindachneri*, *Elieya dentata*, *E. latisternum*, *E. sp.* (unnamed), *Emydura krefftii*, *E. macquarii*, *E. signata*, *E. sp.* (unnamed), *Rhodytes leahopi*, and *Pseudemydura umbrina*.

### Pelomedusidae

These Pleurodiran turtles occur in Africa, South America and Madagascar, and are represented by *Podocnemis*. Information on the group is scarce.

All of the following families are Cryptodiran turtles.

### Kinosternidae

The Kinosternidae are aquatic turtles of the United States, Mexico and Central America. They display remarkable diversity in the mechanisms they have evolved for closing off the head space using a front-hinged plastron. The four genera are *Glaudius* (one species), *Statorotrypa* (two species), *Sternotherus* (four species), and *Kinosternon* (13 species).

*Kinosternon* contains the mud turtles, which produce only a very few of some of the smallest eggs known among turtles. There is marked sexual dimorphism in different populations, with males much larger than females in some places and the opposite true elsewhere. The most common American species are the Eastern (*Kinosternon subrubrum*), Striped (*K. bauri*), and Yellow Mud Turtle (*K. flavescens*), of which only the Striped Mud Turtle is attractive. Other *Kinosternon* species are *K. alamosae*, *K. angustipons*, *K. dani*, *K. herrerae*, *K. hirtipes*, *K. integrum*, *K. leucostomum*, *K. osacae*, *K. scorpionides*, and *K. sonoriense*.

*Sternotherus* contains the musk turtles, all small and drab, and all in the eastern United States. They are the Stripe-necked or Loggerhead (*S. minor*), Eastern or Stinkpot (*S. odoratus*), Razor-backed (*S. carolina*



Top, the leatherback is the world's largest sea turtle. This one was removed from a canal using a gill net and a crane. Above, these baby loggerhead sea turtles have just hatched and will now seek out moonlight to guide them to the sea.

*us*), and Flattened Musk Turtle (*S. depressus*). Stinkpot males mature after two years and reach a breeding peak in August. Females mature at four years of age and may lay one or more clutches of three or four eggs each year.

*Glaudius* and *Statorotrypa* occur in the highlands of Mexico and Central America.

### Chelydridae

The Chelydridae are the snapping turtles, big, nasty animals that don't bite underwater, but are vicious on land. The Common Snapping Turtle (*Chelydra serpentina*) ranges from Canada to Ecuador and can weigh up to 60 pounds (c. 27Kg). The Alligator Snapping Turtle (*Macrochelys temminckii*) ranges from Missouri to the Gulf coast and can weigh up to 150 pounds (68Kg). Both are occasionally used in soups and turtle stews.

### Trionychidae

The Trionychidae are the softshell turtles, with species in the United States, Mexico, Southern Asia, the Malay Archipelago, and Africa. The North American species are the Spiny (*Trionyx spiniferus*), Smooth (*T. muticus*), and Florida Softshell (*T. ferox*). Many are attractively marked and popular in the hobby. Despite their gentle appearance, they are aggressive biters with sharp, effective bills. Some can get up to 35 pounds (c. 16Kg) and are sometimes eaten.

### Sea Turtles

Two turtle families contain the sea turtles. The giant, 1,600-pound (c. 725Kg) Leatherback (*Dermochelys coriacea*) is the sole member of the family Dermochelyidae. I recall a mechanical crane that tipped over trying to lift one from a canal in Florida.

The family Cheloniidae contains the Green Turtle (*Chelonia mydas*), Loggerhead (*Caretta caretta*), Ridley (*Lepidochelys kempi*), and Hawksbill (*Eretmochelys imbricata*). All sea turtles are endangered species.

Sea turtles migrate using magnetite-containing nerve endings in their brains, and the females always come back to lay eggs on the same beach from which they hatched, perhaps using smell or sight landmarks for identification. Only the Green Sea Turtle emerges regularly for reasons other than to lay eggs. All the others come out of the water (females only) to crawl up a beach to the dune line, there to dig out a nest and deposit a large number of eggs, seeming to cry all the while. The tears are the turtle's way of eliminating excess minerals and salts.

Many beaches are hazardous to sea turtle nesting because of recreational vehicle traffic, predators, and curious humans. The U.S. Army Corps of Engineers (responsible for maintenance of beaches) and the U.S. Fish and Wildlife Service (responsible for wildlife) have a turtle protection programme to move the nests to safe areas and cover them. The eggs are easily handled for the first 12 to 24 hours, but afterward must be held right-side up (the way they were found) or the babies will die.

Moved nests, or nests that don't need to be moved, are covered with thick mesh screens to deter predatory mammals, yet provide exit for the young. Upon hatching, the young turtles scurry toward any dim light, such as moonlight on the sea. During their rush to the water, they are attacked by night-feeding ghost crabs that prowl the beaches, along with other predators. The most staggering deaths (often 100% of the hatch) occur when the baby turtles head inland toward the lighted coastal homes and streets.

Adult sea turtles are killed in great numbers by drowning in shrimp and tuna trawls. The U.S. government is attempting to force commercial fishermen to use trap doors in the top of the trawl that allows the escape of turtles and porpoises. The world's only turtle farm on Grand Cayman Island provides a commercial supply of turtle meat and shell, but also re-stocks many beaches around the world with newly-hatched turtles.

### Emydidae

The Emydidae, contains many beautiful turtles of the genera *Glyptemys*, *Terrapene*, *Trachemys*, *Malaclemys*, *Graptemys*, *Emydoides*, and *Deirochelys*. It is the family that has supplied most of the species to the hobby in the U.S.A.

They include the Spotted Turtle (*Glyptemys punctata*), Wood Turtle (*C. insculpta*), the rare Bog Turtle (*C. moulsonbergi*), Chicken Turtle (*Deirochelys reticulata*), Map Turtle (*Graptemys geographica*), Diamondback Terrapin (*Malaclemys terrapin*), and Eastern Box Turtle (*Terrapene carolina*).

The Spotted Turtle has recently been discovered to force earthworms to the surface by stomping the ground with its front feet. The Diamondback Terrapin is an

estuarine species common on southern coasts and taken occasionally for food. Eastern Box Turtles are abundant where I live in North Carolina.

The large genus (*Trachemys* (= *Pseudemys*, = *Chrysemys*) includes spectacular North American turtles such as the Yellowbelly Slider (*T. scripta*), the Redbelly Turtle (*T. rubriventris*), Florida Redbelly (*T. nelsoni*), Painted Turtle (*T. picta*), River Cooter (*T. concinna*), and Florida Cooter (*T. floridana*). The West Indies have many species on different islands, including *T. terrapen* (Jamaica and Cat Island), *T. decussata* (Cuba), *T. stejnegeri* (Puerto Rico and Hispaniola), *T. decorata* (Hispaniola, and *T. malonei* (Great Inagua, Bahamas).

*Mauremys caspica*, the Caspian Terrapin, lives in fresh, estuarine and even polluted waters of Europe and North Africa.

### Testudinidae

The family Testudinidae occurs around the world, everywhere except Australia. It includes the Galapagos Tortoise (*Geochelone gigantea*), the Giant Galapagos Tortoise (*G. elephantopus*), the Eastern American Gopher (*Gopherus polyphemus*), Texas Gopher (*G. berlandieri*), and the Western American Desert Tortoise (*Scolecocryptus agassizii*).

In some places, the Galapagos Tortoises are being wiped out by wild burros (donkeys) which trample their nests. American Desert Tortoises are holding their own, mostly because they occupy safe habitat. They are vegetarians that feed largely on seeds and

grasses, and get their water by eating cacti. They lay eggs once or twice a year. Eastern Gophers live in burrows in clayey or sandy soil that tend to be low in oxygen and high in carbon dioxide, conditions which don't bother the gophers.

### Read all about it

The care and handling of turtles is a lot more involved than simply putting them in a box or tank and feeding what's available. The various species require sunlight to make vitamin D, heat, cleanliness, a variety of foods, special conditions for breeding, even more special conditions for hatching the eggs, and constant reading.

In addition to the standard texts supplied by hobby publishers, there are many newer, little-known books on turtles. Here is a list of these lesser-known publications:

*Amphibians and Reptiles of New England*, by R. M. DeGraff and D. D. Rudis, 1983, University of Massachusetts Press, Amherst, Massachusetts 01004 U.S.A., 85p.

*Amphibians and Reptiles of Nova Scotia*, by John Gilben, 1984, Nova Scotia Museum, Halifax, N.S., Canada, 162p.

*Biology of Australian Frogs and Reptiles*, by Gordon Grigg and co-workers, 1985, Surrey Beatty & Sons Pty Ltd and the Royal Zoological Society, 43 Rickard Road, Chipping Norton, NSW 2170, Australia, 527p.

*Collins Handbook to the Frogs and Reptiles of New Zealand*, by William Collins, 1986, Collins Publishers, P.O. Box 1, Auckland,

New Zealand, 112p.

*Field Guide to Western Reptiles and Amphibians*, 2nd edition, revised, by Robert C. Stebbins, 1985, Houghton Mifflin Co., Boston, Massachusetts, U.S.A., 336p.

*Guía de Campo de Los Anfíbios y Reptiles de la Península Ibérica, Islas Baleares y Canarias*, by Alfredo Salvador, 1985, P.O. Box 1062, 24080 Leon, Spain, 255p.

*Guide to the Identification of the Amphibians and Reptiles of the West Indies Exclusive of Hispaniola*, by Albert Schwartz and Robert Henderson, 1985, Milwaukee Public Museum, 800 West Wells Street, Milwaukee, Wisconsin, U.S.A. 176p.

*Introduction to Canadian Reptiles and Amphibians*, by F. R. Cook, 1984, National Museum of Natural Sciences, Ottawa, Ontario, K1A 0M8, Canada, 200p.

*Nicaraguan Fishes, Amphibians and Reptiles: A Checklist and Bibliography*, by Jaime Villa, undated, Wildlife Publications, 520 North Dixie Highway, Hollywood, Florida 33020 U.S.A., 53p.

*Reptiles and Amphibians of the Virgin Islands*, by W. P. MacLean, 1982, MacMillan Education Ltd, London, England, 45p.

*Reptiles of Gabarone*, by R. D. Auerbach, 1985, Botswana Book Centre, Box 91, Gabarone, Botswana, 48p.

*Reptiles of the Upper Amazon Basin, Iquitos Region, Peru*, by James Dixon and Pekka Soini, 1986, Milwaukee Public Museum, 800 West Wells Street, Milwaukee, Wisconsin, U.S.A. 154p.

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Whether in the wild or in captivity, terrapins love to bask.

# KEEPING TERRAPINS

Every year thousands of terrapins (or turtles as they are known in America) are imported into Britain mainly from North America. Very few of these terrapins survive for more than a few weeks. Yet, as **Dr David Pool** of the Tetra Information Centre shows, given a minimum of care and attention, they can live for 20-30 years and become very interesting pets.

## Species available

By far the most widely available species of terrapin is the Red Eared Slider or Terrapin (*Pseudemys scripta elegans*). This species can easily be identified by the red stripe just behind its eye. Young specimens have an attractive olive-green carapace (upper shell) and a cream plastron (lower shell). As they age, these colours may darken until they become almost black. In the wild (Eastern

USA and Mexico) the Red Eared Slider can grow up to 16 inches (50cm) in length, but it is unlikely to grow much over 10 inches (25cm) in captivity.

Other species are occasionally available, either by accident in a batch of Red Eared Sliders, or by visiting a shop specialising in reptiles. The basic methods of care for these

species are similar to those of the Red Eared Sliders which are outlined here. Further information can be obtained by consulting the books included in the reference list.

## Housing

The basic requirements for maintaining 2-3 terrapins are indicated in Table 1. Don't be tempted to buy a small tank or a terrapin bowl, as they are too small to allow any growth, and are difficult to keep clean. Instead, choose a suitable sized aquarium. The larger it is, the better, but, for 2-3 terrapins, it needs to be at least 24 inches long and 12 inches wide (60 x 30cm). This will give them enough space to grow (remember they can reach 10 inches in length!) and exercise.

A hood on the aquarium is important. This helps to keep the air above the water both moist and warm, as well as allowing a light to be fitted. Cold, dry air makes terrapins susceptible to pneumonia, a common and potentially lethal problem.

### Table 1 BASIC REQUIREMENTS FOR KEEPING 2-3 TERRAPINS

- Aquarium 24 x 12 x 12ins (60 x 30 x 30cm) or larger
- Hood
- Lighting (fluorescent or a 25/40 watt tungsten bulb)
- Heater/thermostat — preferably not glass.
- Smooth rocks, bogwood or cork island
- Gravel — shallow layer on aquarium base
- Filter — power or foam
- Dechlorinator
- Siphon — preferably self-starting
- Food (e.g. Tetra ReptoMin, Bloodworms, beefheart, snails and Daphnia).

Lighting of the aquarium is also important. Terrapins need a certain amount of light to aid bone formation and keep them healthy. Sunlight is the best light source, but, unfortunately, is not controllable and can cause the aquarium to overheat. A more satisfactory source is a tungsten bulb (25 or 40 watts) or a fluorescent tube. The light does not need to be on continually — 5-6 hours each day is usually sufficient.

An island in the aquarium allows the terrapins to get out of the water and sunbathe. Ideally, therefore, it should be positioned under the light bulb and be large enough for them to get completely out of the water. The island, which can be made of stones, bogwood or cork, should have a gentle slope and not be too smooth, to allow the terrapins to climb out. Sharp edges should be avoided as they can damage the shell.

### Water and heating

It has long been considered that the water in a terrapin tank should be no deeper than the length of the terrapin. This is certainly not necessary and in the wild terrapins are commonly found in water that is several feet deep. Instead, provide 6-10 inches of water which will allow the terrapins to swim around unhindered. The larger volume of water will also take longer to become fouled and so will not need changing as often. The water should be kept at approximately 24°C (75°F) using an aquarium heater-thermostat. It is a wise precaution to wrap some plastic netting around the heater to stop the young terrapins burning themselves and the older ones smashing the glass as they swim around. Non-glass heaters are, obviously, a good idea.

### Filtration

Terrapins are messy feeders and, to make matters worse, they like to feed in the water. Consequently, the water will become dirty very quickly. Regular cleaning and water changes are essential, but the frequency can be reduced by installing an efficient filter. The choice is between a foam filter and a power filter. If you choose a power filter avoid fibrous filter media as these will clog up too quickly; use foam media instead. As a general rule, choose a filter that is approximately double the size that would be used in a fish aquarium. The filter will mainly function as a mechanical filter; therefore, regular cleaning is important.

### Choosing a Terrapin

Having set up the terrapin aquarium it is now time to purchase the inhabitants. Choosing a healthy specimen is, obviously, important and Table 2 gives you some indications of what to look for. Much to the annoyance of the shopkeeper, it is the ones



Right, Hatchling terrapins are imported into Britain in their thousands. Given the correct conditions they will live for over 20 years and grow to more than 10 inches in length.

Above, The water in a terrapin tank should be deep enough to allow the specimen to swim freely.

that are most difficult to catch that are usually the healthiest individuals.

### Feeding

Terrapins require a mainly carnivorous diet which can include finely chopped liver, beef or earthworms, and live or freeze-dried bloodworms, *Gammarus* and *Daphnia*. The addition of a vitamin and calcium supplement is also important to keep the terrapins healthy and prevent the shell softening. Excellent commercial diets, such as Tetra ReptoMin, are available and these will provide a complete balanced diet (with added calcium and vitamins) and are less messy to use.

Adding a little variety to the diet will be appreciated; a basic diet of commercial terrapin food can be varied with the live foods mentioned earlier, water plants and even pieces of soft fruit such as bananas. Give the terrapins any snails out of your fish tank; they will love them and will gain valuable calcium from the shells.

Feed hatchlings and young terrapins once or twice each day, removing any food not eaten after 30 minutes. Adult terrapins should be fed once a day and allowed to fast on one day a week. To reduce the problems of water pollution, some terrapin keepers remove their terrapins to a smaller feeding tank at meal times.

### Routine Maintenance

On a weekly basis, or more frequently if the water becomes cloudy and smells, at least half of the water should be removed and replaced with tapwater of the same tempera-



ture. The chlorine in tapwater can damage the eyes and so should be removed using a good dechlorinator. At the same time give the island and gravel, if present, a good clean. The filter should also be rinsed at this stage.

Cleanliness is important at all times since terrapins can pass on harmful bacteria to humans (such as *Salmonella*). After handling your terrapins, or cleaning the aquarium, always thoroughly wash your hands and do not splash the water about around food. It is also advisable not to siphon the water from the tank by mouth. Instead use a gravel cleaner which can be started manually.

Given suitable food and living conditions, your terrapin will remain healthy and live for a long time. The basic living conditions described here can be considerably improved and, in the summer, the terrapins can even be kept outdoors in a pond, providing it is enclosed to prevent them wandering. More elaborate living quarters are described in the books listed at the end of this article.

### Closing thoughts

To end this article I would like to draw your attention to one very important point. That is that **TERRAPINS GROW!** An obvious point, but one that should be considered before you buy the attractive little hatchlings. And don't release them into your local river or pond when they get too big. Not only is this cruel, as the terrapins are unlikely to survive, it is also breaking the law and can result in a hefty fine.

### Further reading

A complete introduction to turtles and terrapins; by **J Cobb** (Published by *TFH Publications, Inc.*)

Turtles, Tortoises, Terrapins — *Aquarium Digest International No. 44* (Published by *Tetra*).

Encyclopedia of Turtles, by **P Pritchard** (Published by *TFH Publications, Inc.*)

### Table 2 POINTS TO NOTE WHEN BUYING A HATCHLING TERRAPIN

1. Calm, co-ordinated swimming — not frantic flailing
2. Bright eyes with no signs of damage or clouding
3. Alert — healthy specimens actively avoid being caught
4. No nasal discharge or troubled breathing
5. Can stay underwater without immediate floating up to the surface
6. Raises its body without any difficulty
7. Hard shell

**T** rue toads are those amphibians that belong to the family Bufonidae, of which our two native species are typical members. None are really specialised, and all are rather similar in general appearance, differing mainly in minor details, size and colour. Toads respond well to captivity and many have lived for decades in vivaria.

I have found through experience, that the less elaborately they are kept, the better they fare. An aquarium with a base of gravel, a water bowl and an old flowerpot will often keep toads in a better state of health than one complete with leaf-mould, growing plants and mosses. It could be said that attempts to simulate natural conditions in such a small environment courts disaster. Such re-creations of Nature are difficult to maintain, and the likelihood of introducing diseases and parasites is, consequently, greater. In such an environment, these invariably escape detection until it is too late. A vivarium with a gravel base can be stripped down once a month or so and the substrate sterilised with boiling water every three, in this way keeping the risk of disease to a minimum.

### The Vivarium

To light or not to light? That is the question. In my opinion, it is better to have lighting available, especially if a true light tube and dimmer switch can be used. While this is not essential, it does display the specimens to better advantage and will be useful if breeding is to be attempted.

A community tank works well with toads, providing that the specimens are of similar size, are not overcrowded, and all are of a size in relation to the vivarium. I have kept frogs, toads, newts and salamanders together with no ill effects and, indeed, all will live amicably together. Some species, however, should be mixed with caution. The Pickerel Frogs (*Rana palustris*), for instance, have toxic skins that can paralyse and kill other amphibians. Another point is cannibalism. To avoid it watch your specimens when they are feeding and ensure that they are of a similar size.

An old aquarium 90cm in length and 45cm (36 x 18in) in width will comfortably house four or five 5-10cm (2-4in) toads. Height is not so important, providing a lid is securely fitted to prevent the possibilities of escape.

Some of the species available originate from tropical climates and, for these, a degree of heat is necessary. A temperature of 75-80° (24-27°C) will suffice and there are several ways this can be achieved. One method that works well is to employ the use of a light bulb that is tinted red or blue. If a thermostat is attached, the temperature can be accurately controlled. This is not essential if the vivarium has been heated when empty and the temperature monitored over a six to eight-hour period. Use of different wattage bulbs may be essential to obtain the required temperature.

A condensation tray could be used to protect the electrics. Other methods include using heating cables, strips and pads under the vivarium or substrate but I'm, person-

# TRUE TOA

In general, reptiles and amphibians make wonderful exhibits, both for study and for keeping in captivity. Many species quickly settle down and, in optimum conditions, can be induced to breed. Few of these settle down as well as the true toads. While they are difficult to breed in captivity, this presents a challenge in itself, as natural history student Kevin Dunster explains.

ally, not in favour of this because toads like to burrow and such heating would probably cause discomfort. Heating the room, or using a standard aquarium heater in a receptacle of water, works well and has the advantage of supplying humidity. Care must be taken to ensure that the water is topped up and that the toads cannot come into contact with the heater or topple over its receptacle.

Also available these days are efficient safe "ceramic" heaters specifically developed for use in vivaria.

### Correct feeding

As with any living creature (including us) a varied diet is essential for well-being. It's important to remember that any animal at its peak is more likely to breed in captivity. A word should be said here of the herpetologists' stand-by, the mealworm. Research suggests that, as well as being difficult to digest, mealworms are devoid of certain essential nutrients required by the animals. The deaths of many reptiles and amphibians in captivity may, in fact, be attributable to overfeeding with mealworms. They should, therefore, only be used to supplement the diet. Most pet-shops supply, or can obtain, crickets which are of far greater benefit to amphibians.

Even if you live in the city there is always a garden, a piece of wasteground or a woodland where invertebrates will be found. An overturned log will expose many beetles, larvae, woodlice, worms and slugs. In the summer crickets and grasshoppers can be caught and, if access to a mercury-vapour lamp is possible, then moths and other winged insects can be procured as well.

The food given will largely depend on the species at hand and this is an area where common sense prevails. A Marine Toad (*Bufo marinus*) that will eat mice and small birds is not going to be impressed by a handful of woodlice. Similarly, an Oak Toad (*Bufo quercus*) barely 2cm (less than 1in) would not appreciate an adult locust.

### Quarantine

After your toad community has been established, it is prudent to set up a quarantine tank for any subsequent specimens you obtain. This vivarium can be smaller than the final abode, and need only contain a base of gravel, a water dish and half of a flowerpot for refuge.

Heating should be incorporated into the

Green Toad  
(*Bufo viridis*)



design for tropical species. Ignoring this caution once cost me dearly when I placed a diseased frog into the vivarium and it wiped out half the community. Specimens should be kept in quarantine for at least a month, and preferably longer.

### Vivarium breeding

The breeding of toads is not too easy, but it should be attempted, if only for conservation reasons. With certain exceptions, such as the Californian sub-species of the Black Toad (*Bufo boreas eximius*) few species of toad are threatened with extinction. However, breeding in captivity would minimise the risk of this happening, and it is possible that the breeding of such species now might guarantee them a future.

If the species hails from a temperate climate, mating can be induced by placing adults into artificial hibernation. If the vivarium is being lit, then the light should be dimmed to correlate with the shortening of daylight hours. The animals should be fed well at this stage, but only put into hibernation those specimens that are considered healthy and vigorous.

The amphibians should then be placed into plastic lunch boxes half-filled with leaf mould. These containers should be placed somewhere protected from frosts and where a reasonable ambient temperature can be assured. An unheated shed or outhouse works well. Alternatively, they can be

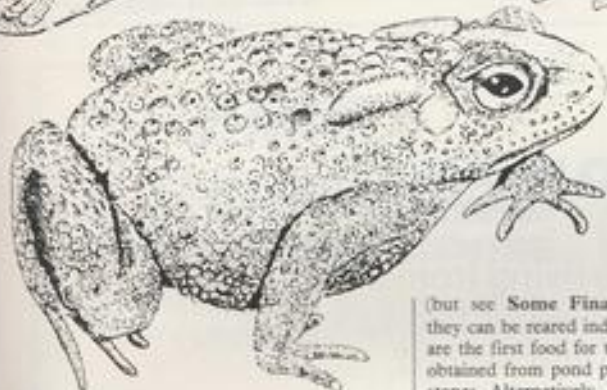
# ADS



Oak Toad  
(*Bufo quercus*)



Western Toad  
(*Bufo boreas*)



These are just a few of my favourite toads. (Drawings: Kevin Dunster).

Black Spined Toad  
(*Bufo melanostictus*)

(but see **Some Final Points** below) or, they can be reared indoors in aquaria. Algae are the first food for tadpoles which can be obtained from pond plants or off twigs and stones. Alternatively, boiled lettuce may be used. As they grow, the tadpoles can be fed Infusoria and, here, cultures as prepared for fish, are excellent. Liquifry and fish flakes follow, then eventually Tubifex and diced earthworm.

Two points to remember: don't overcrowd, and renew the water regularly. As the back legs appear, reduce the water level as tadpoles are now prone to drowning. As the front legs appear, reduce the water to a bare minimum and create little islands for toadlets to clamber on to, out of small stones and driftwood.

Once tadpoles have been reared into toadlets, the next problem is feeding them. Fruit flies, baby crickets and whiteworms can be bred, but it is probably easier to take leaf litter and topsoil found beneath damp logs. Grass sweeping, using a robust but fine net, is another idea, and it provides a good supply of invertebrate nutrition.

placed at the bottom of the refrigerator at a temperature of 30-40°F (4-5°C). Six to eight weeks is generally sufficient.

They must now be placed in an environment that simulates a pond, for the breeding of toads in aquaria is notoriously difficult. Amplexus (mating clasp) often occurs but, often, no spawn is laid. Unpolluted pond or rainwater, and a dense planting of aquatic plants, such as *Elodea* or Milfoil will produce the best results. Breeding aquaria need to be large, certainly nothing less than 36 x 15 x 15in (90 x 45 x 45cm) and preferably larger. An enclosed outdoor pond works best and, here, success is more readily assured.

A nucleus of two males to one female works best, as this ratio appears to stimulate pairing and spawn laying. Tadpoles can be left in outdoor ponds to fend for themselves



MATHY V. PERRE

The Marine Toad (*Bufo marinus*) is a truly impressive animal.

## Selected species

There are many species of toad available on the market, and here are five that I have had dealings with over the years.

### Green Toad (*Bufo viridis*)

While toads could easily be described as interesting, few could be termed as being attractive. This species is an exception. Here we have a European species averaging 8cm (3in) in size. This plump toad is a fawn grey in colour with emerald green marbling and reddish coloured warts.

These toads like conditions a little drier than most, but humidity should not be neglected, and the aquarium should be sprayed daily. As a species, the Green Toad has much to recommend it for it is long-lived and will spawn readily in an outdoor enclosure. Food consists of most small invertebrates.

### Western Toad (*Bufo boreas*)

Larger than the Green Toad, this N. American species is often offered for sale and does well in captivity. The colouring is variable, but under good lighting, this toad is generally an olive green colour with cream/white flanks and dark blotches over the top. Many specimens have a vertebral stripe down the back much like our Natterjack Toad (*Bufo calamita*). I once tried to breed this species, but although they paired, they would not spawn.

### Marine Toad (*Bufo marinus*)

At 14-25cm (5.5-10in) this species ranks among the largest of all toads and, given the right conditions, can do very well in captivity, frequently living for many years. Marine Toads require a degree of warmth to survive, plus high humidity. I have

found it best to keep these large toads on mats of foam rubber which can be cleaned off easily after defaecation. If they are kept in vivaria (on gravel) this will require constant cleaning and will make the husbandry of these toads more tedious than it need be. These toads require a large water dish, as they like soaking themselves for long periods of time.

The food they will eat varies considerably in size but, basically, they will eat whatever they can cram into their mouths, which

often includes smaller toads! Locusts, mice and black crickets would make a good diet.

#### **Black Spined Toad (*Bufo melanostictus*)**

Similar to the Marine Toad but not as large reaching, 10-15cm (4-6in). This is a dark toad with a multitude of pointed and horny warts over its back. Its colour is often a fairly uniform shade of brown.

The needs and, therefore, the husbandry of these toads is the same as for the Marine Toad, and the two species may safely be

housed together. They will both take similar foods. This species originates from Asia.

#### **Oak Toad (*Bufo quercus*)**

At 3cm (1.2in) or less, this is N. America's smallest toad. It is variable in colour, but most specimens possess the dorsal stripe so familiar in American species.

This species can be a hassle to find food for due to its size, although it could be hibernated in the winter months. I don't really recommend it to the complete novice, as it is a little more delicate than the larger species which can be purchased for a similar price. Sweepings and leaf litter should provide food, along with small crickets, fruit flies and such like.

## NEXT MONTH

If you are nuts about Koi — You'll enjoy our August issue. Even if you are not, you'll still find lots to meet your needs in next month's edition of *A & P*.

● On the Koi front, we have a really comprehensive supplement containing specially commissioned articles by **Nigel Caddock**, **John Cuvelier**, **Roger Cleaver** and **Tetra's Dr. David Pool** on growth and nutrition, Record keeping, MOT's for Koi, Koi evolution and breeding.

● For plant enthusiasts we dedicate our Spotlight feature (along with a superb full page colour photograph) to one of our most popular aquarium plants, *Ludwigia natavis*.

● If our last TFM-sponsored competition was anything to go by, there's a real treat in store for book buffs — included among the prizes will be TFH's latest spectacular best seller, *The Marine Atlas* (valued at £50). Also thrown in for good measure will be *Koi*, *Pond and Anabantoid* and *Reef* books. Tune in next month for the competition you can't afford to miss.

● Cartoons, news, society page, letters, and our other regulars ... plus a selection of special features are all lined up for what promises to be an exciting, packed and colourful August issue of *A & P*. Make sure you get your copy. **BOOK NOW!**

#### **Some final points**

Do not release foreign species into the wild. This happened with Marine Toads which were taken from their native S. America and released in Australia in 1935 in an effort to control the Sugar Cane Beetle. Its success spelt disaster and doom to the ecological balance, and many native animals were decimated because of it. In addition, the release of non-native species is illegal.

Do try and keep a note book of what your specimens will and won't eat and, finally, always wash your hands after handling your toads. Remember that they are poisonous. Dogs that have mouthed Marine Toads have been known to die afterwards. This is, however, only a defensive action. No toad has a poisonous bite.

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Sea Cucumbers come in all shapes and sizes. *Eupta lappa* (right) from the Bahamas is long and thin, while *Cucumaria frondosa* (left), the North Atlantic Sea Cucumber, is more compact and elaborate.

Sea Cucumbers may not look exceptional — but they are, as Peter Elphick reveals.

**O**n any field trip or tourist visit to a coral reef, the sea cucumber is likely to be one of the more common forms of marine life to be sighted. On first acquaintance, the usually drab-looking and sausage-like sea cucumber, appears dull and uninteresting. In fact, it is very interesting indeed, and possesses some of the most remarkable attributes of the animal world. It is related to the starfish,

unlikely as it may seem, as both belong to the family ECHINODERMATA (meaning spiny skinned.)

Like the other echinoderms, the sea cucumber (Class Holothuroidea), has a skeleton made up of numerous tiny calcite plates. It has a water-vascular system which serves it for feeding, respiration, locomotion, and sensory perception purposes.

The sea cucumber has an average length of life of four years. Although most numerous in shallow waters, varieties have been found in most sea areas. There are 1100 known living species, and many others have been found in fossil form.

Echinoderms play an important role in marine ecology. Most are highly efficient sea bed scavengers, and as they produce larvae on a vast scale, they are a food supplier to other marine animals.

### A creature of many names

The sea cucumber is also called the sea slug, sea gherkin, sea sausage, cotton-spinner, trepang, and bêche-de-mer. The two latter names, (trepang is a Malay word), are more usually used for the animal after it has been caught, dried, and cured, much as we in Britain use the words kipper and bloater. In its dried and preserved state, it is coveted by the Chinese who use it as the basis for a delicious soup. It has been harvested for this purpose from around the North Australian coast for centuries.

On 27 March, 1644, a Dutch flotilla under the command of Abel Tasman, (after whom both Tasmania and the Tasman Sea have been named), was off the coast of North West Australia, seeking the western end of the Torres Strait, when they fell in with a large fleet of Malay proas. Some of the Dutchmen were fluent in Malay, and they managed to discover that the fleet was from Johore, and that they were heading for the Australian coast to collect trepang. They also learnt that the trade had been going on since time immemorial. Later explorers found that other natives, notably the Buginese from the Celebes, had also been engaged in this trade for a long time. (It is perhaps of interest to note in this bi-centennial year of the first European settlement of the now great nation of Australia, that for more than two centuries after the beginnings of direct European trade with the nearby East Indies, that vast continent's only contribution to international commerce, was the export of the dried remains of the sea slug!)

### Holothurian behaviour

The holothurians (sea cucumbers) tend to congregate in large numbers in response to one or more of several environmental factors, of which the most important is the availability of food. Some species grow to a length of 2 metres, but most have a maximum length of around 30 cms. They range in colour from a mottled cream, through yellow, orange and brown, to black. Most are dark and drab looking.

Motion is accomplished by tube feet which are expanded and contracted by internal alteration of water pressure, along with a similar expansion and contraction of the body. They move in the direction of the mouth end of the body, and movement is sluggish, in keeping with one of their names.

Reproduction is usually sexual in process, although some species can also reproduce by splitting in two, and growing new parts.

The animal eats by catching food with its mucus-covered fern-like tentacles which are situated on the ends of each of ten radial arms. In sequence, each of these arms swings over and the tentacles are inserted into the central mouth, where they are sucked clean. The process has been likened

# SEA CUCUMBER



to a child sucking a lollipop. The water sucked into the mouth end with the food, is expelled out of the rear end.

When irritated or alarmed, some species can emit masses of sticky white threads — hence the name cotton-spinner — which swell up and apparently scare off any predator around. Some sea cucumbers can undertake the remarkable feat of completely expelling their internal organs under conditions of stress and danger, and can then regenerate them within a period of a few weeks.

Some tropical varieties of holothurians are known to produce a toxin (called holothurin.) Although not injurious to man, this is used by some Pacific Islanders to kill fish by poisoning the water with it. This toxin has been found to reduce the growth rate of certain tumours, and may well have medicinal properties. Maybe the Chinese have, once more, shown that they know more than we do.

The animal is perfectly harmless to man. When picked up, most feel soft and rubbery. I have found, on gently squeezing a specimen, that water shot out from it for about 2 metres as if from a water pistol.

As with all echinoderms, the sea cucumber can only live in a marine environment. Even brackish water will kill them. However, unlike other members of this family, the cucumber can withstand partial drying out when stranded by the tide.

### An unusual relationship

The sea cucumber sometimes provides sanctuary for the small pearl fish. This fish — a few inches long and scaleless — swims rear end first into the anal aperture of the cucumber until only its head is showing. The fish receives a continuous bath of clear fluid as water is expelled from the cucumber's system. What benefit the sea cucumber gets from this commensal relationship is not known.

In the trepang production process, sea cucumbers are caught, (collected is probably a better word), and then boiled in a cauldron for about 30 minutes. They are then split and gutted, sun-dried, and smoked. They end up hard and wrinkled, and it must be said, rather horrid looking. There are various grades of trepang, some species being considered better than others, and even the type of wood used in the smoking process can make a difference to the desirability of the end product. The dried meat is particularly rich in protein, and the discriminating Chinese like their protein to be just right.

Sea cucumbers can be kept in salt water aquaria. Care must, of course, be taken to keep particular species in water temperatures appropriate to that of their original environment. As they are good scavengers, they will help to keep the tank clean.

## Books

### A Visual Feast For Invertebrate Addicts

Marine Invertebrates and Plants of the Living Reef

By: Dr. Patrick L. Colin

Published by: T.F.H. Publications Inc.

ISBN: 0-86622-875-6

Price: £19.95

Anyone who has ever pointed a camera at an aquarium — and experienced the anguish of the notorious "flashback", the out-of-focus anemone, the fish that turned away just as you pushed the trigger, the tube worm that decided to close up shop at just the wrong split-second . . . and so on — will know only too well how frustrating aquatic subjects can be.

To attain any degree of mastery of this art is a major achievement, even when a particular shot can be repeated over and over again in the comparatively manageable world of aquarium-based photography. To achieve excellence in the wild, is something else.

Yet, this is precisely what Patrick Colin has done in this magnificently illustrated volume which contains 432 colour and 65 black and white photographs of reef organisms, mainly of the Caribbean, but also including the Gulf of Mexico, Florida and the Tropical Atlantic. This is much more than just a great picture book, though — it contains lots of solid, relevant scientific information, plus a most extensive reference section. But it's the pictures, some of rarely-seen species, that sell the book.

If you thought that the world of seaweeds stopped at *Caulerpa mexicana*, think again. This book, probably more than any other one available within the hobby, will soon put you right. My own personal favourites are the unusual disc-fringed *Halimeda copiosa*, the cup-like *Udotea cyathiformis*, the almost-pine-cone-like *Rhiphocephalus phoenix*, the striped-ribbon-like *Styopodium normale* and the "Riccia-in-disguise" *Dicryosa* . . . but there are more.

When it comes to animals, favourites are impossible to choose but, if for no reason other than their ever more endangered status, the Black Corals (seen here in all their glory) warrant mention.

A great book by a great writer/photographer. So, where are the snags? I can only think of one major one — the book was originally published in 1978 and seems to have been re-published now with no further photographic or bibliographical additions (the most recent reference I could find was dated 1976). There is no indication anywhere that the text has been revised, either — although things have moved on in the intervening ten years.

What we therefore end up with is a state-of-the-art publication, as the art was in 1978. Yet, despite this, I loved every single page of this 512-page volume, and thoroughly recommend it to anyone interested

in the colourful, and often inaccessible, world of reef invertebrates and plants.

John Dawes

### The Discus — King of the Aquarium

By: Bernd Degen

Published by: Tetra Press

ISBN: 3-923880-95-2

Price: £14.95

This colourful, impressive book will be keenly sought out by Discus lovers of all levels of expertise. Without a doubt, both beginners and "veterans" will find material of value within its 103 pages.

The photographs are good (some are excellent) and the text, while showing obvious signs of having been translated from the German (and probably requiring better editing), is nevertheless very readable and will present no problems.

All the chapters are useful in their own way, and some are particularly so. For instance, I was very pleased to see a section devoted entirely to advice on buying Discus. The potential Discus buyer would do well to read this chapter several times before venturing forth — and disregards this at his/her own peril.

Another very strong point in favour of this book is that it does not attempt to blind the reader with science; something that a few other books on specialist or "aristocratic" subjects have been known to do. The Discus is certainly a "king" among fish, but the author has had the good sense to present "royalty" in a highly accessible form which is likely to result in a larger following than would otherwise be the case.

This is not to say that the book is without fault, of course. I have already hinted at one in my second paragraph. I also think that a number of well-chosen, easy-to-follow charts listing, e.g. lighting/heating/water chemistry/heredity parameters, etc. would have helped enormously.

Further, in a book which undoubtedly teaches the reader a great deal about Discus, I feel it somewhat surprising to read that there are "four species of Discus". In fact, according to virtually everyone else, there are only two, *Symphysodon discus* and *S. aequifasciata* (spelt incorrectly in the book), the latter being made up of three subspecies: *S. a. aequifasciata*, *S. a. axelrodi* and *S. a. karaldi*. It was also surprising to see that the conventional/international way of denoting scientific names, i.e. in italics, has not been observed.

Still, these quibbles, while niggling in their own way, will not affect the use of the book when it comes down to buying, keeping and breeding Discus. This, after all, is the main thrust of the work which deserves to do well and find shelf space in the homes of both Discus keepers and all other hobbyists.

John Dawes

Continued on page 46

# BERS

Books continued from page 37

## Gouramis and Other Anabantoids

Rich Fare from T.F.H.

By: H. J. Richter  
Published by: T.F.H. Publications, Inc.  
ISBN: 0-86622-941-8 Price: £13.95

This is rich fare indeed. T.F.H. have chosen to translate and publish Richter's 'Das Buch der Labyrinthfische', first published in 1979. It still contains nearly all of the glorious original photos and, additionally, new ones of species imported since the original publication, such as *Ctenopoma nobilis* and *Betta unimaculata*. The date of the original publication means that some of the most recently described species are omitted and in some cases, e.g. the synonym *Betta rauterayi* (*coccinea*), this is a blessing.

Some of Richter's views are controversial and these are explored in his chapters on classification, evolution and behaviour. His ideas on re-naming the bubble-nesting Bettas to separate them from the mouthbrooders, and further dividing the latter to distinguish *B. macrostoma* and *B. unimaculata*, have now been exhaustively debated. Nevertheless, the theory was well observed and the criticisms were aimed more at the manner, than the content, of his ideas.

In addition to those already described, chapters on anatomy, distribution, care, breeding, varieties and diseases are contained in this book. These precede the

section on the species which explores all those described before 1979, even obscurities such as *Betta macrophthalmus*. The highlights are, of course, the brilliant photographs, particularly of spawning sequences from one of the world's best fish photographers. Those of the Liqueur Gourami (*Paraphromenus deissneri*) and the Orange Bushfish (*Ctenopoma asiaticum*) come to mind immediately. New for this edition are *B. unimaculata* and *Trichopsis pumilus*. Nevertheless, the excellence of the photos should not be allowed to overshadow the text which is scrupulously researched and contains many firsthand observations.

However, this is supposed to be an objective review and not a eulogy. Those inaccuracies and idiosyncracies that have crept in are those of the publisher, not the author. Examples of the former are a *B. smaragdina* labelled as *B. imbellis* female, and the Sunset Dwarf (*Colisa lalia*) labelled as *C. chuna* (page 148). An example of the latter is a picture of Dr. Axelrod on a

Brazilian collecting trip (no Anabantoids there, T.F.H.!). Also, on the same double spread (page 192-3), there are identical pictures of the Leopard Bushfish (*Ctenopoma acatirostre*). Why omit the references and many of the maps of the original edition?

The distribution of the book was held up as dust covers had to be printed because the original cover photo was identical to that of Goldstein's T.F.H. book, which could have caused confusion.

Despite these niggles, every fishkeeper should own this book, but here's a healthy warning for "anabantidians". Take only in small doses, or the effects could prove overwhelming!

David Armitage



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# BREEDING CORYD

**A** few years ago, I kept twenty-two armoured catfish: six *Corydoras paleatus*, six *Corydoras aeneus*, six *Corydoras melanistius* and four *Corydoras trilineatus*; in a large aquarium which measured 90 x 30 x 30cms (36 x 12 x 12in) in size. In the warm tap water which had a temperature of 21°C (70°F), 13 degrees of hardness (dH) and a neutral pH value, a few females immediately gained in size, clearly preparing to spawn. I fed them with red gnat larvae, introduced a few oak leaves into the tank, (weighed down with lead), and raised the temperature to 25°C (77°F), but without changing any of the water. When I looked into the tank the next morning, there were countless eggs stuck to everything.

The fish were peacefully resting on the bottom. Clusters of around two hundred eggs were clinging mainly to the front of the glass. Even the number of eggs stuck to the plants was considerable. The 1.2 and 1.5mm long, light-grey eggs were stuck so fast that it was difficult to prise them away from the glass. I was able to push them to and fro, however, and stick them onto another surface. In this first stage, the eggs felt like little rubber pellets.

## Egg development

At 25°C (77°F), the embryonic development was already well underway, although from the outside, nothing was visible except for the fact that the eggs were getting darker. Later, I ascertained that the dark grey eggs belonged to *Corydoras paleatus*

and the pale amber-coloured ones belonged to *Corydoras aeneus*. After three days the colour changes were at their most obvious, and I saw movement within the egg casing. The embryos were clearly moving around, but to observe this you needed a powerful magnifying glass.

After 76 hours, the young freed themselves from the eggs with powerful movements. During this time the fry's scales rippled up and down, then the egg membrane parted and the tail appeared. After that the larva broke completely free. (If there are any problems during the hatching, then one can help out by tapping the egg with a knitting needle. Normally, however, the young manage unaided and then spiral down to the bottom).

During this particular breeding, up to



AFRIG VAN DEN NIEUWENHUIZEN



AFRIG VAN DEN NIEUWENHUIZEN



AFRIG VAN DEN NIEUWENHUIZEN

Above left, a male *Corydoras paleatus* swims across a ripe female's barbels during courtship. Above right, eggs are scattered along the front glass of the aquarium as the female is pursued by three eager males. Note the eggs clasped between the female's pelvic fins. Top left, *Corydoras metae* has only rarely been spawned in aquaria.

# DORAS

Arend van den Nieuwenhuizen has succeeded in breeding an extremely wide range of fish, including various armoured catfish. In this article (translated from German by Karen Stalker) he recounts his success with some of the best-known *Corydoras* species.

10% of the young partly hatched after four hours and were completely out twelve hours later. I saw similar patterns in other, later cases.

Newly-hatched fry move rather quickly. They look grey if they are *Corydoras paleatus*, brownish if they are *Corydoras aeneus*, and they all gather together in the darkest corners of the aquarium. They always avoid the light. If there is any detritus on the bottom, they even disappear into that.

After about 42 hours, the yolk sac disappears and the fry begin to feed. In tanks which have a smooth (glass) bottom, you can start feeding brine shrimp straight away, but with tanks in which the bottom is covered, I usually feed with infusions of green pond water during the first few days. A roomy, lightly oxygenated tank is recommended with a source of diffused light under which the live food scatters everywhere, (thus the fry can always find food). Green algae also constitute a favourite food of these fry.

Since the young eat a lot, they also defecate a lot, so if there are numerous fry, a proportion of the water must be changed every day. Clear away the suspended excreta with a nylon-gauze covered filter, (a sponge filter would do just as well) though one must carefully and thoroughly clean the components of the filter.

Even at this early age, it can be seen that the young *Corydoras paleatus*, though the same length as the young *Corydoras aeneus*, are more stockily shaped. They all eat well-chopped Tubifex, though you should only give what will be eaten at once so that none is left to rot. Apple snails make good scavengers at this stage. Since the water may become dirty when the catfish are breeding then one must pay constant attention to water quality. During later breeding sessions, I used water of 1 to 2°dH and with a pH of 6.6. This was equally successful, for about 95% of the eggs hatched out.

## Aquarium spawning

If you want to encourage spawning, you should change 20 to 50% of the water in the tank for fresh water. You can also do that, if, after a few days, fish which have been put in a spawning tank have shown no signs of pairing. The fresh water in the breeding tank must always be oxygenated and filtered a few days before the fish are put into it. Sometimes I take fresh water which is three to four degrees colder than what the fish are accustomed to, or I simply let the water temperature fall.

In order to breed these fish, I put in a fertile and restless female together with two or three males, who continually follow her and try to get close to her. Meanwhile, they breathe more quickly, often pushing their mouths forwards. The males repeatedly

try to swim directly up to the female's mouth. In this way, a male will push himself along the female's barbels until these slip behind his pectoral fin. At this point, the male lays his pectoral fin against his body and firmly clasps the female's barbels. Then the female pushes the rear and lower edges of her ventral (pelvic) fins together, so that a pocket is formed which stays open and is directed forwards. As yet, no eggs are visible; they do not appear until shortly before the male's body curves more or less into an S-shape, which thereby directs the anal orifice towards the female. That is the moment when the sperm is ejected and is carried to the eggs by the motion of the water.

This generally peaceful phase lasts fifteen to thirty seconds; then the male releases the female, who pauses a little and supports herself with her ventral fin pocket on the bottom of the tank. Next, the female swims into the plants, or to the glass sides of the tank, diligently cleans a place and sticks the eggs on, if possible, anywhere from a few centimetres below the surface of the water to up to ten centimetres above the bottom. Nonetheless, in normal breeding tanks, you nearly always find the eggs in the upper regions, almost directly beneath the surface of the water.

In the search for a suitable spawning site, the males follow the female and virtually cling to her body while she "arranges" her underside into the egg-laying position. Then she opens her ventral fin and firmly presses the eggs against the substratum, to which they immediately cling. Up to 50% of the pairs do not stick so much as one egg to another; that does not happen until later, when large clusters of eggs are repeatedly deposited in the same place. In my particular observations, *Corydoras paleatus* females carry between one and fourteen eggs in their ventral pocket.

## Other species

The following species are regularly bred in aquaria: *Corydoras aeneus*, *C. cochui*, *C. hastatus*, *C. pygmaeus* and *C. paleatus*. Presumably, *Corydoras panda* is a species which is also easy to breed, for the German aquarist, Hanrieder, bred from the two surviving fish from his trip to Peru, and Dr. Foersch (Munich) bred further from the first generation. We even know of several successful cases of *Corydoras elegans* and *Corydoras natus* being bred. However, on the other hand, *Corydoras barbatus*, *C. bondi bondi*, *C. melanostictus*, *C. menae*, *C. nattereri* and *C. trilineatus* have only been seldom bred — sometimes only once.

In 1955, Nigg and Stettler, for example, reported a four-fold spawning by the *Corydoras reticulatus* after three years' effort. From this clutch of eggs 66,96,5 and 15% of the young hatched in water which was as

near as possible to the favoured natural conditions. Unfortunately, no details of the water's composition were given.

## Natural conditions may be important

Among those species which breed in hard water are those which also live in alkaline water in the wild; for example *Corydoras panda*, and some of those which inhabit soft and acidic water, such as the *Corydoras menae* from a stream in the Llanos del Orinoco with one degree of hardness and a pH value of 5.6.

A good source of food in the form of red gnat larvae (bloodworms) and worms does not always guarantee that spawning will begin, as we know from *Corydoras paleatus* and *Corydoras aeneus*. The usual food is fine for many armoured catfish, but several species find this type of food lacking in whatever it is that is important for spawning. We must therefore look for the missing element in the food we give them.

With wild-caught fish, we must not neglect the conditions of their reproductive period in the wild either.

In the fifties, I spoke to Herr Hoedeman in the Amsterdam Zoological Museum and he said something to the effect that, with various armoured catfish, perhaps detritus forms an important part of their nutrition.

Apart from the water composition and the food provided, the number of specimens at your disposal plays a key role. If we can distinguish between the sexes beyond any doubt, then we ought to keep at least two males (preferably more) to each female, according to our present experience, or with larger groups, corresponding numbers of each of the sexes. Keeping a large number of fish in a special aquarium is especially recommended for those species where we are unable to differentiate between the sexes.

Generally, the breeding period in the wild is considered to last from October until April. Some breeders, such as the Swedish professional fish-breeder Pinter, on the strength of their own experience, prefer to designate the months from August to October and from December to March as the breeding time. These differences may be due to the climatic factors across the species range in the wild. However, when Nigg and Stettler finally succeeded in breeding *Corydoras reticulatus* after three years, the fish spawned on the first, sixth and ninth of April and on the fifth of May. Perhaps other species only become fertile later?

All in all, armoured catfish are extremely easy-to-keep and sociable fish with very interesting breeding behaviour. For less experienced aquarists, it is possible to breed a species such as *Corydoras aeneus* or *C. paleatus*, while the advanced hobbyist might try his/her hand at breeding some of the other species mentioned above.

# Your questions answered

Having problems? Send your queries to our panel of experts who will be pleased to be of service. Every query receives a personal answer and, in addition, we will publish a selection of the most interesting questions and responses each month. Please indicate clearly on the top left hand corner of your envelope the name of the expert to whom your query should be directed. All letters must be accompanied by a S.A.E. and addressed to:

Your Questions Answered, The Aquarist & Pondkeeper, Buckley Press Ltd, 58 Fleet Street, London, EC4Y 1JU



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Barry James



**KOI**  
Roger Cleaver



**MARINE**  
Graham Cox



**DISCUS**  
Eberhard Schulze

## Tropical Oscar basics

I am thinking of setting up a 48in tank for Oscars.

1. How often should I change the water?
2. Is it essential to have a pH kit?
3. What's the best temperature for Oscars?
4. What type of filter should I use?
5. How many fish can I keep in my tank?
6. What sort of catfish can I put in with the Oscars?
7. What's the best kind of livefood to use?
8. Are there any good books on Oscars?

The Oscar is an excellent aquarium fish, being more a pet than an exotic fish.

Reference each of your queries:

1. The water will need partial changing as often as it gets dirty. The frequency depends on size and number of fish, quantity and type of food, temperature, and filtration.
2. No, it is not essential to have water testing kits — Oscars tolerate most water types. Just use dechlorinated tapwater, plus some rainwater, if available.
3. A temperature of 24°C or 75°F is ideal.
4. A power filter is a must for the large appetites of Oscars. The choice is yours; all models are effective.
5. A 48 inch tank could house several Oscars, but remember that, for maximum growth, only one, or at most two, specimens

should be kept.

6. *Corydoras* Catfish are tolerated by most Oscars.

7. Livefood can be of any non-aquatic type, such as earthworms, flies, maggots and mealworms etc. Do not use aquatic livefoods (*Daphnia*, *Tubifex*, Mosquito Larvae) because Oscars are prone to internal parasites which may be present in the cultures.

8. There are several good Oscar books — check the TFH list at your local aquarium or pet shop.

## Career in aquatics

I am hoping to open my own fish shop as soon as possible. Any advice on how to go about following a career in aquatics would therefore be most helpful.

There are two main routes to a career in fishkeeping, the Hobby and the Science. The hobby route is, obviously, via work at a local aquarium or petshop, the aim being to learn from experience sufficient to set up one's own business.

The scientific route is to get a degree, or other qualification, and then specialise in Marine Biology or Fish Diseases etc. The Institute of Aquaculture (Stirling University, Scotland) runs a full-time course in fish diseases for qualified veterinary surgeons or postgraduate biologists, leading to an MSc or PhD. These scientists usually work on fish farms around the world, but a few are working in the hobby.

Increasingly, the hobby trade is demanding academic qualifications. New pet shops applying for a licence from their local council are finding that a City & Guilds Certificate in Petshop Management is required. These are run by PTIA (Pet Trade & Industry Association). For details contact PTIA, on 01-242-4380.

*Editors Note:* See also our recent items on the new course in Aquatics and Ornamental Fish Management due to start at Sparsholt College in September (A&P, Apr '88 and July '88). Ring (096 272) 441 for further information. *John Dawes*

## Koi % or ppm — what's the difference?

Reading different books on fish diseases I get confused regarding the various dosages when they refer to ppm and % solutions. Can you help to explain the difference, and are all the treatments you buy of the same strength?

Answering the last point first, no, not all treatments you buy are supplied in the same strength. Malachite Green, for instance, can be obtained in several different strengths, and the dosage for each will be different. It is very important when obtaining a treatment to find out its correct strength and also the correct dosage for its use. If it is unknown, then please do not use it.

% solutions refer to the strength of chemical recommended and, as stated above, if a book gives a particular treatment rate it will apply to a particular strength of chemical. Ppm (parts per million) refers to the amount of a particular chemical or chemical solution that you need to give effective treatment. If a textbook gives only a dosage in ppm and does not refer to any particular % solution, or strength of chemical, then it is using the chemical in a neat form — in terms of "parts" of that chemical per one million parts of water.

ppm means 1 part of the chemical/chemical solution in 1,000,000 parts of another (in our case, in pondwater). The units on both sides must be the same i.e. grams, gallons, millilitres, etc. To work out how much you need is a simple calculation. Say you need a dose rate of 15ppm of a 36% solution (as would be the case with Formalin), then the quantity of solution you would need would be:

$$\begin{aligned} \text{Qty. of solution (in litres)} \\ \text{to be added to pool} = \\ \text{Pond volume (in litres)} \times \\ \text{dose rate (ppm)} \\ \text{divided by } 1,000,000 \end{aligned}$$

If you are dealing with solid crystals of a chemical, then the calculation is similar, but not exactly the same:

$$\begin{aligned} \text{Qty. of chemical (in grams)} \\ \text{to be added to pool} = \\ \text{Pond volume (in litres)} \times \\ \text{dose rate (ppm)} \\ \text{divided by } 1,000 \end{aligned}$$

You may notice that the units are not the same both sides of this equation. This is



LE POUSSIN

because the equation has been adjusted to convert litres into grams. The explanation for this is that 1ml of water weighs 1gm; therefore, 1 litre equals 1000gms.

## Coldwater Native Source

*I would like to obtain some native species such as Chub, Bream, Stone Loach, Barbel, etc. Can you suggest a suitable dealer?*

I have made some enquiries on your behalf to discover who might stock the varieties of native fish which you require but, unfortunately, without any success. What I can suggest is that you contact some of your local angling clubs or aquatic societies who, I am sure, will have members who will be only too delighted to supply you with some of the varieties which otherwise appear to be unavailable from aquatic outlets.

It is very important to keep acquisitions of native species in quarantine for a few weeks as most wild-caught fishes will no doubt be carrying some parasites not always immediately apparent.

## Marine Enough light?

*I have a 48in marine tank with two 42in "GRO-LUX" tubes over it. Please could you tell me whether or not they will be alright, or if I need a mixture of lights?*

On the basis of the extremely sparse information which you have given about your set-up, it is extremely difficult to give you a short, concise answer.

If your aquarium is no more than 9-10 inches in vertical depth, and if it is used to keep

The Barbel (*Barbus barbus*) is a native species that is hardly ever seen in the hobby.

fishes only, i.e. no marine algae and no invertebrates, then the lighting which you have at present is just about adequate — especially if the aquarium is located in a brightly-lit spot in the house.

However, if the tank is a 24in vertically deep one, i.e. say, a 48in x 18in x 24in or (even better) a 48in x 24in x 24in tank, then you need two more tubes ("NORTH-LIGHT") for a fish-only tank, and four more tubes ("NORTHLIGHT") for a mixed fish-invertebrate community.

Alternatively, you could use three 80 watt "Flora-set" spot-lights at 12-inch centres above the tank. This last suggestion would be preferable if you haven't got a non-toxic plastic or plastic-coated hood, but please protect the spot-lamps with well-fitted coverglasses.

## Plants Die-offs

*I set up my tank some time ago and planted it with Amazon Swords, Java Fern, Hygrophila, Vallisneria, Vallis tortifolia, and Water Wisteria. Everything went well for about 11 months and then some of the plants started dying off. The Hygrophila and Water Wisteria suffered most, but the Vallis also died and the Amazon Swords only produced small leaves that never grew. Then Blue-green algae appeared, along with a drop in pH to around 6 and a rise in hardness. Following weekly water changes, the Vallis has started growing again, but the pH and hardness in the tank are still lower and higher (respectively) than in my tapwater. Your comments would be greatly appreciated.*

Most aquatic plants only grow underwater for a few months in every year as levels in any body of freshwater fluctuate wildly depending on the season, rainfall pattern and temperature. This is especially true of the warmer parts of the world. Therefore your *Hygrophila* and *Wisteria*, in particular, would have degenerated naturally over an 11-month period. If you had facilities to grow these plants emersed for a time you could have re-introduced them to your aquarium when they would have flourished once more. However, *Vallisneria* and Amazon Swords will grow submersed almost indefinitely, if the growing conditions are to their liking. But, your water quality deteriorated to a point where growth was no longer possible. The accumulation of toxins such as phenol, nitrate, etc. led to pollution and, accompanied by a drop in pH and an increase of hardness, led to individual plants being affected as certain elements such as iron and manganese became unavailable to the plants. The Blue-green algae infestation occurred because, as conditions became worse for the plants, they became increasingly more favourable to the algae.

However, I am surprised that

your pH remains so low after your water changes when your tapwater is so much higher. A pH of 6 is too low for many plants and is also too low for many fish species. I would suggest that you add a little chalk to your tank to raise the pH to around 6.8-7.0. At this pH, most plants will flourish. In your case, I don't think rainwater would be better than your mains water as this would tend to decrease your pH even more. General and trace-element fertilisers should certainly be of great benefit.

## Lotus growing

*I have just obtained three Lotus seeds (*Nelumbo nucifera*) from a commercial seed supplier. What is the best method of germinating the seeds, and growing them on? Also, at what size and at what time of year should I move the plants to my outside pond?*

1. Sow the seeds in shallow pans of John Innes No 1 and cover with 1in (1cm) of water. The best time for sowing is late March. Lotus seeds need a temperature of 75°F-80°F (24-27°C) to germinate.

2. Grow on in the greenhouse at the same temperature, gradually increasing the depth of water to 2-3in (5-7.5cm).

3. *Nelumbos*, in my experience, will not succeed outdoors in the average British summer. Try some, by all means, but grow the majority of plants permanently under glass. Use round planting baskets, as square ones tend to trap the growing tuber in the corners.

## TANKED UP. *by Neil Baker*



In a bold move that's bound to set the fish world re-thinking its approach to aquatic shows, the Federation of British Aquatic Societies (F.B.A.S.) and Tropical Fish Hobbyist (T.F.H.) joined forces to stage an exhibition that was every bit as "different" as it was successful and enjoyable.

Saturday, 21 May saw the re-emergence of the F.B.A.S. as a major and long-absent force on the fish circuit with the staging of a new-style event in the spacious, famous and refurbished halls of Alexandra Palace. In some years, this represented a home-coming for the F.B.A.S., who used to stage

their annual shows at this same venue before it was demolished by fire some eight years ago.

All the effort, anguish and apprehension that inevitably accompany the organising of such a major event (particularly on its first run) soon dissipated as the public poured in from the word "Go" on Saturday morning.

A great deal of thought had been given to the actual design of the exhibition stands themselves, and it showed. Gone were the open schemes and ad-hoc designs seen elsewhere. Gone too (I am pleased to say) was the bare trestle-table approach which has, on

## S.A.F. entries rise by 50%

Owing, as they say "to circumstances beyond our control", I was, unfortunately, unable to attend this year's Scottish Aquarist Festival held at the Civic Hall in Motherwell on 14-15 May. I am therefore very grateful to Ian McCallum, the S.A.F. Show Secretary, for sending me a brief report on the show, along with the major prize winners.

One of the most pleasing aspects of this year's show was an incredible 50% increase in competition entries, bringing the total to an impressive 560. The Catfish classes A & B did particularly well, with 25 and 24 entries respectively.

Belton Fish Farm, a thriving Yorkshire-based company, continued to extend its influence on the show circuit by sponsoring the Scottish Supreme Championship. The trophy, consisting of an engraved glass

tankard, was awarded to the winning entry, while all the top three winners each received power filters as well.

Rolf C. Hagen (UK) Ltd, a staunch S.A.F. supporter, supplied no less than 15 beginners' set-ups (consisting of tank, hood, heater/stat and internal filter) to be used by any local schools wishing to participate in the Schools Furnished Aquarium competition. After the show, the company followed up this gesture by allowing all the schools concerned to keep the set-ups.

The organisers would like to extend their sincere thanks to both the above sponsors, as well as to all those who continue to support S.A.F. year in, year out. They also extend a cordial invitation to next year's event to the trade and hobbyists up and down the country.

## MAJOR S.A.F. RESULTS

### TABLEAUX:

1. Muirhouse A.S.
2. Grangemouth & D.A.S.
3. Edinburgh Pondkeepers
4. Dunfermline & D.A.S.
5. District Hemlington Showing Society (D.H.S.S.)

TABLEAU WITH HIGHEST POINTS (Aquarist & Pondkeeper Trophy)

BEST TABLEAU: Muirhouse A.S. (TetraMin Trophy)

SOCIETY GAINING HIGHEST POINTS: Dunfermline & D.A.S.

BEST FISH IN SHOW *Dania devario* owned by S. King (D.H.S.S.) (Bobby Wood Trophy)

SCOTTISH SUPREME CHAMPION: (LMB Trophy, Hospitality Trophy & Belton Fish Farm Tankard)

1. *Synodontis nanae* owned by S. King (D.H.S.S.)
2. *Ethiostoma caeruleum* owned by A. James (Dunoon, Argyll)
3. *Synodontis robbiansi* owned by S. King (D.H.S.S.)

# OUT AND with John Fishworld the shape of st

occasion, been seen on the show circuit, and which has tended to present a somewhat down-market public image of the hobby.

In their place was a professional-looking (and professionally designed) shell scheme which gave the stands the up-market touch which is usually reserved for trade shows, but which the hobby events also deserve.

Absolute perfection is unattainable — and I'm sure that the organisers already have a long list of potential improvements for next year's show — but, if this first effort is anything to go by, then we are in for a very rosy future at Alexandra Palace.

I have always admired and praised the dedication, enthusiasm and sheer technical ability of tableau "constructors". Equally, I have often been critical of the way in which these qualities have sometimes been employed. Quite honestly, I see little point in constructing a tableau in the shape of, say, a loaf of bread with holes cut out to accommodate the show aquaria. On the other hand, I am always delighted whenever a society exploits the outstanding creative and practical abilities of its members and channels them into the production of a "meaningful" tableau. We saw



Southend, Leigh & District Aquarist Society's originally conceived and expertly constructed Southend Pier tableau deservedly took the top award. Not even tiny details, such as the beach and shoreline (far right) were overlooked.

## BAF show continues at Man

The Federation of Northern Aquarium Societies (F.N.A.S.) showpiece, the British Aquarists Festival, moved last year, after 35 years at Belle Vue, Manchester, to the north's leading exhibition centre at G-Mex, Manchester. What a gamble the F.N.A.S. took in moving so "up market", but what a success they made of it.

The moving of the Festival was a major breakthrough, with

the new site (which is only minutes away from the centre of Manchester) attracting almost 13,000 visitors.

The Festival is the prestige show of the north. It allows aquarists to see many of the best fish in the country taking part in the "Champion of Champions", and to view or buy the full range of products displayed by many of the country's leading manufac-

# ABOUT

John Dawes

## World '88 — shows to come



The A & P stand proved as popular as ever with visitors to the show.

some excellent examples of ability and "relevance" coming together at Alexandra Palace. I take my hat off, in particular to Southend Leigh & D.A.S. for

their superb and clever Southend Pier tableau which, deservedly, took the top prize.

Although you could buy virtually anything aquatic at Fishworld '88, it must be admitted that live fish were a bit thin on the ground (or should it be, "in the water"?). No doubt this will be looked at in time for next year's event. There were also a few ripples of discontent regarding the presence of one or two exhibitors... but is there ever a show that's absolutely free of this?

It was great to see new ground being broken in many directions, including the first-ever appearance of a major airline (Malaysia Airlines), at a hobbyist show. Their stand was beautiful, with mountains of free orchids, and even greater mountains of delicious, spectacular tropical fruits being dished out to hordes of very willing recipients. Understandably, therefore, the stand was packed with people throughout the weekend. Further "mag-

nets" were 50 or so tanks stocked with large *Geophagus*, Tiger Cats, Discus, Silver Sharks, Clown Loaches, Fancy Goldfish, Golden Giant Gouramis (yes, golden *Ophoronus goramensis!*) and several other species.

What the exhibitors seemed to have overlooked, however, is that there is world of difference between knowing how to ship fish and knowing how to treat them on arrival at their destination. There is also a special skill involved in preparing fish for a public exhibition. Of course, it could be argued, with some justification, that airline staff cannot be expected to know about aquarium-keeping. Fine — but, if this is the case, perhaps such companies should engage the services of some people who do know how to receive, de-bag, acclimatise, and subsequently exhibit, fish in the future. Perhaps they could/should join Ornamental Fish International and learn all the necessary techniques from these

professionals? Alternatively, they could make use of the abundance of expertise available at Alexandra Palace (expertise which, reportedly, was offered on this occasion). The progressive deterioration in the state of their fish as the show wore on was very sad to witness.

For their part, and to their undoubted credit, the organisers did what they could, and managed, to a certain extent, in helping to slow down the decline... but, as we all know, it's extremely difficult to halt a downward slide, let alone reverse it. Food for thought...

Indeed, as is the case with every major show, the post-mortem will highlight a few matters that need careful re-consideration. It will also show that this first attempt was resoundingly successful.

All those involved with Fishworld '88 should feel justifiably proud with the results of their endeavours. Many thousands of visitors attended a show that had a great deal going for



## Invertebrates at London Zoo

For the weeks of 4-10 July and 8-14 August, there are some very special events in the Insect House at London Zoo. It's all part of National Zoo Month, and at London during the "Invertebrate Weeks" you can expect:

- ★ invertebrate handling sessions
- ★ competitions
- ★ mask making and face painting (for children only!)
- ★ and much more.

One very special event on Wednesday, 10 July (7.00-9.30 pm) is the Insect House Open Evening. During the evening there will be opportunities to meet the keepers, take a look behind the scenes, and find out what London Zoo is doing about invertebrate conservation and the captive breeding of endangered species. There will also be a poster display and

illustrated lecture on "Project Hercules", the recent London Zoo expedition to St Helena in search of the Giant Earwig, followed by refreshments in the Meeting Rooms at the Zoo.

Numbers attending the Open Evening have to be limited, so please ring the London Zoo Press Office on 01-722 3333 (Ext. 233/235) for further details.

It... those who missed it will undoubtedly make sure that they don't next year.

The F.B.A.S./T.F.H. team have come up with a show format that is aimed firmly at elevating the image of our hobby, as well as encouraging the uncommitted to take up aquatics. They may also have come up with a blueprint that could well influence the shape of show to come. We await developments with interest.

## MAJOR FISHWORLD '88 RESULTS

- TABLEAUX: 1. Southend, Leigh & D.A.S. — Southend Pier  
2. Hucknall & Bulwell — Nottingham Castle  
3. Strood — Pagoda  
4. Salisbury — Stonehenge

HIGHEST POINTED EXHIBITOR: M. Smith (Romford)

HIGHEST POINTED SOCIETY: Romford

BEST FISH IN SHOW: Common Goldfish (*Carassius auratus*) owned by D. Lathleiff (Romford)

F.B.A.S. CHAMPIONSHIP CLASS: *Corydoras* Catfish owned by Robbie Somers (S.E.L.A.S.)

## Manchester's G-MEX

turers. Whether your interest is in tropical, coldwater or marine fish, or whether you are a novice or expert, you will find help, guidance and encouragement at the British Aquarist Festival.

The new British Aquarist Festival, moulded by the F.N.A.S., is booming. If you have any doubts, come along to G-Mex on 10 or 11 September 1988, and have a great day.

**WATCH OUT FOR NEXT MONTH'S SPECIAL DISCOUNT ADMISSION OFFER, EXCLUSIVELY IN A & P.**

Enquiries to B.A.F. Organiser, A. Chadwick, 9 Bronville Close, Chadderton, Oldham OL1 2RH.

Trade enquiries to A. Darby, 1 Perrin Street, Hyde SK14 1LE.



Due to the kindness of our editor, I was able to get hold of a copy of the report of the cyanide fact-finding mission to the Philippines by the American pet industry.

The report was a joint project of the Pet Industry Joint Advisory Council in Washington and the Professional Association of Pet Industries Inc. in California. It makes interesting and disturbing reading and, in fact, explodes a few misconceptions about the situation which has been rife for a long time, although it also contains much of what we have heard before. Obviously, a single page is nowhere near enough to allow me to go into any great detail, but below is a little background into some of the findings and the major recommendations.

In October 1985, the P.I.J.A.C. board of directors passed a resolution condemning the use of cyanide for the collection of fishes and the idea of a fact-finding mission was proposed so that the problem could be tackled in more detail with the benefit of first-hand knowledge of the extent of cyanide use, the effect of its use on the reef and the role of other mitigating factors, if any. So, after a preliminary trip by the Project Director, George Blasola, in August 1986, the six-man team assembled in Manila in November of that year.

## Main objectives

Their objectives were:—

- 1) Meet with the Philippine Authorities and the Philippine Association of Tropical Fish Exporters.
- 2) Make first-hand observations of the reefs in the primary collecting areas to assess their health.
- 3) To evaluate the use and impact of cyanide on current reef damage.
- 4) To evaluate the current techniques for the holding and transporting of fish.
- 5) To make specific recommendations to the Philippine Government as to what could be done to address the problem.

## Some findings

The group's findings included:  
a) That the Philippine tropical fish business is based on a well-

## P.I.J.A.C. Cyanide Report

established structure. The primary consideration was found to be the distance between the collector and the exporter. If the distance is relatively small, the fishes go straight from collector to exporter in Manila. However, there is a complex pattern of middlemen and agents which get involved as the distances increase. Sometimes the fishes make two air journeys (one to Manila, and one to the U.S.A. or the U.K.) and, at worst, it can take several weeks to get fish from collector to exporter.

b) Cyanide is not the major cause of Philippine reef deterioration. The group could find no hard evidence that cyanide has contributed significantly to reef destruction and this was borne out by discussions with various scientists. The main problems were being caused by siltation or sedimentation due to deforestation, land development and other erosional processes on the land. The report also found a market with food fishermen. It appears certain that the deterioration of Philippine reefs.

c) Cyanide was verified to be easy to obtain and has served as a method of catching aquarium fishes. In recent years it has also found a market within food fishermen. It appears certain that the use of cyanide has contributed to overfishing and one exporter stated that more fish could be collected with cyanide than nets and that it is the only way for collectors to earn enough to survive. Members of the team were told how cyanide is used to collect food fish. A fisherman can go into a lagoon, spread cyanide around and then paddle around picking off the dead fish. Apparently, there are several documented cases of death attributable to eating cyanide-caught fish.

d) Hong Kong is a major source of cyanide supply for the Philippines. Many chemical companies import cyanide into the Philippines for many different industrial uses, so effective control has become difficult.



According to the P.I.J.A.C. report, more reef invertebrates are likely to be destroyed on Philippine coral reefs through siltation produced through land-based deforestation and other erosional processes than by cyanide.

P.I.J.A.C. fact finding report has recently been published and its main findings and recommendations highlighted on this.

Of course, there are other findings in the report, such as the fact that exporters are relatively well equipped, that overfishing for food seems to be a major reason for low fish populations, even that reports of the situation have been biased and distorted. Unfortunately, space is a problem and I have included the main points.

## Recommendations

The recommendations made by the project team are very much the kind of thing that one would expect, and there are no surprises here. For instance, they contain things like the condemnation by the pet industry in the States of all means of illegal fishing, support from the industry, the Philippine efforts to train fishermen in the use of nets, monitoring of fish collection by the authori-

ties (Hawaii is quoted as an example — what better example?) and improvements in holding facilities on board the collecting boats. However, there are three recommendations which I find interesting. One is to urge the Philippine Government to establish marine reserves in the areas which are heavily fished by aquarium fish collectors. As this report says, this has already proved successful in parts of the Philippines but does depend on:

- a) the support of the community;
- b) sufficient funding.

This recommendation is also tied up with another which is to urge the support of research into maximum sustainable yield estimates. The report suggests either observers accompanying collectors to record catches and the time spent fishing (finance would seem to rule this out to me), or to carry out experimental fishing trials on reefs not fished by collectors. The third interesting point which this report raises is that of longevity of certain species in captivity. The report says that the (American) industry should voluntarily develop a list of species which should not be sold for this reason. This is particularly interesting in the light of recent reports that Ornamental Fish International (OFI) is making similar recommendations to its members (see *A & P*, May News, and June — *Seaview*).

Strictly speaking, I feel that the role of this page should be merely to inform. However, I never could resist a little controversy. In my opinion, as exhaustive as the report is (with the amount of dedication to the task being evident), the report contains a lot of information and recommendations which we have seen many times in the past. I cannot help but feel that this report will fare no better than any which have gone before.

I am sorry that I have, again, used a whole page on one topic, but feel that this is warranted by the importance of the issue. *Seaview* will be back to normal next time — including the promised update on the salt-water "kittens".

# News from the societies

## The Water Lily Society 1988 Conference

You may not have heard of the Water Lily Society since it is only in its fourth year. Yet, it has over 600 members from 18 countries and so, is truly international. Although it is run from Maryland in USA its 1988 conference is being held in Harrogate, England this year.

Most leading water lily authorities in this country are in the W.L.S. In addition, many water lily hybridisers and experts from the rest of the world are also members, including Latour Marliac of Bordeaux.

At the four-day conference in Harrogate (starting 3 August) there will be speakers on many aspects of water gardening from many countries. Therefore, if you are a dedicated water gardener this must be your conference.

The W.L.S. has been highly honoured by being trusted with the job of sorting out water lily varieties. (Official International

Registration Authority for varieties of Nymphaeas and Nelumbo). The Secretary of this International Registration Authority is Philip Swindells, Curator of Harlow Car Gardens, Harrogate, and author of many articles for *A. & P.*

Norman Bennett, President of the Water Lily Society, says: "The W.L.S. can be certain of a prestigious position for many years. No other group can hope to equal its depth of knowledge. Latour Marliac started his nursery producing water lilies in 1875, so they should have started sorting out water lily varieties over 100 years ago. Better late than never. Join the W.L.S. and you can help to do pioneer work sorting out water lilies.

If you are a 'nymphaea maniac', I hope to meet you at Harrogate, or some other time."

For details of W.L.S. or its Conference at Harrogate (3-7 August, please write to: European Secretary, W.L.S., c/o Harlow Car Gardens, Harrogate, N. Yorks HG3 1QB.

## Redcar Fishkeepers Society

The R.F.S. was formed on 2 November 1972 and meets every second and fourth Tuesday of every month of the year at the Royal Naval Club, Lord Street, Redcar. Every club night includes a Table Show, with larger Mini-Shows (covering most of the Open Show classes) also being held on a regular basis. Trophies are awarded at these shows, as well as at the end-of-year one. For further information, contact Brian Lacey (Secretary), 32 Sycamore Crescent, Teesville, Middlesbrough, Cleveland, TS6 0BW.

## OBITUARY Kingston and District Aquarist Society mourn their President

It is with regret that I report the sad loss of Harry Towell, aged 84, who passed away on Easter Sunday following a heart attack.

Harry had been a member of K.D.A.S. since 1950 and had held most of the Committee posts, ie Committee Member, Show Secretary and Chairman. Since the early seventies he had been President.

Harry was well known in the hobby for his help and advice to everyone. He had been a Judge for many years, firstly with the old A.S.L.A.S. and then for F.B.A.S. He was a founder member of the British Killifish Association, Chairman of the Characin Study Society and, when South Park Aquatic Study Society was formed 21 years ago, was the first to help and guide them. He also helped the Catfish Association of Great Britain in the same way.

When I joined K.D.A.S. in the early fifties, Harry became my mentor, and most of the knowledge of the hobby that I have today was passed on by him. He will be sadly missed by the hobby and, most of all, by the members of Kingston. Our deepest sympathy goes to his widow and two sons.

Dave Ellis, a long time friend.

# Diary dates

## Redcar Fishkeepers Society

The new date for the R.F.S. 16th Open Show is 3 July. Venue: Redcar Racecourse. Open to the public as from 12.00 noon. Judging: 2.00 p.m. Auction: 1.00 p.m. For further information, contact B. Lacey (Secretary), 32 Sycamore Crescent, Teesville, Middlesbrough, Cleveland TS6 0BW.

## British Koi-Keepers Society (South Eastern Section)

The 1988 Two-day Open Show of the South Eastern Section of the B.K.K.S. will be held on Saturday and Sunday, 2-3 July. In addition to the show fish, there will be numerous handicraft and dealers' stands. Venue: Polhill Garden Centre on the A224 London Road, Badgers Mount, Sevenoaks, Kent. Further details from Doug Holder (Show Chairman), 20 Salisbury Road, Bromley, Kent, or from Ray Tucker, Tel: 01-302 1179.

## Southend, Leigh & District

## Aquarist Society

This year's S.L.A.D.A.S. show will be held on 16 July at St. Clements Hall, Leigh on Sea. Open to the public as from 3.00 p.m. (after judging). Further information from Chris Cheswright, 2 Cedar Avenue, Wickford, Essex SS12 9DT.

## Port Talbot & District

**Aquarist Society**  
The 18th Open Show will be held at the Talbach Youth Centre, Port Talbot, West Glamorgan, on Sunday, 17 July. Further details from John Egan, 53 Pentre Afan, Baglan Moors, Port Talbot, West Glam. SA12 7RN.

## Billingham Aquarist Society

The 1988 Open Show and Auction will take place on Sunday, 24 July at the Billingham Community Centre, The Causeway, Billingham, Cleveland. Booking in: 11.00 a.m. A further Auction will be held on Sunday, 27 November — Booking in:

11.00 a.m. - 12.00 noon. Further details from G. R. McGregor (Show Secretary), 59 Cleadon Avenue, Billingham, Cleveland TS23 3SL.

## Bridgewater Aquarist Society

The 1988 B.A.S. Open Show will be held at Bessley Community Centre, Greenleach Lane, Worsley, Manchester, on Sunday, 24 July. Benching: 11.30 a.m.-1.00 p.m. Further details from Martin Hole (Show Secretary), 21 Wichbrook Road, Little Hulton, Worsley, Manchester M28 6JL.

## Sandgrounders Aquatic Society

The 18th S.A.S. Open Show and Grand Auction will be staged at Meols Cop High School, Meols Cop Road, Southport, on Sunday, 31 July. Benching: 11.00 a.m. - 1.15 p.m. Open to the public: 1.30 p.m. Auction: 1.30 p.m. (F.N.A.S. rules apply). Schedules and further information on receipt of 10 x 7in s.a.e.

from B. Baldwin, 10 Olive Grove, Southport, Tel: (0704) 43384.

## British Killifish Association

**3 July 1988:** Norfolk Group killifish auction & show, at Carter-on-Sea; for details please contact Dave Soolworthy, Tel: (0493) 720919.

**10 July 1988:** Wessex Group killifish auction & show, at Bournemouth; for details please contact Peter Watkins, Tel: (0202) 27142.

**24 July 1988:** N.E. Yorks Group killifish auction & show, at Wigginton; for details please contact Peter Riley, Tel: (0642) 556437.

**9/10/11 September 1988:** British Killifish Association annual Convention at Bristol Polytechnic. For details please contact Steve Davidson BKA Publicity Officer, Tel: (0272) 609021.

**16 October 1988:** Southern Groups killifish meeting and show at Weybridge; for details please contact Dick Aylott, Tel: (0952) 842923.



DR HUGH DAWSON

A reserve showing extensive *Crassula* growth after being first invaded by the plant only four years previously.



DR HUGH DAWSON

Flowering shoot of Swamp Stone Crop.

# THE SWAMP STONE CROP THREAT

Plants and animals living in some freshwater ponds could be in grave danger of being killed off by a smothering Australian water weed. The threat has prompted an expert to call for its sale to be banned from garden centres.

Journalist and local hospital radio broadcaster **Lindsay Complin** reports.

**C***rasssula Helmsii*, more commonly known as Swamp Stone Crop, establishes itself in a pond and then grows a dense mass, which kills off all but the largest and most established plants and provides an unpleasant environment for fish to live in. In the New Forest it has invaded nine of the 190-240 ponds and lakes and five rare species of pond plant — including Hampshire Purslane and Slender Marsh Bedstraw, which are restricted to New Forest ponds — are near to extinction because of the overpowering effect of the weed.

The Swamp Stone Crop was originally brought over from Australia and New Zealand as a garden pond oxygenating plant. Unfortunately, its vigorous growth was not contained to garden ponds and it can now be found in aquatic environments from lakes to temporary pools throughout Britain, particularly the south east, although it is not so widespread in Scotland and Wales.

#### Current situation

Each small fragment of the plant can grow into a new specimen which makes it very easy for it to spread from pond to pond, and extremely difficult to keep under control and eliminate. Dr. Hugh Dawson, aquatic botanist from the Freshwater Biological Association at Wareham, explained that, over the last twenty years, the number of sites affected by the weed has risen from five to over 100. Ten of these sites are nature reserves including the New Forest, Ynylas in Borth, Wales, Seawall Grounds in Northamptonshire and Ainsdales in Lancashire. It has also been discovered in Bude and Goonhilly Down in Cornwall, Swindon, on the Isle of Wight, Epsom Common, Surrey, Bletchley in Bucks, Highsett in Cambridge, Grantham in Lincolnshire, Chester in Cheshire, and near Rochdale in Lancashire.

#### Control measures

The Nature Conservancy Council have tried rolling the weed up like a carpet but it is very brittle and, as the small pieces which break off can form new plants, this method has only been successful in small areas.

As light is needed for good growth and the plants become sparse generally in areas



Map showing the distribution of *Crassula helmsii* in 1986 at natural and semi-natural sites. Open circles indicate that the species, previously reported at these sites, is no longer present. (Map reproduced by kind courtesy of Elsevier Applied Science Publisher Ltd).

shaded by overhanging trees or bushes, dark coverings can be laid on top of the water to starve the weed of sunlight. This will kill it off within about two months but is impractical for use on areas measuring over 400 square metres.

The Wessex Water Authority have tried feeding the plant to Grass Carp, widely used to control water weed, but unfortunately, the fish are not that keen on eating it.

An effective herbicide compound has already been discovered and, although it can be used effectively for private or commercial control, alternative methods are being sought to prevent chemicals and their side effects being introduced to ponds in the nature reserves. However, considering the rapid rate of growth of *C. Helmsii* and the almost complete suppression of other plants, it could be argued that control by any suitable method is advised.

It has been recommended that a control programme should begin with the intensive

removal of the plants, followed by either herbicidal treatment, shading, or continued, organised and regular removal of the plant to ensure its growth is prevented. An alternative may be high-density re-planting of a desired species of plant in order to suppress the growth of the remaining fragments of the weed. This could follow the treatment with herbicide.

If any rare plants would be endangered by introducing a herbicide, then they should first be removed and then re-planted at a later date.

### The future

Dr Dawson explained that the bright green plant has a far wider range of habitats than most water plants because its requirements are less demanding. It can grow on damp mud in seasonal ponds which dry out, although a pond in Upwey, Dorset, was drained over winter to expose the plant to



Top. A "seasonal" part of the New Forest "swamped out" by *Crassula helmsii*. Above, the tiniest fragments are capable of generating new growth.

the cold. This severely reduced its growth after refilling the pond in the spring.

Although, at present, it is only confined to static waters, experimental results show that it can grow in moderately fast flowing waters, stated Dr Dawson, adding that £100 million was spent nationally last year in clearing unwanted weeds from ponds and waterways, but that figure could rise dramatically should the Swamp Stone Crop get a hold.

"We hope to have done some work this year or next year to find the best controlling technique," said Dr Dawson. However, the Association's research may be hindered by threatened financial cuts of £40,000. As a result, 30% of experienced staff may face redundancy and work into investigating weed control may not continue.

### Control is top priority

"It is still being sold in garden centres, but could do with being banned," he concluded, but added that the problem of most concern now was its control. "It is only a small problem at the moment, but it could grow into a much larger one in the future as the sites affected by this weed are doubling every four years."

Mr Andy Byfield of the New Forest branch of the Nature Conservancy Council stated: "In the New Forest it appears in a new pond every few months. We want to try and nip it in the bud and try to stop it, otherwise we will have an epidemic on our hands that is out of control."

# THE FLORIDA

John Dawes concludes his mouth-watering trip to the Sunshine State.



JOHN DAWES



JOHN DAWES



JOHN DAWES



ANDY JACKSON

Top left, is it a smile — a yawn — or a threat? I didn't get close enough to ask!

Top right, *Pistia* and *Salvinia* in the wild are among the many delights on offer at Myakka.

Right, Manatees are large and gentle creatures which seem to get on extremely well with humans.

Above left, even a hastily assembled (and very exposed) tank cannot fail to show the exquisite beauty of 5-D Tropical's newest creation.

Above right, when *Glossolepis wanamensis* bursts on to the scene anytime now, Ekkwill will have made yet another important contribution to the aquarium world.



JOHN DAWES

# EXPERIENCE

Part 2

**A**s the gigantic jaws slowly and menacingly gaped open — almost like a pair of tiger-toothed callipers being soundlessly prised apart in slow motion by some invisible, but powerful, biological lever — I could see right down to the alligator's throat. I was transfixed. I had never been that close to a twelve-foot, power-packed denizen of the Florida swamps. What an awe-inspiring, magnificent creature it was. I slowly raised my camera, held my breath, and fired.

For its part, the alligator had seen it all before — hundreds of times every day, in fact. Well, you do, don't you, when you live in a pool inside a nature reserve and bitter experience has taught you that you are separated from the hordes of "live food" that stare invitingly straight at you by an insurmountable barrier.

Homosassa Springs may not quite present you with a view of Florida's wildlife "in the raw", but it does allow you to get as close as it is humanly possible to do in safety... well, relative safety (the ever-hungry and audacious Pelicans come pretty close to representing a "health hazard" — almost as unnerving as the world-famous Rock Apes of Gibraltar with their decidedly mischievous love of cameras and the contents of tourists' pockets and bags).

We've regularly heard of Seaworld, Epcot, Disney World and the like — all worthy of their fame and all deserving of a visit. Yet, we hardly ever hear of some of Florida's other offerings — and there are many — which provide superb insights into the State's fascinating wildlife.

## Homosassa Springs

Homosassa Springs is just one of these jewels, situated 75 miles north of Tampa. In addition to the alligators, there are numerous other delights in store. To me, the highlight of my visit was the underwater observatory from which the park's resident captive population of Manatees could be observed at close quarters sleeping, feeding and generally doing all the things Manatees do... which isn't a lot (but they do it beautifully).

Earlier that day, my friend and guide, Rick Gibson, and I had hired a small single-engine plane and had gone searching for Manatees over the Crystal River north of Homosassa. We had seen some adults from the air but they were so far from the nearest boating station that lack of time put an end to our plans of diving with them. Shortly after my return, I learned from Rick that he had managed to find a herd within easy reach and had spent three hours

underwater with them. As I look down while I write this, I can see my hand going green with envy — the rest of my body will soon follow! Still, never mind... perhaps next time.

## Myakka

While Homosassa provides close-ups of wildlife in captivity (though the term gives totally the wrong impression, bearing in mind the more than ample "accommodation"), Myakka River State Park, situated southeast of Sarasota, makes you work for your view of its animals.

It was therefore considerably more difficult to find the alligators, which, like all the other Myakka "residents", run free and are truly wild. We did, however, find them. This time, my "partner in crime" was another good friend, Ross Socoloff, who, while having seen more alligators than I've had hot dinners, was as excited as I was at the sight of a truly massive specimen measuring over 12 feet in length.

Our only disappointment was that we were separated from this majestic alligator, plus five others we could see, by about 60-80 feet of open water. If only we had been able to get closer... Again, perhaps next time...

A trip to Myakka is something that, in my opinion, every visitor to Florida should make a special effort to experience because, although you need to go after the wildlife (both plant and animal), the task isn't arduous and the rewards are unbelievable. Armadillos, alligators, wildfowl, Pickerel Weed, (*Pontederia*), wild irises, bromeliads (air plants), Water Lettuce (*Pistia*), *Salvinia*, Sailfin Mollies, (*Poecilia latipinna*), Mosquito Fish (*Gambusia affinis holbrooki*) — including melanic individuals, and many other animals and plants, are all there to be spotted and enjoyed in their natural habitat — while the problems created by Water Hyacinth (*Eichhornia crassipes*), which is not indigenous to the area, can really be appreciated at first hand. The extensive mats of this plant strike a powerful cautionary note in much stronger "language" than any article or spoken statement can ever hope to do... and if we choose to ignore its implications we do so at our peril.

## Promises of Things to Come

I had gone to Florida to judge at the 10th Professional Show staged by the Florida Tropical Fish Farms Association (see **The Florida Experience — Part 1**, in the June issue of *A & P*). Homosassa and Myakka were therefore two, very unexpect-

ed, but very huge, bonuses.

Two other unexpected bonuses arose from visits I made to two of the giants of the Florida fish farm industry: S-D Tropical, Inc., and Ekkwill Tropical Fish Farm.

Between them, these two huge enterprises take the lion's share of the trophies awarded at the show each year. Yet, like all thriving, pioneering undertakings, they never rest on their laurels. There's always something new and exciting going on.

I can't, obviously, go through every new development in detail. However, one project from each company will serve to demonstrate what I mean.

At S-D Tropical, Inc., work is going on to develop a golden strain of the Pearl Gourami (*Trichogaster leeri*). So far, the colour has been fixed in a few adults and research is going on apace to obtain the same effect in the offspring. The fish I saw while I was there were staggeringly beautiful and there's no doubt that, once the problem is finally cracked (assuming that it is solved), aquarists all over the world are going to fall over themselves to obtain these magnificent fish.

At Ekkwill, several species that were seen for the first time (as a few wild-caught specimens) only a couple of years ago, have been subjected to intensive research in order to establish successful captive breeding techniques. These have now been developed and the fish in question are being bred in their thousands. Once these are released into the trade, the orders will undoubtedly flood in. Just take a look at the photograph of *Glossogobius aureus* accompanying this article and you'll see what I mean.

As I mentioned in Part 1, there are about 300 fish farms in Florida. Not all of them are, of course, involved in research in the way S-D and Ekkwill are, but many of them regularly come up with their own unique specialities — and all, sooner or later, end up at the F.T.F.F.A. show for us to admire and for members of the aquatic trade to consider adding to their shopping list.

Florida boasts of producing the best farm-bred fish in the world. Most of those who attend the annual show in Tampa would tend to agree with this. Now that I have seen some of the "goodies" that lie in store, awaiting next year's event, I feel that, if anything, they will help to strengthen the claim even further.

Here's to the 1989 F.T.F.F.A. show — even if it proves to be "only" as successful as this year's, there can be fewer treats tastier than this one awaiting fish fanatics such as me.

# KOI POOL ON A BUDGET

A Koi pool doesn't have to be a 9,000 gallon affair with a highly complex filter system and £1,000 jumbo Koi swimming in it. Photographer **Andrew Tovey** shows that it need not cost a fortune either, especially if you're handy with a trowel and spirit level. (Photographs by the author — see text for full details).

In February 1987 I started work on a 2,000 gallon formal pond, which was completed and stocked with a few fish by the middle of May that year. Here are the details of how I tackled the job in the hope this may inspire you to build your own Koi pool.

Preparation is nine tenths of any job, so I carefully first drew a plan of the intended pond (Fig. 1). The pond would be situated in the slabbed patio area at the left side of our garden, which served little other purpose as it stood. (Fig. 2). Dimensions would be approximately 12ft x 8ft x 4ft deep, so, with designs complete, and winter's worst behind me, I made a start.

The first job was to take up the required number of slabs and put them to one side. At a later date they would be cut in half and used as coping stones around the top of the pond. Next came the task of digging down to a depth of 2ft., followed by digging a 6 inch deep trench all the way around for the concrete footings (Fig. 3).

I hired a mixer for the week, which saved a lot of time and effort when concrete was needed. Once the footings had cured I made a start on the blockwork. Five courses of ordinary concrete blocks gave me the 2ft height above ground level I required. (Fig. 4).

Once the blockwork was finished I dug an 18 inch slope down to the centre of the pond, where the bottom drain would be sited. This done, I dug two trenches, one from the bottom drain to the discharge chamber, and one from the discharge cham-

ber to the sewer, which was conveniently sited just outside the pond wall (lucky me!).

Next came the first of two visits to "In-Filtration", to purchase high-pressure pipe, three elbows, one bottom drain and special adhesive. Other items, such as filter feed, filter plate standpipe and venturi, I made myself (more details further on), which is just as well, as the pipework and fittings cost £150.

Once back on the site I installed the pipework which was bedded in concrete and covered with tamped down soil (Fig. 5). Next I perfected the shape of the slope to the drain, tamped it down well and laid 1 inch of concrete over it all for strength (Fig. 6).

As can be seen in the pictures, I built a shelf in one corner of the pond, which would hold one large plant pot, containing some reeds and one large lily.

Next, a hole was made in the wall between pond and filter chamber, about two-thirds of the way down, and a piece of 4-inch pressure pipe was cemented in to create a filter feed. A drain cover was then cemented over the hole to act as a grill to prevent fish swimming into the filter chamber. Also, a piece of 1½ inch waste pipe was cemented into a hole between the pond and discharge chamber, at water level, to act as an overflow.

Things were going well and the pond was ready to be lined. Having a friend in the Kit car business made direct fibreglassing the

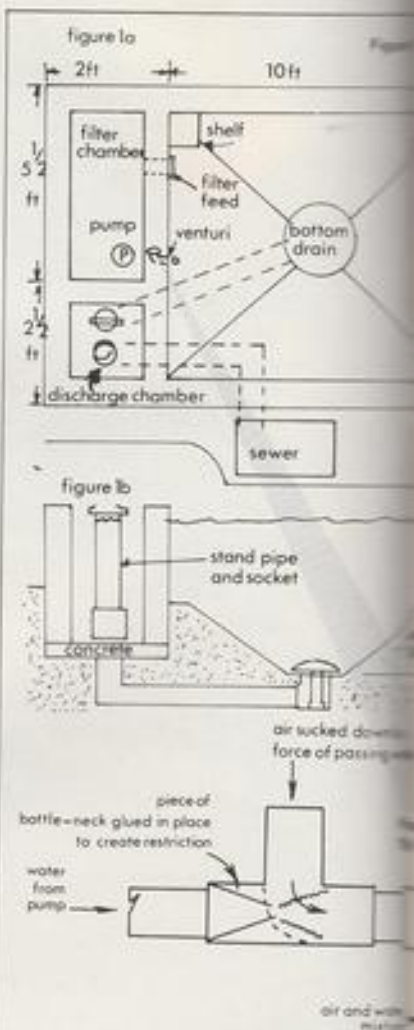


Figure 2



Figure 3

