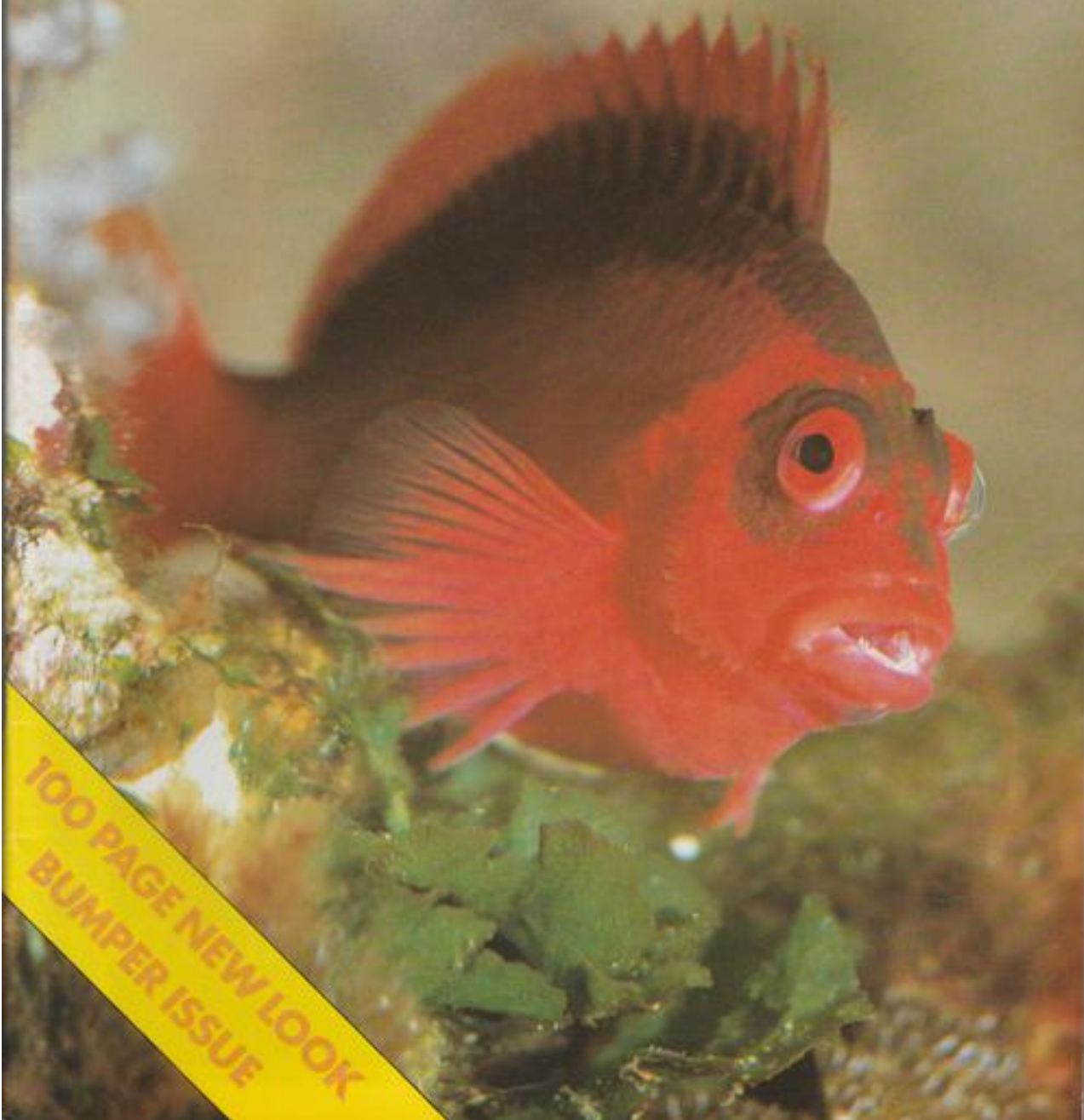


NOVEMBER 1985 85P

AQUARIST

AND PONDKEEPER

FISHKEEPING AT ITS VERY BEST. ESTABLISHED 1924



100 PAGE NEW LOOK
BUMPER ISSUE

AQUARIST

AND PONDKEEPER

NOVEMBER 1985 Vol. L No. 8

Publisher
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Published by
Buckley Press Ltd.
58 Fleet Street
London EC4Y 1JU
Tel: 01-353 4060

Subscriptions
£14 per annum (U.K. only)
including postage. Overseas and
Airmail rates on application. All
subscriptions are payable in advance.
Cheques or International Money
order should be made payable to
Buckley Press Ltd. and sent to:
Aquarist Subscriptions
Subscriptions International Ltd.,
92 Queensway, Bletchley,
Milton Keynes MK2 2QV.
Tel: 0908 70761.

ISSN 0003-7273
Printed by Buckley Press Ltd.

Cover story
Although a few species of Hawkfish are relatively common in the marine hobby, most are, unfortunately, quite rare. *Cirrhitichthys armatus*, the spectacular subject of this month's front cover, falls in the latter category. As can be seen in our superb Bill Tomey photograph, *C. armatus* is a fish with both vivid colouration and undoubted character. Hawkfishes belong to the family Cirrhitidae which contains 10 genera and approximately 34 species, distributed in tropical regions of the western and eastern Atlantic, the Indian and the Pacific oceans.



CONTENTS

Saltwater Selection	12		
David Sands suggests suitable species for a marine set-up.			
Correct Feeding	18		
Dr. David Ford reveals some of the complexities of fish nutrition in the first of three articles on this important subject.			
Producing Champion Goldfish	22		
Have you ever wanted to cultivate your own Champion Goldfish? Pauline Hodgkinson tells you how.			
Giant Toads	30		
As pets, toads are endearing amphibians but some of the larger species are very toxic, says Dr. Andrew Allen.			
Six of the Best	35		
As promised in our October issue, Dick Mills introduces his six favourite fish as the first contributor to our new occasional series.			
	Corydoras Catfish 40		
Among the most popular of catfish for the aquarium. Many new species have become available to aquarists during the last decade. David Sands, who has collected some of them from the wild, describes them and their needs in the aquarium.			
Spotlight	56		
The Lemon Tetra is a bright and lively characin. Read Arend van den Nieuwenhuizen's feature on this desirable species.			
The Most Popular Aquatic Plants in Britain	74		
Barry James provides expert advice on the cultivation of some of our best-loved aquarium plants.			
	The Israeli Experience 80		
Share the excitement of the coral world as John Dawes recalls memories of a hot, sunny January spent exploring the reefs of the Gulf of Eilat in the Red Sea.			
Regular features			
What's Your Opinion?	4	Your Questions	64
Helping Hand	7	What's New	70
Naturalist's Notebook	11	Company Profile—The	
Tomorrow's Aquarist	46	Waterlife Studio	72
Coldwater Jottings	51	Meet the Societies	86
Comment	60	News from Societies	88

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What's your opinion?



Welcome to the new, improved, *Aquarist & Pondkeeper*—which, from what our Editor has told me, should be available in all good book shops and newsagents' establishments. As a regular reader since the early Fifties I look forward to seeing my favourite aquarium magazine on sale in many such outlets. I also look forward to receiving more readers letters again—although the space allocated for W.Y.O. remains two pages; however, I'll endeavour to fit in as many opinions as possible. It's worth remembering that short letters probably stand a better chance of being published than long letters.

I'm writing this in late August in what should have been the summer. My only consolation is that my houseplants have never grown better than they have this year. Swiss cheese plants (*Monstera*) have reached the ceiling—and one has started to grow across the ceiling. Ivy and wandering sailor (*Tradescantia* species) plants have trailed/grown down walls—some plants reaching over 5ft. in length. A small, expensive stag's horn fern is rapidly becoming a large one. Best of all have been busy Lizzie (*Impatiens*) F1 hybrids, grown from seeds sown earlier this year. Pots are just mounds of flowers. The bicolor, Swiss Maid, is particularly attractive, as is a pure white specimen covered in large blooms. I'd like to repaint my living room but some of the plants, e.g. *Monstera*, actually have their aerial roots firmly attached to the painted walls of the room for support. I'll be bringing in my two Christmas cactus plants any day now as it's getting quite cool at night. The rough summer should help plants to produce plenty of buds and blooms. I note that shops

have just begun to sell prepared bulbs, such as hyacinths, for Christmas flowering. I must buy a few. As you know, it's best to plant three or four hyacinths of the same colour in the same bowl to ensure that they all bloom at the same time.

I've cut the wattage of the bulbs in several of my tanks to cut down the rate of plant growth. In most cases I've replaced 40 watt bulbs with 25 watt bulbs. What intrigues me is the fact that whereas I can buy four \times 40 watt bulbs for 99p, the 25 watt ones cost me 53p each. Why? I can never quite understand why higher and lower wattage bulbs cost more when they are the same size outside.

The following letter was written by Mrs. Amanda Almond, who was 23 at the time, and whose address is 92 Upland Road, Billericay, Essex. As the letter is undated I don't know how old it is. Mrs. Almond wrote: "While reading through a back copy of *The Aquarist*—July 1983—I spotted your article on khuli loaches and I thought I'd write to tell you an anecdote about these amusing, oddball fish. I had one of these fish a year ago. It lived in an 18in. community-based tank together with guppies, neons, pearl danios and goldfish. It got itself christened Zeebee because it would spring out of the tank at every opportunity. This was a worrying situation because I have a very-curious, ever-hungry Jack Russell dog.

"When my female guppy became pregnant I put her in an open-mesh net breeder, forgetting all about Zeebee—who, overnight, somehow jumped into the breeder and was waiting for me in the morning. Foolishly I lifted the lid to retrieve Zeebee, and out he jumped—straight into the open mouth of my hopefully-waiting Jack Russell, and never to be seen again.

"I have another community tank in which I have four pearl gouramies, one three-spot gourami, mixed danios and breeding guppies. The guppy fry tend to get eaten—but quite a few tend to survive the attentions of a definitely-unfriendly, three-spot gourami. I agree with your views on these supposedly-harmless fish. The three-spot is undoubtedly the boss of my tank, in which I keep four Bristol shubunkins.

"My 12-year-old nephew gives me his

back copies of *The Aquarist*. He has one community tank in which he has now given up trying to keep guppies as they kept dying; but he has several gouramies and other fish. His speciality is breeding—quite successfully—Siamese fighting fish in a separate, smaller tank. My other nephew has been keeping terrapins for two years now, quite successfully. I suppose you could say we are a fishy family. I think *The Aquarist* is a good, balanced magazine and gives its readers a chance to speak for themselves."

I hope readers will take a special interest in this month's *Aquarist* and write to tell me what they think about it. Remember, it's your magazine and a letter or two will let us know what your opinion is and what, if any, changes we should make in the format of the magazine.

One of my more pleasant memories of a dismal summer was a visit to the National Trust property, Mount Stewart, in County Down. Photograph 1 shows me posing in the midst of a batch of the giant, water-loving plant *Gunnera*. Last time I wrote about *Gunnera* plants, which I photographed at Kew Gardens, one lady reader wrote to inform me that it was quite obvious from my observations that the plants were giant hogweed—and rather dangerous because of their 'sting'. The only things that chewed me that afternoon at Mount Stewart—and it was quite possibly the summer that afternoon—were dozens of flies around the beautiful lake and gardens. Photograph 2 shows a couple of blooms on some of the many waterlilies that were in full bloom in the various ponds and the lake. I did not observe any fish in the man-made ponds. The large house and grounds were the home of Lord and Lady Londonderry.

The following letter reached me some time ago but is undated. It was written by Mr. John Drysdale Gordon, who lives at 89 Cuiken Terrace, Penicuik, Midlothian, Scotland. He wrote: "As water costs so much to heat, the commercial breeding of tropical and even so-called coldwater fish is limited to the warmer countries. The difficulty is that if the fish are crowded together in a small, heated tank the toxic ammonia wastes and lack of oxygen prevent growth. The solution appears to be to heat only part of the pond. If a plastic box with a



false bottom with a recess is floated in a large pond, warm water can be held inside; and so long as the bottom is pierced, oxygen can diffuse in; but because warm water is lighter (less dense) than cold water no convection takes place, and as static water is such a bad conductor no heat is lost. The box must be kept covered by thick plastic or glass.

"The water inside can be heated electrically but it can also be heated by a solar panel or heat pipe. The box should be wide but not deep, and so long as there is a large, deep body of water all the noxious wastes are used up or diluted.

"It is difficult to judge just how many fish can be held; but fish such as guppies can be over-crowded, and a 10 ft. x 5 ft. box could hold about 300; whilst koi fry would only tolerate 100. Disease control is important so a preventative dose of copper must be used every week or oftener." (Readers interested in these ideas should, perhaps, contact Mr. Gordon for further details. I should like to remind readers that I do not accept responsibility for, nor do I necessarily agree with, the views expressed by contributors to *W.Y.O.*.)

Mr friend Dr. Neville Carrington, Managing Director of Interpet Ltd., Dorking, is probably my most regular contributor. In a recent letter, in response to some of my comments in the May issue, Neville made mention of his firm's plastic plants, Plantastics, and sent me an advertisement showing the range available. Neville wrote: "... Actually I believe that there is a case for having both Plantastics and real plants in the same tank since the plaque of nitrifying bacteria which quickly forms on the surface of the plants produces a vast biological area where ammonia and nitrite can be converted into the less-harmful nitrate. Maybe the sample that I sent you has reached the bottom of your wardrobe..."

The only plastic plant that I can remember having was a stem of *Ambulia*. I suspect that it ended up in the bottom of a cupboard with a big bale of inoperative heater/stats. I'm never quite sure

why I keep such items, knowing that they have developed faults and that I'll not use them again. Perhaps I harbour vague ideas of returning them to their manufacturers to ask what they got wrong, i.e. in none of the cases did the heating element burn out; hence the fault must have lain with the thermostat or with its temperature control knob. Chip-operated ones obviously have faults in the electronics; and one or two have such unsafe 'rubber' caps that I would not use them. My only tank that seems unable to support live plants growing in the sand is my angel tank: the angels uproot the plants, although it contains a thriving layer of floating Indian ferns, and a few Java ferns that don't grow so well. Perhaps I'll try a limited selection of species of plastic plants in the 24 in. x 12 in. x 12 in. tank, to furnish it, in the hope that the angels won't uproot them. Actually, the ten angels in the tank are now much too big for it so I'll move some into the gourami tank that housed my late, lovely and lamented clown loaches. I'll have to remove some of the growing plants in the gourami tank to let the angels get swimming space.

Mr. Charles H. Smith's address is 'High Noons', 6 Kirklands Avenue, Baildon, Shipley, West Yorkshire, and his telephone number Bradford 590822. I'm delighted to say that Mr. Smith's letter was written and sent to me one week ago! He wrote: "Thanks for your column, which is always most interesting and informative. It must be 15 years since I last wrote to you, so you

can't really call me a regular correspondent. The family moved to Baildon, near Bradford, 13 years ago, from Harrogate. I found that re-establishing my tanks here proved a hopeless task and I gave up the hobby. However, you can't give it up forever and I started two 24 in. x 12 in. x 12 in. tanks. One is a community tank and the other a tank of barbs. That was three years ago and now I am pleased to say that they are a success.

"People often write to you with problems about plants and I too found their cultivation difficult, even though I have a good depth of gravel and use plant fertilizers. I am convinced that in a lot of cases the problem is light—too little of it! I now have a 40-watt bulb and a Gro-Lux tube in the community tank and two 40-watt bulbs for the barbs, and these are on for eight hours per day. The plants, chiefly Amazon swords in the community tank, and *Cryptocoryne* species and Indian ferns in the barb tank, are doing fine; and the Indian fern is rooted in the gravel. I also try to use as few lead weights as possible and this also seems to help. The Amazon swords are still not sending out runners, though.

"One problem that I do have is that I can keep any sort of barb except tigers, which just die after developing some sort of problem which makes them swim round in circles with their tails uppermost. I have purchased them from several shops but the result is always the same."

For a future issue please send me a letter about: (a) fish that you find difficult to keep; (b) ponds in winter; (c) wattages of bulbs that you find most suitable for good plant growth in tanks of specified sizes; (d) breeding live foods; (e) marines; (f) your early days as an aquarist; and (g) any tips you have that are worth passing on. I look forward to hearing from you—especially if you are a new reader—or an old faithful, like Mr. Charles Smith. Good-bye until the Christmas issue.



Helping hand



Reflections Aquatic Centre

In the last Helping Hand issue, I referred to a visit I made to Reflections Aquatic Centre in Aldershot. I was, unfortunately, unable to include any photographs at the time, either of the shop entrance, or the spacious aisles inside. I am pleased to report that, despite a few photographic failures, I have managed to obtain one photo of the entrance showing the removable ramp that Martyn Haywood has installed to make life in a wheelchair less troublesome when visiting his shop for fish and/or equipment.



As a matter of interest to the Trade, I enclose an item that was printed in the S.I.A. Journal (Spinal Injuries Association) May issue regarding Building Regulations:

"New Government regulations will mean that, as from 1st August 1985, all new offices, shops and other new buildings which are single storey and to be used by the public, or for educational purposes, will be accessible to

disabled people. Such premises will have to conform to the British Standards Code of Practice on Access for the Disabled to Buildings (BS5810).

The Government has given a commitment to extending the range of the regulations (which are subject to Parliamentary approval) over the next few years. Different regulations regarding access came into force in Scotland and Northern Ireland recently."

Pet Care (Bristol)

It appears that the Trade in general is showing a favourable reaction towards the disabled aquarist, as I discovered when I had an invitation from Expoh Promotions to attend their Trade Show at the Holiday Inn in Bristol on 8th September.

I would like to extend my sincere thanks to Christine Pankhurst and Judy Scarfe for their invitation and for providing me with an opportunity to talk to traders regarding the disabled fishkeeper. I was able to demonstrate to them that a wheelchair-bound aquarist does not require a tank stand to be made in such a way that it becomes an unsightly, cumbersome piece of furniture.

Over the past eighteen months, I have been involved in designing a stand that

does not only cater for disabled aquarists but also serves the dual purpose of being an attractive piece of furniture that anyone would be proud to have in their lounge.

It's been hard going but I think we have now managed it.

I took my latest version down to Petcare Bristol and was delighted at the outstanding response from the Trade. I had some very interesting discussions (and offers).

One question that was repeatedly asked concerned how a person in a wheelchair can manage to work inside a tank. The answer is quite simple: just by removing a self-supporting front beam on the stand, it is possible for a chair to be wheeled into position underneath the tank itself. This allows you to bring your body right up to the front of the tank, making the whole of the



inside of the tank accessible for all types of installation and maintenance work, including planting, cleaning and arranging of furnishings. In the past, I, like other disabled aquarists, have had to rely on a "Helping Hand" or else have done the jobs on my own with a great deal of difficulty.

The hinged lid can be opened and held in this position by supports, thus leaving you with both hands free to carry out all your jobs comfortably.

As you can see in the drawing, the height of the stand is such that you can easily reverse out from under the tank once you have finished your work. Then just by replacing the beam (a very easy job) you are left with an outfit that looks like an attractive piece of furniture and not a monstrosity that is of no use to anybody other than a wheelchair aquarist.

I have also made the height right for viewing from an armchair without having to look down or up at the tank.

For further information on the outfit, write to me, enclosing a S.A.E. I look forward to your comments and views. In the meantime:

Good Health and Happy Fishkeeping.

Nick Lushchan,
27 Hungerford Road,
Rugby House,
Calne,
Wilts. SN11 9BH.

Naturalist's notebook



Even if it's only to collect *Daphnia*, most of us have a pecuniary interest in ponds and their conservation. We began as pond-dippers and used the field-ponds to stock our first cold water aquaria in schooldays. Be it a black and sullen village newt-pool, plant-clogged and hardly big enough to attract a moorhen, or a glistening trout-ringed lily water banked with weeping willows contemplating their own reflections in its liquid loveliness, it came under the Ministry of Agriculture's 1985 survey of environmental topics on farms in England and Wales.

The 15-page report which the Ministry sent me shows farm-ponds are increasing by 2,000 a year, fewer in Wales than in England. But over half—of English farmers and even more Welsh see no particular wildlife or amenity conservation value in them, obviously scope for the Farming & Wildlife Advisory Groups. 42% of English farms have ponds, averaging three each, and increasing by about 1% annually. This allows for several farms making new ponds or removing old ones. Wales has an annual net increase of 2½%. Unfortunately, no record was kept of ponds made or preserved for fishes, which came under wildlife conservation. 158,500 ponds were recorded on English and Welsh farms.

More than a dozen years ago, a Cheshire & North Wales group was formed in the Marine Aquarists' Society. I recently attended the inauguration of a Merseyside branch of the Marine Conservation Society whose HQ at Ross on Wye organises serious shore and diving projects for the study of marine life, ranging this year from Sark and Brittany

to Loch Torridon, underwater diving at Port Erin and the sponges and sea-slugs of Bantry Bay. It is compiling a coastal directory of important marine conservation areas, and a marine atlas of the near-shore waters of the Irish Sea off North Wales and N.W. England.

Which do you prefer, a cuckoo-wrasse for your club's next fish-show, or helping an Exeter University biologist at Hatherley Labs prove his hunch that sea-urchins have a preferred orientation on steeply sloping surfaces? I guess most readers plumb for the first. Of course there's more interest in a cuckoo wrasse than just exhibition pride. Like the Mexican swordfish and South American mollies of the freshwater enthusiast, it changes sex. Most of the variably coloured cuckoo wrasses are female, changing under certain imbalance of the sexes to mate; but in the wonderful fish-haunts of the Red Sea I learned they were separated fairly evenly into male and female.

Over 50 years ago a consignment of little swordtails in London Zoo aquarium fascinated aquarists into keeping this easy live-bearer for the novelty of changing its sex, though a similar phenomenon is evident in some other fish, like the vivid scarlet rosefish, ocean perch or Norway haddock, *Sebastes*. After producing several broods of young, female swordtails sometimes develop the male pairing organ with the two lower fins, also the sword-like extension of the tail-fin. Females normally far outnumber the males, and such drastic steps become necessary to equalise the sex ratio. Nor is this confined to fishes, oysters and domestic poultry being well known examples.

There is also the Madeiran scorpionfish, *Sebastes maderiense*, in addition to the great scorpionfish and another inhabiting those waters and appearing on local fish-food markets. Specimens were netted east of Funchal for London Zoo. Sexing fish is sometimes difficult enough without this confusion! Sex and the single swordfish is as good a story as anything in the Sunday newspapers. A female, like the green swordtail, may have seven or eight broods of 40 to 100 young from a single mating, born five or six weeks after pairing, according to the water temperature, from 12 weeks gestation at 67°F down to the shortest period at 87° deg. A female green swordtail gave birth to 242 young in Chicago's Shedd Aquarium.

South American cyprinodont, *Mollie-*

nesia pentensis in New York and Cincinnati Aquaria shares with other mollies this sex phenomenon. In fact two pregnant black female mollies presented to Cincinnati children's aquarium duly gave birth, when they were transferred to a community tank. Two months later their new custodian complained that he had been given two males by mistake. "I just had time to feed them twice a day, and inspect them for ich", said the breeder, "but I didn't have time to observe the sex change". Later the curator observed it in full. A black molly female acted normally for three days after dropping its first brood, and then began hiding among the plants because other mollies were chasing it. She was then isolated, showed signs of submission by lowering her dorsal-fin and even showing fear of two guppies, introduced to the tank. Ten days after producing her brood, she began to grow larger and carried her tail-fin close to her body. The guppies were removed and she calmed down. Then her body grew more slender and on the 24th day the anal fin looked like a gonopodium, the mating organ of viviparous fish.

Returned to the community tank, and 13 days later it began chasing females, followed four days later by copulation. Its dorsal fin grew considerably and 26 days after its motherhood this assumed a bright orange border. The sex change only occurs from female to male. In birds like poultry, where the hen normally uses only one ovary, sometimes in old age the atrophied second ovary develops into a testis which secretes the male sex hormone and enables the hen to assume a comb and other features of the cock bird.

The breeder of swordtails may notice a female after several broods lengthen the rays on her anal fin to develop a tube-like male organ. She absorbs any eggs remaining in her body and develops typical spermatozoa. The offspring born are all females, or neutral. There never seems to be any need to turn males into females, aggression probably avoiding the sex ratio in the wild ever assuming a preponderance of males. Swordtails hybridise of course, and Dr Mombour in prewar Germany produced the famous Wiesbaden swordtails, which rivalled the popular green swordtails nearly 50 years ago. Breeders crossed it back with the red swordtail for a new strain. Males were rare in black Wiesbadens.

THE SALTWATER SELECTION



That colourful marine species of fish exert a magnetic attraction upon aquarists is undeniable but the fear of expensive technology involved can be deterring. David Sands endeavours to allay such fears.

The most difficult decision facing today's aquarist is deciding for or against keeping a marine system. Colour, variety, light and the challenge all draw fish-keepers in but the expense, sometimes baffling technology and a general doubt about keeping 'delicate' animals in an enclosed system, may be off-putting.

In my opinion several important rules, if obeyed, could tip the balance in favour of a marine system, but they *have* to be followed.

1. Purchase the system which can be

afforded, include in the costing all necessary test kits, hydrometer and a budget price for fish. Trying to economise by purchasing the cheapest equipment, or testing pH but not nitrite, nitrate and ammonia is a false economy which can eventually cost money. Sea-test and Tetratesst seem to have the edge over other kits and the needle hydrometer, so simple to use, must supersede the glass type.

2. Once the size of system has been confirmed, I repeat this should be the one afforded and not the largest, as some would advocate, then the selection of fishes can be considered. It would be

Left Clown trigger, always a crowd puller for large display systems.

Below Queen angel—two foot long. Specimens are awesome, often offered at a 50p size and introduced into small systems.



useless to select a large angelfish only to discover the system afforded would be far too small to accommodate its size.

3. Find a good retailer, one who can discuss various fishkeeping aspects, offer a range of products (not just the cheapest) and has marine systems in which the fishes appear healthy, well cared for. Your final selection should be confirmed by shopping around—and comparing each retailer.

A great deal of fuss has been created by retailers installing central filtration systems; these employ large sand filters, protein skimmers, settling tanks, sometimes sterilisation and ozonisers. These systems mirror those utilised by the better marine importers so the transfer of stock (a time when saltwater fishes seem to suffer) should be smoother. On the other hand, aquarists employing standard undergravel systems (50-75% with external power filtration) could argue that any change of system may cause problems once fishes are transferred into a smaller Aquarium system. I believe a great deal of damage and the apparent vulnerability of salt water fishes stems from the poor facilities during collection and exporting i.e. overcrowding, bad handling and incorrect feeding (if at all). Healthy saltwater fish suitable for life in small aquaria are extremely tough; perhaps a surprising statement for many aquarists, yet I believe it would be confirmed by the best marine importer in Britain.

While some retailers allow the sweet shop approach in which newcomers to the hobby can buy as they please regardless of compatibility, attainable size and nature of the fishes, then the saltwater hobby will not progress.

Butterfly fishes, groupers triggers and lionfishes

A great many marine fishes should remain on the reefs where they will enjoy life. Many are butterfly fishes, some of which are specialised feeders, continually browsing on sponges, plant growth or crustaceans. In contrast even some of the so called hardy fish, groupers, triggers and lionfishes have drawbacks. The first two are fast growing, greedy fishes, likely to put pressure on less boisterous species in an enclosed aquarium. The latter group, complete with old aquarists' tales of poisonously spining 1 in 10 fishkeepers to death, are nocturnal predators.

If a large system, 60 in. x 72 in. x 84 in. long aquaria with front to back and depth to match are available, then these fish have a place in a large fish community, otherwise they belong in public aquariums. Massive water changes, undoubtedly required if large fishes are

fed correctly, can be difficult and costly. If a reservoir is not available then pre-heating, salting and pH adjusting can be large and expensive barriers. So, which fishes are suitable for the modest aquarium of 36 in. — 48 in. x 18 in. x 15 in. ? Surprisingly enough there are a great many. I would suggest readers ask the local library for Dr. Allen's book on damsel fishes—there is an amazing number of beautiful species, although not all are imported. A similar book on clown or anemone fishes would also open a beginner's eyes. Many of these small saltwater fishes are adult at 3-4 inches and are well suited to small systems. All damsel, clown and dwarf angels are

territorial and aggressive towards those fishes most similar to them, but if a good rock layout is offered (aquascapes are very important) then subdominant fishes can retreat from an arena. Yellow dwarf angels do not threaten yellow tangs but do chase coral beauty dwarf angels because they are the same basic shape. Freshwater aquarists must be familiar with this behaviour from keeping cichlids—particularly Lake Malawi and Lake Tanganyikan cichlids.

So many beautiful Centropyges (dwarf angels) exist that I believe them to be the ideal marine fish. They settle easily into a mature marine system in particular one which has good, green algae and they



Above Royal Gramma: territorial as with all Basslets but superb for the modest aquarium.

Right Clown wrasse in its juvenile colour can be difficult to feed because of its strange day/night and sand burying trick.

Below A yellow Centropyge living in close harmony with an Hawaiian yellow tang—here there are no disputes over territory caused by colour.

Compatibility charts

36 x 18 x 12—48 x 18 x 15
(average system)

Damsels/clown fishes
Basslets (Royal grammas etc)
Dwarf angels
Gobies
Cleaner wrasse.

36 in. 6 fish maximum
48 in. 9 fish maximum

60 x 18 x 15—72 x 18 x 18
(upwards)

Batfish
Trigger/groupers
Tangs/large angels
Korans/Emperors/blue ring angels
Lion fish
Large Wrasses
Puffer fish
1 fish for each 12 in. length
i.e. 60 in. 1 trigger, 1 grouper
1 tang/large angel
1 wrasse.



feed well on frozen foods such as brine and mysis shrimp (Tetramarine flake is well accepted too!) All three groups of Damsels, Clowns and Dwarf angels adapt well enough to aquaria, frequent spawnings are proof of this. Raising fry is an extremely difficult task and I am not qualified to discuss this specialised field. John Rigg, one of my marine customers from Bolton, has regularly raised fry and provided North West retailers with tank-raised common clowns. He has spawned a pair of flame angels, purchased from me, only to be frustrated by not being able to obtain a small enough food to sustain the youngsters (even after consulting the best marine aquarists in

the world).

Hawaiian flame angels are the most expensive dwarf angels available at about £50 each, so the initial investment, although high, could easily pay a handsome profit, if only a micro food could be developed.

The interest in the symbiotic relationships between clown fishes and anemones draw aquarists into the second phase of saltwater aquariums; the invertebrate system. That clown fishes need an anemone is not disputed, although some North American tank raised clownfishes have never encountered an anemone! Here, the main barrier is a conflict of interest between the requirements of

fish and invertebrates—temperature, salinity and lighting are all different for corals and anemones. Although, if aquarists could resist overstocking a small invertebrate system, many problems would not occur. Shallow tanks with good water clarity (try the glass of aquarium water on a white paper test—if yellowish, a 50% water change should be undertaken) and a good mixture of tungsten spot-lights and Northlite, Tru-light and Gro-lux tubes will sustain invertebrates. I have seen many fish systems collapse because dying anemones have polluted the water. The answers usually rest on poor water clarity, insufficient lighting, incorrect feeding of fish and anemones and, on rare occasions copper pollution.

The life support system of the aquarium

Successful marine fish keeping is not simply related to a big budget, although with each piece of equipment the percentage of success against failure is improved. A large power filter or Tunze style system combined with undergravel filtration and a protein skimmer *must be considered the life support system for fishes*. If they cannot be afforded then many options are excluded.

There is a place for a small system understocked with a small selection based around damsels, clowns, gobies and dwarf angel fishes. With astute maintenance, close monitoring of water quality, in particular pH and nitrate and salinity, small systems can be economical and successful.

A point rarely touched on by writers should be emphasised: if the fish has internal damage before purchase, either from Sodium Cyanide poisoning or bad handling, then all the expertise and money in the world will fail to revive it. The problem is that a sickly fish can be dying over several weeks—the unsuspecting aquarist would normally blame the system.

Whilst it cannot be stated that marine fish keeping is a simple hobby, it can be very rewarding. A large group of yellow tangs competing with an Achilles and powder blue tangs for a whole lettuce in a 250 gallon system is a marvellous sight.

One final cautionary note: whoever first coined the phrase—"the larger the tank the better" did not really know the full ramifications of that statement. I believe this is based on a myth that large systems imbalance less often than small. The problem with a large system when it imbalances, i.e. high nitrate, low pH soiled filter bed, is that it takes a great deal more effort and expense to correct. A small aquarium does have its moments.



Equipment required

C.V. undergravel filter/aeration/power head/Eheim/sacum
Sand/coral gravel
Salt
Protein skimmer
Power filter (external largest affordable loaded with long term filter material) or Tunze style (external biological nitrification system)
pH, nitrite, nitrate, ammonia, test kits
Sea-test Hydrometer, good temperature thermometer
Lighting

Ph range 8.1—8.3 temperature 75-77°F nitrite, nil, nitrate max 20ppm.
Test tap water and saltwater mix *before* introducing to aquarium.

Useful hints

Buy a water barrel in which to store, preheat and salt mix for water changes, ask the retailer for mature sand, preferably from an invert system to mix with new sand when setting up.
Introduce one-two fish at a time, purchase a good range of frozen foods.

CORRECT FEEDING

Variety in fishes' diet is not essential. Live aquatic food from wild sources is not safe.

Fish are not likely to starve due to their owner's absence during a holiday break.

Dr David Ford, Head of Aquarian Laboratories, expounds the basic philosophy of fish feeding.

Nutrition is a complicated subject to study in humans, but even more so in pets who cannot (or will not) collaborate in experiments. Another factor is that basic human nutrition is the same whether the subject is a European, African or Asian. Similarly a pet dog requires the same food materials whether it is a Great Dane or a Chihuahua, and a pet cat needs the same carnivorous diet be it a common tabby or a Champion Siamese. Fish, however, come in 20,000 different species each with its own feeding requirements. These range from the Algae-eating Plecostomus to the Flesh-eating Piranha, from the Coral-crushing Trigger to the Insect-shooting Archerfish.

Despite the complications the frontiers of knowledge in fish nutrition are widening daily. The advent of fish farming, particularly Catfish in the U.S.A., Trout and Salmon in Europe and Tilapia in the Tropics, has generated a great deal of basic research on the subject. In the field of pet fish, research is continuing in the laboratories of Wardleys in the U.S.A., Tetra in Germany and Aquarium in Great Britain.

The Hobbyist Questions

There are three questions that aquarists ask about feeding their fish—how much, how often and is variety essential?

Taking the last question first. Variety is no longer essential. The years of research have produced a range of commercial diets for pet fish that are nutritionally complete. The most popular form of these diets is the flake food, so convenient for storage, handling and feeding to top, middle and bottom

feeders. Flake is available, designed to meet the specific requirements of Carnivores (such as Cichlids), Herbivores (Vegetable diet for Mollys for example), Growth (for fry), even individual species such as Guppy flake food.

Aquarists who have kept fish for many years remember the old days when dried biscuit meal and similar cheap foods were all that was available. These hobbyists will recall their past experiences to justify claims that commercial diets are satisfactory for routine feeding, but live food and home-made concoctions are essential for breeding and growing. This is no longer true. The top quality flakes are now very palatable and nutritionally complete. Of course, "cheap" flakes and other forms of dried food may lack essential elements and these still need supplementation.

Laboratory trials, over many years, have shown that top quality flake can be fed as an exclusive diet, producing large, healthy, long-lived tropical, coldwater and marine aquarium fish.

How often? This depends on the type of fish. Carnivores eat one big meal and lie around digesting it for hours, whereas herbivores nibble all day long. If you own a community tank with mixed species, a compromise is to feed twice a day—morning and evening according to your own busy schedule. If you breed any of the fish, the fry will need several small feeds daily so they can feed almost continuously but without excess food polluting the water. It is simple to check that enough fry foods are being fed, just examine the bellies of fry via a magnifying glass and keep them fat and full, but do not allow the water to go cloudy (do rapid, partial water changes if it does).

It is often advocated that a day's

"rest" is advantageous, e.g. do not feed on Sundays. This is to copy nature's erratic food supply when fish feed during periods of plenty and build reserves to bide them over periods of scarcity. However, over many years my laboratory fish have been fed 6 days a week and my home fish every day of the week—with no measurable differences in growth, colour or longevity. So I believe "rest" days are not important, but nature's system does mean that periods of starvation are not damaging.

Hence there is no necessity to worry about weekends away or even holidays of two or three weeks. If the fish are adult and healthy, they will survive for 6 weeks in an unattended aquarium before any species are lost.

How much? The first question and the most difficult to answer. Aquarists have sponsored research into this question at various Universities (e.g. under the supervision of Professor Klontz at the University of Idaho, U.S.A.) and the latest findings indicate that hobbyists tend to underfeed their fish. Growth trials show that typical pet fish need 5% of body weight per day in 3 or more feeds daily. The lowest feeding rate for survival is 1% of body weight. In flake terms this means an average fish such as a Serpae Tetra weighing 0.5 gram needs 0.025 grams or 3 flakes of a 20 mm (¾ in.) flake daily, either all at once, or preferably divided into 3 feedings. To maintain 100 average sized community tropicals, one level teaspoonful of mixed recipe flakes should be used each day, divided into one, two or even three feeds. One of the advantages of the fish's method of feeding (I wish we humans had it) is that they can eat continuously, digest what they need and excrete the rest. So you can't really overfeed fish, but you can (easily) pollute the aquarium. Trials in the Aquarian Laboratory using food identified with non-digesting colourants, show that if a fish likes a particular diet the food passes through the gut in a daily rhythm similar to humans. If the food is unsuitable in some way, the fish will excrete it as faeces within an hour.

To quote percentages or weights on commercial fish foods is obviously unsuitable for hobbyists, therefore most manufacturers use the "feeding time" method. This states that flake (or granules or pellets) should be fed over a period of several minutes so that every fish gets some food but surplus is not left to pollute the water. As a directive it may be vague, but it's good advice—and it works.

Next month David Ford discusses nutrition and the value of protein.

What makes a champion goldfish? Opinions may differ on this point but not on the dedication and time involved in producing a strain of quality fish as Pauline Hodgkinson explains.

PRODUCING CHAMPION GOLDFISH





The Fantail **left** has a twin tail, a dorsal fin of half the body depth and can be both nacreous and metallic in scaling.

The Bristol Shubunkin **below** has a large-lobed caudal fin, is multicoloured and can be either metallic or nacreous.

Tancho Oranda **above**. This variety has a raspberry-like hood and metallic scaling and is overall silver in colour.

The Veiltail **above right** has a high dorsal fin and a drooping caudal fin. Can be either nacreous or metallic in scaling.



Producing champion goldfish may appear to be an easy task for a few hobbyists though nothing could be further from the truth. The fact of the matter is that only those who are prepared to put the time and effort into their hobby have a chance of achieving success. Almost certainly years of work will have gone into their strain to arrive at the stage where they are continually producing show quality fish.

There are different ideas within the hobby as to what is a champion, for what one group considers to be the ideal fish of its type may fall short of the standard set by others. Fancies and tastes change over the years, dictated by those who are active within the hobby at that particular point in time. It is little wonder that newcomers to our hobby can become confused with just what is conceived to be a top class specimen or mere mediocrity. All the specialist goldfish societies have their own set of 'standards'; however, there is some degree of unity within the major clubs which allows for sporting competition along some common ground, though probably complete unity on every aspect of all the individual varieties of the goldfish can never be fully realised.

Like producing any other form of pedigree live-stock, advancement of the species cannot happen overnight and

patience must be one of the most vital attributes which the goldfish breeder can cultivate, for very often the first attempts at breeding even reasonable quality fish can be disappointing.

One of the short cuts in breeding better quality fish is to start off with good stock from a well established line. Much of the ground work of creating and establishing the characteristics will have already been fixed, though that does not mean to say that future breeding ventures will be without need of skill and that certainly will not mean that there will be no need for improvement. In fact each new breeding season will bring its challenges, disappointments and, hopefully, rewards.

Characteristics are determined by gene make-up

Knowledge gained from membership of one of the specialist goldfish societies is without doubt invaluable and experiences shared widen the scope for quicker advancement in the art of the goldfish culture. Perhaps the most important thing to remember is that goldfish, like all other living creatures, have their characteristics determined by their gene make-up. While few of us are able to understand more than the rudiments of this complex subject, we are able to accept that inheritance of characteristics is passed on from parents to offspring but that not all features are visible and bad as well as good points can hide within the make-up of the fish only to reveal themselves at a later date in future generations. Therefore it is crucial that care and thought must go into each crossing, especially if new blood is being introduced into an existing line. Many disappointments happen because the breeder makes haphazard crossings without any knowledge or consideration of the background of the fish used for breeding and many good strains have been ruined by introducing an inferior progenitor.

Champions do not necessarily produce champion offspring and the need to acquire show standard fish for breeding purposes is totally unnecessary. In fact most of the people who are continually in the winning cards at the top coldwater fish shows with fish which they have bred themselves will usually admit to keeping two classes of fish, those which are exhibited and those which are retained for breeding. So it is plain to see that what is in the inside of breeding stock and not so much what is on the outside is the vital factor.

Opinions differ as to whether any one variety is more difficult to breed and produce good quality show fish than any of the others. The tendency of each individual is to believe that the type of

fish which he specialises in is the most difficult because he has first hand experience and is well aware of the difficulties involved. I have bred many types and have now come to the conclusion that the more exotic and further removed the variety is from the original, the more difficult it is to produce large numbers of top quality youngsters from any one spawning. When breeding the common goldfish the fry will probably need sorting only for the odd few which might possibly be mis-shapen, though the overall quality will depend on the strain and it is usually true to say that a well established line will yield the majority which have more chance of resembling the ideal. Chances of the same successes decrease considerably when the variety becomes more fancy as in the twin tails, especially those with long, broad, flowing finnage as with the Veiltail. The dorsal-less varieties pose another difficulty because the dorsal area has the tendency to be uneven and unless the strain is well fixed will have many babies with 'spikes' or partial dorsal rays. Few fish in any one of these broods will have nearly or perfectly smooth backs so the skill is,



The Lionhead has no dorsal fin and carries a well developed hood. The back should be smooth and red or deep orange.

when breeding these types, to improve the percentage of fish with good backs. However, the more exotic varieties are easier to cull as faults are usually more obvious at an earlier stage so selection can be made more quickly, creating space for the better fish. Colour in the metallic fish should ideally, be red or deep orange without silver markings as silver in the varieties other than the Redcap is considered a fault and in competition would lose points. This fault can be bred out of a strain but will take many generations to achieve. The early colour change from olive green is important for quick change usually gives deeper, richer

colour. Really good strains, if the young are kept at a constant water temperature of around 70°F, will commence to change at about four weeks of age. It is therefore detrimental to use fish for breeding which themselves did not colour in their first season for in turn their offspring will take too long. If the fish happen to be nacreous then the task is made even more difficult due to the greater variety of colours. In theory 50% of the fry in a nacreous x nacreous spawning will be discarded because 25% will be metallic olive green which, though a small number may eventually change to orange, will take a long time to do so. There will be 25% matt, a pinky white with black button like eyes. These unattractive fish will be culled in order to develop the highly coloured nacreous fry. Consequently there will be fewer fish from which to select the good specimens.

Varieties with the raspberry fleshy head growth, as in the Oranda and the Lionhead, normally do not develop sufficient 'hood' growth in their first early years to determine their potential as champions. They may well excel in every aspect but only time will tell as to whether sufficient characteristics of their type will eventually make them champions. In some countries the hood is thought to be the most important part of the fish and in competition faults, which in our shows would disqualify it, are accepted so breeders of these types cannot concentrate on any one characteristic alone but each and every part is important in order to qualify as a champion.

The correct diet determined by the variety being fed is another very important consideration for the single tail slim bodied types can lose their streamlined shape if their diet contains too much starchy, bulky foods more suited to the twin tail fish.

It is very important to keep a comprehensive record of all spawnings, with dates and all relevant information. When breeding pedigree stock important details can be lost for ever if facts are not recorded but merely stored in the mind.

Visiting and taking the opportunity of exhibiting fish at the specialist coldwater fish shows will give the breeder some indication of the quality of his own stock comparing them side by side with others of the same type. Perhaps in this way he will get some indication of how much work he must do before they can be proclaimed true champions. It is by always searching for perfection and never being completely satisfied by the results that the stock can progress and this is not only for the good of the individual but for the hobby as a whole.

GIANT TOADS

A football-sized toad which is the most poisonous and among the largest, is *Bufo marinus* described here by Dr. Andrew Allen.

The largest toad in the world, *Bufo blombergi* from Colombia, preys on rats, mice, snakes, and birds. One specimen I measured during an expedition to the Sierra de Sta Marta had a snout-vent length of 11.2ins (27 cm) and weighed 5.40lb (2604g).

Other giant toads which grow to more than 9ins are *Bufo marinus*, *B. ictericus* and the rococo toad *B. paracnemis*, all from South America, *B. asper* from Malaya, and three sub-species of our common toad, *B. b. gredoncola* from Spain, *B. b. spinosus* from Southern Europe, the Middle East and North America, and *B. b. gargarizans* from China.

During the course of a programme of research on the biochemistry of toad venoms, I have had the opportunity to keep all these species in either indoor or outdoor vivaria. But I will confine my account of giant toads and how to keep them to the two species most commonly imported into this country, the giant or 'marine' toad *B. marinus* and the spiny or dalmatian toad *B. b. spinosus*.

Giant or 'Marine' Toad (*Bufo marinus*).

Distribution. Tropical and subtropical. South and Central America, the southern United States, Puerto Rico, Hawaii, Haiti, the Solomon Islands, and, since 1935, Australia.

The giant toad is the only toad in Australia, where it is called the cane toad. It acquired its new name and home through being introduced from South America to eradicate the cane beetle which was severely affecting the sugar cane crop in north western Australia. In 1935 a batch of giant

toads were released in Queensland in the hope that they would act as a 'biological controlling agent' and rid the plantations of the beetle pest.

Unfortunately, the toad failed in its appointed task: it ignored the cane beetles and instead devoured the local frogs, lizards, birds and other predators of the insect pest, so that the beetles became more numerous. The toads quickly spread and bred successfully and they now take a heavy toll of pet dogs and cats and also deprive the rare native wildlife of food. The original high hopes for biological control were not realised, therefore, and there are now two pests—toad and beetle—instead of one.

Habitat. Very adaptable. Swamp, wet rain forest, jungle, plantations, sierra, meseta and desert, but only found in dry habitats when these are within migrating distance of permanent pools or swamps.

The 'marine' toad is not, of course, a marine toad in the strict sense of the word but it is found and even breeds in saline coastal marshes where it comes closer to living in the sea than any other amphibian.

Particularly abundant in and around South and Central American villages where it preys on rats and mice.

Feeding Habits. Gargantuan appetite. The prey of the giant toad consists of all living creatures susceptible of being swallowed: rats, mice, birds, lizards, snakes, frogs, toads, snails, worms, insects, and even carrion.

A mouse or bird is caught on the tongue like all other prey. The first movement lands it half in and half out of the mouth. There it is squashed and presumably rendered unconscious. Another gulp and it has gone, the whole

operation lasting only a few seconds.

When prey is abundant the giant toad stuffs itself silly eating several mice or several hundred insects a week until it is so fat it can scarcely waddle. When times are hard the giant toad is able to fast for months or even years living off its layers of fat.

Live giant toads are sometimes found sealed inside rocks in cavities with no opening to the outside world. I shall discuss why live toads of this and other species are sometimes found inside rocks and how long they have been there, on another occasion.

Breeding. Extremely fecund. Spawns two or three times a year in permanent pools. The female lays 35-50,000 eggs, which hatch into tadpoles in 3 days.

Enemies. Tadpoles and juveniles suffer heavy mortality but few predators are able to cope with an adult toad the size of a football protected by some of the deadliest poisons in the animal kingdom (the giant toad is almost certainly the most poisonous member of the *Bufo*idae).

The warty skin of the giant toad is a marvellous miniaturised munitions factory producing more than 30 different irritants delirants and poisons which protect the toad against cats, dogs, alligators, snakes and other would-be predators. When the perambulating poison pot we call a giant toad is attacked by a dog, say, muscles around the warts contract, squeezing out bead after bead of acrid milky venom onto the toad's skin until the toad is covered with a foul froth of poison. The dog takes a bite, retreats in confusion, foaming at the mouth and howling with anguish, and, if it has any sense at all, learns its lesson: THIS ANIMAL IS TABOO! If the dog is silly and tries to swallow the toad it will drop down dead, just like that.

One of the poisons in giant toad venom is a bufadienolide, a cardiac glycoside (a heart poison of the steroid family) called *bufotalin* (C₂₄H₄₆O₁₀). Chemically it resembles the lethal digitalins of the foxglove *Digitalis purpurea* and the Malayan upas tree. It makes the heart slow down and stop. Which is why the dog drops dead. (In minute doses *bufotalin*, like digitalis, can be used to slow the beat of a twittery heart. The ancient Chinese used *chen ni* and *sen so*, two extracts from the venom of the Chinese giant toad *B. b. gargarizans*, in the treatment of heart disease).

Another component of giant toad venom, *bufotenin* (5-OH-Dimethyltryp-

Right Giant Toads soon become tame and enjoy a walk around the house.

tamine), resembles mescaline. Like mescaline it is a potent hallucinogen.

The presence of a hallucinogen in giant toad venom helps to explain some rather curious aspects of mongoose behaviour. Mongoose with their immunity to poison are one of the few predators which prey on giant toads. In certain regions of the Caribbean mongoose have developed the habit of feeding exclusively on giant toads, ignoring every other kind of prey. Some mongoose go even further and feed exclusively on giant toad skins, skinning giant toads alive in order to eat their skins. The reasons for this strange behaviour remained a mystery, until research showed that the mongoose were addicted to the *bufotenin* in giant toad skins.

Many flowers, incidentally, lace their nectar with opiates and other addictive hallucinogenic chemicals and more bees than one might suppose spend their days flying around in a drunken doped daze, as anyone who has sat under a lime tree in the flowering season will be aware.

Giant toads are put to an equally curious use in Haiti. Voodoo witch doctors really do have the power to turn human beings into zombies ('the walking dead') using not magic but

drugs made from the skin of the giant toad, the leaves of the *Datura*, and the poison glands of three species of puffer fish, *Diodon hystrix*, *D. holacanthus*, and *Sphaeroides testudinatus*.

Bufotenin is also present in smaller quantities in the skin of the European *B. bufo*, which is why toads were one of the principal ingredients of the witches' potion:

Toad, that under cold stone
Days and nights hast thirty-one
Swelter'd venom sleeping got,
Boil thou first the charm'd pot.

When the witch smeared herself with a fatty ointment made from a toad's swelter'd venom (*bufotenin* is fat soluble, *bufotalin* is not) she really did—with the help of a little autosuggestion—find herself soaring through the sky on a broomstick. But while the witch's mind hover'd through the fog and filthy air her feet stayed firmly on the kitchen floor.

Longevity. 50-120 years.

Requirements in Captivity. Moist tropical vivarium with pool, night temperature 70-75°F, day temperature 80-85°F.

Breeding stimulated by increasing humidity and showers.

Giant toads soon become tame and will enjoy being taken out of their vivarium for a walk round the house, a

shower in the bathroom, or a dinner of wriggly worms on the kitchen table.

Spiny or Dalmatian Toad (*B. b. spinosa*).

Giant southern race of the common toad.

Distribution. Southern Europe, Near and Middle East, North Africa.

Habitat. Most habitats in the Mediterranean world, provided these are within migrating distance of permanent pools.

Feeding Habits. Preys on mice, lizards, small snakes, frogs, toads, newts, snails, worms, insects.

Breeding. Spawns once, in some areas twice, a year in permanent pools.

Longevity. At least 50 years.

Requirements in Captivity. Does well in an indoor vivarium but sufficiently hardy to live and more likely to breed in an outdoor reptiliary (southern counties only) or greenhouse. Suggested community for a 10ft x 8ft greenhouse with large pool:

6 spiny toads

6 adult marsh, edible or pool frogs (*Rana lessonae* complex)

4 bull frogs (*R. catesbeiana*)

8 ribbed salamanders (*Pleurodeles mult*)

3 eyed lizards (*Lacerta lepida*)

or

5 balkan green lizards (*L. trilineata*).



SIX OF THE BEST

We asked Dick Mills, Bulletin Editor of F.B.A.S., to expatiate on the qualities of his favourite six fish species which, it is certain, are among the most popular fishes for many aquarists.

No matter how wide and varied your experiences in fishkeeping, you still retain pleasant memories of certain species, particularly those that managed to spawn—despite the varying living conditions that you often imposed upon them. Conversely, there are fish you absolutely adore but who resist your every effort even to keep them alive!

Top of my list is the Angelfish (*Pterophyllum scalare*) from the River Amazon. I had been smitten with the 'standard' Silver form right from the beginning but even after researching through books and observing the fishes themselves, I still find it relatively difficult to sex the fish reliably; the references to protrusion of the lips, the angle of fins to the body, the pattern of the stripes (which won't work with Marbled, Gold, or any of the Black or Half-black varieties) were all studied and cast aside in favour of watching the now-familiar behaviour patterns between likely self-selected 'pairs'. An even closer inspection of the fishes' extended breeding tubes usually provides the final clues to their sexes. I have since bred a few more 'other varieties'—Marbled, Half-Black and several 'cross-breeds' from Gold forms which never resulted in anything spectacular (but neither did it produce any gold coloured fish!).

One thing I have yet to achieve (with any form of Angelfish) is to successfully raise the fry away from the parents. I keep telling myself I'm not particularly concerned about achieving this, as it's much better for the fish to be raised

naturally by their parents (and who wants 300 or so Angelfish at regular intervals anyway?) but it does niggle a bit to think I can't do it! It's all a question of cleanliness in the raising tank—plenty of partial water changes, gradually increasing aeration, carefully controlled feeding and maybe a bit of luck—or am I trying just that bit too hard?

Another South American Cichlid sharing the same water as the Angelfish, as well as having physically-similar ventral fins, is the Festive Cichlid, *Cichlasoma festivum*. This medium-sized, narrow-

bodied fish is quite peaceful and sometimes regarded as shy, although it will take food from your hand once it gets to know what your presence in front of the tank generally means.

It is quite an easy fish to recognise: the dark diagonal stripe from snout to tip of the dorsal fin is unmistakable as are the filamentous ventral fins. Spawning followed the typical Cichlid open-water pattern, with the adults first clearing a patch on an algae-covered rock, and then keeping a horde of marching Malayan Snails at bay whilst

Festive Cichlid. This medium sized, narrow bodied fish is quite peaceful and sometimes regarded as shy.



the fertilised eggs were hatching. All this whilst their owner was trying to photograph the entire proceedings too! The only problem they did provide me with was that they spawned unannounced one Christmas Eve, and me without any Brine Shrimp Eggs in the house or opportunity to buy any. This first spawning was a tragic failure, but subsequent ones were highly successful.

Still with Cichlids, I'd never really been too keen on Kribensis until a friend of mine left out Society and gave me a pair. They had never spawned for him, but once in my tank they promptly disappeared for ten days or so only to re-appear with 20-30 youngsters in tow. Of course, that put a totally different complexion on things and I became quite a fan of theirs in a very short space of time.

Pelvicachromis pulcher, to give the Kribensis its correct name (it was formerly classified in the genus *Pelmatochromis*), is a secretive spawner; I provided the usual flower-pot for subsequent spawnings (carefully arranged with the large end facing the front glass and my camera lens) but they cunningly dug underneath the pot so that it swung over and around, thus denying me a grandstand view of any intimate proceedings. Sexing is straightforward as the male has dark spots in the upper half of the caudal and none in the rear part of the dorsal, whereas the female has spots in the dorsal but none in the caudal. I was most interested in the breeding coloration of the female—the belly region becomes a rich plum-red, purple colour and the pectoral fins darken considerably but the dorsal remains bright gold. I believe that this colour intensification is to aid communication and species recognition between parent and free-swimming fry, during the parental care period. One of the characteristics of spawnings from this species is the disproportionate number of one sex in the brood; experienced fishkeepers often try to 'read-just' this imbalance by altering the water hardness or pH for the next spawning, but do make any such changes a gradual process to avoid stressing the fishes.

At one time, I was a Furnished Aquarium exhibitor and always on the look-out for suitable fish to use. I decided that the Silver-tipped Tetra would suit my purposes and, to the surprise of my local dealer, promptly bought *two dozen*.

The male fish is a delightful copper-brown slim fish with a thick black line dividing the caudal fin. The female is less colourful but plumper than her mate; both fish have white tips to the dorsal, anal and caudal fins. Most books now

Right Angelfish. Still relatively difficult to sex and it is best to watch the behaviour patterns between self-selected pairs.

Below Silver-tipped Tetra. Most books classify the species as *Hemigrammus nanus* but it is also referred to as *Hasemania marginata*.

Bottom Dwarf Gourami. A vigorous male, once provided with a nice plump female, lost no time in blowing a bubble-nest.





classify the species as *Hemigrammus nanus* but it is also referred to as *Hase-manian marginata*, with the point being made that the genus *Hasemania* lacks the adipose fin found in *Hemigrammus*.

Between Open Shows, the fish were kept isolated in a two-foot tank from where they could be easily netted for their next competitive outing and it was during one of these inactive periods that I noticed that the slim, well-coloured fish were chasing the plumper, drabber ones. Quickly putting two and two together, I realised that the fish were probably a good bet to breed with and so I further segregated the fishes—this time all the slim ones into one tank, all the plump ones into another. After a couple of weeks I put a fish from each tank into another aquarium which contained dense bunches of *Elodea* to act as egg traps. Sure enough, the male lost no time in pursuing the female around the tank until she took refuge in the plants where side-by-side quivering occurred and eggs were expelled. Spawning activity ceased after about an hour or so and both fishes were removed. I don't know how long the eggs took to hatch, but it was around ten days later when I first saw very tiny fry clinging to the front glass and flitting through the water. Initial foods were hard-boiled egg-yolk squeezed through a cloth and Liquifry (Egg-layer version) followed by Brine Shrimp, Micro- and Grindal-worms. Eventually, mashed Whiteworm and crushed flake foods were taken and the young fish grew rapidly from then on.

A vigorous male Dwarf Gourami (*Colisa lalia*) caught my eye in my local shop and, once provided with a nice plump female, he lost no time in blowing a bubble-nest. Transferring him to a smaller tank (complete with bubble-nest captured in a saucer) only spurred him on to greater efforts which included setting about the rest of the tank inmates; Guppies, Mollies and Tetras were harassed mercilessly until he, and his lady, were allowed sole occupancy. Knowing that Dwarf Gourami fry were tiny and often more difficult to raise than fry of the smaller Honey Gourami (*C. chana*), once I saw these preparations for spawning I prudently started a culture of the brightest green water you've ever seen in my greenhouse, to give them a suitably-sized first food. (I also had a tank on the fish-house window-sill that was simply disgusting—full of nutritious *infusoria*, levitating mulm and the like.) A mixture of the two liquids proved to be an ideal first food for the tiny fry who developed quite nicely although there was a high mortality rate around the two week mark. One could blame this on cold draughts affecting the young fish as they took air

from the surface for the first time, except that the fish house was 'space-heated' and no particularly cold draughts were in evidence. Like the 'Kribensis' there was a disproportionate number of females to males in the survivors, so it was a matter of disposing of the fishes in trios—to get rid of the surplus ladies!

A fish I shall always have a soft spot for is the first egg-laying fish that ever spawned in my aquarium. After the excitement of laying on the floor at 3 am one morning to see a female Guppy drop her brood in a hurriedly-prepared nursery tank, the thrill of deliberately conditioning and spawning a pair of egg-laying fish was, as they say, 'something else'.

The American Flagfish, *Jordanella floridae*, is supposed to be an algae-eater, especially the blue-green sort; it is also supposed to be a depression-spawner. The problem is that fish don't always conform to our expectations of them.

The fish neither ate the blue-green algae nor did they spawn as per the book. I transferred them to a temporarily-divided tank in which there was some soft, green algae that hadn't choked the

only bunch of *Cubomba* I had managed to keep growing. Removing the division after two weeks of good feeding brought about an instant colour change in the male as he caught sight of the female. The whole of the familiar red-speckling along his body was suffused with a blue overlay and all of his fins were extended almost to splitting point. The female (less colourful and with a dark blotch at the rear of her dorsal fin) was unceremoniously bundled into the clump of plants; eggs, looking like small oily teardrops, were expelled one at a time and lodged in the leaves. After spawning was completed the female was removed and the male left in with the eggs. They all fungussed! A repeat of the conditioning and spawning process had a happier result because, this time, I added some methylene blue to the water to cut down the bacteria in the water (it also reduced the light too, which is often a destructive agent where eggs are concerned). Again the male was left with the eggs and none was eaten. The fry took at least 10-15 days to hatch but feeding them presented no problems.



Below The American Flagfish is supposed to be a blue-green algae eater but fish don't always conform to our expectations. Separated and fed on green algae, a pair was brought into breeding condition and spawned.

Left *Pelvicachromis pulcher* was formerly *Pelmatochromis*. It is a secretive spawner and when provided with a flowerpot for a cave, will dig under it and turn it so that pairing activity is hidden from the viewer.



CORYDORAS CATFISH

Universally firm favourites with aquarists

Once regarded as tank scavengers, the Corydoras catfish are now enjoying increasing popularity with the availability of many varied species says David Sands.

Photographs by the author

The decade of ever increasing interest by aquarists in Corydoras catfish has occurred because of the wide variation of species available in aquarists' shops. In the distant past, Corydoras had been relegated to 'below tank space' to assume the role of 'scavengers' in community aquariums. On some occasions they have survived only by feeding from excess food placed in the tank for other more favourite fish, and it was often thought they lived simply on the waste produced by fellow inmates. It is hoped such myths have been well and truly banished by aquarists throughout the world. By 'grubbing' for food

missed by others, Corydoras do play an important part in the community tank, but to encourage the best from these small members of the Callichthyidae family, aquarists should make sure that food with a reasonable substance is regularly fed before 'lights out'. Finely shredded shrimp or small chopped earthworms are ideal. Late in the evening is the best time to feed for although they are not truly nocturnal they seem to prefer a half light.

Corydoras, as with all Callichthyidae, possess armoured scutes or scales which flank their bodies. Nature has provided these overlapping plates to give them admirable protection against predators.

They may have other uses too as it is not unknown to find healthy Corydoras in a tank stricken with disease, seemingly immune to the plague above them.

Corydoras should be kept in reasonably large numbers because they are shoaling fish and one of the considerations must be which fish to choose as tank companions. Some cichlids, *Botia* (Loaches) and large Barbs can be seen to nip at the dorsal fins of Corydoras because they often remain motionless, perhaps in the shade of a *Cryptocoryne* plant. Rasboras and Tetras and any of the host of top-tank swimmers are ideal when choosing community fish to live with Corydoras, as these fish are too busy





Left *Corydoras orphnopterus* imported from Ecuador this is an exceptionally rare species.

Below

C. leopardus. A Brazilian species sometimes confused with *C. trilineatus* and *C. jullii* because they all share the same basic pattern and the dorsal fin spot.



Left *C. paleatus*. This wild caught male has exceptional finnage.

Below left

Corydoras adolfi and *C. imitator* are two exceptional species; few *Corydoras* have been discovered from the Rio Negro in Brazil.

wandering to stop and take the time to annoy a resting *Corydoras*.

Choosing which species to live in your tank depends very much on availability at your local shop. They are imported from South America frequently in very large quantities to both Europe and America. Over 100 species of *Corydoras* have been described to science since 1794 when *Corydoras punctatus* led the way by announcing the genus. Bloch described the fish as *Cataphractus punctatus*; the generic name *Corydoras* was only recognised officially by Bleeker in 1862 after separating the name from other Callichthyidae members, *Callichthys* and *Hoplosternum*.

Now the choice is the aquarist's—to find the rarer members of this catfish fraternity. It is worth considering the vast size of the South American continent; Brazil alone is well in excess of three million square miles, and has proved bountiful in providing *Corydoras* species. South America is difficult to visualise; a fish tank does not represent a dot in comparison. The *Corydoras* it provides does offer some perspective; they range from the long and beautiful *C. barbatus* (Quoy and Gaimard 1824), bearded and coloured black/brown with white streaks, to the short *C. arcuatus* (Elwin 1939) with its striking bowline traced along its back from snout through



to the caudal fin. These are two contrasting species from a country veined with river systems and separated by the rain forests of the Amazon.

Several new species have been discovered and made available recently, *Corydoras adolfoi*, (Burgess 1982), and *Corydoras robineae*, (Burgess 1983) Adolf's *Corydoras* (named after Adolf Schwartz) is a rare find in a tributary of the Rio Negro and proved an exceptional and somewhat confusing species. It has a tan body, dark eye mask and a most striking orange head patch, anterior to the dorsal. The confusion was brought about because Dr Warren Burgess (of TFH) thought a mimic found within the populations of *Corydoras adolfoi* to be an adult form but Doctors Nijssen and Isbrücker of the University of Amsterdam obtained paratype material and described the mimic as *Corydoras imitator*, (Nijssen and Isbrücker, 1983). The longer head and the lack of orange patch visually distinguishes the mimic from *Corydoras adolfoi*.

Nature has provided an imitator from another family of catfish. From the Pimelodidae group, *Brachyrhamdia imitator*, (Myers 1927) has the familiar mask across the eye and dark dorsal mark seen so often in *Corydoras*. It is a naked catfish without the protective scutes of the Callichthyidae, *Brachyrhamdia* probably shoal with *Corydoras* for protection. They seem to be rarely imported but when seen are amongst *Corydoras melanistius* types.

Fishes which achieve a great age

Corydoras are excellent aquarium fish for yet another reason. Records show they can live well in excess of ten years. A *C. aeneus* lived all of twenty seven years, old and battered, he must have given 'good service' to the aquarium.

Corydoras are certainly perfect aquarium fishes to breed and well over thirty species have been spawned and raised in aquaria. Some species produce a great number of eggs, *Corydoras aeneus* and *Corydoras zygatus*, Eigenmann and Allan 1942, are known to produce 300-500 fry.

Corydoras barbatus place eggs in groups, high near the water surface. *Corydoras metae* and *Corydoras adolfi* produce a limited number of relatively large eggs (50mm) (egg numbers are low 10-20). Successful *Corydoras* breeders isolate species within aquaria; Two pairs can be conditioned and spawned in 18 in. x 15 in. x 12 in. aquarium. Much is written about sexing *Corydoras*, although ripe females are usually obvious in larger size and roundish shape. Temperature ranges are also the subject

of some debate. In the author's considerable experience 78-80°F is ideal. To encourage mature pairs to spawn, a partial cool water flush, by way of a fresh, aerated water change, is usually successful between July and September, the average rainy season in South America.

Breeding aquariums can be filtered via sponge, box or internal power filters, but need not be lit apart from by natural daylight. Some hardy, potted plants would not go amiss but are not essential. An upturned, old fashioned plant pot and a few of Interpet's excellent artificial 'Amazon sword plants' would be ideal.

Once eggs are seen, removal of the parents to another aquarium is necessary and as the fry emerge, usually after two or three days, the water level should be reduced to about 6 in. The youngsters can be fed on powdered egg layer food until they can take crumbled flake. Microworm, brine shrimp and white-worm can be offered as live food but *Corydoras* can be raised without them.

Over 100 species of *Corydoras* to choose from

Few retailers refuse good aquarium raised catfish, especially *Corydoras*, as they are excellent community fish. Some of the rarer species can be very expensive but if they can be spawned and raised, hobby and investment can be satisfied. With over 100 species to choose from there is plenty of scope for all aquarists to continue the rise in popularity of this wonderful group of fishes.

Corydoras robineae named after the wife of the late Brazilian fish exporter, Willy Schwartz (who already had the distinction with *Corydoras schwaartzii*), is the only *Corydoras* to have a distinctive caudal fin pattern, remarkably similar to its cousin *Dianema urostriatum* (Miranda Ribeiro 1912). The author imported all three species to Britain for the first time earlier this year.

In recent years Peru, Colombia, Paraguay and Ecuador have provided some exciting species. *Corydoras trilineatus*, (Cope 1872) a main stay import from Peru, is often confused with the more slender *Corydoras julii*, (Steindachner 1906, Brazil). Together with *Corydoras leopardus*, (Myers 1933), they all share a distinctive dorsal spot, a light body colour scattered with spots and a lateral line stripe or two. Colombian populations of *Corydoras leucomelas*, (Eigenmann and Allan 1942) (also from Peru) have frequently been available and often misnamed as *Corydoras punctatus*; this species has a distinctive eye mask.

Corydoras metae, Eigenmann 1912 and *Corydoras delphax*, (Nijssen and Isbrücker

1983), are imported in large numbers from Colombia. The light tan body of *Corydoras metae* is nicely striped black across the eye and along the back. *Corydoras delphax* is a typical spotted *Corydoras* in the 'melanistius' style and remained a mystery species for ten years before the recent scientific description.

Much rarer, *Corydoras orphnopterus*, (Weitzman and Nijssen 1970), and *Corydoras atropersonatus*, (Weitzman and Nijssen 1970), are both from Ecuador. The former has a dorsal fin spot and grows larger than the latter which has the same uneven scattering of body spots.

On the Atlantic side of South America thousands of miles from Brazil, the Guianas have provided a fair share of *Corydoras* for collectors. *Corydoras melanistius melanistius*, (Regan 1912), *C. blochi*, (Nijssen 1971), and *C. bondi* have spotted markings for survival camouflage, in different, slower moving waters.

Argentina is home territory for one of the most common of the genus, *C. paleatus* (Jenyns 1842). This species has the distinction of being discovered by Charles Darwin on the voyage of the Beagle over 140 years ago. Often referred to as the 'peppered' *Corydoras*, it has been bred commercially by Far East Asian fish farms and is often available.

From Peru and Paraguay *C. pygmaeus* (Knaack 1966) and *Corydoras hastatus*, (Eigenmann & Eigenmann), 1888 the smallest 'characters' of the genus. Both catfish are fully grown at 1½ in. *C. pygmaeus* shines a grey/green colour, with a dark line which runs through the whole length of the body into its caudal whilst *C. hastatus* has a distinctive caudal peduncle spot. In the aquarium they are best when kept in reasonable numbers—a shoal of six to twelve looks attractive as they swim in 'follow my leader' fashion through the water. Unlike many *Corydoras* species, they do spend time away from the bottom section of the aquarium.

It might be said that *Corydoras* have been flattered by attention received from science and the hobbyist. I believe *Corydoras* worthy of investigation if only for the almost countless variations nature provides. In colour, they range from the bluish *C. nattereri* (Steindachner 1877), to bronze *C. aeneus* (Gill 1858), and in shape and size they can vary from *C. pygmaeus* (1½ in.) to the giant of the genus, *C. barbatus* (5 in.). They have been found from the island of Trinidad to Argentina. The only areas where *Corydoras* have not been found are Chile and the Pacific slopes of the Andes.

Tomorrow's aquarist

It is always nice to hear from Tomorrow's Aquarist readers keeping us up to date with their activities, successes and failures.

Andrew Grant's letter, which we print below, is particularly interesting because it includes some "follow-up" details to his excellent article on breeding Acaras published in our September issue of T.A. Andrew lives at 45 Cameron Street, Dunfermline, Fife, KY12 8DP. He will shortly be receiving this month's gift from the Tomorrow's Aquarist Fund, kindly donated by King British and consisting of a King British Undergravel Filter for a 24 in. tank and a 150g. tub of King British Tropical Flake.

"Sorry for not writing for so long, but I've had a hectic time waiting for my 'O' level results—which thankfully came yesterday.

I've done three more booklets* and also another article (do I hear you say Oh, not again!?) about my pond.**

The Blue Acaras have at last successfully brought up some fry and at this moment they have about 75 centimetre-long babies.

The skunk *Botia* is afraid of coming out from under his slate, so he has reverted to a nocturnal existence. The fry gorge themselves on tablet food. Their parents also pick at it and this helps to break up the particles for the fry to eat.

After feeding livefood to the fish for a while, I was afraid that they wouldn't take any flake. However, I tried them on black vitamin and mineral flakes, and they ate them up almost as quickly as they did the livefood.

By the way, how's your pond getting on?*** I expect everything will be late because of the cool weather we've had recently. (It's terrible up here!).

Best wishes,

Andrew."

Notes from our Consultant Editor

Congratulations on your excellent 'O' level results and good luck with your 'A' levels.

* Andrew has now written over 20 booklets, some in collaboration with his friend, Philip Quinn, on a wide range of aquatic subjects. Write to him if you would like further details.

** Andrew's most recent article will be appearing on this page within the next few months. Don't miss it.

*** My pond has had a mixed season. Fish and submerged plants have done exceptionally well while some marginals have not really been at their best. My lilies produced masses of leaves but, because of the cool temperatures, lack of sun and excessive rainfall, have tended to keep their blooms to themselves (relatively speaking). Last year, however, they produced countless, large flowers throughout the summer. Let's hope that next summer proves to be a good one for lilies and pondkeepers alike.

Photo-Fit competition photographs

Some months ago, we published the results of our highly successful £1,000 Photo-Fit Competition sponsored by 'Atlantis'. We have now received the

photographs which were taken at the two prize presentation events that followed out submission of the winners' names to the sponsors.

The Under 16 Prize was won by Martin Bell who is seen receiving his award from Tony Lowe (left), the Retail Development Manager (North East) for Thomas's (the manufacturers of 'Atlantis') and Tim Ledgard, the London Area Retail Consultant.

The second photograph shows Anthony Huxley, the Over 16 winner, being presented his prize by Brian Packer, the Retail Development Manager (Midlands) for Thomas's.

We offer our congratulations once more to both winners and our sincere thanks to all the participants who made the competition such a resounding success.

If you would like to see a full list of all the prizes that were on offer, have a look at page 34 in the May issue of the *Aquarist & Pondkeeper*.



Coldwater jottings



Stephen J. Smith

Autumn... time for spring cleaning! EARLY this year—before the ice had even begun to disappear from the surface of the ponds—a friend of mine asked me what he could do about his collection of Koi, which had recently diminished “because of the freezing temperatures”, he said.

I'm afraid I was a little blunt in my reply, but it was meant in good humour, though with a serious undertone: “And you told me you'd cleaned your pond last Autumn...!”

While it is true that most coldwater fish do not tolerate exceptionally extreme low temperatures, it is not necessarily cold that kills them. In water greater than eighteen inches or so in depth the fish will usually nuzzle down into the deepest part where temperatures are maintained throughout all but the severest Winter. The most likely cause of death is usually as a result of that weekend in front of the television when it should have been a case of braving the Sunday afternoon Autumn mist and getting to grips with the annual task of giving the pond a good ‘Spring clean’.

No other animal is more dependent upon its human keeper than fish—and no other animal is subjected to such horrific conditions as fish are. It is of little surprise to me to hear of high Winter casualty rates when so many fish are forced to live throughout the year in ponds which contain a high concentration of decaying leaves and other matter: poor husbandry is often overlooked by Mother Nature throughout all but the Winter months, when she caps those aquatic horror chambers with ice which seals in toxic gases and suffocates even the hardest of fish.

A little time spent in cleaning the pond, before the onset of Winter will serve to prevent so much trouble throughout the colder months—and reward the diligent fishkeeper with strong healthy fish which in turn will be better conditioned to provide strong healthy spawnings.

Before beginning to empty the pond, carefully remove all plants and place them in bowls containing pond water. Removal of the fish is never such a simple task, however; even the round-bodied varieties of goldfish are fairly quick off the mark when the net is around and it isn't long before they are rendered invisible by all the sediment which is soon stirred up in trying to catch them! So half-empty the pond first by either siphoning or using a pump which is protected by a grille or strainer to prevent any fish being accidentally sucked up.

Once the water-level has been lowered it should be a far easier task to catch your fish. Even when you think you have accounted for all your collection do take care when you proceed to emptying the remaining water, and check the residual sediment very carefully for signs of smaller fish which may not even have coloured—an unexpected survivor or two of an unnoticed spawning.

When removed the fish should be placed in aquariums which again, have already been filled with water from the pond. Some fishkeepers like to keep two or three of their favourite specimens indoors during the winter, so it is a good idea to prepare and site an adequate aquarium—furnished if you prefer—a good couple of weeks beforehand.

A word of caution: please do not overcrowd if you are intending to keep fish in aquariums. I would recommend no more than two or three pond fish for a three-foot aquarium, and if the traditional longer-bodied fish such as Comet, Shubunkin or Koi are to be living behind glass for the next few months make sure you give them adequate swimming-space (ie, a four or even five-foot aquarium).

But back to the pond. To remove the layer of leaves and sediment from the bottom of the pond I always find that the most useful tools are perhaps the most unlikely—a dustpan and brush! Once most of the debris has been cleared I usually summon the assistance of someone who will gently play a hose onto the sides of the pond while I use a stiff household broom to remove the most stubborn areas of mud or algae.

Once completed, these last few inches

of water are emptied out, and a thorough check of the pond construction is carried out so that any running repairs to cracks, tears or loose bricks can be made. In carrying out repairs, and incidentally when cleaning the pond, do take extreme care if it is necessary to stand inside it.

Also, do not be tempted to use any cleaning agents as these will almost certainly be harmful to both fish and plants.

If I am cleaning a pond during Summertime for any reason I would prefer at this stage to leave the pond empty for a few days, if possible in the sun, as a precautionary measure. Most bacteria and fish parasites can be eradicated in this way as they do not have a fish host in which to continue their life cycle.

The pond is subsequently filled with clean water and allowed to stand for a week or so before reintroducing fish and plants.

In the meantime attention can be paid to the plants themselves by snipping off dead leaves and stems and if necessary dividing and repotting into plant baskets.

Starting a *daphnia* pond

It is well-known—especially among readers of these columns—that *daphnia* is a rich source of live food. Large quantities of good clean *daphnia* are considered by many fishkeepers to be essential in the successful rearing of healthy fry. Thus, I find it very useful and extremely convenient to establish a *daphnia* culture in its very own pond. A further advantage here is that it is certainly not necessary to clean-out a *daphnia* pond as the intended inhabitants thrive on decaying matter!

Also, I find that the ‘sludge’ removed when cleaning my other ponds is ideal for the *daphnia* culture.

The *daphnia* pond is specially constructed and consists of a three-foot square structure approximately nine inches deep overall but with an extra three-inch depth towards the centre. This centre depth is filled with cow manure, which provides an ideal medium for *daphnia* to breed.

When the pond is filled with water a ‘starter culture’ is added (though this is not always necessary), and by the time the following season's spawnings are about to hatch there is a plentiful supply of healthy *daphnia*—right at your doorstep!

Spotlight

THE LEMON

TETRA

by Arend van den Nieuwenhuizen. Photograph by the author.



In the aquarium this species shows its coloration to the best effect when there is natural light falling on to the tank, especially if it is illuminated by morning sunlight. For the great majority of aquarists, however, such a location will not be possible so the internal arrangement of the aquarium plays a big part in providing the best possible conditions for this small fish, which grows up to about 4 cm.

It loves crystal-clear water and prefers soft water, at a temperature of 24-26°C. A largish aquarium should be provided, as far as possible, with marginal vegetation containing 'indentations' here and there and an open swimming area which is not too brightly illuminated. In this area one can, however, position a clump of vegetation which reaches towards the water surface and which in time may well form a group of plants reaching and growing along part of the surface in this part of the tank. If one then adds plant species which keep low to the bottom of the tank and also have various, contrasting leaf forms, with a number of shady recesses between this lower vegetation and here and there a piece of decorative moor oak, then an attractive 'home' will be created for the Lemon Tetras and other fish, in which they will certainly be extremely comfortable. In such an environment, together with other not too lively tank members of the middle water layer, *Hyphessobrycon pulchripinnis* will be much more attractive than one may have expected on first seeing the fish on display in a shop. In the aquarium they have a beautiful, yellow coloration with a vivid black in the fins which forms a further contrast with the bright red in the upper part of the eye.

The Lemon Tetra is a sturdy species. Young fish are sensitive, however, and will react unfavourably and noticeably to poor water quality, for example. Consequently, it is advisable to renew 10 to 20% of the water every week, as one ought to do as a normal routine in any case. The Lemon Tetra is best kept in a shoal of at least 6 specimens and such a group will display the same kind of display behaviour known to hobbyists from *H. bentosi rosaceus*. It is well known that the Lemon Tetra finds its own eggs a most welcome titbit. To bring about the best possible breeding condition, therefore, live food is especially called for, including all kinds of mosquito larvae and fruit flies. So it is possible to create an attractive South American community of fishes based upon this species. Hatchetfishes in the upper water layer, for example. As inhabitants of the middle water layer, including the open area in the centre of the tank and the marginal vegetation, one can choose

from the *Nannostomus* species. Forming a contrast to pulchripinnis one then has, for example, *H. heterorhabdus*, *H. callistus*, *Nematobrycon* species and others. Whichever are chosen from the fish available, however, they must be species whose behaviour is peaceful. For the lower water layer one could select, for example, *Paracheirodon axelrodi* or *Petitella georgiae*, but not both together, preferably, because shoals of these species will intermingle in the aquarium. *Corydoras* species are suitable for the bottom of the tank, such as *Corydoras habronis*, *C. bondi bondi* or *C. barbatus*. The latter, however, does not keep to the bottom of the tank but follows very much in its swimming behaviour the pattern of the Dwarf *Corydoras* species. There is a wide choice at one's disposal, therefore. Browsing through reference books may well turn up many other ideas, providing one bears in mind that the fish will have certain demands and that the different species should be compatible with each other from the point of view of their behaviour.

Ease of breeding and sexual differentiation

The Lemon Tetra can be bred with a great deal of success. In the male black in the anal fin is more prominent than in the female and his body is a little slimmer. Sexual differentiation is straightforward when the females are ready to spawn, for the markedly rounder abdomen is a sure sign.

For breeding purposes a tank of 40 x 25 x 25 cm is adequate, but one of 50 x 30 x 30 is better. A substrate is unnecessary. The glass bottom of the tank should be painted on the underside so that it does not reflect. This arrangement is preferable to a substrate of sand or peat since it is easier to see the eggs once they have fallen to the tank bottom after spawning. One need not worry that this increased visibility of the eggs at the tank bottom will encourage the fish to turn on the results of their spawning for they do not usually begin to look for eggs until they have finished pairing. The fish must be removed from the tank at the right time, therefore, or a suitable grid must be placed in the spawning tank. The tank should be filled with soft water which has a water hardness of up to 6°DH.

After filling, the tank should be left to stand for a few days. During this time the temperature is adjusted to 24°C and aeration introduced. The plants are disinfected in the accustomed manner in a bath of alum. Suitable plants are *Myriophyllum*, *Cabomba* and also *Rotala* or *Ceratopteris* species which

can be anchored by a piece of lead. If one places a breeding pair in the tank on a Saturday afternoon it is almost certain that they will be seen pairing on Sunday morning, after which they can be removed. If the water in the breeding tank is not crystal-clear and of good quality one should not expect breeding to be successful. The water can be made a little more acid by means of a peat extract or one can use a peat filter which has been cleaned in advance, during the days the tank is left to stand in readiness. If the water is not right, the fish will still spawn, but it is almost 100% certain that the eggs will be covered with fungus. Before spawning one sees the male drive the female in a turbulent fashion which gradually becomes more gentle. Finally spawning takes place, usually in the plants in the upper part of the tank. Because of the slight adhesiveness of the eggs most of them fall to the tank bottom.

Although the eggs are not very sensitive to light it is advisable to give the breeding tank some shade by putting a newspaper around it after the adult fish have been removed. At a temperature of 24°C the small tails of the young are already visible after 24 hours and the fish are out of the egg membrane. They then attempt, in a circling movement, to move to the upper part of the tank. At this stage, however, they do not manage it, but always fall back to the bottom of the tank. At this stage, too, the young can easily be seen. Later it is much more difficult to do so because they hang like transparent splinters of glass on the sides of the tank and amongst the plants. It is important that the temperature does not vary during the first two weeks, as the young fish are very sensitive to any such variation. Five days after spawning the young Lemon Tetras are free-swimming and are first given Cyclops nauplii, animalcules and such like. After three to four days one can begin to feed freshly-hatched brine-shrimp. It is a good idea to check on the consumption of the food by means of a magnifying glass.

For the first few days the young keep themselves close to the tank bottom, just like the young of *rosaceus*. At the beginning they do not grow particularly quickly, but their growth rate accelerates as soon as they move on to larger food-stuff. If they are given a healthy diet, partial water changes are carried out on a regular basis and a constant temperature and conscientious removal of decaying food particles are maintained, the result will be correspondingly healthy fish which will begin to show the adult coloration in the eyes and tail-fin after only four weeks. After six weeks the fish develop their full coloration.

Comment

by Roy Pinks

One of the commonest failings of the fishkeeper is an inbuilt belief that a fish is sick in some way if it rejects food which it is offered. This is particularly disappointing at a time when fish food production has become something of an art, or so it is claimed, and the end product has become irresistible to its consumers. The assertions in advertisements can be very misleading, as they can only apply to the average healthy fish, already settled in acceptable surroundings, and feeding normally. There are certain categories of fish which will require weaning to standard package foods, and these are not always recognised by their owners. The large but usually reliable category which seldom passes by anything which looks edible are freshwater tropicals.

Fish falling in the following groups are likely to need some coaxing:

- a those in shock, eg exhausted after breeding or recently transferred to the tank;
- b those which fundamentally prefer live food, but which will often accept dried food;

c fish temporarily upset by a change in environment, eg an oxygen shortage or the emergence of a rogue fish;

d fish which are sick;

e marine fish.

I will concentrate on a-d, as the final category really warrants separate treatment. So far as a is concerned, although you will want to rush things, it is best to wait until the fish is swimming briskly around before offering food. Hunger will eventually stimulate it into action, and two days for tropical and seven days for coldwater should see things through, at summer temperatures. In the case of coldwater fish they will show little interest in eating if the water is below about 50°F (10°C), so just leave them alone in these circumstances, as they positively do not need food.

In fact its addition to the water will be harmful since it will either foul it or provide food for the inevitable snails, both of which are highly undesirable. In the case of b, you only have yourself to blame if you keep fish but lack the initiative to provide them with a range of offerings. It is quite possible to

keep most tropicals alive and well on one single food, but how much better they become if you ring the changes.

Live food or various dried foods

It is not absolutely necessary to provide more than a small percentage of live food (even dwellers in high-rise can maintain whiteworm cultures), but if this is impossible buy small tins of several different dried foods and offer a pinch randomly. You really need to read up your subjects here, as it is important to know the difference between an omnivorous species and a carnivorous one which will sometimes be tempted by man-produced food.

With c, the cause may not be immediately evident, and intelligent observation alone will determine the likely cause of fasting. In all cases, removal of the cause should restore confidence, but use the time yardstick at a above before resuming feeding.

When confronted with sickness it is advisable to give your patients the

From researching nature

DoroMin foodsticks

Less waste... more natural goodness

Here's a naturally better fishfood that's unique to Tetra - floating foodsticks which absorb water quickly to become digestible almost immediately, but continue to float for ages! It's another clever idea resulting from extensive research at Tetra's West Aquarium - Europe's largest fish breeding centre. DoroMin foodsticks are made by a special extrusion process - to a formulation researched to provide a complete, perfectly balanced diet. And your fish will love them because they contain only the foods the fish would eat in their true natural environment.

Rich in protein, DoroMin foodsticks are ideal for larger fish such as cichlids, catfish, barbs, and sharks. And they're economical, with minimal wastage which also solves the problem of water pollution caused by uneaten fragments of conventional food.

Tetra



Tetra Fish Care, Mitchell House, Southampton Road, Eastleigh, Hants., SO5 5RY





The Oscar (*Astronotus ocellatus*) is a typical carnivore with a large appetite for earthworms, small fish and insect larvae but which, when settled in can be induced to eat dried food

best food you can muster, but halving the normal amounts until they have recovered. Of course, if food is rejected at any stage, cut back until the

fish will accept anything you offer.

You need only feed once a day, and as fish have to suffer setbacks in the wild, it is better to let them get hungry

during your annual holiday than to have them overfed by a non-fishkeeping neighbour. It is quite astonishing, in such enlightened times, how many pet keepers wrongly assume that because they have accustomed themselves to four meals a day, such gluttony also applies to their pets. But we are all inclined to view our charges through human eyes, and it's time we stopped doing so. I think it is also important that we came to recognize the consequences of over-feeding.

Dirty tanks give rise to smells and sick fish, and this much is easy to recognize. In a pond, however, the lavish introduction of pond pellets and other pond food can result in obese fish, which look quite frightful. I saw a pondfull of egg-shaped goldfish recently, some a foot long. The owner was giving them away because the pool had become over-stocked.

It was interesting to note that there were no specimens present under about 4 ins., so breeding must have stopped long ago. My advice to the owners that the pellets were really intended to fatten trout, and that they should reduce the menu drastically was viewed with grave suspicion, which supports the notion that the greatest enemy of man and fish is man.

...naturally better foods!

TetraRuby

Enhances the colours of your fish... nature's way

Tropical fish in aquaria tend to lose the brilliance of their colours because essential naturally-occurring substances are absent from their diet. But TetraRuby actually contains those natural pigment-enhancers, and puts the colour back! Its regular use will restore and intensify the vibrant natural colours of your fish. TetraRuby is a complete diet too - based only on foods found in their normal habitat to provide all the vitamins and trace elements vital to keep your fish active and healthy.

It's yet another example of the intensive Tetra research and development programme that is unsurpassed in the world.

For further information, or assistance with any fishkeeping problems, contact the Tetra Information Centre at PO Box 27, York, YO2 2ZZ.

Always ahead with the best ideas... naturally.



Your questions answered

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

Your Questions Answered, The Aquarist & Pondkeeper, The Butts, Brentford, Middlesex TW8 8BN.



TROPICAL
Dr. David Ford



COLDWATER
Arthur Boarder



PLANTS
Vivian De Thabrew



KOI
Hilda Allen



MARINE
Graham Cox



DISCUS
Eberhard Schulze

Coldwater

Pond for breeding goldfish

I intend to make a concrete garden pond essentially for breeding fancy goldfish. Have you any tips which might help me? I intend to make the pond about 12 x 8 x 2ft.

The shape of the pond is an individual taste. I made a pond especially for breeding and I found it very successful. It was about the size you intend to make and was irregular in shape. It has a deep hole with sloping sides near one end. This was for a water lily container and I found that it was very useful when cleaning out the pond as most of the mud had been washed into the hole by the movements of the fishes. The base sloped gradually from the hole to nothing at the opposite end which I made narrower and formed the spawning area where the water plant nests were anchored. I made a path around the pond and had a tunnel leading to a small circular pond which could be shuttered off from the main pond to serve as a rearing pool for youngsters.

Remember that if you want to be successful at breeding good fancy goldfish you should keep to one variety only as otherwise you could get many useless cross-breeds. For instance, the sperms from a male shubunkin could fertilise the eggs from a moor. Three or four pairs would be enough for your pond but you will need some spare tanks for hatching and rearing.

Brown algae

I have a 30 x 15 x 12 inch tank with a number of fancy goldfish in it. There are several water plants and several plastic ones. I have noticed that a large shell and all the plastic plants have a coating of brown substance on them. What is the cause of this please?

The deposit is a form of brown Algae and may be caused by wrong conditions in the tank. Get rid of the plastic plants. I do not know why you use such things. They cannot give off oxygen by day nor use up much of the waste matter from the fishes. Stick to proper growing plants and see that the fishes are not overfed. I would go so far as to say that 90% of troubles with water in a tank are caused by overfeeding. In a properly set up tank there is usually a fair amount of natural food for the fishes in the form of soft vegetation. If you set up a tank or pond with plants and fishes, give no food for a fortnight; I am sure that the water will remain in good condition. Most beginners just cannot help pouring food into a tank as soon as it has been set up and fishes added. If only the fishes were allowed to settle down and get used to their new quarters there would not be so many complaints of dirty and smelly water.

Hand spawning

When hand spawning fancy goldfish is it customary to take the eggs first before stripping the male or vice versa?

Trout breeders take the eggs first and then spread the milt of the male over them. However, I have taken the

milt from the male first and then stripped the eggs to spread over and among them. This has proved quite successful and I do not see that there is much difference in the fertilising of the eggs. Make sure your fishes are chasing before trying to hand strip them or injury may be caused.

Leaking pond

I have a concrete pond which has sprung a leak and I am intending to empty it and paint it with sealant. I am wondering what to do with my goldfish, about thirty of them, while the pond is empty. I have been offered a bath and wonder if this would be all right for keeping them in while the pond is being treated?

The bath should be quite all right for holding the fishes while the pond is empty. This is a much better receptacle than buckets which have been used by some pondkeepers for temporary storage. The latter have a very small water surface and so the bath is much better. Keep the bath in a cool place as possible and change some of the water every day. It may take you at least a week to treat the pond as the surface of the concrete must be perfectly dry before it can be painted. Why not save yourself all the worry and a lot of time by lining the pond with a good plastic liner? The task can then be completed and the fishes returned in one day.

Surface bubbles

I often see bubbles on the surface of the water in the mornings. Why is this please?

There are several reasons for this. (1) Over-stocking with fishes. (2) Polluted water. (3) Water too warm. (4) Too many water plants, and (5) Paint or tobacco smells in the room. If there are more fishes in the tank than there should be, the oxygen will soon be used up and the fishes will be at the surface mouthing for air. It may seem strange to suggest that too many plants could be a danger, but they only give off oxygen during the daylight and at night they cease to do so and give off carbon-dioxide. Polluted water will not hold sufficient oxygen and this is usually caused by over-feeding and the uneaten food soon starts to decay. Warm water contains less oxygen than does cold and so if the tank is in a warm room and the plants stop giving off oxygen, the fishes will soon be upset. Heavy smoking in a room, usually during the evening, can also pollute the water that it leaves a film on the surface and so can tend to prevent the entrance of fresh air.

Tropical

Breeding *Hypostomus plecostomus*

I have two *Plecostomus*, one being 10 ins. long, 2½ ins. wide at the head, the other only 5 ins. × 1½ ins. What I want to know is how I differentiate between male and female, and what are the best conditions to make breeding successful?

Late last year, when cleaning my tank out (4 ft. × 2 ft. × 1 ft.), I disturbed the eggs by mistake and I lost the young. So having done it once, so to speak, I would like to try again with a bit more success.

It is always said that *Hypostomus plecostomus* will not breed in the aquarium, so if you actually got a pair to spawn you certainly must try again. This time, note all the details of behaviour, water conditions, etc. and let us know for publication.

Surface swimmers

I have a 36 in. × 12 in. × 15 in. aquarium with an assortment of freshwater Tropical fishes eg Neons, Black Neons, Golden Barb, Harlequins and small Angels.

I am not experiencing any problems other than most of my fish tend to swim in the lower half of the tank.

I would be grateful, therefore, if

you could suggest any species which would occupy the upper half of the tank and live quite happily in a community aquarium?

In general you can choose fish with upturned mouths, indicating that they are surface feeders, to guarantee top swimmers. Well known examples are Mollies and Guppies, both suitable for the community tank. Others include Golden Medaka, the *Rivulus* species and quite a few Tetras.

A useful book is "All about Tropical Fish" by Derek McInerney & Geoffrey Gerard, George G. Harrap & Co., ISBN 0245 550771 (1966), who list the swimming area of each fish.

Blue acaras

I wish to set up a 4 ft. tank for *Aequidens pulcher* and any compatible Catfish. Could you please advise on water quality, filtration, decor and number of fish, etc. Which species of Catfish would be suitable?

Aequidens pulcher (the Blue Acara) is a bully to smaller fish but will accept equal size or larger fish. It likes to dig so use plastic plants or pre-potted real plants. The water can be de-chlorinated tapwater and the diet should be carnivorous, ie, beefheart, earthworms, shrimp, etc. and carnivore flake.

The fish will breed readily and are good parents—the male has longer dorsal and anal fins. Courting can be boisterous and the parents raise their young with great attention, therefore, if you want to breed the fish they should be kept alone in the aquarium. If you must have Catfish, choose some of the larger species from the *Corydoras* range. Up to 16 in your 4 ft. tank.

Cockatoo dwarf cichlid

I should like to breed the dwarf cichlid *A. cacatuoides* in a small way. Would you please be so kind as to send me some details of its maintenance and breeding including the maximum number of pairs per 2 ft. or 3 ft. tank for (a) maintenance (b) breeding?

How do they get along with other *Apistogrammas*?

A list of references, specifically on *A. cacatuoides*, including any in German would be handy.

The Dwarf Cichlid *Apistogramma cacatuoides* is commonly known as the Cockatoo Dwarf Cichlid or Crested Dwarf Cichlid. It originates from South

America where it lives among floating plants in slightly acid, softwater, at temperatures around 24°C. So reproduce these conditions in your 2 ft. or 3 ft. tank. The usual breeding set-up is one male and two females (and often both females have a nest, the male guarding both). They breed in the roof of hollows in the wild, so supply two or three pots laid on the side. The 3 ft. tank could hold a shoal, say three or four males and a group of females—six or eight with plenty of pots for breeding. Spawning is several times per year and the young are very small, so *infusoria* is needed, followed by brine shrimp.

The males are more vivid and slightly larger and they mix with other *Apistogrammas* in the maintenance tank without problems, but chasing will occur in the breeding tank, of course.

Read about them in "The Complete Aquarium Encyclopedia of Tropical Freshwater Fish", Dr. Ramshorst, Elsevier Phaidon, ISBN 0 7290 0009 5 (1978) and F-67.00 of TFH Exotic Tropical Fishes. More details from the Newsletters of the British Cichlid Association.

Channel catfish

Having just set up a 48 in. × 15 in. × 15 in. tank I have acquired a large gold catfish which I presume to be a "channel cat". (10 in. long). He is quite happy on a diet of dog food and the occasional earthworm, which incidentally he is not altogether fond of (he just leaves them to die off).

I have purchased two small catfish of what I presume is the same breed. I am hoping to grow them on with breeding in mind. Do you think this is on the cards as I believe they are river fish?

1. My questions are as follows is the tank large enough?
2. What power filter do you recommend (external) to back up a U/G system? Also what do I feed a snake-head on as he will eat nothing at all?
3. At what size do 'Sailfin Mollies' breed. (Green variety).

Your photograph is indeed of a "Channel Catfish", *Ictalurus punctatus*, also called the Spotted Catfish. These fish are intensively farmed in Southern U.S.A. and millions of tonnes are produced annually. The American housewife accepts the appearance of the fish and it is bought and cooked like our Cod or Herring.

The fish breed readily, using a pit dug in the mud base of ponds and are

good parents. The fish also readily accept artificial foods, hence its popularity with fish farmers.

There are no records of the fish breeding in the aquarium. The usual glass and gravel base would deter the fish, so you have a problem with your plans for breeding it.

If you want to power an undergravel filter your best bet is to get the "Atlantis P240" for one (or both) uplifts. This pump has an uplift adapter and special suckers for mounting in the corners—it is also silent. If you want an external power filter, the Atlantis X550 is designed for the 48 in. tank, but to supplement an undergravel the smaller X300 will suffice.

Female Sailfin Mollies are adult at 7 to 9 cm, but will breed during initial growth—about 6 months.

Gouramies

I am intending setting up a tropical fish tank using only different varieties of gouramies. The tank will be 36 in. x 18 in. x 12 in. with a Hagen Aquaclear Power Filter. Please could you give me any advice relevant to the successful keeping of gouramies.

Gouramies belong to the genus *Colisa* and there are four species, *Colisa chana* the Honey Gourami, *Colisa fasciata* the Giant Gourami, *Colisa labiosa* the Thick lipped Gourami and *Colisa lalia* the Dwarf Gourami. All are popular aquarium fish because they are undemanding and easily breed. The wild fish come from India, Burma, Thailand and are found in all types of water, being Anabantids they have air-breaking organs and hence can survive in low oxygen waters.

Therefore, no special aquarium conditions are required—include some floating plants to help anchor bubble nests and remove the power filter during breeding, still waters are better for the nest and fry.

Dwarf Egyptian mouthbrooders

Would you please help me identify a fish or, to be more precise, a pair of fish I was given by a young friend who lost interest in his tropical set-up. He purchased them from a dealer under the name of 'Egyptian Mouthbrooder'?

Basic coloration of both fish is salmon pink including finnage, with yellow to green eyes. The female is 6 inches long with no other distinguishing marks of coloration. The male is slightly larger at 7 inches and

has a series of zigzag silver lines along his flanks that make his scales look iridescent. His dorsal, caudal and anal fins have white spots between the rays of which there are 16 spiny and 12 soft on the dorsal fin.

They appear to be quite prolific breeders as two days after obtaining them they spawned, the male clearing a depression in the gravel where the female deposited the eggs; after fertilisation by the male she then took all the eggs into her mouth for 9 days, after which she 'spat' out a host of small fry, two of which died but 188 have survived. They are voracious feeders and take anything offered. At the time of writing they are 5 weeks old and are all $\frac{1}{2}$ to 1 inch long.

The fish you describe is *Haplochromis Multicolor*, usually called the Dwarf Egyptian Mouthbrooder. It is an African Cichlid and in recent reclassification of the species, the fish was renamed *Pseudocrenilabris multicolor*. However, all the aquarium books use the original name.

With 188 young, you do not need advice on how to keep and breed the fish!

Koi Alternative aeration

I have noticed that some pond-keepers use a different means of returning filtered water to their ponds by what appears to be an aerator below the surface. Can you provide some information on these, and if they are better than a waterfall which I prefer.

There are reasons for most things, and not everyone has the need, or the space to allow for construction of a waterfall. But if taking aeration by itself as the main factor, I doubt whether the under-water device you mention has any advantage over a waterfall, or that of an open-ended pipe return above the surface.

However, some people have suffered objections from neighbours by the noise nuisance of splashing water returns which sound much louder at night, and the return has to be at or near pond level with consequent loss of valuable aeration; or both problems solved to some extent by the use of an under-water return.

The type of aerator you are probably referring to operates on the simple principle of increasing the velocity of the flow of water from a pump through

the restriction of a venturi nozzle, sufficient to entrain air via a small connecting pipe open to atmosphere.

The consequent reduction in water output imposed by the restriction of the aerator can be quite marked, and becomes important if the pump is also expected to operate a filter at the same time. This could be of benefit in winter when there is less need of strong aeration, and a water return at, or just below the water level will keep open that important hole in ice and avoid unnecessary cooling as happens with a waterfall in winter.

Should you wish to experiment with this type of aerator, it need not be elaborate and a device offering little restriction to flow can be made up from a tee-piece, or by inserting a short length of $\frac{1}{2}$ to $\frac{3}{4}$ inch diameter pipe cut off at an angle facing towards the outlet, and pushed into a tight-fitting hole in the return pipe directed below water level.

Marine

Having kept freshwater tropicals for many years I have now set up my first marine tank, and would be very obliged if you could help me on a few points.

1. The tank is now maturing and all is going as it should, but one thing is worrying me and that is the pH of the water which seems to be high at about 8.7. Will this pH reading be O.K? If not is it possible to reduce it?
2. The reverse flow system is run by a Eheim power filter. How often should the filter medium be changed?
3. I would welcome your advice on stocking levels for say the first 3-6 months and suggestions for fish. I may add that my local shop is always very well stocked so that I would find making a choice bewildering.

Lastly, I will give details of tank which may affect your answers.

Tank size: 53 in. x 18 in. x 12 in.
Capacity after decorating: 27 gallons.

Temp: 76°. Specific gravity: 1.021.
Base medium: 12 lb of calcium plus per sq. ft. 12 lb of coral sand per sq. ft.

I do hope that you will not think me too moronic with these questions as I feel it much better to be safe than sorry.

Look forward to hearing from you.

1. pH of seawater: If your reading

of the pH value of the seawater is correct then there is something radically wrong with the brand of synthetic seawater which you are using, i.e. something is wrong either with the basic formulation or the method of blending is inadequate to achieve a truly homogeneous blend of all the different salts. Whether using natural tropical seawater or synthetic seawater, I have never recorded a pH reading higher than 8.5—and even that reading only after many hours of intense illumination in aquaria containing masses of *Caulerpa* algae which, photosynthesising at high level, were depleting the water of acidic CO₂, nitrates and phosphates. At such a high pH the toxicity of ammonium/ammonia becomes a vastly more serious problem than at the more normal pH8.1-pH8.3.

This abnormally high pH should be reduced before adding fishes or invertebrates by at least a 33% water change. You may even find that a 50% water change is necessary.

2. Reverse-flow filtration: Unfortunately, you don't state what filtrant media you are using in your power-filter. If you are using charcoal and filter floss, the charcoal should be changed whenever the seawater again begins to assume a yellowish coloration when viewed lengthwise through the tank. Filter floss lasts forever and simply needs a good rinse in the old rejected seawater every time you do a partial water change. If you are using cockle-shell and coral-sand in the power-filter, this material lasts indefinitely and should not need to be discarded in the life of the aquarium.

3. Stocking

(i) **Ratios:** for the first six months of your apprenticeship period I would stick rigidly to the old rule of 1 in. of fish to each 4 galls. of seawater. This would give you room for 7 in. of tough, hardy beginner's fishes. After this six months learning period is over, you could double this level of stocking, i.e. you have room for 14 in. of fishes overall, i.e. seven fishes at 2 in. long or two fishes at 7 in. long or any other combination of sizes which totals 14 in. total length;

(ii) **Species:** with regard to species of fishes to be chosen, rather than telling you what my selection would be, I would rather suggest that you buy a colour illustrated paperback book of coralfishes (—about £2.00 in 1984) and select from these pages the selection of fishes which you like the looks of. Then take this list to a well experienced dealer and ask him; a) to delete any fishes from the list which are unsuitable, i.e. too aggressive; too docile;

grow too large; not suitable for beginners, etc., and b) to rearrange the remaining fishes on your list into a suggested sequence of purchase in such a way that you purchase the most docile species first followed by the increasingly less docile species at suitable time intervals.

Discus

I wonder if you could help me? I am very interested in starting a Discus tank. The tank size is 5 ft x 2 ft x 2 ft. Prior to my interest in Discus I had marines in the tank which had 2 Eheim 2015 external filters, 2 Whisper 800 (for under-gravel) and 3 Rena 220 watt heaters.

Firstly, would this be adequate for Discus and, most importantly, I have been puzzled by many books about Discus where each one seems to state different conditions for housing i.e. water temperature, softness and acidity, could you please tell me the most accurate or widely used of the above? Secondly, the water here is very chalky so would the use of either peat or blackwater extracts be of any use?

I would lastly like to know how many Discus I could have. I intend buying them at about 1/2 in. in size, and is it alright to get more than one species, say 'browns', 'greens' or 'turquoise' and would it be safe to let them all stay in there to breed or do they require separate housing?

Your 5 ft x 2 ft x 2 ft aquarium will hold approx. 500 litres (110 galls) of water and when positioned in a warm room will need approx. 350 watts, in a cold room approx. 500 watts of heating. Although the above mentioned wattages are somewhat lower than the normally recommended ones, they are quite adequate. A great number of discus fish come to a very early end because their keepers are too generous with the wattage of the heaters. I have known cases where 600 watts were used in an 48 in. x 18 in. x 18 in. and a fine selection of discus died because the heat produced by a sticking thermostat of just a single 300 watt unit was much greater than the actual heat-loss of the aquarium. As there are, today, electronic thermostats, I can see no reason at all for anyone, but specially discus fish keepers, to use anything else but such a device.

The undergravel filters can certainly be disposed off since the 2 Eheim 2015 power filters are more than enough.

One could be used with a biological filtering media and left alone for several months, whereas the other could contain peat, or Optima, or both as a mechanical, chemical filter. Peat would put into the water certain hormones, trace elements and humic acids; it would lower the dKH somewhat and Optima would remove the coloration, ammonium, uric acids and nitrite without changing the hardness or pH values of the water. Although there is no need to run an airpump as well, most hobbyists like the gentle stream of bubbles rising through the water.

Discus fish are no different to any other fish if we consider their natural habitat and the way we keep them; they are very tolerant as to water conditions. Discus fish are found in the 'wild' in a water which is very low in dissolved salts and a varying pH. The lowest pH I found was just over 4 whereas the highest 7.7. Both kinds of water contained discus fish.

To recreate an Amazonian type of water to keep discus fish within the limits of an aquarium would be almost impossible; even if one were determined enough to have a go it would, within a very short time, take the pleasure away from keeping these lovely fish. There is just no need to go to these limits. We know today that discus fish can be kept successfully in a water with varying degrees of hardness and pH values. The extremes are: Zero degrees to about 22 degrees of hardness; and pH values: 4.5 (for short times) to about 8.4. At the extremes one would experience problems with the fish and the water would never be very stable for very long. The accepted range of hardness and pH is: hardness 4dGH to 10dGH and pH around 6.5. To breed discus fish, the water has to be somewhat lower in dissolved salts than one would need just to raise a shoal of youngsters. The water I use for breeding is 150 uS; this is approx. 4dGH and the pH is always 6.4 to 6.8.

Your aquarium will take about 7 to 8 fully grown fish but to raise 3/4 inch babies you will need many more. These small fish will get lost in 500 litres of water. If you could either raise these youngsters in a much smaller aquarium until they have doubled in size and lost their shyness and then transfer them to larger quarters or at least, put a divider into the large aquarium until they have settled down. The divider can be moved along as they grow and make use of the provided room. This way, you will always get a better fish.

All discus, regardless of colour, will breed with one another if that 'special something' is there.

What's new

Norwood Aquarium Ltd.

Another cold winter coming?

Last winter's bitter weather caught everyone by surprise, say aquatic wholesalers Norwood Aquarium, with the result that for a time there was a rush for garden pool heaters that caught a number of retailers around the country on the hop, and in many instances it took a time before supplies caught up with demand, but by then the damage was done.

The moral is: be ready in good time, Norwood advise. Among the reliable models on the market are the Lotus and the Uno pool heaters. Both work on the same general principle, having a protected heating element mounted in a float and working off mains voltage.

Their value is in allowing oxygen to enter the pool by keeping a patch of water free of ice, and thus preventing fish from suffocating.

They may be left all winter in the pool, and simply switched on when there is a threat of icy weather.

Another useful item that retailers should be featuring in the autumn is the pond net. They are particularly valuable where garden ponds are sited near trees, and prevent leaves falling in the water and rotting, with the possibility of fouling the water and killing the fish.

Norwood currently stock the Lotus net in three sizes. It is equipped with securing pegs, and also serves to protect ponds from the attentions of birds and cats.

'Lahaina' Tropical Aquariums are marketing two brand-new products developed by their designer, **Chick Holland**.

1. The Pressurised Constant Water Level System (C.W.L.).
2. The Gravity Pressurised Down Flow/Reverse Flow System with Optional Surface Flow/Cross Flow Facility.

The **Constant Water Level System (C.W.L.)** is a new, unique British water management system, invented by **Chick Holland**, which is designed to maintain the level of the water in an aquarium constant by dividing the tank up into a large viewing area, and a smaller reservoir compartment which is further subdivided

into two sections, housing the reservoir itself and all the other necessary electrical equipment (such as pumps and heaters).

Water from the main tank (viewing area) flows over a weir into the first pump-containing chamber (Compartment 1) and, in so doing, passes through a pre-filter. As water passes from Compartment 1 to Compartment 2, various aeration, biological and chemical filtration arrangements are possible. This is followed by heating and further aeration of the water prior to its return, under pressure, back into the main viewing area.

Once this sophisticated system (which can be refined and adapted to work in a number of modes) is in operation, it is virtually maintenance-free, apart from routine changing/cleaning of the filter media and the occasional topping up of Compartment 2 with fresh water. All the while, the level in the main tank remains constant.

The **Down Flow/Reverse Flow System** is a unique method of achieving a total main tank water turnover in a short space of time. 100% filtration and maximum biological build-up are ensured by means of the **'Lahaina'** new undergravel filter plates which incorporate specially-designed mesh supported by a grid (capable of taking the weight of rocks, substrate, etc.), overlying a system of drilled plastic pipes. Additional filtration, aeration and heating are provided for in a system of interconnecting chambers which can also be linked up to the C.W.L. system outlined above. A further refinement allows the system to be adapted to give a Surface Flow/Cross Flow effect which will increase the total turnover rate.

For full details of the above systems, both of which have *Patents Pending*, contact:

Chick Holland,
'Lahaina' Tropical Aquariums,
School Lane,
Udimore,
Rye,
East Sussex, TN31 6AT.
Tel: (0797) 224237.

WHEN we visited **Escot Aquaculture** for our *Company Profile* (see *Aquarist & Pondkeeper*, May 1985), we were struck by the enthusiasm, energy and

obvious ability of the proprietors, **John Clifford** and **Kohn Kennaway**, and by the tremendous potential of the site itself.

Things have gone very well for **Escot** who, after a highly successful summer season on both the coldwater and tropical side, are now involved in a number of significant developments.

For example, the coldwater wholesale department is expanding into a new warehouse on site. This is being combined with seven extra acres of rearing ponds and an extension to the Company's hatchery during the winter months. The team is also being strengthened by the appointment of **Dr. Paul Bryant**, a fish farmer himself, who specialises in nutrition and diseases.

Plans for the winter include extensive travelling by **John Clifford** and **John Kennaway** throughout Europe and the Far East, including Japan and Singapore, to select stock (coldwater and tropical) and suppliers for next season.

The tropical section at **Escot** is also expanding to include a wholesale and dry goods department. In addition, a new retail tropical shop has already been designed with full facilities for disabled fishkeepers, 350ft. of viewing area, and a regular supply of rare and brackish water species (also available to the Trade).

The interest in disabled fishkeepers has been taken a significant stage further in that **Escot** have recently launched their new **"Escot Dual-Line Stand"** designed by **Nick Lushchan** for use by wheelchair-bound and able-bodied aquarists alike. This stand has already been exhibited at various venues with great success and arrangements have been made with a leading manufacturer who will supply the specially-designed tanks.

One other recent development has been the installation of three ponds from the impressive **Deepools** range (see *Company Profile* in our July 1985 issue). **Escot Aquaculture** are now the main Stockists for **Deepools** and can supply and deliver individual ponds to order.

For full details of all the services available, contact:

John Clifford, Escot Aquaculture,
Escot Mews, Escot, Ottery St.
Mary, Devon, EX11 1LU.
Tel. (0404) 822188.

Company profile

The Waterlife Studio

As we all know, one little thing often leads to another, and another, and before you know it, you are inexplicably and inextricably involved in a series of events that can permanently alter your whole life. This is, in fact, what has happened to David and Elaine Leigh, the Managing Director and Company Secretary of The Waterlife Studio.

It all started quite innocently (!) with a Water Wheel (more about this product later). Having designed and produced a prototype, the next logical step was, of course, to find the best possible commercial outlet for it. After exploring several avenues, David and Elaine came to the inevitable conclusion that they could market the product as well as, and probably better, than anyone else. It was at this point that the "one-thing-leads-to-another" chain of events took over resulting, after several months of hectic activity, in the Grand Opening of The Waterlife Studio attended by David Bellamy at the end of last July.

The site itself has a great deal going for it, being, as it is, located within the thriving Booker Garden Centre near Marlow in Buckinghamshire. However, this on its own, cannot guarantee success. You need a great deal more than just rows of fish and plant-filled troughs and tanks—you need good, sound advice. This is the second major plus mark that The Waterlife Studio has going for it. David and Elaine Leigh, together with Director Glynn Smith, can, between them, tackle virtually anything dealing with the tropical freshwater and cold-water hobby.

On the tropical side, they can offer, in addition to the normal on-site advice, a full design and installation service for new and experienced aquarists. This is supported by starter-kits of various sizes put together by the Company and consisting of a tank, hood and complete range of accessories. Newcomers are also strongly urged to set up their tanks and allow them to settle down before buying any fish. This, of course, is not only sound advice but also goes a long way towards establishing goodwill on both sides.

The fish in the tropical room at The

Waterlife Studio are housed in 80 individually filtered tanks ranging in size from 2 to 4 feet. On average, there are 200 or so species in stock at any time. It was pleasing to see during our visit that the state of health of the fish was such that some were actually spawning in the shop tanks. Although this is not uncommon with species such as Guppies, Mollies and Swordtails, it is a consider-



The Waterwheel

ably rarer event with more difficult species. When it occurs, therefore, it can usually be taken as a sign that conditions are just right. Two species that were particularly active in this sense were Dwarf Gouramis (*Golisa lalis*) and Red-hump Geophagus (*Geophagus steindachneri*). In the former case, two tanks had, between them, no less than six bubble-nests staunchly being defended by their respective males in resplendent breeding colours, while the *Geophagus* tank contained several females carrying sizeable broods of eggs in their mouths.

Turning to the coldwater side, there was also a very comprehensive collection of both fish and plants. Whereas plants often play second fiddle to fish in many establishments, at The Waterlife Studio they are given equal billings. There were, for example, about 50 species of

marginals for ponds, 5 species of deep-water aquatics, 25 varieties of Lilies, plus a selection of other plants such as Lotus, Water Chestnuts and Water Hyacinths (both also suitable for outdoor ponds in summer) and Caladiums, better suited to indoor ponds.

Plans are also already in hand to take things further on the plant side by setting out a $\frac{1}{2}$ -acre site for the propagation and resale of pond plants.

At the moment, most of the fish, ranging from small Comets to Koi, are housed under cover in three bays of holding tanks, each filtered mechanically and biologically by large Ashford pond filters.

Some of the fish can also be viewed in a selection of splendid fully stocked outside ponds which give an indication of what can be achieved with a little care and thought. This is further backed up by a full design, installation and maintenance service closely matching that offered for tropical aquaria.

One of the ponds has a rather special touch in the form of the charming Water Wheel developed by David Leigh and referred to in the opening section of this article. In many ways, the Water Wheel is a reflection of David's thorough, professional approach to everything he does. It is, for example, an accurate (48 cm. diameter) scaled-down model of an existing Water Wheel which is over 100 years old. It runs smoothly and quietly and is built from rust-proof, frost-proof and ultra-violet ray-proof materials, carries a seven-year guarantee and is supplied complete with a supporting frame, bearings, header pool and $\frac{1}{2}$ in. hose connector—all for £130. It can even be supplied with a pump and 2 ft x 3 ft x 4 ft Mill House for £295, plus carriage.

Full details of this, plus all the other services and products on offer (including waterfalls, fountains, ornaments, liners, dry goods, etc.), may be obtained from David or Elaine Leigh, or from Glynn Smith, at The Waterlife Studio, Booker Garden Centre, Bar-moor House, Clay Lane, Booker, Nr. Harlow, Bucks, SL7 3DH. Tel. (0494) 26865.

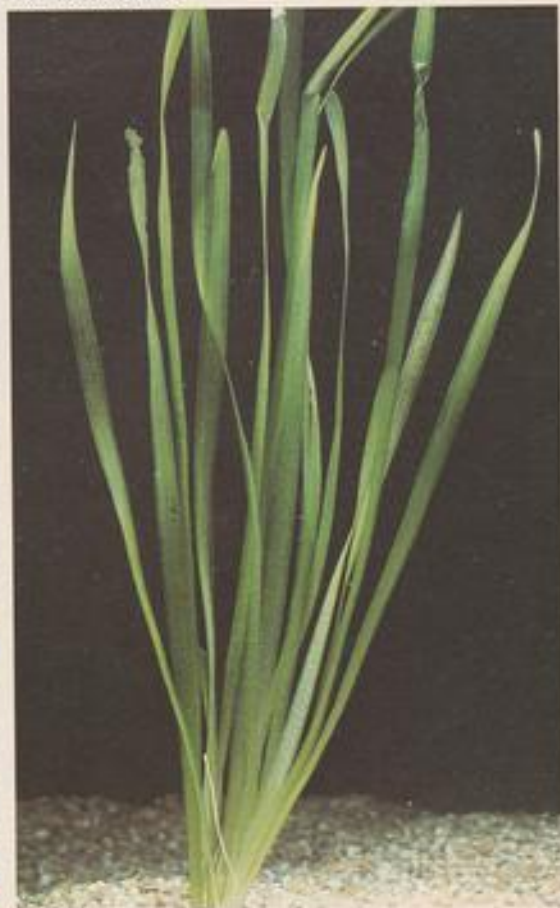
THE MOST POPULAR AQUATIC PLANTS IN BRITAIN

Barry James describes and illustrates those aquarium plants which, in his experience, find most lasting popularity among British aquarists.

Cryptocoryne affinis



Vallisneria spiralis



Over the last 25 years that I have been supplying aquatic plants, the same species have retained their popularity. This is despite the fact that numerous new species have become available, many of which are easier to grow and are more attractive in appearance. It was only when the editor asked me to write this article that this fact really registered. Why should this be? I think the answer lies in several reasons. Firstly, the British are creatures of habit. Once a name is fixed in their mind they ask for the same item automatically. Secondly, the growers in Singapore have geared themselves up to grow these species in vast numbers and therefore the price is very reasonable compared with newer introductions. Lastly, I think that the plants themselves have proved attractive, easy to grow and are capable of putting up with a certain amount of rough treatment in the hands of dealers and so are on sale for a longer period than some of the more tricky species. In order of popularity

they are: Green Cabomba, *Egeria densa*, Amazon Sword, Vallisneria, Water Wisteria and *Cryptocoryne affinis*.

Coming from South America to the Southern States of the U.S.A., Green Cabomba (*Cabomba caroliniana*) is a hardy plant which will survive quite happily at 55°F. However, it will not make a lot of growth at this temperature but needs 68-75°F to really make progress. The segmented leaves are arranged alternately around the stem, and are dark green in healthy specimens. A little known fact is that this genus is allied to the water lilies. It displays this affinity when it produces tiny arrow-headed floating leaves when flowering occurs. The flowers themselves are only $\frac{1}{8}$ in. or so in diameter and white in colour. They are only rarely produced in aquaria but commonly on daylight-grown plants. In spite of its easy going nature many people have difficulty growing this plant. It seems to appreciate well-aged water and abundant light, especially in summer. Weaker illumination, however, will be tolerated

in winter. If successful it will wind itself around the surface of the aquarium and may reach a length of 5 feet. Cabomba should be pruned regularly to encourage the production of side shoots and a bushy habit. If unhappy, Cabomba progressively drops its lower leaves until, finally, the top of the stem becomes brittle and snaps off. Fish will be seen greedily pecking at the decaying remains of the stems and leaves; a habit which many people conclude must mean that the fish are eating the plant. In fact they are merely browsing on the micro-organisms which themselves are feeding on the disintegrating tissues.

Egeria densa was formerly known as *Elodea densa* and this name is still commonly used. It is an undemanding plant which will thrive over a vast temperature range. It will even grow outside all year in favoured areas of Cornwall and Devon. As a tropical aquarium plant it is unrivalled tolerating temperatures in the low eighties Fahrenheit. However, the most luxuriant

Egeria densa



Hygrophila difformis





Echinodorus paniculatus or Amazon Swordplant is an old favourite from Central America.

growth is made at much lower degrees of warmth. Around 60-70°F seems to suit it best when it will produce large whorls of bright green to almost mauve coloured leaves. It can grow up to 10 feet in length, but repeated pinching out of the growing tips will keep it nice and bushy. White male flowers are sometimes produced. Female flowers are unknown in cultivation. Rooting is somewhat weak but the plant readily absorbs nutrients through its leaves, so liquid rather than tablet fertilizers are called for. Lighting should be quite bright as it grows in open situations in the wild. The temperate zones of South America are its original home although it has been introduced all over the world and thrives where conditions suit it.

The Amazon Swordplant (*Echinodorus paniculatus*) is an old favourite. Like all the members of this genus its home is the Americas. This particular species ranges from Central America down to Argentina. Plants sold in the U.K. are almost exclusively cultivated in Singapore. They are exported in two forms: those specimens grown out of water and those grown submersed. The former are stubby plants with thick lanceolate leaves and short petioles. Often specimens have flower stems attached when exported. When the growing fields are flooded the submersed form is produced. During the change from emersed to submersed growth, whether this is in cultivation or in the aquarium, many of the outer leaves are lost. As they turn yellow they should be removed. How-

ever, the central leaves of the rosette elongate, become softer, lighter-green and will reach a height of 18 in. Amazon Swords are gross feeders and need plenty of room to grow, so plant them near the middle of the tank otherwise the symmetry will be destroyed. Aquarium grown plants have shorter petioles than imported specimens and are much tidier looking plants. They are very subject to attack by snails so these should be removed or killed. Often, even when growing submersed, flower stems are produced. These, however, do not develop underwater but instead produce viviparous plants along its length. Allow them to reach a height of 6 in. before pegging them down into the gravel with lead wire. After a few weeks they will be about 9 in. tall and can then be separated from the mother plant and moved if desired. Amazons thrive from 72-82°F and require moderate to good lighting. They are seemingly indifferent to pH and DH levels.

Tape Grass or Vallisneria is our fourth candidate in the popularity stakes. *Vallisneria spiralis* or 'Straight Vallis' and *Vallisneria spiralis* or 'Twisted Vallis' which has beautiful corkscrew-like leaves. These grassy plants are much used as background plants, the straight variety in deep tanks where it reaches a height of 18 in., and the twisted variety in shallower tanks no more than 12 in. deep, or in deeper tanks as a middle-ground plant. Both varieties increase rapidly by runners, and have to be severely curtailed if they are not to over run the tank. Again, they are not exacting regarding the temperature coming from both Sub-tropical to Tropical zones. They respond very badly to under-gravel filtration, often becoming stunted to only an inch or so in height. Funnily enough this abnormal growth can look most attractive. Moderate lighting and an indifference to pH and DH conditions are other factors in the popularity of these versatile species.

Water Wisteria

Water Wisteria (*Hygrophila difformis*), formerly known as *Synsenna triflorum*, was first imported into this country in 1954 by the late Colin Roe. It has remained popular ever since and is always in the top selling list. It is a highly variable plant which grows as a weed in Far Eastern ricefields. Emergent leaves are grey-green and slightly hairy. The small leaves are entire or slightly toothed. Submersed its true beauty can be seen. Huge light-green finely divided leaves, which closely resemble the Sumatra Fern in some of its forms, are borne on stout



Cabomba caroliniana is an extremely popular plant that requires high illumination for healthy growth.

fleshy stems. It requires a minimum temperature of 78°F but prefers soft slightly acid conditions to be seen at its best. It propagates easily from root, stem and even leaf cuttings. Looks best in the rear corners of the aquarium where it will reach a height of 18 in. or more. So far all the plants previously mentioned have been selected species which belong to large groups, and are all centre-ground or background plants. However, the sixth best selling plants are various species of the genus *Cryptocoryne*.

These plants have rightly caught the imagination of aquarists for their versatility, hardiness, utility and, above all, for their long lasting properties. Coming from the Far East they range from dwarf plants only an inch or so high such as *C. nevilli* to giants such as *C. usteriana* which will reach a height of 2 feet under ideal conditions. In between these two extremes are plants which will occupy all three regions of the tank: foreground, middle-ground and background. Leaf colour ranges from the apple-green of *C. pontederifolia* to the deep red of *C. purpurascens*. Leaf shapes are similarly varied: from lanceolate to caudate, from smooth to bullate. *Cryptocorynes* are perennial plants, and do not like being disturbed once planted. They are mostly slow growing and hence fairly expensive, but if they are allowed to increase naturally, fine stands become established after a year or so and go on getting better year by year. Space does not permit me to deal with individual species but we may go into more detail later.

THE ISRAELI EXPERIENCE

Stand on the beach in the water and watch Yellow tailed Tangs, Blue Tangs, Boxfish and Parrotfishes swimming around your feet. John Dawes describes this experience.



Question: Where can you stand on a beach facing seawards and have three separate countries in your field of view at the same time, in addition to the country you are in?

Answer: The beach at Eilat on the Red Sea coast of Israel.

This remarkable state of affairs is just one of the many pluses that make this part of the world an absolute must for anyone who, like me, is captivated by the natural history of coral reefs and the almost indescribable beauty of their inhabitants.

The small Israeli town itself lies snugly at the northern end of the Gulf of Eilat (Aqaba), and the countries referred to above are Jordan, (its only port, Aqaba, being a stone's throw away from Eilat), Saudi Arabia and Egypt. The scenery is rugged, dramatic and arid, and the weather, even in winter, is warm and sunny, except during sandstorms when it is warm and dusty and gives you a feeling in your throat as if you had swallowed a bagful of talcum powder.



Main picture The Underwater Observatory is reached via a spiral staircase which descends down the central supporting column of the circular building at end of the jetty.

Above Among the rarer inhabitants of the reef are the magnificent "soulful-eyed" Toadfishes, *Riekertia allisi*.
All photographs by the author.



Usually, unpleasant spells of this kind only last for a day or two. During the summer months the heat is, as they say, "something else", but if you visit the area in winter, as we did last January, the sun is still high in the sky, the sea is a "delicious" 25°C and the cost of a trip very reasonable indeed. Add to this a water clarity that is almost unbelievable, Boxfishes within a metre of the shoreline, a protected stretch of coral reef extending several miles down the coast and Parrotfishes measuring 2ft. in length, and you begin to get an idea of what dreams are really made of.

This is just as well because Eilat itself is not that great. In fact, it looks and feels very much like other tourist resorts much closer to home, except that you can get mouthwatering falafels, kebabs and other exotic delicacies in lovely warm pitta bread just as easily as you can get a hot dog here. However, we visited the area to look at the fish and, in this respect, you have to score the place, particularly the Coral Beach, 200 out of 100!

As soon as you put your face mask on and look below the surface, the magic really begins. You don't even have to swim—all you have to do, if you feel so inclined, is to stand a few feet away from the shore with the water reaching no further up than your waist, bend forward,

dipping your mask just below the surface, and have a look. If you haven't experienced having shoals of Yellow-tailed Tangs (*Zebrasoma xanthurus*), also known as Blue Tangs, Boxfish (*Ostracion cubicus*) and Parrotfishes (*Scarus gibbus*) so near that you can, literally, touch them, the sensation is quite breathtaking.

As soon as you swim off in the direction of the large coral heads that lie parallel to the shore along the several miles that make up the marine reserve at Coral Beach, you move into a world that is so magnificent that you forget everything else as you are bombarded from every direction by the "force" of the beauty that surrounds you. Gradually, as partial control of your brain returns, you begin to see things that look familiar but "not quite right". For example, there are numerous Triggerfish which are unequivocally identifiable as Picasso Triggers. Yet, here in the Red Sea, they belong to a different, but similar, species to the *Rhineacanthus aculeatus* that most marine hobbyists are familiar with. The ones swimming around you so tamely that you can hand-feed them if you have the patience (and I have a lot of patience for such things) belong to the species *Rhineacanthus assani*. The same goes for the Clown Fish which come out to display in front of you and defend their anemone whenever you poke your

face just that little bit too close. They are unmistakably an *Amphiprion*, but one not often seen in the hobby, *A. bicinctus*. On the other hand, some of the old familiar faces are there as well. Prominent among these are the Cleaner Wrasses (*Labroides dimidiatus*) and the Lionfishes (*Pterois volitans* and *P. radiata*).

Taking the Cleaner Wrasses first, they play a major role in the overall health of a reef through their removal of parasites from other fish. The lengths to which some fish go to obtain "treatment" was very forcibly brought to me by the behaviour of a 3ft. Flute Fish (*Fistularia petimba*). Normally, Flute Fish swim in the upper and middle reaches. However, I saw one, from some distance away, almost resting on the bottom. This seemed a bit odd so I slowly swam towards it until I was

Left This Diagonal-lined Butterfly, *Chaetodon fasciatus*, is being cleaned by a medium-sized Cleaner Wrasse, *Labroides dimidiatus*. **Centre** The almost sponge-like appearance of this Angler Fish, *Antennarius* sp., provides the perfect formula for its sedentary, but predatory, way of life. **Right** Coral Trout (actually they are Groupers), *Variola louti*, are common predators on the Red Sea reefs.



floating some 2 metres directly above it. There was no doubt that the fish had seen this large (well, relatively speaking!) "predator" approaching because it reacted with dramatic and very fast changes in coloration. However, it remained stubbornly where it was, lending strength to my belief that there was something very wrong with it. I therefore dived and approached it. I got within 18 in. of it and it still wouldn't move. Just as I was going to reach out to inspect it, a really tiny Cleaner Wrasse emerged from inside the Flute Fish's gill cover. No wonder the Flute Fish stuck to its "seat". Its changes of colour immediately assumed their real significance. I was being told in no uncertain terms, "I'm being done at the moment—You wait your turn!"

Although my encounters with Lionfish were not quite so eventful, they were no less interesting. The reputation of these venomous fish is so well established that it warrants no further description here. What merits mention is the impressive beauty and non-aggressive behaviour of these fish in the wild (as long as you have a bit of sense and don't attempt to handle them, of course).

Lionfish spend most of their time resting on, or very close to, the bottom, sides and even roof of cavities in the reef. As you dive into one of these and

look around, it is quite uncanny to see how an 8 in. Lionfish can rest so comfortably at such impossible angles, paying little if any attention to your intrusion. Under such conditions, these fish can be seen in their real "colours", i.e. not as highly venomous rarities but as just fascinating inhabitants of the complex reef community.

Of course, not everyone likes diving on reefs. Tales from elsewhere, some substantiated, of shark and barracuda attacks (both types of fish occur in the Red Sea) can, quite understandably, put many people off. Anyone who falls into this category is superbly catered for by the Aquarium and Underwater Observatory, known as The Coral World, situated at the southern end of the Coral Beach marine reserve. There can be little doubt that the collection of Red Sea fish, seaweeds and invertebrates owned by The Coral World is the best in the world. To put it mildly, it is mind-blowing! Admittedly, the people in charge have a lot going for them. For a start, they have the reef on their doorstep. In fact, it goes further than that—the underwater observatory is built on the reef itself. It is approached by means of a jetty/pier at the end of which there is a spiral staircase leading down to a circular observation chamber which sits on the reef and looks out over it in all

directions through toughened circular windows. Whether you are a diver or not, you must visit the observatory, you will not be sorry.

The Aquarium works on an open filtration system which basically involves taking water from the sea and returning it via an outflow pipe after it has been pumped through the tanks. These are divided into outdoor ones housing sharks, rays and turtles, and including the impressive "walk-in" reef tank, and indoor ones accommodating everything from Spanish Dancers (Nudibranch molluscs) to Groupers (*Variola*), Flashlight/Lantern Fishes (*Photoblepharon*) and Toadfishes (*Riehertia*).

Great skill at the top is, obviously, required to run such a delicate, finely balanced, enterprising set-up. In this respect, The Coral World can boast two of the most knowledgeable, pleasant, unselfish people imaginable. From Day 1, Eitan Levy and David Fridman helped me in every way they possibly could and provided me with an insight into Red Sea fauna that has changed my whole outlook on how marine organisms can and should be kept.

Relevant details of brochures and sets of colour slides are available from The Coral World, Underwater Observatory and Aquarium, P.O. Box 829, Eilat, Israel.



Meet the societies



Bury & District Aquarist Society

Bury & District Aquarist Society was formed in 1950 to "promote interest in fishkeeping and to raise the standard of fish kept by members". Thirty five years later, this Society is still going strong and must have a great deal going for it judging from the fact that some of the original members are still active in Society activities today.

A good example of how B.A.D.A.S. attempts to fulfil its aim of raising standards is the Breeders' Award Scheme in which members are encouraged to breed their fish under competitive conditions. There are four grades in the scheme, ranging from the breeding of 'easy' species to 'difficult' ones. As each grade is achieved, members receive a Grade Card, the final accolade

being the Master Breeders Award, presented on successful completion of all four grades. At the moment, B.A.D.A.S. members keep a wide range of tropicals, coldwater, marines and plants, covering virtually the whole spectrum of possible.

Although membership of B.A.D.A.S. is not large, the monthly meetings are well attended. No doubt, the programme on offer, plus the pleasant atmosphere, have a great deal to do with this. The meetings are held on the first Tuesday of the month, starting at 8.30 p.m. at the Royal Hotel, Silver Street, Bury.

Activities include lectures by members and visiting speakers, slide shows, Table Shows, facilities for borrowing books from the Society's library and Open Nights. The Table Shows carry trophies for each Class, plus annual awards for the member with most points and for the one with most entries throughout the year.

Characins, Rasboras, Killifish, Cichlids, Catfish, Coldwater species, Marines, Plants and other subjects have all been featured at one time or other in the B.A.D.A.S. programme, both in lectures and in competitions.

At 5p per book per month, the library offers incredible value for money to members and is, quite naturally, always in great demand during meetings.

Because of the Society's relatively

modest size at the moment, few large social events can be organised. However, groups of members regularly get together and travel to events and places of aquatic interest. One such trip was to one of the Open Days which King British of Bradford hold from time to time. Those who attended were given talks and demonstrations and were taken on a tour of the factory and other departments. The visit proved to be both interesting and informative.

On Open Nights, the Society invites other neighbouring Societies, such as Bridgewater A.S., to attend the meeting. The invitation is then reciprocated, thus encouraging the strengthening of friendly ties between the various clubs. Joint activities that take place on Open Nights include Inter-club Table Shows.

Members of B.A.D.A.S. regularly compete (reportedly quite successfully) at the British Aquarist Festival staged at Belle Vue, Manchester, by the Federation of Northern Aquarium Societies (F.N.A.S.) to which the Society is affiliated.

If you live in the Bury area, you would be made very welcome at any of the meetings. Subscription Rates: Single, £3.00; Double, £3.50; Juvenile, £1.00.

Apply to: Mrs. Dorothy Hodges, 6 Eton Hill Road, Radcliffe, Manchester.



King's Lynn Aquarist Society

King's Lynn Aquarists Society will shortly be celebrating its tenth anniversary (in February actually).

From personal experience (having known some members for several years and having recently participated in one of the Society's meetings), we can assure anyone contemplating membership that they will be made most welcome indeed. Not only are the get-togethers held in a warm, friendly atmosphere, but the knowledge and expertise of some of the members ensure that a wealth of valuable advice is always available.

There are, in fact, two types of meeting held every month so make sure that you make a note of the 'right' one in your diary. On every second Thursday, there is the 'normal' meeting open to all existing and potential members. Regular invitations also go out to neighbouring Societies with

whom there is a reciprocal agreement. On every third Thursday, there is another meeting, but this time it is restricted to Committee members only.

This arrangement eliminates the potential problem of filling up members' evenings with administrative matters and cutting into the time available for lectures, raffles, Bench Shows, discussions, etc.

The venue for the meetings is The Victoria Public House, Loke Road, King's Lynn, with proceedings getting underway at 8 p.m.

During Club nights, a range of activities is always provided. For example, major speakers may be invited and, although virtually the whole evening may be dedicated to the lecture and ensuing discussion, time is always made available for Society announcements and other equally important aspects of business. Prominent among these are raffles, quizzes, a regular Bench Show and the 'opening' of the K.L.A.S. shop and library.

Since some of the members own fish houses and regularly breed large numbers of fish (including some of the rarer and more difficult species), there is usually an interesting selection available for exchange and/or sale.

Each month's Bench Show concentrates

on two Classes of fish. One is always for A.O.V. (Any Other Variety) and the other is a pre-selected one announced in the previous month's Newsletter. Points are accumulated over the year and go towards the award of various trophies at the Society's A.G.M. in November. The main awards are the Shield presented to the member with most points, the A.O.V. Trophy and the Champion of Champions Trophy. Competition for the last of these is open to anyone who wins a 1st, 2nd, or 3rd prize at the monthly Bench Shows.

A further trophy is presented at the K.L.A.S. Open Show to the member with the top number of entries.

For the last six years, the Society has held one of these major Shows as the high point of its annual programme of events. They have all proved to be very successful and have attracted entries from far and wide.

Every year trips are also organised to major Shows and shops, even though the Society has its own successful 'shop and library'.

If you are interested in attending any of the K.L.A.S. meetings, you are cordially invited to do so. Subscription Rates: Single, £2.00; Double, £3.00.

Apply to: Mr. M. Laws, 'Sun Ray', Westwinch, King's Lynn, Norfolk.

News from the societies



Blackburn Aquarists & Waterlife Society members who completed a 15 mile sponsored walk.

Blackburn Aquarists & Waterlife Society

A 15 mile Sponsored Walk was completed by our members and raised approximately £140. The money is to go towards providing a 4 ft. cabinet tropical aquarium for our local hospice which is called the East Lanes. Hospice, Park Lee Hospital, Blackburn. The aquarium

is beneficial to patients and visitors to the hospice and to our members in learning about the setting up and maintaining of an aquarium.

Runcorn Aquarist Society

Monday, 13th January 1986, Runcorn Aquarist Society Annual General Meeting to be held at the South Bank Hotel,

Lord Street, Old Town, Runcorn at 8 p.m. New members welcome. Further details from Mrs. R. Muckle, 23 Adela Road, Runcorn, Cheshire WA7 4TU. Tel: Runcorn (092 85) 76099.

Bradford & District Aquarists Society

10th November: Open Show. Details obtainable from show secretary, Mrs. S. Hinchliffe, 9 Bartle Lane, Great Horton, Bradford. Tel: 0274-502269.

Reigate & Redhill Aquarist Society

Information concerning the whereabouts of the undermentioned trophies (awarded at our last Open Show in 1979) would be greatly appreciated and should be sent to: Mrs. M. Corbutt (Secretary R. & R.A.S.), 64 Holmesdale Road, Reigate, Surrey. Tel: 41413.

1, The Crawley Aquarium Cup; 2, The Interpet Trophy; 3, The Fighter Cup; 4, The Killie Challenge Cup; 5, R.R.A.S. Shield; 6, Wood Trophy; 7, N.U. Trophy; 8, G. & M. Trophy; 9, 1969 Committee Trophy; 10, Daphne Morris Cup; 11, Wright Trophy; 12, The Society Trophy.

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