

FEBRUARY 1989

AQUARIST

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AND PONDKEEPER

40-PAGE SUPPLEMENT

COLOURFUL TROPICALS



KOI AND BONSAI

DRAWING ROOM DRAGONS

BRITISH SEA ANEMONES

FISH CONSERVATION

AQUARIST AND PONDKEEPER

FEBRUARY 1989
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COVER STORY

(Photograph:

J-M Labat/Ardea, London)
The Lemonpeel Angelfish
(*Centropyge flavissimus*) is
one of the more peaceful
members of the family Pomacanthidae. Older books refer
to this spectacular fish as *Holacanthus flavissimus* and this
has led to a certain amount of
confusion among marine
aquarists. Juvenile Lemon-
peels, in keeping with other
Angels, show different color-
ation to the adults, although
in this case, the differences
are nowhere near as dramatic
as in other species. Both
adults and young are pre-
dominantly brilliant yellow,
but small specimens also
exhibit a roundish blue eye-
spot in the centre of the body.
Although the diet should be
predominantly flesh-based,
some algal content is also
recommended for this small
(4in-10cm) fish, along with a
temperature around 27-28°C
(80-82°F).

GUEST EDITORIAL

Dr Chris Andrews, well-known regular contributor to A & P and other publications in the UK and abroad, is an Assistant Curator at London Zoo in charge of the Aquarium and Insect House. Following a BSc Hons degree in Applied Zoology (Leeds) and a PhD in fish diseases (Liverpool), Chris spent eight years as a fisheries scientist for Yorkshire Water. He was also a consultant for Tetra fish foods until his appointment as Assistant Curator in December 1985.



Which Fish Should We Keep?

Many aquarists first enter the hobby by keeping goldfish (a cultivated variety of a wild species) or by setting up a community tank of some hardy tropical fish (many of which are now bred for the ornamental fish trade on fish farms in Florida or the Far East).

Some hobbyists never progress beyond goldfish keeping or their community tank, finding each fascinating in its own way, while others begin to sample the delights of more unusual or delicate fish, perhaps specialising in collections of livebearers or killifish or cichlids. Then, of course, there are the many facets of marine aquarium keeping. With this huge diversity of potential aquarium inmates, is it not time to re-examine the suitability of some species for the home aquarium?

Some species are unsuitable because they are considered to be endangered in the wild and, perhaps, protected by legislation such as the Convention on International Trade in Endangered Species (or "CITES" for short). The Asian Dragon Fish (*Scleropages formosus*) is one such commercially valuable species that is currently protected by CITES, although as and when this species is bred in sufficient numbers in captivity, or when further information becomes available on its status in the wild, it may be more readily available in the aquarium trade. (See *The Dragon Fish Experience* by editor John Dawes in Jan A&P).

Other species are unsuitable for the hobby as a result of the extreme difficulty experienced in keeping them alive in captivity. Certain species of butterfly fish obviously come within this category and the excellent initiative taken by the Ornamental Fish International organisation in effectively banning its members trading in *Chaetodon trifasciatus* is to be welcomed. Similar bans may follow, although such decisions must be made on a rational basis, and not as a result of ill-informed animal welfare or conservation scare-mongering.

Some fish which are imported as very young juveniles which then grow rapidly and assume huge proportions (even in the home aquarium) may also be unsuitable for the amateur hobbyist. The Giant Gourami (*Ophronemus goramy*), various species of *Colossoma* (Pacus) and several species of South American catfish probably all come within this category. Fortunately, none of these fish are thought to be threatened at the moment, but certain species which form an important food source for the local natives are taken from the wild for eventual sale into the aquatic trade. Subsequently, it becomes an animal welfare issue as ill-equipped hobbyists struggle to maintain gargantuan fish in undersized facilities.

Whose fault is it? Clearly the hobbyist must find out as much as he or she can before buying a fish, and retailers must impress upon their customers the potential problems of certain kinds of fish. Similarly perhaps, the trade, from exporter through to retailer, need to ask themselves, "Are we satisfying a demand or creating one?"

The actual number of fish involved in this aspect of the aquatic trade may be relatively small, but does it represent an unacceptable, even irresponsible, face of fishkeeping?

I, for one, do not want to see the range of fish species available to hobbyists reduced unnecessarily, but there are some species that should not be kept at all.

Dr C. Andrews

CONTENTS

PLANT RULES OK?

Plant your tank "a la Amanda Grimes" and your fish will thank you for it. **5**

A TALE OF TWO HOBBIES

Nigel Caddock visits a keen hobbyist who has found the perfect combination between Koi-keeping and that other truly oriental art, Bonsai. **14**

ASIAN SPINY EELS (Part 1)

The twists and turns of the spiny eel world are untangled by Dave Curran. **15**

SPOTLIGHT

THE SPOTTED HEADSTANDER

Dr David Pool of the Tetra Information Centre focusses his attention on this charming, peaceful and hard-to-breed "eccentric". **18**

FAVOURITE TROPICALS

SUPPLEMENT FAVOURITE EGGLAYERS

The list of "Top Ten Tropicals" includes no less than seven egg-layers. Each receives special attention from Dr David Ford, Head of the "Aquarist" Advisory Service. **35**

BOTTOM FAVOURITES

"Life at the bottom" is every bit as varied and exciting as "life at the top", as David Sands proves in emphatic fashion. **39**

FAVOURITE AQUATIC PLANTS

Six species (and their varieties) of tropical aquatic plants regularly top the popularity stakes. Barry James of Everglades Aquatic Nurseries, examines each in turn and gives some expert tips on their cultivation. **51**

FAVOURITE LIVEBEARERS

Dick Mills looks at the most popular livebearing species and varieties which continue to enthral beginners and veterans alike. **57**

DRAWING ROOM DRAGONS

Bring a touch of pre-history to your life by keeping lizards... with a little help from Dr Gareth Evans. **74**

CONSERVING FISH SPECIES FOR TOMORROW'S HOBBYISTS

In the first of three articles on this topic, Dr Chris Andrews of London Zoo Aquarium takes a look at the awesome size of the problem facing fish conservationists. **77**

SEA ANEMONES OF THE BRITISH SHORE (Part II)

Some of the lesser-known anemones and their main predator are reviewed by Andy Horton. **79**

STAR SPOT

Starfish are quite remarkable creations. Peter Elphick reveals just how special they are. **82**

REGULARS

News 7, Books 9, Seaview 12, Naturalist's Notebook 20, Herpetology Matters 21, Koi Talk 23, Your Questions Answered 24, Letters 26, Out and About 67, Coldwater Jottings 69, Product Round-Up 70, News from the Societies 72, Next Month 23, Diary Dates 72, Cartoons: Fred the Piranha 12, Jinks 77.



PLANT RULES OK?

When it comes to planting an aquarium Amanda Grimes believes that you can't beat "planned informality".

At this time of year, when most of my beloved garden is sleeping, I can more fully appreciate my aquatic gardens. For me, the pleasure of landscaping a tank is only superceded by breeding fish — and is accompanied by the same hit and miss approach.

After my hectic years in Fleet Street, I spent about ten years of comparative peace and solitude as a professional gardener — years in which I learnt that rules are made to be broken. One of the first rules was the mistaken idea that a garden is an island of peace. It is not. Working in London, or any large town, it soon becomes apparent that a garden is usually surrounded by other people's "bright ideas" — anything from blocks of flats to invasive Russian Vine. Your first job is to create the illusion of seclusion.

In an aquarium, this can be done by either painting the back and sides of a tank, fixing to these surfaces plant friezes or, in my case, attaching dark-coloured paper to them. I use dark green crepe paper, backed up by thin polystyrene sheeting, which is a useful insulator. This not only gives an excellent backdrop to your tank furnishings and fish but the dark colour helps the fish to feel more private — or so I like to think! It also, of course, dispenses with the unsightly "behind-the-scenes" view of wires.

Having established your "island", you must now decide what kind of landscape it will have. This is the fun part . . .

When my sister set up her first tank, her landscape was reminiscent of South Cornwall, soft, gentle and kind to the eye. My first tank looked like a rain forest. She had

pink, white and grey rocks, delicate plants and delicate fish. I piled in the bogwood, black and brown rocks, coconut shells and large-leaved plant. My fish disappeared into the jungle.

My point is that both tanks worked well. You can — I do — have one of each . . . and many variations in between. It is purely a case of bearing in mind traditional recommendations while feeling free to try alternatives.

One of my best "broken" rules is the location of large Amazon Sword plants. If you like the Trooping of the Colour, or regimented borders, you'll agree that tall plants like this should be kept to the back of aquaria. I personally hate symmetry and love Nature, so it will come as no surprise that I always plant Amazons at the front of my tanks, slightly off-centre. It is a voyeuristic approach — I enjoy "spying" on my fish through the leaf-stems . . .

In "terrestrial" gardening, I have found that groups of the same plant — while cutting down variety — give a more satisfying and natural look. My aquatic landscapes are the same; some tanks have only two species of plant in them. As I am constantly reading *AGP* letters from aquarists who have difficulty with plants, this should be consoling advice!

Of course, landscaping must involve compromise. What pleases the eye does not necessarily please the fish. But even this can be turned to your advantage. I have effectively split a four-foot tank into two by placing large rocks slightly off-centre and planting groups of Twisted Vallis at their bases. This has created two "territories" — enabling me to keep two pairs of cichlids in

the same tank without the fighting.

True to tradition, I bank gravel towards the back of large tanks. Over the years I have noticed the headache that this gives rise to — the fish reshaping this slope into a flat surface! But experience has taught me a few tricks that not only overcome this but add to the landscape interest. I build bridges of flat rock — the kind you see in Japanese prints — and plant in front of them to emphasise the difference in level. I also lay large flat rocks up the length of this slope to prevent erosion. These rocks can be easily transformed into quiet, secluded avenues by planting groups of Twisted Vallis up either side. Notice I said "groups" — not a row. Rows of plants, I find, look artificial and arranged . . .

This feature, as you will have noticed, is not an exploration of species of plants but rather an exploration of imagination. A garden should be an adventure, a journey from one area to another, each section holding fresh surprises and mysteries. My garden is designed in such a way that the whole is never seen. In applying this to your aquaria, it is the fish that become the mysteries, the surprises. When friends glance into my tanks, they often comment on how few fish I have. It is gratifying when, at the end of the evening, you can look back and realise how often they have interrupted themselves with cries of: "Oh, look at that fish! Where did it come from?"

I recently sat an exam. We were all given a sheet of advice to cut down on exam nerves. At the bottom, the university had included a last recommendation that I will leave you with: "In spite of the above, do what suits you best" . . .

News

Hagen's big move

Monday, 12 December, 1988, was a red letter day in the, as yet, relatively short life of Rolf C Hagen (UK) Ltd.

It marked the move, after less than six years, from the company's original and (to quote the company's chairman) "very limited, uncomfortable quarters on Kirstall" to spacious brand new premises that offer, in addition to state-of-the-art accommodation, ample scope for further expansion which is expected within the next two years.

The opening ceremony was marked by the presence of the company Chairman, Rolf Hagen and his wife Marianne. Referring to Hagen (UK) as the parent company's "young



Left to right: Mr Rolf Hagen (Chairman), Mrs Marianne Hagen (chairman's wife), Mr Andrew Bartyla (Managing

Director of Hagen UK). In the background the staff of Hagen UK.

daughter," the Chairman commented that the tremendous success generated by the efforts of Managing Director Andrew Bartyla and his enthusiastic staff "made it an easy decision and almost a foregone conclusion to put up this home for Hagen (UK)."

The new, and bigger, premises have also resulted in the employment of 15 additional staff (all the "old" staff having moved over to the new location).

For further information, contact Rolf C Hagen (UK) Ltd, California Drive, Whitwood Industrial Estate, Castleford, W. Yorkshire, WF10 5QH. Tel: (0977) 556622; Telex 557972 Hagen; Fax (0977) 513465.

One-day Fisheries management conference

Over the last ten years importations of ornamental fish to the UK have increased enormously, so that today licences are issued for the import of tens of millions of fish annually. Over the same period of time both fish farming and the commercial value of recreational fisheries have also grown rapidly, as has the awareness of the problems posed by fish diseases. For instance, there is the potential risk associated with transfers of fish of introducing "new" diseases to wild and cultured stocks with, possibly, devastating results.

Readers of *Aquarist and Pondkeeper* will have read in the August and November '88 issues of fears generated by the recent SVC outbreak. There are also other potential dangers such as that fish imported as coldwater ornamentals might survive in our freshwaters and harm native fish by predation, competition or habitat destruction.

Whether the present practice of importation minimises these risks, what they are and whether they are overstated are the subjects of a one-day meet-

ing to be held on 13 April 1989 at the University of Reading. Speakers have been invited from all sections of the community interested in pet fish, fish farming, fisheries, conservation and fish diseases. There will also be an opportunity for everyone attending to put their point of view in an open debate towards the end of the day.

For further information write to: Jerry Domaniewski, Department of Agriculture, University of Reading, Earley Gate, Reading RG6 2AT.

Fishworld '89 is on as planned

The Federation of British Aquatic Societies is pleased to confirm that FISHWORLD '89 will proceed as planned in the Great Hall of Alexandra Palace under new sponsorship (27-29 May, 1989).

The FBAS report that initial response from exhibitors around the world should ensure that the event will be by far the largest and most prestigious aquatic event ever to take place in the UK.

Floor plans and exhibitors'

manuals were available during the first week of January 1989 for despatch as a matter of priority to Fishworld '88 exhibitors and the companies who had requested them.

Any further enquiries relating to FISHWORLD '89 should now be addressed to: Fishworld 89, Fishworld Exhibitions Ltd., Cliveden House, Priors Way, Maidenhead, Berks SL6 2HP. Tel: 0628-38912/770500. Telex: 848794. Fax: 0628 29942.

Somerset invests in the future

West Somerset's tourist industry is spending hundreds of thousands of pounds on new projects to meet the challenges of the 1990's.

One which will appeal to all aquarists and pondkeepers, will open in May. At Washford Cross, between Minehead and Watchet, a redundant building which is part of a BBC Transmitting Station is being converted into a Tropical House and Aquarium called "Tropiquaria."

The key to the viability of this project is the supply of free heat given off by the BBC's transformers in a neighbouring building; piped through into the Tropical House, it can maintain the temperature at a constant 85°F. Visitors will experience walking through a jungle with waterfalls, tropical trees and plants, spiders, snakes and appropriate sound effects. Underneath, in a system of subterranean tunnels, will be an aquarium of local marine life.

"Tropiquaria" is the brainchild of local businessman Stephen Smith (Not "our" Stephen Smith! Ed) who says that the project is costing £200,000. He is particularly keen on attracting school visits, as "Tropiquaria" will be educational as well as entertaining.

For further information, contact Tim King, Tourism Officer for Somerset, on (0984) 32291. Ext 243.



Books

Know Your Pet: Aquarium Fish

By: Joan Palmer
Published by: **Wayland (Publishers) Ltd.**
ISBN: 1-85210-433-3
Price: £6.95

Having spent a significant part of my working life with children, first as a schoolteacher (9 years) and, later, as a teacher trainer in a university education department (8 years), and having carried out a programme of research into the educational uses of aquatic organisms, I have long felt that children generally receive a raw deal when it comes to pet books that are written specifically for them.

I therefore welcome any book, such as **Know Your Pet: Aquarium Fish**, which makes a genuine attempt at rectifying the situation.

Aquarium Fish is colourful and (very importantly) not over-long. The language used is, generally, easy to follow, and most of it should be well within the capabilities of many children. The publishers do not, however, identify a clear target age group, other than "young children", so (presumably) decisions regarding the suitability of the text must be left to the individuals themselves... or their parents. If by "young children" the publishers mean, say, those up to 10-11 years of age, then terms such as "emarginate" and "crescentic" may well be a bit too ambitious — particularly since they are not included in the otherwise very sensible Glossary on page 44.

Much of the advice is sound and easy to follow and could well set a young fishkeeper on the right road. However, if less space had been dedicated to **Fish and Their Origins**, **The Sign of the Fishes**, **The Chinese and Their Goldfish** (surely 1655 is at least several hundred years out regarding the timing of the earliest report of keeping goldfish in ponds!), **Seahorses**, **Anemones**, **Corals**, **Sponges**, etc., then there would have been more room for more detailed advice on freshwater aquaria (both coldwater and tropical).

The author, after all, suggests that marine aquaria "may be something to look forward to when you have become an expert with freshwater fish". Yet, she then goes on to dedicate six pages to marines... When the total number of text pages, including the **Glossary**, **Further Reading**, **Useful Addresses**, the topics mentioned above, plus all the freshwater aquarium advice sections, is only 37, then space is at a premium and, in this case, could have perhaps been allocated more thoughtfully.

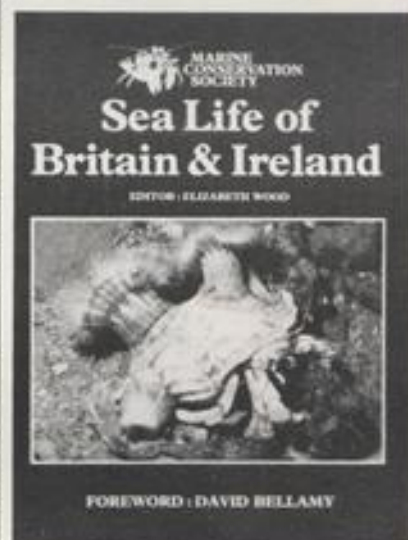
Further, one or two aspects of fish anatomy should have been checked out more thoroughly. For instance, the use of the term "ventral" when referring to the anal fin, is confusing. "Ventral" is sometimes used

often in American literature, to refer to the pelvic fins. In fact, the pelvics — either by this or any other label — are not mentioned at all!

In addition, the choice of a cover photograph showing three tropical marine fish for a book whose main focus is freshwater seems somewhat inappropriate.

In summary (and despite the above-mentioned reservations, plus some others), I am pleased that Wayland (Publishers) Ltd., have made a serious attempt to cater for young aquarists. However, had they done their homework more thoroughly, the resulting book would have been, in my opinion, much better all round. Even as it stands, though, **Aquarium Fish** has quite a bit to offer, and could well be seen as a generally adequate introduction to the hobby of aquarium fishkeeping for many aspiring aquarists.

John Dawes



Sea Life of Britain and Ireland

By: Marine Conservation Society
Edited by: Elizabeth Wood
Published by: **Immel Publishing Ltd.**
ISBN: 0-907151-33-7
Price: £14.95

In April '88, I reviewed the Marine Conservation Society's **Guide to Inshore Marine Life** by David Erwin and Bernard Picton. I said at the time that, in my opinion, the guide "should... be regarded as a first, and very worthwhile, step by the MCS and the publishers towards compiling a much more comprehensive and informative photographic survey of the... wealth of marine life living round our coastline."

Sea Life of Britain and Ireland is the

second joint venture between the MCS and Immel. It is not, however, the "comprehensive" guide that I was hinting at in my earlier review... instead, it is something very different... and far more educational and thought-provoking. It is, in my view, a real gem of a book — and not just because of its excellent illustrations.

I think that this book will do more for encouraging understanding and co-operation between the various, and often conflicting, parties involved in conservation matters than many of its predecessors. As a result, I feel more hopeful than I have felt in some time, that *real* progress can be made in the future.

I have always been conservation-minded. Equally, I've always been a fervent believer in progress through balanced, sensible discussion, rather than through extreme action, confrontation, accusation, or "finger-pointing". I am therefore delighted to see **Sea Life of Britain and Ireland** taking such a positive, constructive approach to the vast array of conservation problems which face us, under Dr Elizabeth Wood's expert, balanced, well-informed, non-scaremongering, sensitive editorship.

Each chapter deals with a different habitat, ranging from the open sea to sea lochs and lagoons, taking in rocky reefs and shores, living wrecks, pebble and shell grounds, soft seabeds and shorelines, and estuaries and inlets on the way. The text is provided by a panel of distinguished authors, some of whom are also responsible for many of the illustrations. In addition, there is a further panel of specialist photographic contributors and three illustrators... plus a foreword by David Bellamy.

Bringing all parties together must have presented a major headache, but the effort has been well worth it.

Watch out for this book in the shops over the coming months. At £14.95 it is a fantastic, and virtual, give-away.

Now — how about that "comprehensive and informative survey...?"

John Dawes

An Interpet Guide to African Cichlids

By: Dr Paul V Loiselle
Published by: **Salamander Books**
Price: £4.95
ISBN No: 0 86101 407 3

Dr Loiselle is the most recent author to be recruited to the Salamander series of Guides, and here he brings all his talents to bear on African cichlids.

Established cichlid fanciers may be

Books

AN INTERPET GUIDE TO
**AFRICAN
CICHLIDS**
A splendid introduction to this diverse and attractive
group of tropical freshwater fishes
Dr Paul V. Loiselle



fish, for he takes plenty of time (over half the book) to introduce the aquarium needs of cichlids found in Africa. However, owing to their diverse needs, this time is well spent, especially for aquarists taking up the African challenge for the first time, and among the wealth of information there will surely be something new for those already experienced in Cichlid keeping.

Differences between lacustrine and riverine species are clearly explained with Lake species being separated further: Lake Tanganyika fishes are included with riverine species, as they require similar conditions; those from Lakes Malawi and Victoria are

treated as independent groups (both here and within the final species section). Apart from differing water condition needs, another important species-separating factor is reproductive attitudes; monogamous and polygamous characteristics are closely examined.

A seemingly large number of variable factors are considered: what size tank, how many fish, with what male/female proportion levels, recommended aquarium furnishings, suitable plants and correct filtration systems — but these are collated together in two clear-to-understand Tables, **Aquarium Selection and Aquascaping**. **Feeding** is similarly dealt with, each Table containing much relevant information and showing instant comparisons between different groups of fishes. Chapters on **Routine Maintenance, Health Care and Breeding and Rearing** complete the first part.

Recent name changes have not been included (which could have confused non-cichlid devotees), so identification is straightforward, although high-quality photographs make this task very positive anyway. With production staff and author separated by the Atlantic (and most of the USA as well), it is a tribute to editorial skills and perhaps "Transatlantic Diplomacy" that such a readable and concise book has emerged. Knowing the enthusiasm with which Dr Loiselle writes, one can only wonder just how much material was trimmed from the original text; you certainly can't see the joins!

Yet again, Salamander have come up with a best seller: once South American cichlids come under the scrutiny of their investigative authors the "Cichlid Saga" will be complete. (Yes, I know that Asian species have yet to be covered, but you wouldn't expect even Salamander to give them a Guide to themselves, would you?)

Dick Mills

News from the societies

International Cichlid Convention News

In one of our recent updates, mention was made of special rates being offered by the Hyatt Hotel in Orlando for those attending the Convention next August. Charley Grimes of the American Cichlid Association now informs, in the latest News despatch, that the full details for hotel bookings (which should be made direct) are: Hyatt Orlando, 6375 West Irlo Bronson Memorial Highway, Kissimmee, Florida 32741. Tel: (407) 396 1234. Telex: 567436.

When making reservations, callers should, according to Charley, use the code

"American Cichlid Association." He adds, "If you experience any difficulties, ask for Ms Erin P. Corrado. She'll get it straightened out."

Just to recap:

- (i) The ICC will be held between August 10-13, 1989.
- (ii) The special room rate of \$68/night will be offered by the Hyatt, between August 4-15, 1989.

Charley Grimes can be contacted for further details at 8342 W 88th Street, Indianapolis, IN 46278, USA.

More news from the societies appears on page 72.

KENT KOI COLLECTION

SHOWA SANSHOKU

Koi of the variety *showa* are impressive fish and popular with all Koi-keepers, but the **SHOWA SANSHOKU** pictured here is truly magnificent.

It is, without doubt, one of the most striking and impressive examples of its variety. Its sheer size and volume are awesome — some 77 cm or 31 inches.

The head is beautifully proportioned and the back shape is almost perfection, which, in addition to the volume, makes this an outstanding 'Jumbo Koi' (although the angle of this particular photograph does not do the fish full justice).

The quality of the colour and pattern on this Jump Koi is quite astounding. The dominating *sumi* (or black) pattern is superb, being described as stable; that is it will neither deepen nor fade. The *sumi* is perfectly complemented and balanced by the deep *hi* (or red) which is of uniform colour and intensity, and without areas of *sumi* penetrating the pattern. The white skin is of the highest quality, without even a hint of a blemish.

This is a truly remarkable example of a **JUMBO SHOWA SANSHOKU**.

Watch out for another show-stopping specimen in the next installment of the **KENT KOI COLLECTION** in the March issue of *Aquarist & Pondkeeper*.

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Seaview



by Gordon Kay

Coral birth

Most of us know that reefs are formed by each generation building on top of its ancestors, but do we know how corals actually reproduce? At night, sperm and eggs are released into the water. Many of these are eaten by fish, but enough fertilised eggs grow to produce larvae (or planulae). Tiny hairs cover the planula and propel it through the water, the tiny organism growing as it drifts in the plankton, testing many surfaces until — at about two weeks old — it finds somewhere suitable to rest.

The under-surface spreads to form a disc, while the upper surface pushes inward to form a mouth and gut. As it grows, the coral animal takes in zooxanthellae — tiny plants which are vital to its survival. With the aid of sunlight, these algae produce oxygen, sugar and essential nutrients which they share with the coral polyp. In return, the algae take up the coral's waste products, namely carbon dioxide and nitrogen.

Having formed a mouth, this



Most jellyfish, such as these *Cassiopeia* (Seen floating upside down to expose their symbiotic micro-algae to light), are members of either the Macro- or Megaplankton community.

first coral polyp goes on to produce its stinging tentacles. It then starts to produce a skeletal framework so that it sits in a sort of cup. Cloning (non-sexual reproduction) then begins, perfect replicas budding off (but remaining attached to) the parent. This clone then sends out buds so that a honeycomb of calcium carbonate is built up to give shelter to the polyps and structure to the reef colony.

Sunbathing sea slugs

Like coral, many nudibranchs also have their own built-in solar energy reserves, although, unlike coral, they do not take zooxanthellae on board. Instead, they strip chlorophyll from algae and store it in their leaf-like gills. With this internal food source, the lucky little sea slugs can afford to spend much of their time sunbathing!

Reef algae

The relatively unpolluted water around a coral reef is clear because of the comparatively

low concentration of plankton. This, in turn, is due to the almost total lack of nitrogenous compounds which algae use as nutrients. The lack of these substances results in limits on the growth of planktonic algae — the phytoplankton — which in turn, affects the number of animals that utilise the phytoplankton for food zooplankton.

There is so little free carbon dioxide in seawater (0.44ml per litre, maximum) that in areas of lush algal growth, the algae have to turn to hydrocarbons in order to photosynthesise. This causes the precipitation of carbonates with the result that pH values can rise as high as 10. This could, conceivably, happen in the aquarium, although water movement and aeration are usually vigorous enough to prevent it.

Plankton defined

The word "plankton" was coined by Victor Hensen in 1887. In general terms, it means any living organism — plant or

animal — that drifts passively in water. While many planktonic organisms are microscopically small, there is a great variation in size. For instance, the pulsating bell of some of the larger jellyfish can be two metres across — with tentacles of up to 20m (66ft) long. Plankton can be divided generally into two categories, namely *phytoplankton* (drifting plants) and *zooplankton* (drifting animals). *Holoplankton* is a term used to describe organisms which spend their whole lives as part of the plankton; organisms which spend only their early life in the plankton being known as *meroplankton*.

Plankton is classified still further according to size. The classifications are:

0.2-2.0m Megaplankton
2.0-20cm Macroplankton
0.2-20mm Mesoplankton
20-200µm Microplankton
2.0-20µm Nanoplankton
under 2µm Picoplankton

Turbidity is higher in estuaries than in the open sea as a result of the suspended particulate material derived from the rivers, from the sea and from the reworking and resuspension of particles by currents and tides. Nearly all light is absorbed in the first 1-2m and so phytoplankton contributes little to primary productivity. More emphasis is placed on the abundant and constant supply of organic detritus as a source of food to power estuarine food webs. Detritus can be defined as all types of biogenic material (usually plant fragments) in various stages of macro-

FRED THE PIRANHA.





NIGEL CADDOCK

Mary's impressive collection of Bonsai adds an extra-special touch to an already special pool.

A TALE OF TWO HOBBIES

The arts of Koi-keeping and Bonsai complement each other perfectly, as Nigel Caddock discovered when he visited Mary Riddoch, an expert hobbyist who's managed to do just that.

To me, gardening and water gardening are synonymous, and the truly successful pond is one that quietly blends into its surrounding by contributing to the overall perspective, offering a complementary feature to enhance nature, rather than bulldozing it into aesthetic submission.

Although a Koi pond is far from natural, the really good Koi pond should endeavour to attain an air of "au naturel" and, whatever else, strive to be in keeping with its surroundings. If you can bring to mind your favourite Koi pond, I would like to bet it meets the afore-mentioned criteria; the best of the best even achieve this natural harmony without one noticing.

One of my very favourite Koi ponds belongs to a most charming lady, Mary Riddoch, of West Derby, Liverpool. Mary's pool epitomises the essence of the harmonious blending of Koi and garden.

Mary achieves this by the most satisfying combination of two of Japan's most beautiful exports — Koi and Bonsai.

Bonsai is a most fascinating hobby and has much in common with Koi-keeping; both are very beautiful, both can be successfully kept in British gardens and, most similar of all, both topics have an endless learning curve by which the more one learns the more there is to learn.



NIGEL CADDOCK

Mary Riddoch's pool is a well-planned blend of Koi and garden.

Another major factor that is common to both hobbies is what I call the "waffle factor" (I really call it something else but this is a family publication!) This is the degree of confusion introduced by the "experts" which often causes confusion, particularly among newcomers.

Bonsai, like Koi, need not be expensive. They are, with the application of common-sense, easy to keep, can be spectacularly beautiful and really are an absolute must for Koi ponds. In fact, under Mary's supervision, I have been inspired to begin keeping Bonsai. Mary described how, for as little as £5, you can do-it-yourself by "Bonsai-ing" a small shrub. Certainly, she, herself, has done extremely well and her collection of magnificent Bonsai provide beautiful seasonal variations and ever-changing patterns of continuity.

For those of you who, like me, have often looked longingly at Bonsai but admired them from a distance intimidated by their mysterious reputation, you really should think again. Bonsai offers a fascinating hobby and a new dimension in both gardening and Koi-keeping.

Do not be intimidated by the "experts" but seek out the real hobbyists who, like real Koi-keepers, practise their art quietly but are always prepared to share their knowledge for the benefit of others.

ASIAN SPINY EELS

Part 1

How do you tell a *Macrogathus* from a *Mastacembelus*? This, plus a number of other complex issues, comes under close scrutiny from Dave Curran.

The Mastacembelidae are a family of eel-like fishes which are collectively known as the spiny eels. This common name becomes apparent when we observe the shape of these fish, and the row of dorsal spines which they possess.

Spiny eels, contrary to popular belief, are quite commonly available in the UK, with the specimens available coming from various parts of Africa and the Far East. I have personally either heard of, or seen, for sale at least thirteen (29 per cent) of all known African species and nine (43 per cent) of all known Asian species. Occasionally, many others become available to the aquarist.

The African mastacembelids, or the Afro-mastacembelinae, are composed of the genera *Careomastacembelus* and *Afro-mastacembelus*, and presently total almost fifty species. Research is still being carried out regarding these fish, and so it would be inappropriate to go into these here.

It is therefore the Asian mastacembelids, or the Mastacembelinae, which I will concentrate on here.

This subfamily consists of the genera *Mastacembelus* and *Macrogathus* with which the aquarist is more familiar, as they contain the more commonly available specimens found in the hobby.

Identification problems

It is very difficult to differentiate between these two genera simply by looking at them in aquaria; indeed a number of the African spiny eels look remarkably like the Asian ones.

Some species can be readily identified in the hobby i.e. *Mastacembelus favae*, *M. armatus*, *M. erythrotaenia*, *Macrogathus siamensis*, *M. maculatus*, *M. zebrius* and *M. circumcinctus*, but I am often asked, "How do we tell one genus from the other?" Well, this used to be a simple matter when there was just the one species i.e. *Macrogathus aculeatus* in the genus *Macrogathus*. In 1980 this genus was revised (Roberts 1980) to break *M. aculeatus* into three distinct species, the other two being *M. araf* and *M. siamensis*, but the



Above, a spiny eel in typical resting posture. Below, *Mastacembelus erythrotaenia*, the Fire Eel, is probably the best-known of all the spiny eels.



method of identifying *Macrogathus* remained the same. The primary difference was the possession of rostral toothplates (these form a series of bony plates which lie in pairs on the underside of the rostrum or "snout").

Nowadays things are a little bit more complicated, as not all the species possess these toothplates. In fact, only four species are currently known to possess them; these are *Macrogathus aculeatus*, *M. araf*, *M. mekongensis*, and *M. siamensis*. Even so, *Macrogathus* is generally accepted to have a more specialised rostrum, it being slightly to considerably larger than the coronomeckelian bone. This bone is longer and more slender than in *Mastacembelus*.

It was reported by Roberts that adult *Macrogathus* are always under 35cm (c13.8in) and adult *Mastacembelus* always over 40cm (c15.7in) in standard lengths (although *Macrogathus* are known to grow to 45cm — c17.8in — and *Mastacembelus* days grows to little more than 30cm — 12in). *Mastacembelus* are also considered to have more slender bodies.

One further defining characteristic which has been discovered recently and is gaining more and more recognition is the possession of finger-like processes (fimbriae) and broad-based flaps (fimbrioles) on the anterior nostrils. These apparently serve to close the nostrils while the fish is foraging in the substrate or hiding in it, thereby preventing foreign matter entering the nostril.

To a certain extent this is used as a guide to differentiating between these genera, as all species of *Macrogathus*, with the exception of *M. semiocellatus*, possess six fimbriae only, but this species, together with all species of *Mastacembelus*, possess only two fimbriae and two fimbrioles. *M. semiocellatus* itself can be distinguished from *Mastacembelus* by its larger rostrum.

For further defining characters I would refer the reader to Travers 1984 and Roberts 1986.

ASIAN SPINY EELS

I shall continue this article with a summary of the Asian Mastacembelids.

Mastacembelus alboguttatus Boulenger, 1893

This is a rather attractively marked species from Burma, and is considered to be very rare. I once possessed a specimen of *M. alboguttatus* which unfortunately quarrelled with a *M. armatus* and did not recover from the resulting wounds. This is one of those species which comes into the hobby as an incidental import and it was not known to the retailer as a rarity (had he known, I may not have got it so cheap!). On the contrary, he thought it was *Macrogathus maculatus*. In fact, it was not correctly identified until after its death. This species grows to 49cm (19.3in) and its vertical fins are completely united.

Mastacembelus armatus (Lacepede, 1800) Tyre Track Eel

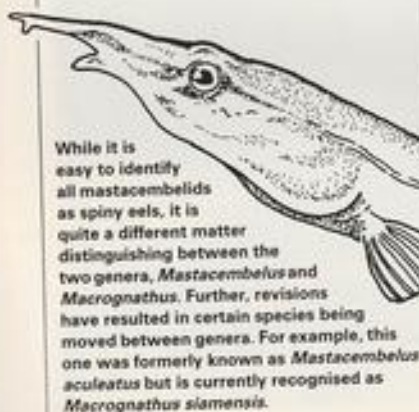
This is the most widely kept species of *Mastacembelus* and is also the most widely distributed of the Asian species. *M. armatus* is found from Iran, throughout the Indian subcontinent to China, and southwards to Sumatra, Java and Borneo. Colour patterns vary considerably with locality and, as a result, many synonyms have come about. This fish is confused with *M. furus* which has led to the same common name being used for both fish.

The pattern usually consists of a dark network over a light background. This may be broken to give a wavy appearance, but some specimens are known to have an overall brownish colour with a lighter underside, especially as adults.

Some species assigned to the synonymy of *M. armatus* may be brought back to specific status by Tyson Roberts (Roberts 1986, pp 105 and 107).

These are big fish, growing in the wild to about 1 metre (39in), but in captivity usually remain smaller at about 70-80cm (27.5-31.5in).

The vertical fins are generally united but there may occasionally be a slight notch between the caudal and anal, or between all three fins.



While it is easy to identify all mastacembelids as spiny eels, it is quite a different matter distinguishing between the two genera, *Mastacembelus* and *Macrogathus*. Further, revisions have resulted in certain species being moved between genera. For example, this one was formerly known as *Mastacembelus aculeatus* but is currently recognised as *Macrogathus slimensis*.

Mastacembelus dayi Boulenger, 1912

This is another very rare species, and comes from the Irrawaddy River in Burma. The three specimens examined by Roberts were the only ones known to him. Thus it is very unlikely that this fish will ever find its way into the hobby, except, probably, by accident.

M. dayi has, since 1956 (Sufi) been placed in the synonymy of *M. unicolor*. Roberts has brought it back to specific status and claims that it is more closely related to *M. alboguttatus*.

This is a relatively small *Mastacembelus*, reaching only 30.5cm (12in). The vertical fins are not united.

Mastacembelus erythrotaenia Bleeker, 1870. Fire Eel

This is probably the best known of all the spiny eels. Indeed, it is the most colourful, with its pattern of red dots, dashes and stripes on a dark brown or black body.

Again, this is a fish which grows to about 1 metre (39in) in the wild, but less in captivity, usually 60-70cm (24-27.5in).

This is quite a peaceful fish which is found in the wild from Thailand and Cambodia, southwards through the Malay peninsula to Sumatra and Borneo.

A synonym of this fish is *Mastacembelus argus*, which is still thought by some aquarists (and retailers) as a valid species, but as Sufi rightly noted, the type specimen, as in the case of specimens of *M. erythrotaenia* are devoid of their red pigment when preserved. Thus, the whitish areas were interpreted as red. The "argus" pattern does differ from the typical *M. erythrotaenia*, but patterns have been recorded which are intermediate between the two.

Mastacembelus furus Hora, 1925

This species has had quite a history. It has been known as a species, subspecies, variety, and more recently, as a synonym of *M. armatus*, but this is one more species that has been re-given its specific status by Tyson Roberts.

The easiest ways to differentiate between *M. furus* and *M. armatus* are judged to be a well-developed network of lines on the body which almost always extend across the abdomen in *M. furus*, whereas in *M. armatus* the network rarely does so. In *M. furus* the areas within the network are often yellowish, but not so in *M. armatus*.

Also, although both species grow to the same length, *M. furus* is deeper-bodied and has a greater girth than *M. armatus*; this becomes more apparent as the fish grows, especially as it exceeds 30cm (12in).

Both the afore-mentioned species co-exist in the wild, and *M. furus* is found from Thailand to western Malaysia.

It is possible that specimens of Tyre Track Eels from Thailand are actually this species.

Mastacembelus mastacembelus (Banks and Solander, in Russell, 1794)

A synonym of this species (*Ophidium mastacembelus*) is the type species of the genus.

This extremely attractive fish grows to about 58cm (23in) and is coloured with brown and yellow but, unfortunately, it is never seen in the hobby (at least, in the Western World) as it comes from the Tigris and Euphrates, and rivers around the Shatt-al-Arab Waterway, in Iraq and Iran.

Mastacembelus oatesii Boulenger, 1893

This is another rare fish as it is endemic to the Inle Lake in Burma, and has probably never been seen in the hobby. In fact, Heiko Bleher did not report seeing any spiny eels in the lake.

This, too, is one of the smaller *Mastacembelus* species, only attaining a length of 37cm (14.6in).

Travers distinguished this species from other *Mastacembelus* by its lower number of fin rays (dorsal 48-56, and anal 46-60) and its lower vertebrae count (79-80).

The fimbriae and fimbrioles are rather short in this fish.

The vertical fins are united only at the base.

Mastacembelus unicolor (Kuhl and van Hasselt) Cuvier and Valenciennes, 1831

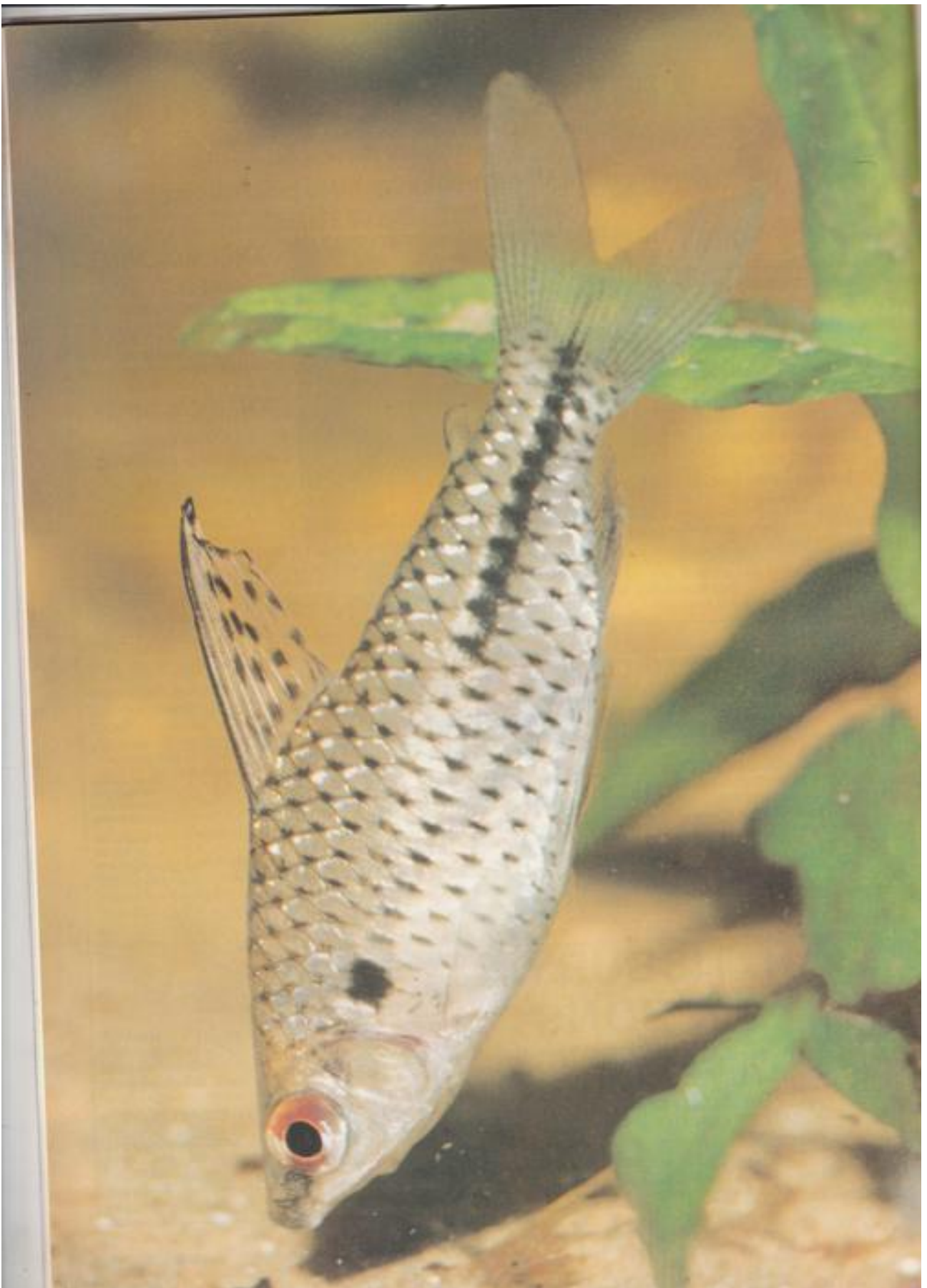
This species is from the Malay peninsula and the Islands of Sumatra, Java, Borneo and Banka. Roberts reports that specimens of *M. unicolor* found north of this range are probably referable to *M. armatus* or some other species.

M. unicolor grows to about 48.5cm (19in), and the caudal fin can be free from the dorsal and anal, or united to either at the base, or wholly united to the anal.

This species, too, has probably never been seen in the hobby.

Note: Full details of all the references mentioned in this article will be included in Part II.

See also Dave Curran's previous articles in *A&P* - June '86 and June '87



Spotlight

THE SPOTTED HEADSTANDER

(*Chilodus punctatus*)

If you have a taste for fish with a touch of "eccentricity" about them then Dr David Pool of the Tetra Information Centre has the perfect suggestion.

(Photograph: David Sands).

The Spotted Headstander (*Chilodus punctatus*) is one of three 'headstanders' which are commonly available in the UK. The other two species, the Marbled Headstander (*Abramites microcephalus*) and the Striped Headstander (*Anostomus anostomus*) are not closely related to *C. punctatus*, but the three are often grouped together because of their unusual and very characteristic headstanding activity. This similarity has, in the past, led to *Chilodus* being included in the family Anostomidae.

However, their terminal mouth (as opposed to the mouth being directed upwards as in the Anostomidae) and the lack of teeth in the genus *Chilodus* indicate that it is, in fact, a member of the family Curimatidae — a view held by most authorities. Closely related species are, therefore, the Curimatopsis (eg *C. saladeris* — the Rose-coloured Curimatopsis), *Prochilodus* (eg *P. insignis* — the Flag-tailed Characin) and *Curimata* species.

The only species in the genus *Chilodus* is the Spotted Headstander, *C. punctatus*, described by Muller and Troschel as far back as 1844. More recently, a subspecies known as *C. punctatus zumevei*, which has no black longitudinal band, was described by Puyo (in 1945). It is likely that this subspecies is simply a slight variation which occurs in the Rio Maroni, from where it was captured.

The Spotted Headstander is widely distributed over the north east of South America, including the Amazon and Orinoco river basins. There they occur in small shoals in still or slow-flowing water. They are often found among reeds or other emerging vegetation, where their coloration and headstanding behaviour act as ideal camouflage.

Aquarium Care

C. punctatus is a very peaceful species which is ideally suited to larger community aquaria containing non-aggressive fish. If

given suitable conditions they can live for up to 7 years and grow to a length of 9cm (c3.5in). A suitable aquarium should be at least 75x30x30cm (30x12x12in) in order to provide sufficient space for this active fish. A dark soft substrate is best, together with similarly coloured decorations such as bogwood or stone. This will bring out the best coloration, as well as allowing the fish to settle and behave normally. The aquarium should be planted with small plants such as *Cryptocoryne* species and *Anubias* and fewer large species such as *Vallisneria*, *Sagittaria* and *Aponogon*. Floating plants are also useful as they provide shade which, in turn, encourages the Spotted Headstander to be active.

Water quality is important. The water should be neutral or slightly acidic (pH 6.3 to 7.0) and soft (GH less than 6°dH). A temperature of 24-27°C (75-80°F) is ideal.

Because of these requirements, filtration over aquarium peat is to be recommended. Filtration is also important to prevent pollutants occurring in the aquarium. However, the filter outflow should be directed against the aquarium side to prevent strong water currents.

Feeding

C. punctatus will readily accept a range of dried foods, although they tend to take the food as it sinks or from the substrate. They are herbivorous fish, and in the aquarium can be seen nibbling at algae growing from the plants or rockwork. To supplement their diet, vegetable-based dried foods and plant material such as lettuce and spinach should be offered occasionally. Livefoods are also eaten, and are particularly useful in tempting the appetite of newly-acquired specimens.

Breeding

Spotted Headstanders are difficult to breed, although with a little care, (and more than a little patience and determination!)

this can be achieved. When mature, the parents can be easily sexed, the female being larger and deeper than the male.

In order to get the parents to spawn they should firstly be conditioned by providing the aquarium conditions already described, and given a diet rich in vegetable matter and containing freeze-dried, tablet or livefoods. When ready to spawn, the fish change colour slightly, with a small dark spot approximately 5mm (0.2in) in diameter developing just behind the gill cover, and the longitudinal band fading.

The breeding aquarium should contain water of the quality mentioned previously and have areas of filter wool, algae or Java Moss (*Vesicularia dubyana*) on the tank base. Prior to spawning the parents become very active and begin to prod potential sites with their noses. When a suitable area has been located the male pushes the female into the substrate where she lays on her side. At this time the male pushes his tail under that of the female and the eggs are released and fertilised. This behaviour is repeated several times before the spawning is complete.

Fry Development

The parents are great egg eaters and should be removed after spawning. The eggs, which swell to a diameter of 2mm (0.08in) hatch after 3-4 days and the fry are free-swimming 2-3 days later. At this stage the fry gather in small groups, all with their heads pointing downwards. They can be fed on *Artemia* nauplii (newly-hatched Brine Shrimps) and rotifers, followed by dried fry foods. The fry are, unfortunately, very difficult to raise. Perfect water quality and a good supply of food are essential to the endeavour if any of the fry are to be raised to maturity.

One of the nicest sights in fishkeeping is a tankful of tiny headstanders, all "standing" to attention. I would strongly recommend any fishkeeper to try keeping this species and, if they are lucky, to breed and raise the fry.

Naturalist's notebook

By Eric Hardy

New estuarine fish?

Is the Blue Whiting becoming a new fish of our estuaries? Our first Mersey specimen, a 10cm juvenile, lay on my desk last autumn as I checked its black mouth, forked tail, protruding jaw and spaced dorsal fins, and counted fin-rays and gill-rakers.

Not then in NW Water Authority's list of 35 species from their weekly trawls above Eastham, NW Sea Fisheries' records or my life list of 74 estuary fishes, it was only added to the British list since the war and wasn't in Travis Jenkins' classic 1954 *Fishes of the British Isles*. Though NW Water later confirmed its presence, it hadn't been noted in the Irish Sea.

Micromesistius, the Blue Whiting, is very different from Common Whiting, a deep-water fish with only pelagic young like my specimen coming inshore. Deep water shoals appear off the Porcupine Bank west of Kerry to spawn in February, then move north to Spitzbergen and the Faroes. A modern fishery for fish meal developed and, in 1979, shoals appeared in the English Channel and were caught 4½ miles off Sussex in 60ft of water in Rye Bay.

Conservation angles

A dozen freshwater crayfish were saved from mechanical diggers at Ullenhall Brook near Henley in Arden, Warwickshire, last year by removing them to tanks during river management work, and returning them under the stones when it finished.

A different angle of conservation is the Water Research Centre's development of "biosensors" based on cyanobacteria to replace the large numbers of fish currently under physical stress when used to detect chemical pollution of waters by agricultural and other toxic wastes. The bacteria's reaction to very low concentrations of herbicides can be measured electronically.

After Lundy Island, the second and third statutory marine



nature-reserves are soon to be brought into operation at Skomer and Menai Straits. Consultations over the latter began this autumn. Ecologically it is like a saltwater river running between remarkably different geological structures. At all three, certain restrictions will be imposed on "scientific" collecting as well as bait-digging and commercial fishing.

Estuarine Slug

The Red Frond Sea Slug, *Dendronotus frondosus*, is one of the most beautiful of marine molluscs around the west coast from Anglesey, Menai and the Isle of Man, north to Greenland and the Baltic and south to North France; but it is not usually found far up estuaries, excepting that one was recently brought to Liverpool Museum from 7 miles up the Dee estuary at Heswell.

Wearing a branched head-veil as well as frilly, branching gills along each side of its body, this 2in Sea Slug is marbled reddish-brown, spotted white. It was formerly called *D. arboreseus* and, once common at Hilbre Island, became scarce there after modern silting.

Milfoil return

The changing water of Merseyside is not always for the worse. At Mere Sands Nature Reserve near Rufford, in lakes that filled former glacial sand-

Milfoil *Myriophyllum* — welcome return resident of some Merseyside waters.

extraction quarries, the pH has recently risen from 4.8 to 7.8, with a vast growth of Water Milfoil in their sweeter waters last year. The corresponding increase in aquatic life brought increased numbers of water-fowl, especially duck, until nearly 900 Teal fed there early in the winter as well as many Shoveler, Wigeon and Pintail, and over 115 Gadwall.

Stranded Leather Turtles

A Leather Turtle, Britain's largest reptile, was tangled in a buoy rope at Port Isaac, North Cornwall, in August. An annual visitor to western coasts, this specimen did not measure its maximum 10ft; only half that, but at 700lb, it was a good weight since they seldom exceed this in British waters. The specimen in question was, unfortunately, dead.

These turtles are seldom stranded alive on British shores. Regularly seen swimming off-shore, as off Lundy, they are usually among the jellyfish they feed upon, often confusing floating plastic bags, fatally. They bury their eggs by the Cambois River of Brazil and reach Britain in the Gulf Stream. They also breed on the Malaysian coast, in the Pacific and Virgin Isles (West Indies).

While a licence is required to sell Leather Turtles, marine

turtles were scheduled for protection under additions to the Countryside Act. Large public aquaria like London Zoo are the only convenient place to keep them.

The six species of barnacle growing on them are used to identify their breeding and deep water feeding haunts in warmer seas, by ageing and identifying the tropical species.

The Leather Turtle stranded on the North Wales coast at Harlech last September, and now in the Welsh National Museum at Cardiff, has been proved the largest turtle on record in the world. It was a male nearly 9ft long and 10ft wide, weighing 2,016lb.

1988 was a record year for Leather Turtle visits. One caught in a fishing net off Harlech in 1975 was ignorantly assumed to be the "monster" reported four months earlier by two schoolgirls returning late along the beach near Barmouth, which their art master promptly exploited with picture postcards sold as its portrait. Obviously a Plesiosaurus picture copied from books! I interviewed the girls, who had no knowledge of marine life, on TV, and discovered that they had obviously encountered their first grey seal on the beach!

Parasitic Wrasse

Among interesting Mediterranean fish which attract the marine aquarist is the brightly blue-green and yellowish male Peacock Wrasse, marked with rows of red spots. Large females, which are duller greyish-green, have recently been observed parasitising the smaller females by laying eggs in their nests while in use, and leaving the smaller occupant to guard and rear them.

A similar habit named the beautiful Cuckoo Wrasse which ranges up our rocky west coast. Rainbow Wrasse occasionally reach British waters, too, up to the Isle of Man. As aquarium fishes the smaller wrasse are lively as well as colourful. In the dark they sleep on their side and breathe slower than most fish.

Herpetology matters



By Julian Sims
Bronze frogs

Angus McKey from Royston, Herts, has written in requesting advice about maintaining Bronze Frogs (*Rana clamitans*) in an indoor vivarium during the winter.

This species naturally occurs in south-eastern Canada and the eastern United States, where winter temperatures drop very much lower than we experience in Britain. In the wild, Bronze Frogs hibernate through these unfavourable months, but if kept indoors at living room temperatures, they will remain active and continue to feed.

Care must be taken that the frogs (and moss, soil or "foam rubber" substrate in the vivarium) do not dry out. This is always a potential problem when keeping amphibians indoors, especially with the desiccating effect of central heating.

Vivarium Covers

Perforated zinc has, for many years, been a traditional material for covering vivaria and their ventilation ports. Its use has been widely recommended in older books and magazine articles. Yet zinc can pose a risk to the health of livestock.

Perforated zinc is, in fact, thin sheet iron which has had holes stamped through it, and then coated or "galvanised"

with a layer of zinc. The zinc protects the iron from rusting, even in damp conditions. Should the layer of zinc become damaged, only local rusting takes place where the iron is exposed — the corrosion does not spread further.

Almost too good to be true! Unfortunately, zinc is slowly attacked by oxygen in the atmosphere, resulting in the formation of a thin film of white oxide on its surface.

Such zinc compounds are used in anti-perspirants to suppress sweat release from mammalian skin. If zinc compounds have this effect on our relatively dry skin they should certainly be kept well away from the skin of amphibians which are naturally moist. Some of the better zinc hoods are painted as a preventative measure.

Suitable alternative materials from which to make safe vivarium covers (which will also prevent the escape of insects) include fine nylon meshing, cotton gauze or perforated aluminium (which is usually painted). Any of these materials can easily be pinned to a wooden framework, especially important for the tensioning of cotton or nylon.

This bottom view of a Flying Gecko from Borneo clearly shows the animal's incredible "flying" equipment.

Taking to the air

Several species of tree frog, two types of tree-dwelling lizard and one genus of tree snake are all capable of travelling substantial distances by gliding or parachuting from the branches or leaves of trees. Incorrectly, most of these animals have been described as "flying" amphibians or reptiles.

Among the tree frogs, the Costa Rican Flying Frog (*Agalychnis saltator*) is an accomplished glider, as are various species of the Old World genus *Rhacophorus*. The Gliding Frog (*R. reinwardti*) from Java is aptly named. Wallace's Flying Frog (*R. nigropalmatus*) can cover a distance of up to 24 ft (7.3 m), although any quoted gliding distance depends on the height of take-off and the angle of descent.

Other arboreal frogs which have fully webbed hands and feet enabling them to glide, include *Hyla miliaria* and *Phyllomedusa* from tropical America.

The Flying Dragon (*Draco volans*) from the Philippines, Malaysia and Indonesia is, in fact, a gliding lizard which lives in the trees of rain forests and rubber plantations. Five or six ribs project from each side of the lizard's body and support two flaps of skin which can be

spread out to form a brightly coloured parachute or folded inconspicuously against the side of the body. Even though the ribs are flexible, the flaps of skin are not moved up and down in true flight.

The Flying Gecko (*Psychosaurus kuhli*) from Borneo, Java and Sumatra, has fringes of skin along the sides of the head, limbs, body and tail and webbing between the toes. This skin vastly increases the surface area of the gecko and slows its rate of descent when jumping or falling from a branch. The fringe also breaks up the outline of the gecko against the rough bark of a tree, providing valuable camouflage — protection from predators and concealment prior to the capture of insects.

Also from South-East Asia, members of the colubrid genus *Chrysopelea* are known as "flying snakes". After launching themselves from a branch, these snakes alter the shape of their belly scales. They become slightly concave so as to trap air, act as a parachute.

Gliding is an interesting adaptation to habitat. It has been evolved by some tree-living frogs, lizards and snakes, allowing them to escape from arboreal predators and travel relatively long distances rapidly and without additional risk from ground-dwelling hunters.



Koi Talk



by John Cuvelier

No poison threat

My mention in the December *Koi Talk* of a possible threat to Koi from the effects of poison used to control grey rats evoked a rapid reply from D. S. Gilliam, the manager of The Medina Garden Centre, an Isle of Wight garden centre. Not only had my correspondent found a dead rat floating in the pool (presumably killed by the poison used), but he had also suffered an accidental spill of a dish of poison bait actually into the waterfall feeding the pool!

Following removal of as much of the powder bait as possible from the site of the spillage and a 50 per cent change, the fish in the pool, including Koi, apparently suffered no ill effects (this incident happened in the spring of '88). That's certainly a relief to know, and my thanks to the gentleman in question for the information. It just goes to show how useful such an exchange of information can be.

Winter musts

By the time you are reading this, we shall all be in the grip of the worst of the winter's weather. Now is the time for all and sundry to settle down to designing that alteration to the pool and filter system you've been promising yourself.

Do you really need that continental holiday or new suit? That car you've been threatening to trade in for a later model will surely do you for another year. Think of all the pleasure

which could be obtained from a larger, deeper, clearer pool. It'll last a lot longer than the tan from two weeks of decadence in the sun!!!

For those about to launch themselves into the task of building their first pool, do beg, borrow or steal, all the back numbers of the *Aquarist* and *Pondkeeper* you can find. You might even be able to buy them! There is a veritable mine of information for the newcomer to the hobby just resting between the covers. Get out and buy one or two of the few books on Koi-keeping which are about, but bear in mind that books on Water Gardening in general are not a lot of help when building a pool for Koi, as their requirements differ considerably from those of the normal inhabitants of a garden pool.

Your local library might be a source of help, particularly if you can supply a list of titles.

The main thing is not to go off at half cock not really knowing what you are about, as that can be very costly. If you have a Koi dealer in the locality, pick his/her brains. Dealers are more than willing to offer help and advice to a possible future customer for Koi.

Sensitive alarms

Changing the subject rather, here's a useful tip for those of you whose pools are protected by infra-red sensors and who are annoyed by random operation of the floodlights/alarms. We found that these usually occur in the middle of the night or when our pooch is wandering about doing what a pooch has to do!

The particular model of sensor which we have is the "Clipsal" which has a white film covering the sensor. By experiment, we have found that the device can be desensitised by the placing of white polythene

across the face of the sensor, held in place by a rubber band. Thus, it ignores things like tree branches moving in the wind, and dogs and cats, but still reacts to the human body which, after all, is what is required.

The humble pedal bin bag is an ideal source of material for this modification. No doubt other makes of sensor could be similarly modified. Just watch this space... you see it all here... eventually!

Parting shot!

My newspaper the other day carried the results of one of those interminable surveys of what's in and what's out among the "yuppies."

Would you believe that one of the "outs" is the keeping of a Koi pool? How little they know! Our pool will be around long after the yuppies have departed to that big bank in the sky!

NEXT MONTH

FREE POSTER

Given favourable weather conditions, March will see life stirring once more in ponds up and down the country. In fact, frogs, toads and newts are likely (with a little luck) to have already come out of their winter sleep and have embarked on the serious business of doing what comes naturally and ensuring the survival of their species.

With this in mind, our March edition will contain a number of special **Spotlight on Amphibians** articles. Not all the species featured will be native to the UK, though. For example, Mexican Axolotls (shown right) and giant, climbing toads from Asia are just two of the exotics which will appear in our first spring issue, courtesy of authors such as **Dr Gareth Evans, Julian Wood and Julian Sims.**



There's also a very special **FREE Gift** for all our readers waiting within the covers of *A&P* next month:

It is a spectacular, large (23 x 16 in) full-colour poster — the first of **FIVE** that we have planned for 1989.

We've had so many enquiries and requests regarding the colourful selection of top-quality poster-sized photographs that adorn our stand so effectively at aquatic shows, that we thought we'd take the matter to its logical conclusion... and give away an exclusive selection of colourful, impressive posters to your readers.

So, if you'd like one of these superb pictures absolutely **FREE**, make certain of obtaining a copy of *A&P* next month. You will, of course, also get a super selection of tropical, coldwater and marine features, along with our usual, unmissable crop of regulars.

ACT EARLY — BOOK YOUR COPY TODAY



Favourite
TROPICALS

PUBLISHED BY

AQUARIST

AND PONDKEEPER

- **LIVEBEARERS**
- **AQUARIUM PLANTS**
- **EGGLAYERS**
- **BOTTOM-LIVING FISH**

FAVOURITE TROPICALS

FAVOURITE EGGLAYERS

Dr David Ford, of the 'Aquarian' Advisory Service gives a personal run-down on the seven egg-layers which repeatedly form part of the hobby's Top Ten.



AQUARIAN FISH FOODS

Angels are available in a wide array of colours and finnage configurations. This is a 'basic' Silver Angel.



AQUARIAN FISH FOODS

The Neon Tetra recently ousted the Angel as the No 1 tropical species.



DENNIS BARRETT

The Harlequin is the most popular of all the Rasbora species.

The top ten Tropicals (see box) are the best choice for any beginner in fishkeeping. They are popular simply because they are attractive, compatible, undemanding and available. Seven of the ten are "egg-layers" — a non-scientific but useful grouping for aquarists to identify collections of species.

BASIC GENERAL REQUIREMENTS

Another grouping we use is that all the top ten are "community fish" i.e. can be mixed in the aquarium without it becoming an underwater jungle! Their water chemistry requirements are similar, or undemanding; that means they will accept moderately hard or soft, mildly alkaline or acid waters. Hence, treated tapwater in any part of the UK may be used. This doesn't mean they will accept any quality of water, of course. For healthy fish, the water must always be clear and clean, whatever its chemistry.

The temperature of the water can be equal for all the fish — around 24°C (75°F). All will

The Ten Top Tropicals:

Neon Tetra (*Parachanna aeneus*); Zebra Danio (*Brachydanio rerio*); Angelfish (*Pterophyllum scalare*); Harlequin (*Rasbora heteromorpha*); Guppy (*Poecilia reticulata*); Dwarf Gourami (*Colisa lalia*); Swordtail (*Xiphophorus helleri*); Siamese Fighter (*Betta splendens*); Platy (*X. maculatus*); Corydoras (*Corydoras* spp.).

accept the so-convenient flake foods and thrive on this diet throughout a long life, remaining colourful and active. A feature of that activity is that it covers the top, middle and bottom of the aquarium . . . which is important for the aquascene to look always busy and attractive.

The lifespan of species varies, but egg-layers do, generally, live longer than live-bearers. It is nature's answer to the predation problem. If you give birth to live young that can look after themselves immediately, it matters less that some larger fish may swallow you. If you produce eggs and vulnerable fry that are often food for other fishes, then you need to spawn frequently to give your offspring some chance of survival. The top ten livebearers may only live months in the wild, and perhaps two or three years in the aquarium, but many egg-layers can live five or more years in captivity (the best example, but not a tropical fish, of course, is the Common Goldfish which can live 20 or more years in the home).

Although by definition they are community species, each species does have its own special needs, especially for breeding purposes. Livebearers will give birth in the community tank, but egg-layers cannot be expected to spawn in such crowded surroundings (although they sometimes do).

In the wild, egg-layers that pair will often choose a "nest" and drive other fish away from an area greater than the average aquarium. Therefore, they can create great stress in the community tank. If a pair forms, or you hope to find a breeding pair, you must set up a separate breeding tank. Egg scatterers do



DAVID SANDS

Shoaling down Loaches are less timid than solitary specimens.

FAVOURITE TROPICALS

BOTTOM FAVOURITES

"Life at the Bottom" need not consist of a single, lonely, Bronze Catfish. David Sands has other (better) alternatives.

What community tropical aquarium would be complete without a few bottom feeders? They rummage about the substrate like aquatic hoovers forever searching for that lost piece of flake food that all the other fishes have overlooked! The Catfish and Loach ACME Cleaning Company are the true characters of the aquarium and they

quickly endear themselves to the beginner as surely as they continue to fascinate the experienced fishkeeper.

"SUCKERMOUTHS"

The newcomer is often recommended the "Sucking Loach" *Gyrinocheilus aymonieri* a thin, silvery-slippery character (aquarium glass kisser) that has a continual urge to hang on to vertical surfaces in its continual

search for food. These inch-long loaches grow fairly quickly (they can treble in size within the first month) and can become a menace if they turn to mucus-stripping of aquarium companions in an effort to obtain more protein for the least amount of effort.

The more exotic aquarium retailer may offer an alternative in the shape of the Common 'Plec' (Suckermouth Catfish — *Hypostomus*) a rather prehistoric-looking

Right, upside-down Catfish should never be kept singly. Left, wild-caught Peppercatfish (*C. paleatus*) have exceptionally attractive dorsal fins.



DAVID SANDS



DAVID SANDS



BLUJA ZUKAL

The Slimy or Giant Kuhli Loach is best kept in a small shoal.

fish that swims clumsily and, like the Sucking Loach, can attain 10-12 inches (25-30cm) in length. The 'Plec' produces a great amount of waste when fed correctly and can soon become disruptive towards aquarium plants and other fishes in its panic to reach food first.

BETTER CHOICES

There are a great many bottom feeders much better (in my opinion) suited to the community aquarium. The firm favourites are such because they possess character, compatibility in size/character and have an interesting colour pattern.

Corydoras

Top of the list has to be South American *Corydoras* and the two farm-bred species most widely available, the Bronze Catfish, *Corydoras aeneus* and the Peppered Catfish, *Corydoras paleatus* are adored by fishkeepers the world over. Almost everyone knows these dwarf, two/three inch (5-7.6cm), catfishes which thrive in shoals but it is not common knowledge that a happy shoal can consist of several species.

In nature, huge shoals sweep across the river bed and these groups sometimes consist of three or four species. While most aquariums could not accommodate a great shoal, four to six specimens of different species will mix quite well. Like will keep to like but, as a rule, all the species associate happily together.

There is no need to have pairs (I call this the 'Ark Syndrome') unless you wish to develop breeding stock. Feed them especially when the aquarium lights are out and they will swarm across the gravel like ants to stirup.

Finely shredded shrimp/prawn, as a

special twice-weekly treat, will keep these catfishes happy for as long as you keep them (twenty odd years is the common record!).

Corydoras are known to roll their eyes (it cleans them of irritation) in a winking fashion... and for sometimes darting to the water surface and gulping air. If these trips to the surface are made too often then it must be taken as a sign of stagnation or depleted oxygen at the lower aquarium levels. If all catfishes in the aquarium (especially *Corydoras* and smaller loacarids such as *Ancistrus* and *Pecholia*) are darting up to the water surface every now and then, and the frequency increases, then severe stagnation is almost certainly the cause. Another sign is that bottom dwellers rise off the substrate and hover in the upper levels.

To correct this situation involves little work; simply a gravel siphon set and, perhaps, a closer look at the air pump output...

If internal or external power filters are employed and not undergravel (the ideal is both power and undergravel filtration) then it is doubly important that the substrate be raked and siphoned on a strict and regular basis.

Commercial or tank-raised *Corydoras* are not too fussy about water chemistry and will live in soft to hard, acidic to alkaline waters (pH 6.1 to 7.7) although wild-caught specimens thrive in soft/neutral to slightly acidic waters (pH 6.2 to 7.2). Both wild and tank-raised strains prefer a temperature range between 76 to 80°F (24.5-27°C).

Kuhli Loaches

The Indo-Chinese Kuhli Loach, *Acanthopthalmus neyeri* and *A. semicinctus* are small, slender snake-like banded bottom-dwellers that have the beginner challenging the petshop/fishshop assistant;

"I want that one!" they say, pointing to a writhing mass...! These loaches — scaleless, soft-skinned fishes, are amazing 'disappearing fish' (they hide in the gravel, in the bogwood and amid plants).

They thrive in a densely planted aquarium system and help keep organic 'bits' off the finer plant leaves, so they might be considered the friends of foliage. Groups interact quite interestingly and might be found to be less light-shy than individuals. Three or four specimens are encouraged by competition for food to venture out among other aquarium fishes.

The Kuhli Loach is a superb community fish and enjoys a neutral to alkaline pH in fairly warm waters 70-82°F (25.5-28°C).

Bristle Noses

The Bristle-Nosed Catfish, *Ancistrus dolichopterus* is a smaller version of the Common Suckermouth Catfish but it has the advantage of not growing larger than four inches or so in aquarium (around 10cm). Males of the species develop head bristles as they approach half-adult size and, because parental care is shown by the male towards fry, they can be spawned and raised within the community aquarium. In direct contrast *Hypostomus*, the Common Plec, spawns at almost a foot in length (30cm) and requires large burrows in which to care for eggs and fry. All the Bristle Nose needs to be happy is a nice cave/sideways-on plant pot or piece of bogwood in which a home can be made.

Although Sucking/Bristle-nosed Catfishes are frequently sold as an instant cure for an algae problem they also require a fairly substantial diet of lettuce, shrimp and flake food. They are very adaptable to water conditions and will thrive in a very wide pH



RUBEN ZUKAL

A young male Bristle Nose, already showing the "bristles" responsible for this species' common name.

and temperature range, although they do not feed well at low temperatures . . .

Clown Loaches

The Indo-China Clown Loach, *Botsia macracantha*, has been near the top ten of all aquarium fishes for many decades and will continue to do so for many more to come. It is often available as one-to-two-inch babies (2.5-5cm) but anyone who has seen an eight-inch (20cm) specimen — rarely if ever imported from the wild these days — will know what a prince of loaches this fish is.

Few people realize that adult Clown Loaches (in nature) often venture into tidal waters and will happily live in semi-brackish waters. They, like Kuhli Loaches, are also scale-less, soft-skinned fishes. They feed on crustaceans and therefore, it is very important to offer shrimp, fresh fish, mussel/cockle on a daily basis.

One specimen will sulk, but two will continually argue for the top place in the pecking order, so I firmly recommend three to five specimens to a shoal. They are not a cheap aquarium fish, but I believe if they are worth keeping, they are worth keeping well. A handful of salt, temperatures between 80-85°F (27-29°C) and plenty of aquarium space will ensure a group thrives in an aquarium. If the tank is under two months old, it is essential to treat the water with something like WS3 the day you introduce your specimens and do not change the water or worry about the effect on the loaches . . . prevention of White Spot on scale-less fishes is much better than cure.

Upside-down Cats

A catfish that swims upside down is bound to attract a lot of interest and *Synodontis nigriventris* has attracted fishkeepers

into adding it to their community aquarium for a great many years. This little catfish, adult at three inches (7.6cm) or so, is imported from Nigeria and Zaire in Africa by the thousands and sadly, most are bought singularly. They thrive like all shoaling fishes when kept in groups, and the bigger the group, the better.

Floating plants and floating cork serve as great hiding places for these catfishes that have evolved to swim upside down as a result of which a downward be-barbled mouth can face to the water surface and

gobble up all the aquatic insect life living there or among the surface plants. Freeze-dried *Tubifex* and bloodworm are relished by these and most other species of *Synodontis*. They are not fussy about water conditions, although specimens thrive in soft/neutral to slightly acidic waters (pH 6.2 to 7.5), in a temperature range between 78 to 84°F (25.5-29°C). The Upside-down Catfish is very hardy and peaceful, making it a popular oddity in the catfish community aquarium scavenger-cleaner gang of bottom-to-top feeders.



JOHN DAVIES

These full-size 'Plecos' demonstrate just how large these fish can grow.

FAVOURITE AQUATIC PLANTS



Barry James of Everglades Aquatic Nurseries introduces the top six favourites of the aquatic plant world.

(Photographs by the author).

I have been importing and growing aquatic plants for the past 28 years. During this time the same half a dozen or so species have consistently been those most constantly in demand by aquarists. The same is also true of tropical fish where Neons, Swordtails, Mollies, Angels, Tiger Barbs and Sucking Loaches seem to be essential stock for all aquatic shops. Bearing in mind the constant stream of new species and varieties continually appearing on the market, this is really quite remarkable.

It was only when our editor asked me to write this article that this situation really registered. Why should this be?

I think there are several reasons for this anomaly. Firstly, I think many people start their first aquarium after seeing and admiring that of a friend and so take a

Left, there are various Amazon Swords which grow well in tropical tanks. This is *Echinodorus paniculatus*, the most popular of all the Swords.

Below, *Ludwigia arcuata* is a widely available plant that is altogether smaller than its

equally popular 'cousin' *L. mullertii*.



certain amount of advice from him or her. Secondly, the British are creatures of habit. Once a name is fixed in their mind they ask for that species automatically when replanting their aquarium. Thirdly, the growers in Singapore have geared themselves up to growing these species in vast numbers, and therefore the prices are very reasonable compared with newer introductions. Lastly, I think that the plants themselves are attractive, easy to grow in aquaria and are capable of putting up with a certain amount of rough treatment in the hands of dealers, and so are on sale for longer periods than some of the more tricky varieties.

In order of popularity the top plants are: — Green Cabomba, *Egeria densa*, *Echinodorus paniculatus* (Amazon Sword), *Vallisneria spiralis* (Straight Vallis), *Synsphaerium triflorum* (Water Wisteria — now known as *Hygrophila difformis*) and *Ludwigia mulleri*.

Green Cabomba

Coming from South America to the Southern States of the USA, Green Cabomba (*Cabomba caroliniana*) is a hardy plant which will survive quite happily in temperatures as low as 55°F (12.8°C). However, it will not make a lot of growth unless the water is a lot warmer and needs 68-75°F (20-24°C) to make real progress. The segmented leaves are arranged alternately around the stem and are dark-green in healthy specimens.

A little-known fact is that this species is related to *Nymphaea* — the Water Lily. It displays this affinity when it produces tiny arrow-headed leaves when flowering occurs. The flowers themselves are only 1/2 in or so in diameter and white in colour. These are but rarely produced in aquaria, but are common in daylight-grown specimens.

In spite of its easy-going nature, many people have difficulty growing this plant. Often, the lower part of the stem sheds its leaves and the stem itself rots and breaks away at gravel level. To overcome this annoying habit, the newly-purchased cuttings should be allowed to float in the aquarium until numerous roots appear from the nodes. Only then should the stems be planted.

Cabomba seems to appreciate well-aged water and abundant light. If successful, it will wind itself around the surface and may reach a length of 5ft (1.5m). Regular pruning will encourage a bushy habit. Other well known species of Cabomba are: *C. pulcherrima* (Red Cabomba), and *C. aquatica* (Yellow Cabomba).

Egeria densa

Egeria densa was formerly known as *Elo-dea densa* (this name is still commonly used). It is an undemanding plant which will thrive over a vast range of temperatures. It will even grow outside in favoured areas of Devon and Cornwall.

As a tropical plant it is unrivalled, tolerating temperatures in the low 80's°F (around 28°C). However, the most luxuriant growth is made at lower temperatures. Around 60°F-75°F (15.5-24°C) seems to suit it best,

when it will produce large whorls of bright green to almost mauve-coloured leaves. It can reach 10ft (c 3m) in length but regular pinching out of the growing tips will encourage side growths and keep it nice and bushy.

Under greenhouse conditions white male flowers are sometimes produced. Female flowers are unknown in cultivation.

This species makes poor root growth and nutrients are absorbed through the leaves. For this reason liquid, rather than tablet, fertilisers are called for. Lighting should be quite bright as *Egeria* grows in open situations in its home countries of South America. In the last 50 years it has spread far from its original waters, having been introduced into ponds and rivers all over the world.

Amazon Sword

The Amazon Swordplant (*Echinodorus paniculatus*) is an old favourite and is a member of a large genus endemic to the Americas.

This particular species has a wide distribution from Central America in the North to Argentina in the South. Plants sold in the UK are almost exclusively cultivated in Singapore. They are exported in two forms, some specimens being grown out of water and others submerged. The former are stubby plants with thick lanceolate leaves and short petioles (leaf stems). Often, specimens have flower stems attached when exported.

When the fields in which these plants are growing are flooded either due to the Monsoon rains or deliberately, as part of the growing policy, morphological changes occur in the plants. New foliage has longer petioles and lamina (leaf blades), and the rigid nature changes to a soft flaccid one. Eventually, the old emerged leaves turn yellow and die. Submerged growth is lighter in colour and grows to a height of 18in (45cm) compared with a maximum of 12in (30cm) attained by emerged-growth specimens.

Amazon Swords are gross feeders and, growing in the form of a rosette, need plenty of elbow room and so are best planted in the middleground of aquaria. After two years of aquarium life, these plants weaken and should be replaced.

Nutrient deficiencies will lead to various forms of abnormal growth. If the foliage is very pale green, lack of iron is indicated. Brown holes indicate, however, that *Hypostomus* Catfish are browsing the plant too enthusiastically. The same symptom can also be due to snail damage.

Often, when growing submerged, flower stems are produced. These, however, do not produce underwater flowers, but instead, produce viviparous plants along their length. Allow them to reach a height of 6in (15cm) before pegging them down with lead wire into the gravel. After a few weeks, when they are around 9in (c23cm) tall they can be separated from the mother plant and moved to another site.

Amazons thrive from 72°-82°F (22-28°C) and require moderate to good lighting. *E.*

paniculatus is seemingly indifferent to pH and DH (acidity and hardness) levels but requires moderate to good lighting. Other species of *Echinodorus* which have stood the test of time and continue to be popular are: — *E. cordifolius* (The Radicans Sword), *E. major* (The Ruffled Amazon), *E. parviflorus* (The Black Amazon) and *E. tenellus* (The Pigmy Chain Sword).

Tape Grass

Tape Grass, or *Vallisneria*, is my fourth candidate in the popularity stakes. *Vallisneria spiralis* (Straight Vallis) and its shorter relative *V. spirifolia* (Twisted *Vallisneria*) which has beautiful corkscrew-like leaves are both equally popular. These grassy plants are much in demand as background and middleground plants respectively.

The straight variety reaches a height of 18in (45cm) in deep tanks while the twisted variety only manages 12in (30cm). Both species increase rapidly by runners and may have to be severely curtailed if they are not to over-run the tank.

Again, they are not exacting regarding their temperature requirements, coming from both sub-tropical and tropical latitudes. They respond very badly to sub-gravel filtration, often becoming stunted to only an inch or so (2.5cm) in height. Funnily enough, this abnormal growth can look most attractive in the foreground.

Moderate lighting and a wide tolerance of pH and DH are other characteristics of these plants. Other species which widen the applications of this genus include: *V. gigantea* (Giant Vallis), *V. neotropica* (Giant Red Vallis) *V. species var. contortionist* (Corkscrew Vallis) and *V. asiatica* (Giant Twisted Vallis).

Ludwigia

Ludwigia mulleri is a species whose exact origins is open to some doubt. What cannot be questioned, however, is the high esteem in which it is held by aquarists. Its simple oval leaves vary in colour from rich green to bright crimson, depending on the lighting levels in which it is grown.

Fast-growing, it should be planted in bunches of half a dozen cuttings lightly held together with soft lead. It roots prolifically and grows fast, so regular pruning is necessary to retain a bushy habit. Like my other favourites, it is not particular as to water chemistry, and is equally at home in both temperate and tropical aquaria.

L. arcuata is a smaller plant in all its parts, with long needle-like leaves but the same colour range as its larger relative.

Wisteria

Synsphaerium triflorum was christened Water Wisteria by its importer, the late Colin Roe, probably on account of its finely dissected foliage. Taxonomists have now moved it to *Hygrophila* and it is now called *Hygrophila difformis*.

Always in the top selling list, this highly



variable plant was originally collected in the rice fields of SE Asia, but is now cultivated in huge pools throughout the region for export into the aquarium market.

Emergent leaves are grey-green and slightly hairy with entire or toothed margins. Submersed, a transformation occurs. Huge bright green finely divided leaves are produced which closely resemble another aquarium plant, the Sumatra Fern. The stems are stout, fleshy and very brittle.

Wisteria requires a minimum temperature of 78°F (25.5°C) when submerged but will tolerate much lower temperatures in its emergent form. It propagates easily from root, stem and even leaf cuttings. It is best positioned in the corners of aquaria where it makes a first class screen for unsightly equipment.

Hygrophilas are useful plants to grow in aquaria. Other species include:— *H. polyperma* (The Dwarf Hygrophila), *H. subcylindrica* (Willow-Leaved Hygrophila), *H. namensis* (Blue Hygrophila) and *Nomophila stricta* (Giant Hygrophila).

Right, *Egeria densa* — undemanding, luxuriant and a strong favourite with aquarists.

Left, *Vallis* is available straight, twisted, short or long. The type shown here is *Vallisneria* sp. var. *Contortionist*.

Below right, previously known as *Synnema triflorum* this "Top Six" aquarium plant, Water Wisteria, is now known as *Hygrophila difformis*.

Below left, *Cabomba* in its various guises is the most popular of all aquatic plants for tropical aquaria.



reasonably unusual, for offspring from other species (say, *Barbus conchius* x *B. nigrofasciatus*, or *Colisa lalia* x *C. labiosa*) usually conform to Nature's "species safeguard" by remaining infertile in themselves.

As an aquarium fish, the Swordtail can be quarrelsome with its own kind; it can swim backwards almost as easily as in the normal direction and two males will spend minutes at a time displaying against each other with alternating forward and backward swimming motions. The aquarium should be securely covered for these fishes are excellent jumpers. A further intriguing characteristic of this genus is the ability for sex-reversal to occur; it is not uncommon for females to develop male characteristics (including the gonopodium) but no reports exist of males turning into females.

PLATIES*

Platies (the name is derived from the original generic name of *Platyposcilius*) are now classified within the same genus as the Swordtails, *Xiphophorus*, thanks to the discovery of *X. xiphidium* (1932), *X. pygmaeus* (1943) and *Xiphophorus milleri* (1960) which provides conclusive proof regarding conspecificity.

The Platy, *X. maculatus*, like its immediate relative, has also been cultivated into similar colour strains — Berlin, Comet, Moon, Red, Tuxedo, Wagtail, Weisbaden etc, and there are also "hi-fin" variants to add to the range of extremely appealing fishes.

To the innocent onlooker, a Platy could be taken for a shorter chunkier Swordtail but it lacks the "sword." A "stretched version" (the caudal peduncle is longer) having more clearly defined scales is *X. varians*, the Variegated Platy. This, too, has been cultivated into vividly-coloured forms, with such attractive names as Sunset and Marigold.

CONCLUSION

Regardless of whatever popular livebearer you keep, the quality of the strain will degenerate if you do not keep a tight control on things.

Livebearers are no respecters of colour strain: filling your tank with a wide selection of colour varieties of, say, Platies will mean nothing to the fish themselves and males will mate any likely female that happens along. Result? A hotchpotch of vari-coloured offspring conforming to no known standard. Even if you intend to specialise in one strain only, you must still be vigilant, for placing an unnoticed male into a tank of females could set back the breeding programme some months if he contributed unwanted bad qualities into the offspring.

Having outlined some of the pros and cons of these popular fishes (and the merits surely outweigh the disadvantages), give these fishes a try, provide them with their requirements in plenty (space, live and vegetable foods) and go ahead and design yourself a fish! Who's going to be first with the equivalent of the Blue Tulip?



Far right, Guppies come in all shapes, sizes and colours. This is a huge Blue Star male produced by Providence Tropicals in Florida.

Far right middle, a Gold Dust Molly developed by Summerland Tropical Fish Farm and exhibited at last year's Florida Tropical Fish Farms Association show. Such Mollies are still quite rare in the UK.

Above, a Championship Class Black Sailfin Molly, such as this one from Sailfin Tropicals, is a truly magnificent sight.

Right, Painted Marigold Swords (this one comes from Blackwater Fishery) are widely available in the States and are beginning to make a mark in the UK. There is also a hi-fin lyretail form of this fish which is quite spectacular.

Above, far right, an excellent Black Platy from Ruskin Tropicals in Florida — just one of many varieties of this popular species.

* For further details on Platies and Swordtails see the special Spotlight feature written by John Dawes in the January 1989 issue of *Aquarist and Pondkeeper*.





THE AQUASTORE (FILTON)— WELL WORTH A VISIT

Having recently been to the Aquastore in Filton, Bristol, I can thoroughly recommend it as a most worthwhile place to visit. Certainly there are lots of tanks... and certainly there's lots of fish in them, the best of which are quite exceptional in quality. But there's much more besides.

While I was there, for example, a number of customers came in with their own personal fishkeeping problems. One had a water sample which was promptly and comprehensively analysed in his presence by Aquastore's "resident" consultant Ian Sellick, whose knowledge of water chemistry and (particularly) cichlids, is second to none and is well-known to *A & P* readers and other hobbyists.

Others wanted to know which fish were compatible with each other, what were the best foods for particular species... and so on. Every question was handled confidently and competently by the Aquastore staff who, as a result of this

OUT AND ABOUT

by John Dawes

approach, have built up a very positive relationship with a clientele that has grown enormously in the 18 months that the store has been open and which shows every sign of continuing its steady climb.

I shouldn't really be pleasantly surprised by the quality of the advice given. After all, the Aquastore is owned by Technical Aquatic Products whose water treatments and remedies have secured a firm and sub-

stantial foothold for the company, here and abroad.

The same professional approach extends to health problems behind the scenes where a well-stocked laboratory is used for testing and developing new TAP products, as well as for examining sick or dead fish for customers who then receive a full diagnosis/treatment/post-mortem report, as applicable.

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lay out a tank, or what different types of lighting, gravel or filtration system to use, then there are numerous variations on show to help you decide. If you want to see a really super marine tank, that, too, is on display.

So is a wide range of foods, dry goods and books, plus plants and a host of other interesting offerings (such as customised tanks).

As you can probably gather, I was impressed by a lot of what I saw during my visit. In any case, any store that takes the trouble to keep at least some of its *Corydoras* in a sand-based tank (as opposed to gravel) immediately starts off on the right foot as far as I'm concerned.

The Aquastore is open Monday - Friday from 9 am - 9 pm; on Saturdays, from 9 am - 6 pm; and on Sundays (for Sunday Club members), from 10 am - 5 pm.

For further details, contact: Aquastore, 542 Filton Avenue, Filton, Bristol, BS7 0QG. Tel: (0272) 692345.



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Coldwater jottings



Stephen J. Smith

Fancy that!

There appears to be some healthy debate developing with regard to the availability of good quality Fancy Goldfish for the hobbyist. This has been sparked off, partly, by my own observations of the retail scene (*Coldwater Jottings* — June 1988) which, it appeared to me, offers little in the way of good quality Fancies.

Some retailers have, apparently, tried but with little success. As I stated in my follow-up in November's *Jottings*, perseverance will pay off: from correspondence I have received and in talking with hobbyists up and down the country, I can only repeat that there is without doubt a demand for good-quality, clean and reliable Fancy Goldfish.

Only those suppliers who are prepared to persevere in continuously and reliably meeting this obvious demand will achieve the deserved success which the less dedicated seem to expect more immediately.

An obvious example within the hobby is the Sutton's Goldfish farm in the West Midlands. Their reputation as the best of British Goldfish is the well-deserved result of several years' dedication.

So, again, hobbyists, create the demand which you have expressed to me around the country. And to retailers: give it a go and stick at it.

The result will not only be good for the trade but can only serve to improve interest in the

hobby as well as standards of Goldfish in this country.

On a "lighter" note

My recent tasks have been "brightened up" in more ways than one by the following correspondence from regular reader Oswald "Gurnie" Holmes of Preston.

Gurnie writes: "Having tried unsuccessfully to obtain the right fountain at the right price to freshen up our Goldfish pond, I decided to try something different, and hit upon the idea of a 'lighthouse' waterfall.

"First, I had three discs of wood cut by a joiner, to 12 in, 11 in and 10 in diameters by approximately 1 in thick.

"In addition, I also had cut a dozen strips of three-ply, 4ft long, 1 1/2 ins wide at one end, tapering to 1 in at the other. These strips were then nailed to the discs to make a good solid frame.

"A half a bag of plaster was sufficient to provide ample covering to form the tower and balcony (moulded in an old tart tin) and roof (moulded in an old plastic bowl). A transparent plastic cake dish, when inverted, provided an ideal 'house' for the light.

"Prior to construction, I had drilled two holes through the centres of the discs to provide for a length of copper tubing, which serves as a mast for a Goldfish-shaped (of course) weather-vane, and which also carries a length of quarter-inch polythene tubing through which water is projected into the pond from the edge of the balcony.

"A cheap sample-pot of black paint was used to enhance the stonework on the tower and create the effect of leaded framework on the light housing. In addition, a flash lamp bulb is mounted in an old flash lamp mounting within the light chamber, with the switch situated in the small (and oddly-shaped) lighthouse-keeper's house at the base. I should stress, however, that the lamp is only switched on for visitors as a huge stock of batteries would

be needed for continuous use.

"The Goldfish weather-vane (sticking to the end of my nose in the picture) was cut from an old beer can, straightened out and fortified by means of a little extra metal attached with adhesive. This is mounted on a 6in nail which is inserted into the metal tube to act as a pivot.

"As I was uncertain about the

durability of plaster on wood, I hammered a lot of 1/2in nails into the wooden frame and made a network of wire around the frame. The results, as the accompanying photographs demonstrate, is as solid as a rock and, with a garden hose attached to the tubing, provides a truly 'illuminating' addition to the pond."



Gurnie's lighthouse. The thin black tube running down the lighthouse (on the left) acts as a rain 'fall-pipe'.



"Gurnie" Holmes (87) testing the strength of the jet flowing from the base of the lighthouse balcony. The weather vane is pivoted on a copper tube "mast" and not on his nose!

DEALING WITH BACTERIAL DISEASES

Apart from preventing them breaking out in the first place, the most important factor in dealing with bacterial diseases is, not finding the appropriate cure, but identifying the disease correctly. The classic example of this is "Mouth Fungus" which is not a fungus (so will not be cured by fungicides) but is bacterium-based. Further problems are that bacterial diseases are often hard to diagnose (due to their minute size) and often hide behind, or are associated as a secondary complication with, other symptoms.

The most common bacterial ailments include "Mouth Fungus", Dropsy and "Malawi Bloat", Finrot, "Pop-eye", Ulcers and Wasting Disease or Tuberculosis. Many of

these may be regarded as an ever-present hazard in the aquarium, waiting for conditions to be bad enough (or good enough from the bacteria's point of view!) in order to strike. What can be done to treat such insidious adversaries?

Unfortunately, although the answer is always staring us in the face, it seems we are loathe to practise exemplary aquarium hygiene all the time. In this sense, perhaps we deserve what our fishes get. Prevention is better than any cure (even the successful ones) but help is on hand.

Proprietary remedies, such as those containing phenoxethol, are well-researched and come with full instructions which, if followed to the

letter, will effect a cure. Such remedies may be broad-spectrum-based or more specialised (again positive identification of the disease is critical). More advanced remedies, such as antibiotics, can only be obtained through a veterinary surgeon and here,



Ulcer disease, one of the most commonly seen bacterial-caused diseases.

too, correct application is vital.

Read all you can on treatment procedures: accurate dosing can mean the difference between life and death; invest in the necessary Copper Test Kit where copper-based remedies are used. Consider the effect of treatment upon the water conditions: most remedies lower oxygen levels in the water. Consider the effect of water condition upon treatment (I bet you read that bit twice!): filtration systems containing activated carbon will remove medication, thus nullifying its hoped-for effect; possible detrimental effects of protein-skimming and ozonisation on treatment should be also investigated. Large amounts of organic matter in the aquar-



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NEW PRODUCTS

ium (back to bad management again) will also affect the treatment's efficacy. Some levels of water hardness and pH may also react unfavourably with remedies and produce toxic side effects.

Then there's the problem of what to do if the treatment fails. **DON'T TRY ANOTHER ONE IMMEDIATELY.** A 50 per cent partial water change or so should be carried out, and activated carbon filtration used for a few hours to remove most of the original treatment before proceeding with the next remedy.

Many bacterial disorders affect the internal organs of the fish. Here, the use of medicated foods will get the treatment to the root of the trouble quickly. Intra-muscular injections of antibiotics (or for the drainage of excess body fluids) are best carried out by the qualified vet, who will also appreciate it more if the "patient" is a large Koi, rather than a tiny Tetra for this form of treatment!

Ultra-violet light exposure and ozonisation should be investigated before being used in conjunction with remedies. (UV treatment and ozonisation will only kill pathogens in the water, not those in, or on, the fish.)

Before setting out on the remedy trail, get a good diagnosis and treatment book (see January's *A & P* for review of Salamander's **MANUAL OF FISH HEALTH**); identify the disease positively, and the correct method of treatment.

HANDLE ALL REMEDIES WITH CARE; modern drugs can be dangerous. Do not allow them to come in direct contact with eyes or skin, children or other pets. Again, reference to the instructions will give first-aid guidance in this respect.

Finally, when mixing materials use protective gloves and keep the containers used only for disease treatments, not for water changes or transporting fish to Shows!

HAGEN

The one component of aquarium hardware that is expected to soldier on regardless, month in month out, is the airpump. Reliability, allied to quietness, has been achieved by **HAGEN** in a range of new pumps — **ELITE**, **MAXIMA** AND **OPTIMA**. The use of long-lasting Tensile-Flex rubber provides proven long wear characteristics; thick wall construction ensures quiet operation and the internal pump module simplifies servicing.

The Elite has three models, the 800, 801 and 802 which will prove both economically and practically suitable for small to medium aquariums. The Maxima has twin outlets and is obviously the choice for larger tanks with, say, twin under-gravel filter airlifts to service. Top of the range Optima has its output electronically controlled and also includes a metal "noise eliminating" inner case.

Most pumps suffer from neglect, dust and grime drawn in with the air adding to wear: a refillable air inlet ensures that only clean air reaches the pump mechanism. The prices of the new pumps range from £4.99 to £24.99.

Still with airpumps, don't forget the **FORCE 1** and **FORCE 2** models: Force 1 for smaller aquariums has a mechanical rheostat that will not wear out which provides positive airflow control. Force 2 has similar features but is more suited to larger aquarium situations. Prices are £9.99 and £14.99 respectively. Details from: **ROLF C. HAGEN (UK) LTD**, California Drive, Whitwood Industrial Estate,

Castleford, West Yorkshire WF10 5QH (Tel: 0977 556622 Fax: 0977 513465).

JUNGLE GIANTS

Not all Koi-keepers have room for the equivalent of the Bridge over the River Kwai around their pools, but the use of bamboo as a decorative material in such surroundings is undeniably attractive. **Jungle Giants** have recently published a **BAMBOO INFORMATION PACK** listing no less than 31 species that can be grown in the garden. (Previous to this, details of Bamboo culture was hard to find, even if you knew where to look.)

The pack consists of individual cards outlining each species' requirements and to what size it will grow under normal conditions. Size appears not to be proportional to hardness as species capable of withstanding temperatures as low as -25°C will still soar above your pool to a height of 20ft or more! Fortunately, species range from as small as 10 inches, so cultivators around local airports will not have to worry about fitting warning lights to all their species!

In addition to the Information Pack (the price of £4.00 plus 20p p+p includes a £1.00 voucher against your first bamboo order) **Jungle Giants** also supply thick (2.5 inches diameter) bamboo poles for constructional use in Japanese-style garden. The Bamboo Information Pack is available by Mail Order only from **JUNGLE GIANTS**, Morton, Bourne, South Lincolnshire PE10 0NW (Tel: 077837 546).



INTERCEL (UK)

Once the pond freezes over harmful gases (especially those from decaying vegetation in an uncleaned pond) can build up under the ice with detrimental effects on the fish. Electric pond heaters have long been used to keep part of the surface area clear to help disperse the noxious gases, and now a new product attacks the problem from another angle — from above the water. The **THERM-A-DOME** requires no electricity and, consequently, has no running costs and is practically maintenance-free too!

The **THERM-A-DOME** is made from expanded polystyrene and looks just like a miniature igloo. Operation is simplicity itself: the provided Anchor Unit is filled with pebbles and attached to the inside of the dome so that the line length is equal to the depth of water where you intend to float the dome. Once ice forms, the dome is locked into position but flexes enough to prevent ice pressure from working outwards and cracking the pond walls. The hole in the top of the unit vents toxic gases to the atmosphere and should be kept open by pouring warm water into it or over the unit, should it become covered with snow. Beneath the dome there develops a stable insulated area where fish can breathe.

Each unit can protect 40 sq ft of pond area and, of course, more than one unit should be used in large ponds. Retail price is £11.25, inclusive of VAT, and further details can be obtained from: **INTERCEL (UK) Unit 5E, Hearthcote Road, Boardmans Industrial Estate, Swadlincote, Burton-on-Trent, Staffs.**



News from the societies

F.B.A.S.

The Federation of British Aquatic Societies has made the following two important announcements:

As from 1 January 1989, all FBAS Merchandising (Ties, Badges, Books etc) will be handled by a single Officer and not two as previously. All enquiries, Mail Orders etc, should be sent to:

J. Edwards, FBAS Merchandising Officer, 14 Upper Dane Road, Margate, Kent CT9 2LX.

Customers hiring the popular AQUATALKS tape/slide programmes should note a slight renumbering of latest titles.

38. FISH-HEALTH by David Pool, (TETRA UK Ltd).

39. SRI-LANKA: Part 1 Freshwater Fishes by Dick Mills.

40. SRI-LANKA: Part 2 Marine Fishes by Dick Mills.

41. CAMEROON KILLIES by Rod Roberts, B.K.A.

The 1989 FBAS YEAR-BOOK contains details of all FBAS services (Judges, Speakers, Books, AquaTalks, etc) and

is available from the above address, price £1.20 including postage.

Southern Livebearers Aquatic Group (Scottish Area Group)

The Scottish Area Group of S.L.A.G. is a specialist society which is involved with the keeping and breeding of livebearers, some of which are nearing extinction in the wild. The group meets once a month at the Victoria Social Club, 11 Albany Street, Edinburgh.

At the meetings, everything from the keeping and breeding of individual species, positively identifying similar species, and preventing cross-breeding among closely related species is discussed. New members can obtain a lot of information from these discussions, as well as being able to obtain new species from existing members. Many of these fish cannot be obtained from local suppliers or other sources. The new calendar for

1989 was set at the recent A.G.M. and is as follows:

24 February — *Characodon* species

24 March — *Brachyraphis* species

21 April — *Gambusia* species

19 May — *Alfaro* species

16 June — *Skiffia* species

28 July — *Limia* species

25 August — *Phallichthys* species

22 September — *Ilyodon* species

20 October — *Cnestrodon* species

17 November — *Goodeid* species

15 December — A.G.M.

At the meetings listed above, live specimens of the relevant species are exhibited to aid discussion. Anyone wishing further information about the group or its meetings can contact: Frank Clark (P.R.O.), 83 Dalry Road (2F3), Edinburgh, EH11 2AA.

Southern Livebearers Aquatic Group

At the recent AGM, the following were elected to act as officers of S.L.A.G.:

President: John Dawes (A & P Editor)

Vice President: Jim Chambers (British Museum — Natural History)

Chairman: Jake Milligan
Vice Chairman: Mervyn Strange

Secretary/Treasurer: John Corbett, 26 Durham Road, Liverpool, L13 5SY

Species Control: John Bath
P.R.O. UK: George Stamou, 5 Braithwaite Tower, Hall Place, London, W2 1LP

P.R.O. Overseas: Ivan Dibble
Technical Editor: Don Kenwood

Printer: Harry Shields
Journal Editor: Gordon Forrester

Photographer: Dennis Barrett

For further information of S.L.A.G. and its activities, contact the Secretary, John Corbett (address above).

Diary dates

British Marine Aquarists Association

On Saturday 4 and Sunday February 5, the BMAA will be at Dave's Aquarium, 225 Folds Road, Bolton

Along with its information and display stalls, the Association will be holding slide shows and various tank setting up demonstrations... with a few personalities present. On Saturday, BMAA Chairman and A&P columnist Gordon Kay and Underworld's Dave Keeley. For further details ring ROY MARTIN

C.A.G.B. (Northern Area Group)

The Northern Area Group's Spring 1989 Convention is scheduled to take place on Sunday 19 February at The Mill on Wigan Pier. Guest speakers: Heiko Bleher (African Catfish



and Their Environment) and A & P editor, John Dawes (Language of Fishes). There will also be trade stands, an auction and a catfish information stand. Further details (on submission of S.A.E.) from Trevor Morris, 102 Cale Lane, New Springs, Wigan, Lancs, WN2 1HB, or ring Adrian Morris on Wigan 832772.

Billingham Aquarist Society

Import dates:

Auction Sales:

12 Noon — Sunday 26 February 1989

12 Noon — Sunday 26 November 1989

The Open Show and Auction Sale will be held on Sunday 9 July 1989. All events will be at the Billingham Community Centre, The Causeway, Billingham, Cleveland. Details from the secretary G. R. McGregor, 59 Cleadon Avenue, Billingham, Cleveland TS23 3SL. Tel: 0642 5630235.

Rothwell & Wakefield Aquarist Society

The R & WAS 6th Annual Open Show and Auction will be held on Sunday 12 March 1989 at Blackburn Hall, Rothwell, nr Wakefield. Booking in and Benching from 11.30 am. Judging 2.00 pm. Auction from 2.00 pm. For further details, contact the secretary, Kevin Swinson. Tel: 0977 511464.

Malvern & District Aquarist Society

The 16th Annual Open Show of the above society will be held on



Easter Sunday, 26 March at The Malvern Youth Centre, Albert Road North. For further details, contact Frank Myatt (Hon Sec), 8 Willow Grove, Malvern Link, Worcestershire, WR14 2SE. Tel: (0684) 572 644.

Merseyside Aquarist Society

The 1989 M.A.S. Open Show will be held at Rainhill Village Hall, Dane Court, Rainhill, Prescott, Merseyside on Sunday 23 April. Further information from J. Bailey (Hon Sec), 11 Auburn Road, Liverpool, L13 8BJ. Tel: (051) 228 8199.

DRAWING ROOM

Iguanas are large, interesting lizards which, given proper care — as provided by Dr Gareth Evans — can develop into extremely rewarding pets with a difference.

(Photographs by the author).

As a small boy, like innumerable others, before and since, I was captivated by stories of dinosaurs and mythical dragons. Consisting of more than a hundred species in some 49 genera, the Iguanid family of lizards bear more than a passing resemblance to these fabulous beasts — as their frequent appearances, suitably magnified, as film "stand-ins" testify. This striking impression has attracted many reptile keepers to the Iguanidae, a group which, if well cared for, make most rewarding vivarium subjects. Of the many species within this family, only a relative handful find their way onto dealers' lists with any degree of regularity.

Probably the most often encountered example of its kind, originating from the northern and central regions of tropical South America, the Green Iguana, *Iguana iguana*, is a robust, tree-dwelling lizard some 5ft (150cm) or so in length, when adult. The bright green of the 8in (20cm) hatchlings fades with maturity, most of the adults being a more greenish grey colour. A row of large, flexible spines runs from the base of the skull, down the back, continuing in smaller form along the tail. Although small in juveniles, and of similar size in both sexes, this crest is larger and more spectacular in the adult males. The long tapering tail accounts for around three-fifths of the animal's length, and is typically marked with darker bands every 2in (5cm) or so. The limbs, toes and claws are of stout design and powerful, perfectly adapted to the climbing life-style.

The bulk of these animals (and of other iguanid species) offered for sale are juveniles. Success with young iguanids is linked to several crucially inter-related factors, and without careful attention to each of these, the youngsters are unlikely to thrive.

ADEQUATE HOUSING

The housing requirements of these creatures are largely dictated by their size. Most of the species commonly to be had are medium to large, active lizards, and, as such, obviously require suitably spacious quarters. The Green Iguana is basically an arboreal animal, and its container should be equipped with a number of climbing branches, sufficiently strong and well secured to withstand the attentions of its inmate. Choosing naturally smooth branches, or sanding them down to avoid cracks and crevices, can help cut down

potential parasite breeding grounds as well as minimising the risk of injuries to your charges.

Although lacking somewhat in visual appeal, newspaper offers a most hygienic substrate material. However, if a more pleasing, natural effect is desired, bark chippings, gravel, peat and moss make excellent alternative choices as floor coverings. A layer of sand can be used, but the fine grade white sands should be avoided as they tend to be eaten with the food, sometimes causing mouth and/or digestive problems.

Fresh water should always be available, and a deep dish large enough for the lizard to immerse itself completely in will prove popular, as well as aiding sloughing and maintaining humidity levels.

Being tropical animals, a background temperature of 22-24°C (72-75°F) is required at night, rising to a daytime 26-28°C (79-82°F), with localised hot spots of around 30-32°C (86-90°F). One common solution is the use of ordinary incandescent light bulbs to provide the requisite level of heat. This is a situation which, although adequate, is far from ideal.

Prolonged periods of illumination may disrupt the animal's day/night biorhythm (an important consideration in long-term captives, and often critical for captive breeding). Additionally, there is some evidence that protracted constant exposure to light may adversely affect reptilian eyesight on a long term basis. Clearly it is preferable that the sources of light and heat should be independent of each other. Some reptile keepers have experimented with heater pads and horticulturist's soil warming cables, but it is, firstly, difficult to heat a large vivarium by this method, and secondly, some doubt has been expressed as to the suitability of such an essentially unnatural way for iguanas to receive their heat.

In the wild, basking in direct sunlight accounts for much of their heat gain. Consequently, probably the best solution to this particular problem involves the employment of ceramic heaters — available in a variety of wattages — which produce heat, but no light. Attached to one end of the vivarium ceiling, contained within a stout mesh guard to prevent accidental burning, and coupled with a reliable thermostat, such a heater will provide the required internal thermal gradient. This will ensure that the animals are not forced to endure the heat of the hot spots without there being relatively cooler areas of the tank to which they can

escape. Moreover, this enables the iguanas to thermo-regulate in response to their needs as they do in the wild.

There is a temptation to reduce heat loss by minimising air-flow through the vivarium. This must be resisted, as a stuffy atmosphere is of no help to the inmates' health — fresh air is vital.

While looking at the topic of heating and lighting, it pays to consider the place of ultra violet light. There has been some suggestion that some skin tumours and certain retinal problems may be linked to continual useage of sources emitting significant levels of UV radiation. However, UV light is necessary for the synthesis of vitamin D3 in the skin, the vitamin responsible for the regulation of the bodily stores of calcium and phosphorus, deficiency causing poor bone formation. This is of obvious relevance to growing youngsters.

While it is possible to supplement the dietary intake of vitamin D3, UV does seem to have a stimulatory effect on appetite. It would seem that in view of this, and the important role UV plays in vitamin assimilation, there is a case for the judicious use of a suitable light source on an occasional basis.

APPROPRIATE FEEDING

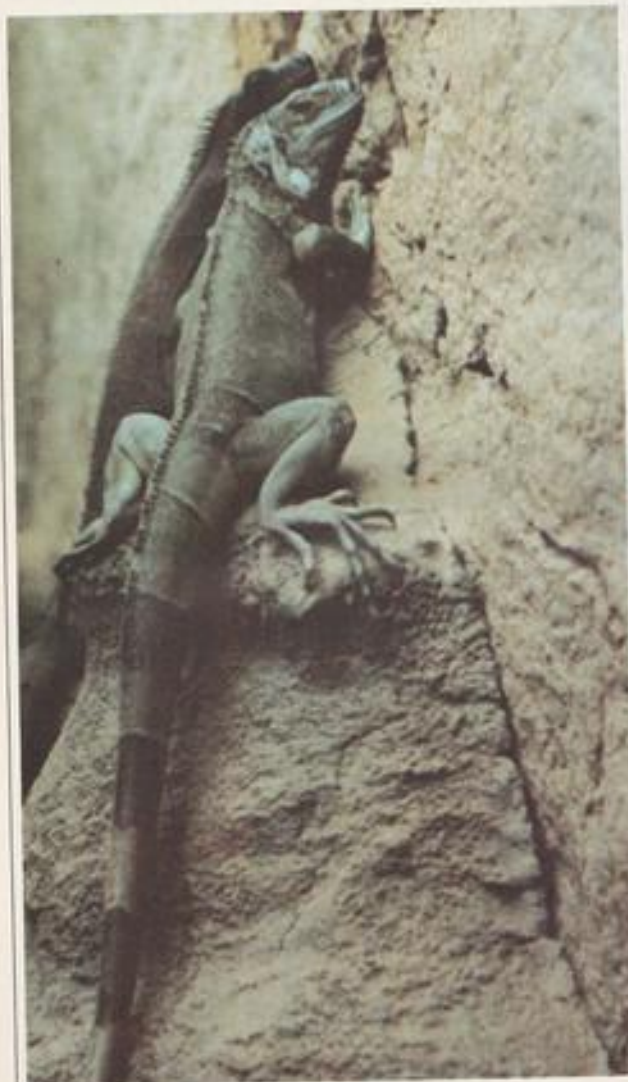
As with all herpetile species, good nutrition is the key to healthy development and life. With most of the iguanids there is simply no substitute for a wide and varied diet. Juveniles are largely omnivorous, though in general, favouring a slightly carnivorous bias. Invertebrates of all sorts will usually be accepted eagerly.

Greenstuff and fruits will also play an important part in the diet, but should be chosen with care; lettuce is of limited value, being little more than cellulose and water; cabbage has suppressive effect on the metabolism (acting on the thyroid gland). Dandelion leaves and cress, on the other hand, offer relatively high amounts of carbohydrates, proteins, roughage, vitamins and essential mineral salts. Moreover, they are inexpensive and readily available. Cress is easily cultivated to give a year-round supply, while few, indeed, are the gardens devoid of the hardy dandelion.

When adult, Green Iguanas are almost exclusively herbivorous, and bearing in mind the previous caveat, almost any leafy vegetable will be eaten. Fruits should also feature, bananas, peaches, apricots and tomatoes proving particularly popular. Well drained canned fruit will do as substitute for fresh, but it is a poor second to the real thing.

Other iguanids have different dietary requirements, though most of the commonly encountered species have needs along the previously described, omnivore lines.

DOM DRAGONS



Top left, the Green Iguana is probably the most often seen large lizard on dealers' lists.

Below, *Ctenosaura similis*, one of the Spiny-tailed Iguanas, can have a somewhat unpredictable temperament.

Above, the Desert Iguana is docile but not suitable for beginners.

Below left, Rhinoceros Iguanas are among the most expensive iguanids to buy.

Top right, the Basilisk or Jesus Christ Lizard (it walks on water!) is not an iguana, as such, but belongs to the same family.



It should go without saying that all foodstuff offered should be as fresh as possible. Greenstuff is safest washed to remove any traces of weedkiller, slug pellets or other contaminants, and whenever possible, all food should be dusted with a suitable vitamin/mineral supplement. (Calcium deficiency is a very serious threat to growing iguanas).

SELECTING AND TREATING NEW ACQUISITIONS

When selecting your iguana, it is worthwhile looking for one with well-developed fat reserves on the back legs and around its tail, which indicate that it has been feeding. A skinnier animal may do just as well in the long run, but, all other things being equal, why start out with potential problems?

While on this subject, it would seem appropriate to mention that, on occasion, iguanas may refuse all food. In the long-term captive this should be no immediate cause for alarm, unless it continues for a protracted period and/or is accompanied by a deterioration in condition or other clinical symptoms (in which case veterinary advice should be sought). Many reptiles quite naturally fast in the wild at certain times of the year, notably Bosc Monitors and Royal Pythons. However, a newly-acquired specimen, especially if juvenile, showing such reluctance should be encouraged to eat normally as soon as possible.

Assuming that you have tried the animal with many and various foodstuffs to no avail, there are a number of measures which may help to overcome the problem.

Most animals have what is termed a "comfort zone", an area of no-man's-land which they keep between themselves and potential threats. Encroach within this, and the animal retreats until a new comfort zone gap is established. Clearly, the close confines of the vivarium render this threat avoidance strategy largely unworkable;

stresses result, and aberrant behaviour patterns may emerge. Thus, the feelings of real or supposed danger experienced by the young lizards may prove sufficient for them to stop eating. Young iguanas are somewhat shy animals, particularly when newly bought, and failure to account for this in the design of their vivarium can contribute to problems of this sort. Sections of cork bark, artificial caves, foliage branches and other similar hiding places can make all the difference.

Events outside the vivarium may also engender feelings of insecurity. Loud noises, heavy footsteps and movements in the vicinity of their tanks can cause the animals to be ill at ease, and thus may be contributory factors to appetite depression. Feeding in the early morning or late evening when the surroundings are quiet and peaceful may help, as may keeping the area around the tank in subdued lighting (or simply covering the viewing panel).

The temptation to handle a new acquisition can be enormous, but handling is one of the most often overlooked of stresses. The bodily removal, particularly of a newly-wild-caught animal, from a relatively secure environment, to be placed in an uncertain and threatening situation can prove a very great stress. No iguana showing the slightest reluctance to feed should be handled any more than is absolutely necessary — there will be plenty of time once it is feeding properly.

Looking on the bright side, though, otherwise healthy animals, in my experience, can reasonably be expected to feed eventually, given time and perseverance.

Large and active lizards, the iguanas require suitably spacious quarters to thrive. The provision of adequate space for an animal which can grow to between 4-6ft (120-180cm) must be one of the major problems of iguana ownership, and one easily forgotten when they are first seen as youngsters. Insufficient space for exercise

can cause crippling stiffness, not to mention the likelihood of the inmates injuring themselves against the confines of their container.

Furthermore, they seem unable to recognise a transparent barrier, and may severely damage their snouts by rubbing them into the glass. However, the provision of a reduced viewing window, which does not extend to the vivarium floor, largely overcomes this problem, as well as helping to minimise any disturbance and feelings of threat due to external events.

Often attractively coloured, iguanas with their active natures are most rewarding animals to keep. Although presenting heavy accommodation demands, they have much to offer the reptile keeper, and well tended, provide much interest, if for no other reason than their somewhat prehistoric appearance. For all those small children at heart, who never really grew out of their fascination with the dinosaurs, these lizards come a pretty close second.

OTHER IGUANAS

Spiny-tailed Iguanas (*Ctenosaura*)

Inhabitants of Mexico and Central America, these animals are largely terrestrial iguanids, about 60-90cm (2-3ft) in length. A low ridge of spines runs along the neck and back; their relatively short, spiny tail gives them their common name. Care is similar to the Green Iguana, except that they are more carnivorous.

Although a personal favourite, they do have rather unpredictable temperaments, and will deliver painful bites.

Desert Iguanas (*Dipsosaurus dorsalis*)

Occasionally seen on dealers' lists, this striking little animal (40cm — c16in) is not the easiest of lizards to keep, but its colourful appearance makes it well worth the trouble. This docile creature is largely vegetarian (garden flowers doubling well for its wild diet of cactus blooms).

Not an ideal choice, however, for a first-timer, but well worth considering for those with some experience of lizard husbandry.

Rhinoceros Iguana (*Cyclura cornuta*)

Any animal with nasal projections runs the risk of being labelled "Rhinoceros" whatever. As one might expect, this animal possesses horns (3 blunt conical ones) on its snout. Despite their belligerent appearance, these omnivorous, 120cm (4ft) lizards tame well, and can display remarkable intelligence in captivity. They are generally one of the most expensive iguanas to buy.

Basilisk (*Basiliscus*)

Although not an "iguana" as such, this iguanid is often seen for sale. More of an omnivore than the Green Iguana, much of the rest of the care of the latter species applies to this one also.

Known as the "Jesus Christ Lizard" after its ability to walk on water (not a feat exhibited in the relatively cramped conditions of even the largest domestic vivarium) this animal's most remarkable feature is the casque-like cranial adornments, which are most striking in the male.



... "Then of course, I had a swim-on part in 'A Fish Called Wanda'..."

The conservation of wildlife is a subject close to the hearts of many ornamental fish hobbyists. This is the first in a series of three articles by Dr Chris Andrews of London Zoo Aquarium that look at the size of the problem facing fish conservationists, including some of the most obvious threats to wild fish populations around the world. The second feature will look at three particularly threatened tropical environments that are of special interest to aquarists while the role of zoos and aquaria in the conservation of fish will be discussed in the third and final article. All three articles are based on a paper presented by Chris at the fifth World Conference on Breeding Endangered Species in captivity, held in Cincinnati (USA) in October 1988.

CONSERVING FISH FOR TOMORROW'S HOBBYISTS

SIZE OF THE PROBLEM

As with other forms of conservation, one of the main difficulties facing fish conservationists is the current size of the problem. There are around 20,000 species of extant fish, of which 41% live in freshwater, with the majority of the freshwater species occurring within the Tropics. Bearing in mind that, by volume, 97% of all water is in the oceans (with much less than 1% as freshwater in rivers and lakes), the surprisingly high proportion of freshwater forms presumably reflects our better knowledge of those habitats, as well as (most importantly) the degree of isolation and speciation which can occur there.

According to IUCN (1986) there were 286 species of fish that were considered to be threatened, with 21 species thought to be extinct. Primarily as a result of the addition of 250 species of cichlids from Lake Victoria (Africa), the number of threatened species of fish has now risen to 596, with 24 species thought to be extinct (IUCN, 1988).

The vast majority of the fish listed in the 1988 IUCN Red List of Threatened Animals are freshwater forms, and some examples of their geographic distribution are provided in the Table.

From the Table it can be seen that 22.4% of the estimated 700 species of North American fish are currently considered to be threatened, while only 0.4% of the estimated 2,700 species of South American fish, and 1.3% of the estimated 1,200 species from the Oriental Region, are similarly categorised. The larger proportion of fish species of threatened status from Africa (14.8% of around 2,000 species) is the result of the recent inclusion of 250 species of cichlid from Lake Victoria in the Red List.

It is suggested that the large difference between the proportion of threatened fish species in North America when compared to South America, the Oriental Region and Africa, may be related to the greater pressures on fish populations in North America, although it more likely reflects our lack of knowledge of the status of the fish faunas of tropical regions.

With this in mind, it is interesting to consider the situation in Sri Lanka, for which there are relatively good data on the fish population. Sri Lanka has a freshwater fish fauna of around 54 species, which is very



Pollution can have obvious effects such as the death of fish, or longer-term, less visible, but equally harmful ones.

low for a tropical island of its size, especially bearing in mind the proximity of the varied fish fauna of India, and the relatively recent separation of the island from the continental land mass.

Unfortunately, 18.5% of its freshwater fish species are considered to be threatened. Clearly, there is a need to have similarly reliable data on the freshwater fish faunas of other tropical regions too, as a result of which the proportion of threatened forms may be much higher than is currently appreciated.

CAUSES OF THE PROBLEM

A number of human-related activities are inducing changes in natural fish populations at a rate that has never been experienced before. These activities, which may cause species extinctions and other irreversible changes, can be discussed under two main headings:

- Habitat alteration, including habitat

DISTRIBUTION OF SOME THREATENED FISH

	FRESH-WATER SPECIES*	THREATENED SPECIES**
USA, Canada	c.700	157
South America	c.2,700	12
Africa	2,000 +	46 + c.250
Oriental Region	c.1,200	15
Sri Lanka	54	10

Notes

- * From Lowe-McConnell (1975), Moyle and Cech (1982)
- ** From IUCN (1988); all threatened categories included.

destruction, pollution, and the introduction of alien species.

- Over-exploitation, including over-fishing for food and over-collection for other purposes.

Habitat Alteration

Habitat alteration is a major cause of changes in fish populations in both freshwater and marine environments. For example, dams may act as barriers to migrating fish, and man-made lakes and reservoirs may replace small streams or ponds, with consequent disruption to the local fauna. The widespread filling-in and/or drainage of ponds, marshes and other small water bodies can have a significant effect on communities of smaller fish species, and some such environments may also act as an important nursery ground for larger and perhaps commercially valuable species too.

Further examples of wholesale habitat destruction are coral mining on tropical reefs, and the current worldwide onslaught on tropical forests (both of which will be referred to in my second article.)

The effect of pollution on aquatic ecosystems can be sudden and obvious (eg acute fish mortalities following the release of a toxic effluent), or more gradual and, perhaps, discrete (eg the effects of acid rain on upland fisheries in North America and Europe, or the sub-lethal effects of other pollutants on fish longevity, fecundity and resistance to disease). Heated, nutrient-rich or sediment-laden effluents may also change the chemical and/or physical characteristics of the receiving water body, which may bring about a change in the nature of the local fish fauna or, even, extinctions.

The introduction of alien fish species can adversely affect local fish populations in a number of ways, including via competition, predation and hybridisation, eg the effects of the introduced Nile Perch (*Lates niloticus*) on the endemic cichlid fauna of Lake Victoria will be referred to below.

Over-exploitation

Subsistence fisheries have existed for a very long time, and have probably had very little impact on wild fish populations. However, it was the development and use of large-scale mechanised fishing techniques in the 1950's and 1960's that highlighted the

effects of the over-exploitation of fish stocks.

Several of the commercially important North Atlantic and Pacific fish stocks declined dramatically as a result of over-fishing, although in some instances the population decline was initially interpreted as the result of a natural fluctuation in stock levels, rather than the effects of over-exploitation. Unfortunately, controlling the level of exploitation by Man does not always bring about a complete recovery of a fishery, and replacement of the previously exploited species with another, perhaps less desirable, form may occur.

It is generally assumed that this type of commercial over-exploitation will not, however, lead to the total extinction of a species,

as there will come a point when the fishing is no longer commercially viable, and exploitation (fishing) will cease. However, this may not be the case for particularly high-value fish, such as some of the species for the ornamental fish trade.

There is a thriving worldwide ornamental fish trade, with an estimated total retail value (in the early 1970's) of around 4,000,000,000 US dollars per annum. Although a large scale aqua-cultural industry has developed to satisfy a significant section (some estimates indicate that 80-90% of all ornamental fish are captive-bred) of the live fish demands of this industry, large numbers of tropical freshwater and tropical marine fish are still removed from the wild.

Malpulutta kretseri — one of Sri Lanka's threatened species.



AQUARIAN FISH FOODS

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Recent legislation may offer a degree of protection to some species, but there is very little monitoring carried out on the trade in exotic fish, and it is very easy to circumvent the restrictions. However, the careful exploitation of some fisheries on a long-term sustainable yield basis may play an important role in the conservation of aquatic habitats, and this will be mentioned in my second article, with particular reference to coral reef fish.

The fish populations of the world are suffering from a diverse range of problems at the present time and it is important that any effects that the aquarium trade are having are seen in conjunction with the threats such as habitat destruction, pollution and over-fishing for food. In my next feature I will look in more detail at the problem facing African freshwater lakes, coral reefs, and the rivers and streams which flow through tropical forests such as those in the Amazon Basin.

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Above left, the Plumose Anemone (this sub-species is *Metridium senile pallidus*) is rarely seen in the long-tentacled state, as shown in the photograph. Top right, the Daisy Anemone (*Cereus pedunculatus*) is usually larger than its close relatives, the *Sagartia* species. Right middle, *Sagartiogeton undatus* is a long-stemmed elegant anemone. Top left, The Grey Sea Slug (*Aeolidia papillosa*) — seen attacking a Beadlet Anemone, is the main predator of British Sea Anemones. Above right, the numerous colourful tentacles of *Sagartia elegans* can be clearly appreciated in this photograph.

SEA ANEMONES OF THE BRITISH SEASHORE *Part 2*

In the second of his two articles on the subject, **Andy Horton** looks at some of the less common types of Anemone . . . as well as at their main predator. (Photographs by the author).

PLUMOSE ANEMONE

Differing in appearance from the Beadlets, Dahlia, and Snakelocks Anemone mentioned in the first article, the Plumose Anemone (*Metridium senile*) can possess up to 1000 tentacles arranged in delicate feathery, or plumose cycles. It feeds on invisible zooplankton and small

particles of suspended organic matter. The short slender tentacles are unable to catch the large items. Even a Sandhopper, *Talitrus saltator*, a small crustacean 15 mm (0.6 in) long, would be safe with the largest example of the species. Plumose Anemones found in deep, sublittoral waters, with a base of 15 cm (6 in), may reach a height of 30 cm (12 in).

Pulverised mussel and the special com-

mercial brands of liquid invertebrate food provide the best diet. If this anemone is to be kept for over three months, special attention needs to be paid to its feeding requirements. It prefers the conditions afforded by a special tank, with invertebrate filter feeders; the *Sagartia* species of anemone, perhaps with the Hairy Porcelain Crab, *Porcellana papyracea*, and the smaller Spider Crabs, *Pisa armata*, and *Macropodia rostrata*.

It makes a good companion to creatures that would be attacked in the aquarium by the more usual aggressive crabs and fish found on British shores. It is also compatible with the Hermit Crabs, *Pagurus bernhardus* and *Pagurus prideaux*, and can be kept with the Little Cuttle, *Sepiella atlantica*, the Shrimp, *Cragon crangon*, the

Two-spot Goby, *Gobiusculus flavescens*, the Sea Urchin, *Parasmelanus*, and the various Cushion Stars.

Plumose Anemones need to be watched carefully. If a lot of suspended food matter is introduced, frequent water changes will be necessary. Plumose Anemones thrive best in cool, freshly collected seawater.

Distributed widely in the cold waters of the Western Atlantic, the Plumose Anemone can be found in the shallow seas surrounding all areas of the British Isles and Scandinavia. Colour varieties are mainly all white, or a bright orange, or brown with tentacles of the same colour, or grey, or white.

Two varieties, or sub-species, have been distinguished. The variant *dumalis* is the larger form. It is usually found in offshore waters, attached to wrecks and hard rock surfaces. The snorkler may find this anemone easiest to obtain. The terrestrial collector should try piers and jetties at extreme low tide during the summer months, where this anemone adheres in gaps between the embedded mussels and barnacles. Reproduction is by an asexual process known as basal laceration.

The distinction of the dwarf variety, *pallidus*, which could be easily regarded as a juvenile of the larger species, arises because the smaller form undoubtedly reproduces frequently, both in aquaria and on the shore.

Extensive observations of three anemones (15 mm (0.6 in) basal diameter) indicates that they will creep over a rock, and small fragments of tissue separate from near the base of the anemone, leaving up to a dozen fragments in its wake. Each fragment then develops into a separate anemone.

On the underside of the rocks that will be uncovered by the outgoing tide only a few times a year, as many as 100 small Plumose Anemones may be found. They could conceivably be confused with the orange, more elongate anemone, *Diadumene cincta*, which is more regularly reported from deep water. Congregations of the variant *pallidus* occur when tides and currents provide a substantially reduced food supply. These conditions may often be found in harbours and marinas.

In aquaria, the behaviour of the Plumose is unpredictable. Sometimes, they settle down immediately and open their tentacles attractively. At other times, they will contract into flat discs with the tentacles retracted, while some will wander ceaselessly around the tank, and only expand in darkness.

SAGARTIIDAE

Species: *Sagartia elegans*

Sagartia troglodytes

Cereus pedunculatus (Daisy Anemone)

It is tricky to differentiate the three British species of this family of anemones. Furthermore, they will all adhere to rocks from between 30 mm (1.2 in) and 80 mm (3.2 in) below a sand and rock terrain found in widespread locations on the British coast.

On a recent visit to the coast I discovered *Sagartia* anemones with buff-brown, grey, white, black, bright orange, bright yellow,



Sagartia species (this is *S. troglodytes*) are difficult to differentiate.

dark red/magenta tentacles, and a mixture of two or three of these colours. Colour varieties exceed in number and diversity any other genera of anemones.

Cereus, or the Daisy Anemone, is likely to be larger, with a display of up to 750 tentacles spanning from between 30 mm (1.2 in) to 70 mm (2.75 in). Colour is usually a speckled brown, resembling a common form of *Sagartia*.

Look for these anemones between mid-tide level and the low water mark on sand and rock coasts, with a minimum of shelter. They require quite large stones, or bivalve molluscs, cockles or tellins, to which they attach themselves beneath the surface. A trowel is a useful instrument to dig up the underlying rock since it is rarely possible to detach the anemone without unearthing its fixing stone. Remember to return the rock and leave the seashore as you found it. *Cereus* is difficult to detach without damage. It is often best to take both the anemone and the rock, as only intact specimens settle and thrive in aquaria.

All three species consume zooplankton and minute pieces of mussel. The tank floor should contain shells beneath the surface of the coral sand to which the anemones can adhere. All species of *Sagartiidae* possess 'acontia'; thin white threads that will be emitted from the centre of the anemone under certain conditions.

SAGARTIOGETON UNDATUS

When the lights are out, this anemone will expand to its full beauty, the column often reaching 10 cm (4 in) in length, and the pale yellowish-brown tentacles expanding gracefully over the brown and yellow striped body. *S. undatus* is distinguished by a brownish-black marking across the disc at the top of the anemone and including several of the tentacles. In this respect it differs from the similar *Sagartiogeton laceratus*.

It is only *S. undatus* that is likely to be found on the lower shore, attached to shells, groynes, or to a rock insinuated in a cranny where it is very difficult to collect. It is not common, but known to be widely distributed in areas where other anemones are found

throughout the British Isles. In daylight it is easily overlooked as the contracted appearance is small, as little as 2 mm (0.08 in) thick. The basal diameter can reach 6 cm (2.4 in).

Make sure that this species is fed sufficiently. It will consume mussel or prawn. Its own expanded bulk needs to be filled with food once a week.

GREY SEA SLUG (*Aeolidia papillosa*)

Finally, a word about the major predator of British sea anemones. Distinguished by preying solely upon sea anemones, this shell-less mollusc is unlikely to be mistaken for any other creature. It reaches 12 cm (4.7 in) in length, and varies in colour from white to grey, sometimes with a tinge of red. When it is picked up, the absence of the shell is most noticeable. Three species of the similar genus *Aeolidia* have also been identified. They are all only slightly different, and have similar feeding and behavioural patterns.

Occurrence of the Grey Sea Slug on the shore varies from year to year. I have always found them in the presence of *Sagartia* anemones. In my aquaria, they showed immediate interest in the Plumose and small Dahlia Anemone. Only after transferring to a separate tank did they readily attack the Beadlets, latching on to the base, and pursuing one particular red victim.

The Grey Sea Slug has a short natural lifespan, dying after coming inshore to spawn. In aquaria, it will be attacked by Wrasse.

Info required on other species

In my two articles on British anemones, I have restricted the test to the common shore species suitable for home aquaria. If anyone has kept other anemones, notably the true burrowing anemone *Peachia haitia*, or the two anemones commensal with Hermit Crabs, *Callisactis parasitica*, and *Adamsia palliata*, I will be pleased to hear from them.

Postscript

Latest observations indicate that both the larger Plumose and *Sagartia* anemones will consume boiled mussel flesh in quite large pieces, up to three-quarters of the bulk of the anemone. This seems to occur more readily in the presence of live plankton in fresh seawater, or newly-hatched Brine Shrimp.

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The appropriately named Crown of Thorns (*Acanthaster planci*) with a colourful — and distinctly non-thorny — Granulated starfish (probably *Choriaster granulatus*). Right: An elegant Reed Sea inhabitant — the Red Starfish (*Fromia* sp.)

STAR SPOT

In an earlier article (July, 1988), I talked about the sea cucumber, a member of the phylum ECHINODERMATA. The starfish is of the same phylum although it bears little or no outward resemblance to the cucumber, apart from its spiny skin. A brilliantly coloured starfish is one of nature's finest sights. This cannot be said of its unlikely relative, the sea cucumber.

As with all echinoderms, the starfish (Class: Stellerioidea — Subclass: Asteroidea), has a skeleton made up of tiny calcite plates, and has a water-vascular system which serves it for most of the necessary processes of life, including locomotion, respiration, feeding, and sensory perception purposes. There are about 1,800 known living species, and others have been found in fossil form.

The best known variety of starfish is probably that known as the Crown of thorns. In the 1970s, they reached plague proportions on the Great Barrier Reef. They ate the coral polyps, and the story of their devastation of vast areas of the reef was carried by the world press. At first, the plague was attributed to man's activities in the reef area, but now it is thought that it was part of a natural and cyclical process.

Like the sea cucumber, the starfish is an efficient scavenger, but some eat shellfish, some are cannibalistic, and some, like the species mentioned above, eat coral. They, in turn, are preyed upon by a variety of sea creatures, including large molluscs such as the Triton Conch and Trigger Fish.

The starfish has a large central disc, from which radiate arms, typically five, but sometimes more in number. Sometimes these arms are little more than vestiges. The animal's mouth lies in the centre of the underside of the disc, and on the underside

conchologist and marine consultant, Peter Elphick reveals some of the reasons why he believes starfish to be among nature's finest offerings.

of the arms are bands of tube feet used for motion and for holding on to underwater surfaces. If pulled from a rock, some of the animal's feet may be left adhering to it. The starfish can move in any direction, no part of it being the front.

Remarkable reproductive powers

Reproduction is usually sexual with some types being hermaphrodites (ie both male and female). The starfish also has a remarkably well developed regeneration system as oyster farmers once found to their cost. During attempts to prevent starfish from preying on oyster beds, the caught starfish were chopped up and thrown back into the sea. This process resulted in an actual increase in their numbers, for it was found that, providing a portion of the central disc remained connected to an arm, new starfishes were generated.

The asteroids can only live in a marine habitat. Many like rock and coral shores, but some varieties are found in deep water, including one at a depth of 6,000 metres off the Cape Verde Islands. Some have a chemical secretion apparatus to help fight off predators.

Some starfish grow to a diameter of more than a metre (c.39in), but the more usual size is from 15 to 30cm (6-12in) across. They are found in many colours, including red, olive green, and a brilliant cobalt blue. Some have coloured spots.

Unusual feeding methods

The starfish eats by passing collected food particles along the line of tube feet to the mouth, hand to hand, or rather, foot to foot, so to speak. When the prey is too large for this method to work, the starfish performs one of the outstanding feats of the underwater world. It forces its stomach out through its mouth, which then envelops the prey and digests it in situ. Only after this process is complete, is the stomach returned to its proper place.

The starfish opens oysters by wrapping itself around the shell, and attaching its tube feet to both parts of the bivalve. It then exerts pressure in equal but opposite directions on each half of the shell. The oyster's powerful adductor muscle gradually weakens under the pressure, and when the shell gapes, out comes the extendable stomach of the starfish, and in goes the oyster.

The starfish can be one of the most interesting reef creatures to watch and to photograph, partly because of its lack of mobility, and partly because of the bright colours of some of them. Some hide under rocks by day, but gentle removal of the rocks can pay dividends. (Please, please, always remember to replace these rocks when you have finished.)

To date, no economic use for the starfish has been found. As far as I am aware, the sea-cucumber-eating Chinese do not relish the starfish, but I would not be too surprised to learn that they did!